FINAL REPORT

WHO PROJECT

Mapping of National Centres / Institutions on Tropical Diseases in India

Prof. N.K. Ganguly
Distinguished Biotechnology Research Professor and Advisor
Translational Health Science and Technology Institute
National Institute of Immunology
New Delhi
Table of Contents

Abbreviations and Acronyms..........................................................3
Executive Summary.................................................................8
1. Team members.................................................................10
2. Diseases covered............................................................10
3. Project outline...............................................................11
4. Mapping strategies...........................................................11
   4.1. Areas addressed.......................................................12
   4.2. Methodology............................................................13
5. Profile.............................................................................18
6. Strengths..........................................................................95
7. Funding............................................................................227
8. Outputs............................................................................242
9. Comparative Analysis......................................................258

APPENDIX – I: Questionnaires used in the survey..........................279
APPENDIX – II: Private sector organizations that contribute to tropical diseases in the area of drugs, diagnostics and vaccines..................................................285
APPENDIX – III: List of institutes and allied information for different zones......287
ABBREVIATIONS AND ACRONYMS

A
ADF - Actin-Depolymerizing Factor
AICTE - All India Council for Technical Education
AIDS - Acquired Immune Deficiency Syndrome
AFLP - Amplified Fragment Length Polymorphism
ART - Anti Retroviral Therapy
ASEAN - Association of Southeast Asian Nations
ASO - Anti-Streptolysin O
ATP - Adenosine triphosphate

B
BAL - Bronchial Alveolar Lavage
BCG - Bacillus Calmette-Guérin
BMOH - Block Medical Officer- Health
BSL - Biosafety Laboratory

C
CAD-CAM - Computer Aided Design and Computer Aided Manufacturing
CAPD - Continuous Ambulatory Peritoneal Dialysis
CD - Circular dichroism
CDC - Centers for Disease Control and Prevention
CEP - Continuing Education Programme
CFA - Colony Forming Assay
CHIK - Chikungunya
CIEP - Countercurrent-immunoelectrophoresis
CMC - Christian Medical College
CME - Continuing Medical Education
CNS - Central Nervous System
COE - Centre of Excellence
CoMFA - Comparative Molecular Field Analysis
CoNS - Coagulase-negative staphylococci
COPD - Chronic Obstructive Pulmonary Disease
COSIST - Commission for Strengthening of Infrastructure in Science and Technology
CPCSEA - Committee for the Purpose of Control and Supervision of Experiments on Animals
CRP - C-reactive protein
CTX - Cholera toxin

D
DC - Dendritic Cell
DCGI - Drugs Controller General of India
DCP - Diploma in Clinical Pathology
DDT - Dichlorodiphenyltrichloroethane
DEC - diethylcarbamazine
DEN - Dengue
DHFR - Dihydrofolate Reductase
DHPS - Dihydropteroate Synthase
DLT - Diploma in Laboratory Technology
DOTS - Directly Observed Therapy, Short-course
DNA - Deoxy Ribonucleic Acid
DNDi - Drugs for Neglected Disease Initiative
DSC - Differential Scanning Calorimetry
DST-FIST - Department of Science and Technology Fund for Improvement of S & T Infrastructure
DTM&H - Diploma in Tropical Medicine & Hygiene
DTO - District TB Officer

E
ELISA - Enzyme-linked Immunosorbent Assay
ELISPOT - Enzyme-linked Immunospot
EM - Electron Microscope
EPTB - Extra-Pulmonary Tuberculosis
ETEC - Enterotoxigenic E. coli

F
FAB - Fast Atom Bombardment
FACS - Fluorescence Activated Cell Sorter
FIND - Foundation for Innovative New Diagnostics
FPLC - Fast Performance Liquid Chromatography
FT-NMR - Fourier Transform Nuclear Magnetic Resonance

G
GAPD - Glyceraldehyde-3-phosphate dehydrogenase
GC-MS - Gas Chromatography-Mass Spectrometry
GFATM - The Global Fund to Fight AIDS, Tuberculosis and Malaria
GFP - Green Fluorescent Protein
GIS - Geographical Information System
GMP - Good manufacturing practice
GR - Geographical Reconnaissance
GST - Glutathione-S-transferase

H
HEK - Human Embryonic Kidney (cells)
HHV - Human Herpes Virus
HI - Hemagglutination inhibition
HI - Hirsch index
HIV - Human Immunodeficiency Virus
Hly - Hemolysin
HPV - Human Papilloma Virus
HPLC - High Performance Liquid Chromatography
HPTLC - High Performance Thin Layer Chromatography
HR-MAS - High-resolution Magic Angle Spinning
HTS - High Throughput Screening

I
IAVI - International AIDS Vaccine Initiative
IBSC - Institutional Biosafety Committee
ICAM - Intercellular Adhesion Molecule
ICDDR-B - International Centre for Diarrheal Disease Research, Bangladesh
ICE - Integrating Conjugative Elements
ICTC - Integrated Counseling and Testing Centre
ICU - Intensive Care Unit
IDSP - Integrated Disease Surveillance Project
IEC - Information Education and Communication
IEC - Institutional Ethics Committee
IFA - Immunofluorescent Assay
INCLEN - International Clinical Epidemiology Network
iOWH - Institute for One World Health
IP - Intellectual Property
ITMN - Insecticide Treated Mosquito Nets

J
JE - Japanese encephalitis

K
KFD - Kyasanur Forest Disease

L
LAP-LPS - Lipid associated protein-lipopolysaccharides
LF - Lymphatic Filariasis
LPA - Lypophosphatidic Acid
LVT - Leprosy Vaccine Trial

M
MALDI-TOF - Matrix-assisted Laser Desorption Ionization - Time of Flight
MAP - Mitogen activated protein
MDR-TB - Multi-drug resistant tuberculosis
MDT - Multi-drug Therapy
MHC - Major Histocompatibility Complex
MLT - Medical Laboratory Technology
MODS - Microscopic Observation - Drug Susceptibility
MoU - Memorandum of understanding
MPLC - Medium Pressure Liquid Chromatography
MRSA - Methicillin Resistant Staphylococcus aureus
MSF - Medecins Sans Frontieres

N
NAC - Neutralizing Antibody Consortium
NACO - National AIDS Control Organization
NCE - New Chemical Entity
NGO - Non Government Organization
NMITLI - New Millennium Indian Technology Leadership Initiative
NRL - National Regulatory Laboratory
NVBDCP - National Vector Borne Disease Control Programme

O
ORF - Open Reading Frame
ORS - Oral Rehydration Solution
OPD - Out-patient Department
OSDD - Open Source Drug Discovery

P
PAGE - Polyacrylamide Gel Electrophoresis
PCA - Principal Component Analysis
PCR - Polymerase Chain Reaction
PFGE - Pulse-field Gel Electrophoresis
PKDL - Post-Kala-azar Dermal Leishmaniasis
PMTCT - Preventing Mother-to-Child Transmission (of HIV/AIDS)
PneumoADIP - Pneumococcal vaccines Accelerated Development and Introduction Plan
POC - Point-of-Care
PPTCT - Preventing Parent-to-Child Transmission (of HIV/AIDS)
PTB - Pulmonary Tuberculosis

Q
QA - Quality Assurance
QC - Quality Control
QSAR - Quantitative Structure Activity Relationship
QPCR - Quantitative Polymerase Chain Reaction
QIP - Quality Improvement Programme

R
RAPD - Random Amplification of Polymorphic DNA
RBC - Red Blood Cell
R&D - Research and Development
RFLP - Restriction Fragment Length Polymorphism
Rh - Rhesus (blood group)
RHD - Rheumatic Heart Disease
RNTCP - Revised National TB Control Programme
ROM - Rifampicin, Ofloxacin, Minocycline
RPR - Rapid Plasma Reagin
RS - Remote Sensing
RT-PCR - Reverse Transcription Polymerase Chain Reaction

S
SAARC - South Asian Association for Regional Cooperation
SAIF - Sophisticated Analytical Instrument Facility
SAPNA - South Asian Pneumococcal Network Alliance
SAR - Structure Activity Relationship
SBFTIR - Single bead Fourier Transform Infrared (Spectrometer)
SDS-PAGE - Sodium Dodecyl Sulfate Polyacrylamide Gel Electrophoresis
SEM - Scanning Electron Microscope
SID - Society for Innovation and Development
siRNA - Small Interfering Ribonucleic Acid
SODIS - Solar Disinfection (of drinking water)
SPARSHA - Society for Positive Atmosphere and Related Support to HIV/AIDS
SRL - State Referral Laboratory
STD - Sexually Transmitted Disease
STEM - Scanning Transmission Electron Microscope
STI - Sexually Transmitted Infection
STO - State TB Officer
SXT - Sulfamethoxazole-Trimethoprim

T
TBNA - Transbronchial Needle Aspiration
TD - Tropical Disease(s)
tRNA - Transfer ribonucleic acid
TEM - Transmission Electron Microscope
TGA - Thermogravimetry
TOT - Transovarial Transmission
TWAS - Third World Academy of Sciences

U
UGC - University Grants Commission
UNDP - United Nations Development Programme
UNESCO - United Nations Educational, Scientific and Cultural Organization
UNICEF - United Nations Children's Fund
UP - Uttar Pradesh
UPSACS - Uttar Pradesh State AIDS Control Society
USAID - United States Agency for International Development
UV/IR - Ultraviolet/Infrared

V
VCTC - Voluntary Counseling and Testing Centre
VDRL - Venereal Disease Research Laboratory

W
WHO - World Health Organisation
WN - West Nile

X
XDR-TB - Extensively Drug-resistant Tuberculosis
Executive Summary

Tropical diseases comprise of a major group of diseases, some of them often neglected, but nevertheless responsible for a major share of the mortality and morbidity in the tropical regions of the world. This is particularly true for the South East Asia Region, and especially so for a country like India. A number of major tropical diseases that pose a significant threat to the health and well-being of the Indian population, were short-listed, and on the basis of which, the centres and institutes of national importance, as well as some major universities and private organizations that have contributed significantly to the area of Tropical diseases, were mapped. The major purpose of the mapping exercise was to identify the key institutes in the area of Tropical diseases on the basis of their strengths, by way of scientific expertise and infrastructure; their funding, received from government, non-government, and international agencies; and their outputs, by way of publications and patents, having national and international impact. An attempt has been made to summarize the entire report and present the Key Issues in the form of a Comparative Analysis as the concluding chapter of the report.

The mapping was carried out by searching each geographical zone for investigators working in Tropical diseases. The investigators were zeroed down on the basis of their publications and from the database of funding agencies. Websites of institutes and universities to which the investigators belonged were searched and other scientists working in the areas of tropical diseases in the department/institute were included in the master list.

Tropical diseases other than the “Big Three”, namely TB, Malaria and HIV/AIDS, are neglected. Disease surveillance still remains an important lacuna in India for want of trained manpower and funding. Integration of technologies like Geographical Information System (GIS) and Remote Sensing (RS) with the National disease control programs would substantially improve data generation, thereby providing a better picture of the ground-level situation of these diseases, which in turn would help in developing and formulating National policies for control or eradication of these diseases. Stress should also be laid on building mathematical models for epidemiology in a large country like ours.

Since the epicenter of the majority of Tropical diseases lies in remote rural areas, where resources, including human resources, are often very scarce, there is a need to train health personnel at various ‘levels’ in the programmes targeted to the rural parts of India. The tropical infections are mainly concentrated in areas where there is malnourishment and crowding. Nutrition holds the key for the proper functioning and coordination of the various systems of the body, including optimal activity of the immune system to fight infections. Unraveling the link between micronutrients and disease can lead to development of cheaper and easy-to-implement interventions, which can have better penetration into the health system.

The present mapping exercise has provided some revelations too. One of the major findings involved the Questionnaire survey. During this survey, many faculties from
Peripheral institutions expressed their desire to be more involved in the area of Tropical diseases. However, many of them faced difficulties due to (i) lack of infrastructure and facilities, (ii) lack of support from institute administration, and (iii) lack of transparency in the project review process for procuring funding. An incentive mechanism which encourages these peripheral institutes and universities to provide necessary support to talented investigators would be welcome. Better access to existing sophisticated analytical instrumentation facilities and bio-safety containment facilities could help utilize otherwise under-utilized expensive instruments to their full capacity.

A top-down approach should be adopted to address issues of National importance. These include evidence generation for such studies that estimate disease-burden and cost-effectiveness of interventions, which contribute towards formulating disease policies.

The present project has attempted to map not only the strengths of the various organizations in India, by way of manpower and infrastructure, but has also highlighted the gaps and the gray areas where work in needed, with reference to Tropical diseases in the Indian context.
1. **Team Members**

The project entitled “Mapping of National Centres / Institutions on Tropical Diseases in India” assigned by WHO/SEARO to Prof. N.K. Ganguly has been implemented by a team of five scientists under him. Besides the core group of scientists, two secretarial staff has provided assistance in the project. The details of the team members are given below.

1. Prof. N.K. Ganguly (Project-in-Charge)
2. Dr. Kaushik Bharati
3. Dr. Sanjukta Sen Gupta
4. Dr. Bratati Mukhopadhyay
5. Dr. Madhuri Dutta
6. Ms. Swati Verma
7. Mr. Radhesh Notiyal (Secretarial Assistant)
8. Mr. Tara Bir Thapa (Attendant)

2. **Diseases covered**

The area of Tropical Diseases is an immensely important area, particularly with reference to a country such as India. Yet, Tropical Diseases are often the most neglected area of medical research. Leaving aside the “Big Three”, namely, malaria, tuberculosis and HIV/AIDS, which receive a good deal of attention and funding, most other diseases fall within the category of Neglected Tropical Diseases. Keeping this in mind, the present project has tried to cover most of the Tropical Diseases that are of relevance to India. These are listed below.

1. Malaria
2. Diarrheal Diseases
   - Rotavirus diarrhea
   - Cholera
   - Amoebic dysentery
   - Giardiasis
   - Shigellosis
   - Enterotoxigenic *E. coli* – related diarrhea
3. Leishmaniasis
4. Helminthiasis
5. Pneumonia and Meningitis
6. HIV / AIDS
7. Leprosy
8. Tuberculosis
9. Dengue
10. Japanese encephalitis
11. Typhoid / Paratyphoid
3. Project outline

The project “Mapping of National Centres / Institutions on Tropical Diseases in India” involved a thorough mapping of all National centres as well as institutions, including medical, technological, and research organizations, as well as universities that were of relevance to the project. The criteria for identifying the centres and institutions included their strengths by way of contribution in the area of Tropical Diseases, such as research, teaching, as well as training. The major aims and objectives of the project was to assess the profile, strengths and comparative advantages of the institutes and establish how each of them could contribute towards control and elimination of Tropical Diseases from the region.

*Timeline of the project:* 1/06/2010 – 30/09/2010

*Deliverables:* Interim Report, Final Report, and Financial Statement

4. Mapping strategies

The mapping project was initiated by dividing the entire geographical area of India into 5 zones amongst the 5 scientists. Each member of the core group was allotted a zone. The responsibility of each member was to map all relevant National centres / institutions and universities that fell within their respective zones. The details of the zones are presented below.

Map of India subdivided into five zones
Table 1: States and union territories included under various zones

<table>
<thead>
<tr>
<th>Zone-1</th>
<th>Zone-2</th>
<th>Zone-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Arunachal Pradesh</td>
<td>• Uttar Pradesh</td>
<td>• Rajasthan</td>
</tr>
<tr>
<td>• Assam</td>
<td>• Delhi</td>
<td>• Gujarat</td>
</tr>
<tr>
<td>• Nagaland</td>
<td>• Haryana</td>
<td>• Daman &amp; Diu</td>
</tr>
<tr>
<td>• Manipur</td>
<td>• Uttarakhand</td>
<td>• Dadra &amp; Nagar Haveli</td>
</tr>
<tr>
<td>• Mizoram</td>
<td>• Punjab</td>
<td>• Madhya Pradesh</td>
</tr>
<tr>
<td>• Tripura</td>
<td>• Chandigarh</td>
<td>• Chhattisgarh</td>
</tr>
<tr>
<td>• Meghalaya</td>
<td>• Himachal Pradesh</td>
<td></td>
</tr>
<tr>
<td>• Sikkim</td>
<td>• Jammu &amp; Kashmir</td>
<td></td>
</tr>
<tr>
<td>• West Bengal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Bihar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Jharkhand</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Zone-4</th>
<th>Zone-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Orissa</td>
<td>• Maharashtra</td>
</tr>
<tr>
<td>• Andhra Pradesh</td>
<td>• Goa</td>
</tr>
<tr>
<td>• Tamil Nadu</td>
<td>• Karnataka</td>
</tr>
<tr>
<td>• Puducherry</td>
<td>• Kerala</td>
</tr>
<tr>
<td>• Andaman &amp; Nicobar</td>
<td>• Lakshadweep</td>
</tr>
</tbody>
</table>

4.1. Areas addressed

The major areas where information was collected were (i) profile of institution / university, (ii) strengths, (iii) funding, and (iv) outputs. A proper, balanced profile of all the institutions engaged in Tropical Diseases was developed.

The profile provided all the essential information about an institution, including the funding / governing agency, when it was established, its vision and mission, as well as a brief description of its contribution in the area of Tropical Diseases.

The strengths of a particular institution were evaluated on the basis of the expertise of the scientific investigators, the infrastructure provided by the institution, the various training programs offered, the quality of basic research carried out, the products developed by way of drugs, diagnostics and vaccines, as well as any clinical research performed and clinical trials carried out.

Another essential addressed was funding obtained by the scientists in the area of Tropical Diseases. Here, funding obtained from National and International agencies, as well as from NGOs was covered.

One of the major and crucial areas addressed was the output of a particular institution in the area of Tropical Diseases. This was assessed by critically analyzing the publications and patents of the scientists. Publications were evaluated on the basis of criteria such as the number of papers published in each disease area, cumulative citation, and h Index,
while patents were weighed on the basis of National and International scope of the patents filed and granted.

Finally, a comparative analysis of all the institutes, was made, in order to emerge with a clear consensus as to which institutes were contributing more in the area of Tropical Diseases. The various areas addressed, and on the basis of which the chapters of the Final Report have been drafted, is briefly highlighted below.

1. **Profile**
   - Name of Institution / University
   - Agency
   - Established
   - State
   - Address and Contact Information
   - Vision and Mission
   - Contribution to Tropical Diseases

2. **Strengths**
   - Expertise – Scientists
   - Infrastructure – Facilities, Services, Platform Technologies
   - Programs – Training, Courses, Workshops
   - Basic Research
   - Product Development – Drugs, Diagnostics, Vaccines
   - Clinical Trials

3. **Funding**
   - Grants – National, International, NGOs

4. **Outputs**
   - Publications
   - Patents

5. **Comparative Analysis**
   - Comparative Analysis of Institutions for Tropical Diseases

4.2. **Methodology**

The strategies that were adopted for collecting data from the various institutes involved a multi-pronged approach. At the first instance, the websites of the institutes were consulted. All research institutes, medical institutes, universities and any and all other institutes in all the respective 5 zones were carefully scanned, scrutinized and short-listed for incorporation into the master list. Any information that could not be culled out from the institute websites were obtained from the respective Annual Reports. All Annual Reports were gathered from the respective institutes. After analysis of the Annual Reports and data obtained from the websites, further information was obtained by
sending Questionnaires to the Institutional Heads or Principal Investigators in the specified format (Appendix-I). Further information gaps were filled by contacting the Principal Investigators and speaking to them telephonically. Besides the National Centres/Institutions, lists of the major Private Sector companies that also contributed to Tropical Diseases in the areas of Drugs, Diagnostics and Vaccines were compiled, along with the respective web-links (Appendix-II).

All the institutes in all the 5 zones, covering the length and breadth of India have been presented in the maps below. In Zone-1, a total of 8 institutions have been found to be relevant to the project. Of these, 5 were located in West Bengal, and 2 in Assam and 1 in Bihar. However, in spite of rigorous scanning, no institutes or universities of relevance were found in Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura, Meghalaya, Sikkim, or Jharkhand.

**Institutions in Zone - 1**

[Map showing institutions in Zone 1]

In Zone-2, a total 26 institutions were short-listed that were of relevance to Tropical Diseases. These 26 institutes were distributed over 4 States, the Union Territory of Chandigarh, as well as the National Capital Territory of Delhi. There were 14 institutes of relevance in the National Capital Territory of Delhi, which was the highest concentration of institutes within the smallest geographical area. The National AIDS Control Organization (NACO), which had been included in the Interim Report, has been deleted in the Final Report, following the wishes of the governing authority of NACO, on the basis that HIV/AIDS is not strictly a Tropical Disease. However, the disease as such (i.e.
HIV/AIDS) has not been deleted from the Master List, on the basis of the argument that the largest concentration of HIV/AIDS cases occurs in the Tropical regions of the world, with India being a country with a high disease burden. There was only 1 institute each of relevance in Haryana and Jammu & Kashmir respectively. Punjab and Chandigarh had 1 and 3 institutes respectively that worked in the area of Tropical Diseases, including Panjab University. Uttar Pradesh had 6 institutes that worked in the area of Tropical Diseases, including important universities such as Banaras Hindu University, Chhatrapati Shahuji Maharaj Medical University, University of Delhi, and Jawaharlal Nehru University. However, Himachal Pradesh and Uttarakhand did not have a single institute or university that was of any relevance to the project. This finding underscores the fact that Tropical Diseases were given a lesser priority in the hilly regions of India.

### Institutions in Zone - 2

<table>
<thead>
<tr>
<th>State</th>
<th>Number of Institutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haryana</td>
<td>1</td>
</tr>
<tr>
<td>Jammu &amp; Kashmir</td>
<td>1</td>
</tr>
<tr>
<td>Chandigarh</td>
<td>3</td>
</tr>
<tr>
<td>Punjab</td>
<td>1</td>
</tr>
<tr>
<td>Uttar Pradesh</td>
<td>6</td>
</tr>
</tbody>
</table>

Zone-3 comprised of 4 States, namely Rajasthan, Gujarat, Madhya Pradesh and Chhattisgarh and the Union Territories of Daman & Diu, and Dadra & Nagar Haveli. However, there were only 5 institutes of relevance in this huge geographical region, with 3 in Madhya Pradesh and 2 in Rajasthan, underscoring the fact that even in jungle and arid areas of India, Tropical Disease institutes were largely lacking.
Institutions in Zone - 3

- Rajasthan (2)
- Madhya Pradesh (3)

Zone-4 comprised of 3 States, namely Orissa, Andhra Pradesh and Tamil Nadu, and 2 Union Territories, namely Puducherry and Andaman & Nicobar islands. The mapping exercise revealed that this region possessed a total of 21 institutes. Orissa had 4 institutes; Andhra Pradesh had 6 institutes, including the University of Hyderabad; while Tamil Nadu had 9 institutes, including 3 important universities viz. Madurai Kamaraj University, Bharathidasan University, and Anna University Chennai, which carried out work in the area of Tropical Diseases. The 2 Union Territories possessed 1 institute each in this area of Tropical Diseases.

Institutions in Zone - 4

- Orissa (4)
- Andhra Pradesh (6)
- Andaman & Nicobar (1)
- Puducherry (1)
- Tamil Nadu (9)
Zone-5 possessed 14 institutes of relevance in Maharashtra alone, including the University of Pune. The National Institute for Research in Reproductive Health (NIRRH), Mumbai, which had been included in the Interim Report, has been deleted from the Final Report, according to the wishes of its Director, who has indicated that NIRRH is not pursuing any research pertaining to Tropical Diseases. King Edward Memorial Hospital and Seth Gordhandas Medical College has been included. Karnataka and Kerala possessed 8 and 2 institutes respectively. Goa and the Lakshadweep islands, however, did not possess any institute relevant to the project.

A comprehensive list of institutes (as enumerated above) along with the respective scientists/ doctors that has been compiled for each of the zones has been presented in Appendix – III.
5. Profile

Zone-1:
- Arunachal Pradesh
- Assam
- Nagaland
- Manipur
- Mizoram
- Tripura
- Meghalaya
- Sikkim
- West Bengal
- Bihar
- Jharkhand

Institutions relevant to Tropical Diseases from Zone-1

[1] Indian Institute of Chemical Biology (IICB)

Agency: Council of Scientific and Industrial Research (CSIR)

Established: 1st January, 1935

State: West Bengal

Address and Contact Information: 4, Raja S.C. Mullick Road, Kolkata-700032, West Bengal, India. Phone: +91-33-2473-0492; Fax: +91-33-2473-5197, +91-33-2472-3967; Website: www.iicb.res.in

Director: Prof. Siddhartha Roy; e-mail: director@iicb.res.in

Vision and Mission: Infectious diseases continue to be a serious health problem throughout the globe. The situation is further complicated by the emergence of drug resistant newer clones. Progress in controlling, eliminating or eradicating infectious diseases is a key part of the international health agenda. Keeping this in mind the Infectious Diseases and Immunology Division of Indian Institute of Chemical Biology (IICB) is conducting various research programmes on Leishmania donovani, the causative agent for visceral leishmaniasis, and major enteropathogens like Vibrio cholerae and Shigella spp., which are major health concerns in India. With the use of genomics and proteomics the group at IICB has already undertaken intervention strategies for controlling the diseases caused by these human pathogens. The strategies include: (1) prevention of host-parasite interaction, (2) identifying new trans-membrane proteins, specific for the parasite that can be potential target sites for drug development, (3) targeting sub-cellular organelle, glycosome for anti-leishmanial drug design, (4)
developing DNA topoisomerase-based therapeutic agents derived from indigenous plants, (5) structure-function relationship of important enzymes like DNA topoisomerase/adenosine kinase, (6) protein kinases in relation to cell signaling, (7) programmed cell death in Leishmania, (8) development of vaccines and diagnostics, (9) stress survival and regulation of virulence gene expression in *V. cholerae*, (10) role of diverse intra and extracellular small signaling molecules in expression of genes essential for growth, survival, biofilm formation and virulence of *V. cholerae*, (11) genetic mapping of ctx, rrn and sxt loci of *V. cholerae* genome to understand rapid emergence of new epidemic clones (12) comparative genomics of *Shigella* species. In the Molecular and Human Genetics Division, Dr. Samit Adhya has identified a multi-protein complex from *L. tropica* inner mitochondrial membranes that is functional for tRNA import *in vitro*. He is currently engaged in identifying and characterizing the functions of the many subunits of this complex. In the Structural Biology and Bio-informatics Division, Dr. Subrata Adak is involved in studying oxidative stress responses in Leishmania.

**Contribution to Tropical Diseases:** Major programs include Leishmaniasis and cholera, involving basic research and technology development for diagnosis, immunoprophylaxis, and chemotherapy of these diseases. The specific areas in which research is being carried out in the area of Tropical Diseases include the following:

- Structural function of individual domains of type I and type II DNA topoisomerase of *Leishmania donovani*.
- DNA topoisomerases of *L. donovani* as targets for development of therapeutics.
- Programmed cell death of *L. donovani* induced by DNA topoisomerase inhibitors.
- Macrophage biology in relation to disease pathogenesis using visceral leishmaniasis as the model macrophage disease.
- Comprehensive cyclic nucleotide signaling in the infectivity of a eukaryotic intracellular pathogen like Leishmania.
- Immunomodulators of natural origin for effective therapy against macrophage-associated diseases.
- Regulation of protein kinase(s) and protein phosphatase(s) in Leishmania promastigotes.
- Storage, maintenance and characterization of Leishmania strains.
- Signaling mechanisms involving phosphatidyl choline hydrolysis to control interaction between macrophage and *L. donovani*.
- Studies on developmentally regulated galactosyltransferase, galactose terminal glycoconjugates and attenuation of *L. donovani* promastigotes.
- Search for new chemotherapeutic targets against Leishmania.
- Role of phospholipid composition on the adjuvanticity and protective efficacy of liposome-encapsulated *L. donovani* antigens.
- Development of a simple blood based assay for the diagnosis of visceral leishmaniasis.
- Antigen presentation of experimental leishmaniasis.
- Immunoprophylaxis and immunotherapy against experimental leishmaniasis.
- Identification of host protective antigens of *L. donovani*.
- DNA vaccines against experimental visceral leishmaniasis.
Hybrid cell vaccination against leishmaniasis.
Effect of hns mutation on colonizing efficiency of *Vibrio cholerae*.
Studies related to stress survival and virulence gene expression in *V. cholerae*.
Genome diversity and molecular basis of evolution of pathogenic clones of *V. cholerae*.
Molecular basis of stringent response in *V. cholerae*.
Comparative genomics of *Shigella* spp. to understand evolution of epidemic *S. dysenteriae* type 1 clone.

[2] National Institute of Cholera and Enteric Diseases (NICED)

Agency: Indian Council of Medical Research (ICMR)

Established: 1962 (as Cholera Research Centre); 1979 (re-named as NICED)

State: West Bengal

Address and Contact Information: P-33, CIT Road, Scheme XM, Post Box No. 177, Beliaghata, Kolkata-700010, West Bengal, India. Phone: +91-33-2363-3373; +91-33-2353-7470; +91-33-2363-3374; +91-33-2370-5533; +91-33-2370-0448; +91-33-2370-4478; Fax: +91-33-2363-2398; +91-33-2370-5066; Website: www.niced.org.in

Director: Dr. Gopinath Balakrish Nair; e-mail: (1) nairgb@icmr.org.in; (2) gbnair_2002@yahoo.com

Vision and Mission: The vision, of the National Institute of Cholera and Enteric Diseases (NICED), is to perform research and develop strategies for treatment, prevention and control of enteric infections and HIV/AIDS threatening the Nation’s health. In order to fulfill its vision, National Institute of Cholera and Enteric Diseases (NICED) will (1) Identify enteric infections and HIV genotypes of national health priority; (2) Initiate appropriate multidisciplinary research (epidemiology, bacteriology, virology, parasitology, clinical medicine, immunology and molecular biology) to develop strategies for treatment, control and prevention of enteric infections and HIV/AIDS of national health priority; and (3) Collaborate with other national and international scientists who are working for the same vision.

Contribution to Tropical Diseases: NICED conducts research on acute diarrhoeal diseases of diverse etiologies, with the major stress being on cholera. It also conducts research on typhoid fever, infective hepatitis and HIV/AIDS with an inclination towards epidemiological research and screening. Aims of this Institute are to conduct research on these diseases in both basic and applied aspects. The Institute also trains health professionals for better management and prevention of diarrhoeal diseases and for rapid and correct diagnosis of the etiological agents. Epidemiological investigations of diarrhoeal diseases are carried out in different parts of India. Antisera against *Vibrio*
*Vibrio cholerae* are raised in this Institute and supplied to the national and international laboratories. Presently, specific monoclonal antiserum for detection of *Vibrio cholerae* O139 strains have been developed and are supplied to WHO (SEARO), New Delhi for distribution to various national and international laboratories. As WHO Phage Reference Center, this Institute receives a large number of *Vibrio cholerae* strains from all over the world for Phage typing. This Institute has its basic science set up with well equipped, modern technological facilities in different disciplines such as bacteriology, virology, parasitology, biochemistry, pathophysiology, molecular biology, electron microscopy, immunology and biochemistry. Clinical Division of this Institute has set up its units at two different state hospitals, namely Infectious Diseases (ID) Hospital and Dr. B.C. Roy Memorial Hospital for Children. A BSL-3 facility was installed in NICED in 2007 in the ID Hospital campus.

Several workshops on management and preventive aspects of diarrhoeal diseases are sponsored by WHO, UNICEF and Ministry of Health and Family Welfare, Govt. of India. These national and international workshops are conducted at the Institute and also in different parts of India involving doctors of State Health Services and international participants. Several workshops sponsored by WHO, DBT on rapid screening methodology for detection of different enteropathogens are also conducted in this Institute, at regular intervals. The WHO recognized this Institute as "WHO Collaborative Centre for Research and Training on Diarrhoeal Diseases" in 1980. NICED, thus over the decades has evolved as a focal center in diarrhoeal research not only in India but also abroad.

[3] Bose Institute

**Agency:** Department of Science and Technology (DST)

**Established:** 30th November, 1917

**State:** West Bengal

**Address and Contact Information:**

**Main Campus:** 93/1, Acharya Prafulla Chandra Road, Kolkata-700009, West Bengal, India. **Phone:** +91-33-2350-2402/2403/ 6619/6702; **Fax:** +91-33-2350-6790

**Centenary Campus:** P 1/12, C. I. T. Road, Scheme – VIIM, Kolkata-700054, West Bengal, India. **Phone:** +91-33-2355-9544/9416/9219, 2355-7430; **Fax:** +91-33-2355-3886; **Website:** www.boseinst.ernet.in

**Director:** Prof. Sibaji Raha; **e-mail:** director@bic.boseinst.ernet.in
**Vision and Mission:** Acharya J.C. Bose founded the Institute in 1917, with the purpose of investigating fully "the many and ever opening problems of the nascent science which includes both life and non-life". The institute has evolved over the years into a multi-disciplinary research organization with stress on fundamental research in its pursuit of advancement of knowledge in Science and Technology and at the same time developing highly competent and able scientific manpower for the country.

**Contribution to Tropical Diseases:** Research in the area of Tropical Diseases is performed by two scientists, one in the Division of Molecular Medicine and the other in the Department of Microbiology. Prof. Subrata Majumder of the Division of Molecular Medicine works primarily in the area of Leishmaniasis. Prof. Sujoy K. Das Gupta of the Department of Microbiology works in the area of Tuberculosis. Research in these areas primarily involves basic research.

Prof. Majumder is actively involved in investigating the mechanism of establishment of pathogenesis by the intracellular protozoan parasite *Leishmania donovani*, the causative agent of visceral leishmaniasis (VL). His research is currently being extended to study the interplay of host immune responses, immunomodulation and the development of therapeutic targets against VL and Tuberculosis. Since mononuclear phagocytes are target cells for a diverse array of microbes, in spite of possessing potent antimicrobial machinery, different therapeutic approaches are being explored that aim at the activation of macrophages to dampen the pathogenic effects of the infection. Ceramide as a novel second messenger implicated in altered signal transduction has also been studied in the light of VL and Tuberculosis. It has been shown that *L. donovani*, the causative agent of VL, induces ceramide generation which is associated with the downregulation of normal signaling factors of the host. The siRNA mediated silencing of CCR5, a chemokine receptor of prime importance in *L. donovani* entry has proven to be quite an effective means of restricting the parasitic entry, therefore, various receptor mediated signaling and their modulation of other receptor functions involved in VL is another area of interest.

Prof. Sujoy K. Das Gupta works on the molecular biology of mycobacterial plasmids and phages, which have been used extensively in the genetic engineering of the TB pathogen *Mycobacterium tuberculosis*. Moreover phages and plasmids are interesting systems for study as they are considered to posses long evolutionary histories. His investigations have provided significant new information regarding how the mycobacterial plasmid pAL5000 replicates in its host. It has been revealed, for the first time that a novel mechanism exists by which a replication protein (RepB) could be activated through coupled expression with another replication protein (RepA). Investigations have also revealed how RepB initiates replication by bending the pAL5000 origin of replication. Another area of research involves the genomics of mycobacteriophages. He has characterized two key enzymes encoded by Mycobacteriophage D29: (i) Gp50, a cyanocobalamin dependent ribonucleotide reductase and (ii) Gp56, a thymidylate synthase (ThyX). Both these enzymes are considered to be evolutionarily ancient indicating that mycobacteriophages themselves may be of ancient origin. He is also interested in developing peptide based diagnostic tools for TB using mimotopes of common mycobacterial antigens.
[4] Calcutta School of Tropical Medicine (CSTM)

Agency: Government of West Bengal

Established: 1921

State: West Bengal

Address and Contact Information: 108, Chittaranjan Avenue, Kolkata-700073, West Bengal, India. Phone: +91-33-2241-4900; Fax: +91-33-2241-4915;
Website: www.caltropmed.org

Director: Prof. Krishnangshu Ray; e-mail: (1) stm.director@gmail.com
(2) krishnangshu2007@yahoo.com

Vision and Mission: The Calcutta School of Tropical Medicine is the only institution in India engaged exclusively in research, post-graduate education and healthcare for Tropical Diseases. Basically, the objectives have remained unchanged and the school provides facilities for research, post-graduate teaching, training, investigation and treatment in tropical diseases.

Contribution to Tropical Diseases: The Calcutta School of Tropical Medicine (CSTM) has a glorious past in Tropical Disease research. Currently the institute has undergone upgradation in the research wing, with the addition of the Department of Laboratory Medicine and the Department of Biochemistry and Medical Biotechnology, with the aim of carrying out basic research. The institute runs the following courses: (i) MD (Tropical Medicine), (ii) DTM&H, (iii) MSc (Medical Biotechnology), and (iv) DLT. The institute has an attached hospital, the Charmichael Hospital for Tropical Diseases, the only one of its kind in Asia. This hospital is totally dedicated to providing clinical care in the area of Tropical Diseases, such as malaria, kala-azar, helminthic and protozoal infections, bacterial and fungal infections, as well as providing care to HIV / AIDS patients. Some of the recent advances of the institute are as follows:

- Initiation of the construction of “Centre of Excellence” building for the treatment and research in HIV / AIDS (jointly funded by NACO and Government of West Bengal).
- Opening of Endoscopy Facility by the Department of Tropical Medicine.
- Signing of MoU with the University of Manchester, UK in the area of HIV / AIDS.
- Sanction of a Bioequivalence Study Centre.
- Commencement of Exchange Visiting Studentship.
- Sanction of Thalassemia Detection Centre under the Department of Hematology.
- Approval of DCP course by the Government of West Bengal.
- Approval of Post-graduate courses in Microbiology and Dermatology.

Some developmental projects that are in the pipeline include the following:
- Up-gradation of the Department of Microbiology by creation of a Molecular Laboratory and a Biosafety Laboratory.
- Establishment of a six-bedded Intensive Care Unit for terminally ill patients.
- Constitution of a Public Health Cell to facilitate outbreak control and other surveillance programs.
- Establishment of a Drug Information Dissemination Centre.

The CSTM is building up research and academic tie-ups with institutes of National importance like NICED, the Indian Statistical Institute, as well as ICMR headquarters. It is establishing links with reputed International institutes such as the London School of Hygiene and Tropical Medicine and McGill University, Canada. The institute contemplates initiating two new courses, for example, MD (Infectious Diseases) and MSc (Immunology) in the near future.

[5] Rajendra Memorial Research Institute of Medical Sciences (RMRIMS)

Agency: Indian Council of Medical Research (ICMR)

Established: 1981

State: Bihar

Address and Contact Information: Agam Kuan, Patna-800007, Bihar, India. Phone: +91-0612-2631565; Fax: +91-0612-2634379; Website: www.rmrims.org.in

Director: Dr. Pradeep Das; e-mail: (1) rmrims@rmrims.org.in (2) dirrmris@sancharnet.in

Vision and Mission: The Rajendra Memorial Research Institute of Medical Sciences (RMRIMS) conducts research on various aspects of Visceral Leishmaniasis, also known as Kala-azar, and HIV/AIDS. Tuberculosis is now being included. RMRIMS is one of the designated ICMR centres for bio-medical informatics and has been declared a WHO Reference Centre for Leishmania Parasite and Sera Bank.

Contribution to Tropical Diseases: In the area of Tropical Diseases, the following are the thrust areas of RMRIMS:

- Successful application of PCR as a better diagnostic test for Kala-azar, with encouraging results as compared to conventional microscopy of bone marrow/splenic aspirate, and similarly also in PKDL cases, especially with macular lesion, where sensitivity of conventional microscopy is very poor.
- Studies on VL-HIV co-infection.
- Cost effective integrated vector management.
Establishment of a repository of 22 different isolates of Leishmania; preservation of 119 sera samples of various categories of Kala-azar patients for future work.

Successful demonstration of the use of plants’ extract as animal product free culture medium for propagation of Leishmania promastigotes.

Role of cytokines in responsive and unresponsive patients.

Immu-no-pathology of PKDL patients.

Database design of leishmania parasite.

Routine biochemical and hematological diagnosis and treatment of VL/PKDL/HIV.

HLA typing of VL patients.

Re-establishment of the “Integrated Counseling and Testing Centre (ICTC)” for HIV/AIDS.

Various clinical drug trials for treatment of VL, PKDL and co-infection and also to assess the safety and efficacy of combination therapies in shorter duration. Some clinical trials undertaken by RMRIMS along with names of the funding agencies are mentioned below:

- Dose finding study of Miltefosine in treatment of PKDL (WHO/TDR).
- Paromomycin Phase IV study (iOWH).
- Combination therapy of Ambisome, Miltefosine and Paromomycin for treatment of VL (DNDi).
- Combination therapy of Miltefosine and Ambisome for treatment of VL (WHO/TDR).
- Single low dose of Ambisome for treatment of VL (MSF-Spain).
- Treatment of Kala-azar co-infected with HIV/ Tuberculosis (MSF-Spain).
- Validation of sand fly distribution and Kala-azar disease prevalence through Remote Sensing & GIS in endemic and non endemic foci of Kala-azar to re-assess its applicability for the entire Kala-azar endemic region.

RMRIMS also provides training to M.Sc and Ph.D students of Life Sciences, as well as teaching and training to M.Pharm students. It also provides training to district Medical Officers in the Kala-azar Control Programme.

[6] Regional Medical Research Centre (RMRC), Dibrugarh

Agency: Indian Council of Medical Research (ICMR)

Established: 1982

State: Assam

Address and Contact Information: Post Office Box # 105, Dibrugarh-786001, Assam, India. Phone: +91-373-2381494, 2381506, 2381548, 2381566; Fax: +91-373-2381748, 2381548, 2381494; Website: www.rmrcne.org.in

Director: Dr. J. Mahanta; e-mail: icmrrcdi@hub.nic.in
**Vision and Mission:** To develop and promote Bio-medical research in the north-eastern states of India and build up scientific and technical man power, making a network of health facilities of the region and to collect information about traditional system of medicine with a multidisciplinary approach. The priority areas in which research is targeted include the following: (i) Diseases having priority in National health programme, (ii) Diseases common in two or more states of the region, (iii) Diseases unique to the region, and (iv) Exploration of traditional knowledge in Medicine.

**Contribution to Tropical Diseases:** Regional Medical Research Centre, North East Region is one of the six regional centres of Indian Council of Medical Research. It covers the most remote and less developed seven states of the north-eastern region and is responsible for carrying out Biomedical Research in the region. It runs with intramural grant from ICMR and extramural ad-hoc projects from different funding agencies. With regard to Tropical Diseases, its current focus of research is on (i) mosquito borne diseases (ii) HIV and drug abuse, and (iii) trematode infections.


**Agency:** Ministry of Technical Education, Government of India

**Established:** 1950

**State:** West Bengal

**Address and Contact Information:** Kharagpur-721302, West Bengal, India
**Phone:** +91-3222-255221; **Fax:** +91-3222-255303; **Website:** www.iitkgp.ac.in

**Director:** Prof. Damodar Acharya; **e-mail:** director@iitkgp.ernet.in

**Vision and Mission:** The history of the IIT system dates back to 1946 when a committee headed by Sri N.R. Sarkar, recommended the establishment of four Higher Technical Institutions in the Eastern, Western, Northern and Southern regions, on the lines of the Massachusetts Institute of Technology, USA, with a number of secondary institutions affiliated to it. The committee felt that such institutes would not only produce undergraduates but they should be engaged in research, producing research workers and technical teachers as well, who would be at par with those from first class institutions abroad. With the above recommendations of the Sarkar committee, the first Indian Institute of Technology was born in May 1950 in Hijli, Kharagpur, in the eastern part of India.

**Contribution to Tropical Diseases:** Research in the area of Tropical Diseases is carried out by a single faculty, namely Prof. A.K. Das, Head, Department of Biotechnology. His area of research is essentially basic research, and involves crystallographic study of *M. tuberculosis* and *S. aureus* proteins.
[8] Indian Institute of Technology Guwahati (IITG)

Agency: Ministry of Technical Education, Government of India

Established: 1994

State: Assam

Address and Contact Information: Guwahati-781039, Assam, India. Phone: EPABX: +91-361-2583000; Fax: +91-361-2690762; Website: www.iitg.ac.in

Director: Prof. Gautam Barua; e-mail: gb@iitg.ernet.in

Vision and Mission: Indian Institute of Technology Guwahati, the sixth member of the IIT fraternity, was established in 1994. The academic programme of IIT Guwahati commenced in 1995. At present the institute has eleven departments covering all the major engineering and science disciplines, offering B.Tech, B.Des, M.Tech, Ph.D and M.Sc programmes. Within a short period of time, IIT Guwahati has been able to build up the necessary infrastructure for carrying out advanced research and has been equipped with state-of-the-art scientific and engineering instruments.

Contribution to Tropical Diseases: Dr. Vikash Kumar Dubey, Associate Professor (vdubey@iitg.ernet.in) and Dr. Vishal Trivedi, Assistant Professor (vtrivedi@iitg.ernet.in) work in the area of Tropical Diseases. Dr. Dubey works in the area of antileishmanial drug discovery, while Dr. Trivedi works in the area of intracellular signaling in Plasmodium falciparum.

Zone-2:
- Uttar Pradesh
- Delhi
- Haryana
- Uttarakhand
- Punjab
- Chandigarh
- Himachal Pradesh
- Jammu & Kashmir

Institutions relevant to Tropical Diseases from Zone-2

[1] Central Drug Research Institute (CDRI)

Agency: Council of Scientific and Industrial Research (CSIR)

Established: 17th February, 1951
State: Uttar Pradesh

Address and Contact Information: Chattar Manzil Palace, M.G. Marg, Lucknow-226001, Uttar Pradesh, India. Phone: 522-2612411-18 (PABX), 0522-2612413 (after office hours); Fax: 522-2623405/2623938; Website: www.cdriindia.org

Director: Dr. Tushar Kanti Chakraborty; e-mail: (1) director@cdri.res.in (2) tkchakraborty@hotmail.com

Vision and Mission: The vision of the Central Drug Research Institute (CDRI) is to achieve excellence in drug R&D and strategic positioning of the laboratory, nationally and globally. The mission of CDRI is to strengthen and advance the field of drug research in India. CDRI is considered to be a pioneer research organization in the field of biomedical research where all the infrastructure and expertise are available to develop a drug right from its concept to market. The very latest techniques and methodologies are employed for developing drugs, diagnostics and vaccines to combat diseases prevalent among mankind in general and Indian population in particular.

Contribution to Tropical Diseases: CDRI is a multidisciplinary research laboratory consisting of scientific personnel of various areas of biomedical sciences. For administrative and scientific purposes the Institute's manpower has been grouped into 17 R&D Divisions and few divisions providing technical and scientific support. Two data centres and one field station located outside CDRI are providing operational support. In relation to Tropical Diseases, the focus areas in Drug Discovery & Development involve malaria, leishmaniasis, filariasis and tuberculosis. Researchers at the institute address issues pertaining to design and development of novel drug molecules as well as optimization and preclinical development of lead molecules and combination therapy regimens, besides investigation of novel drug delivery systems. A significant basic research component of the programme focuses on identification and characterization of novel drug targets, understanding mechanisms of drug action and drug resistance, investigation of aspects of parasite biology and host-parasite interaction, immunoprophylaxis and immunodiagnosis. The contribution of host genetic factors in malaria susceptibility in Indian populations is also under investigation. The structural biology component of the programme aids in molecular modeling and X-ray structure determination. Tuberculosis is considered a one of the “Big three” killers, along with malaria and HIV / AIDS. The failure of the present therapy for tuberculosis stems largely from the lengthy course of the drugs-in-combination leading to poor compliance. This allows the emergence of multi-drug resistant (MDR)-TB, the most urgent problem at present. Therefore, simplifying and shortening treatment for drug-sensitive tuberculosis and providing new treatments for MDR-TB constitute two major goals in the development of novel drugs for tuberculosis. Tuberculosis research and drug screening program at CDRI focus towards this end.
[2] Central Institute of Medicinal and Aromatic Plants (CIMAP)

Agency: Council of Scientific and Industrial Research (CSIR)

Established: 26th March, 1959

State: Uttar Pradesh

Address and Contact Information: P.O. - CIMAP, Near Kukrail Picnic Spot, Lucknow-226015, Uttar Pradesh, India. Phone: +91-522-2359623; Fax: +91-522-2342666; Website: www.cimap.res.in

Director: Prof. Ram Rajasekharan; e-mail: (1) director@cimap.res.in (2) lipidindia@yahoo.com

Vision and Mission: The Vision of CIMAP is “innovation and empowerment in science and business of medicinal and aromatic plants towards enabling India as the ultimate in green technologies and herbals for life par excellence”. The Mission of CIMAP is “to be the ultimate in green technologies for better health and life”.

Contribution to Tropical Diseases: Dr. Ajit K. Shasany works in the area of Leishmaniasis as a collaborator with Dr. Anuradha Dube of CDRI.

[3] National JALMA Institute of Leprosy and other Mycobacterial Diseases (JALMA)

Agency: Indian Council of Medical Research (ICMR)

Established: 1st April, 1976

State: Uttar Pradesh

Address and Contact Information: PO Box No. 1101, Dr. M.Miyazaki Marg, Tajganj, Agra- 282001, Uttar Pradesh, India. Phone: EPABX: (0562) 2331751-4; Ext. Office: 201, 206, 217, 213; Direct: 2331756, 2232222; Fax: (0562) 2331755; Website: www.jalma-icmr.org.in

Director-in-Charge: Dr. Kiran Katoch; e-mail: kirankatoch@rediffmail.com

Vision and Mission: This Institute came into existence on 1st April, 1976 when the India Centre of JALMA was officially handed over to the Govt. of India and subsequently to the Indian Council of Medical Research. This was named as Central JALMA Institute for Leprosy in 1976 and has been renamed as "National JALMA Institute of Leprosy and other Mycobacterial Diseases" in 2005 to reflect its broader research areas. The Institute has completed 30 years of its existence under ICMR. The Institute has a major thrust on
leprosy (40%), relevant areas of tuberculosis and other mycobacteriosis (40%), HIV (10%) and Filariasis etc (10%).

**Contribution to Tropical Diseases:** The Institute is engaged in (i) Research, (ii) Patient care, and (iii) Human resource development.

(i) **Research:** The major thrust of research programmes of the Institute is on Leprosy, Tuberculosis and HIV infection.

**Leprosy**

- Understanding the disease better using electrophysiological, immunological, molecular and electron-microscopic tools.
- Developing better technologies for diagnosis using immunological, molecular and in-situ techniques.
- Viability determinations using mouse foot-pad, ATP and molecular methods.
- Studies on drug resistance using molecular methods.
- Studies on transmission using epidemiological and molecular approaches.
- Improvising treatment regimens and surgical methods.
- Studies on drug metabolism, disposition and kinetics.

**Tuberculosis and other Mycobacterial Infections**

- Development and application of techniques for DNA fingerprinting.
- Studies on drug resistance using conventional and molecular (probes, microarray) methods.

**HIV / AIDS**

- Studies on the relationship between HIV and TB and HIV and Leprosy.
- Studies on the clinical course of disease.

(ii) **Patient Care:** Since this Institute is involved in clinical and therapeutic research, it is essential to provide good quality patient care. Patient care activities have, therefore, been quite significant.

- About 30,000 patients attend the OPD of the Institute every year.
- Among these 8,000 to 10,000 are new patients of leprosy and related diseases. Of these new patients nearly 50% suffer from leprosy, who are registered and treated in our hospital.
- OPD treatment, in-patient treatment and surgical treatments are given free of cost.

(iii) **Human Resource Development:** The Institute also actively participates in human resource development by:

- Imparting training to Medical Officers and other categories of leprosy workers.
Guiding M.D, M.S, M.V.Sc and Ph.D students.

Imparting specialized training to scientific personnel in recent immunological and molecular biological technologies.

Participating in various multi-centric National and International collaborative programmes.

Conducting postgraduate courses in Life Science disciplines of Biotechnology, Biochemistry and Microbiology.

The Institute has state of the art facilities like BSL-3 labs, DNA Chip Lab, Proteomics Lab, all well equipped laboratories, modern hospital and well set Field Programmes at Ghatampur as well as Agra. The Institute has established its leadership in all important aspects of leprosy and mycobacterial research. The Institute is participating in and co-coordinating several multi-centric studies on Leprosy and Tuberculosis.

[4] Sanjay Gandhi Postgraduate Institute of Medical Sciences (SGPGIMS)

Agency: Autonomous

Established: 1983

State: Uttar Pradesh

Address and Contact Information: Raebareli Road, Lucknow-226014, Uttar Pradesh, India. Phone: +91-522-2668004 to 2668008; +91-522-2668700; +91-522-2668800; +91-522-2668900; Fax: +91-522-2668017 or 2668078; Website: www.sgpgi.ac.in

Director: Prof. R.K. Sharma; e-mail: rksharma@sgpgi.ac.in

Vision and Mission: Sanjay Gandhi Postgraduate Institute of Medical Sciences (SGPGIMS), Lucknow (India) is a University established under State Act in 1983. The Institute is located on a sprawling 550 acres residential campus at Raebareli Road, 15 km away from the main city. The institute offers its own degrees, which are duly recognized by the Medical Council of India. The Institute is rated amongst the top medical institutions in the country, delivering state-of-art tertiary medical care, super-specialty teaching, training and research. Dedicated faculty members endeavor to provide quality education, patient care and research and strive to meet the challenges and needs of the society. The Institute offers D.M, M.Ch, M.D, Ph.D, Post Doctoral Fellowships (PDF) and Post Doctoral Certificate Courses (PDCC), and Senior Residency in various specialties. The peers in the field have recognized the courses offered by the Institute and the candidates obtaining degrees from SGPGIMS have been highly placed both within the country and abroad.
Contribution to Tropical Diseases: Work in the area of Tropical Diseases at SGPGIMS is carried out by the Department of Microbiology. It has the facilities for isolation and identification of various pathogenic microbes and determining their antimicrobial susceptibility. The department has laid down guidelines for care of patients with AIDS at the Institute. The department has facilities for tissue culture. In collaboration with WHO, the department conducts surveillance for transmission of poliovirus in UP and Bihar. Disinfectant and antibiotic policies of the hospital are also formulated by the department from time to time. Consultations on management of infectious complications in patients are also offered on referral basis.

The Department of Microbiology carried out the following major activities:

Clinical Services

- Aerobic and anaerobic bacteriology.
- Mycobacteriology, including molecular diagnosis and sensitivity testing.
- Serology and microbial immunology.
- Mycology.
- Parasitology.
- Virology, including tissue culture and molecular diagnosis.
- Automated rapid BACTEC culture for aerobic bacteria, mycobacteria and fungi.
- Hospital surveillance and infection control programs.

Special Services

- Hospital infection prevention week is being organized every year.
- Department is recognized as national centre for polio in the states of UP and Bihar. It takes important steps for maintenance of wild and vaccine strains of polio isolated from the states.
- Department regularly participates in External Quality Control Program with CMC Vellore and CDC, Atlanta (USA).
- Direct observed therapy short course (DOTS) for tuberculosis.
- Voluntary Counseling and Testing Centre (VCTC) for HIV.
- Viral diagnostic services including PCR for endemic arboviruses.
- Diagnosis of opportunistic parasitic pathogens.

Community Activities

- Investigation of measles, dengue and diarrhoeal disease outbreaks.
- Investigations for swine flu, epidemic/outbreaks of dengue/dengue hemorrhagic fever and acute hemorrhagic conjunctivitis in and around Lucknow.
- Study on neurocysticercosis in Mohanlalganj block, Lucknow district.
- Arrangements of public lectures on health promotion.
Teaching and Training

The Department of Microbiology carries out various training programs such as MD, PhD and Post Doctoral Certificate Courses (PDCC) in the area of Microbiology, and teaching activities for students and residents of M.D, D.M, M.Ch, paramedics, nurses and technicians. The department also organizes CME/Workshops/ Conferences.

[5] Banaras Hindu University

Agency: Autonomous University

Established: 1916

State: Uttar Pradesh

Address and Contact Information: Varanasi-221005, Uttar Pradesh, India. Website: www.bhu.ac.in

Head, Department of Biochemistry, Faculty of Science: Prof. Om Prakash; Phone: 230-7323 (Department of Biochemistry); 230-7322 (Prof. Om Prakash); e-mail: oprakash@bhu.ac.in

Head, Department of Zoology, Faculty of Science: Prof. K.P. Joy; Phone: +91-542-2307148 (Department of Zoology); 0542-6540735 (O); 09935614935 (M) (Prof. K.P. Joy); Fax: 0542-2368174; e-mail: (1) kpjoybhu@gmail.com; (2) kpjoy@bhu.ac.in; (3) hod.zoology@gmail.com

Head, Department of Medicine, Institute of Medical Sciences: Prof. I.S. Gambhir; Phone: 230-7520, 9501 (Department of Medicine); 230-7521 (Prof. I.S. Gambhir); e-mail: gambhir_bhu@yahoo.com

Head, Department of Microbiology, Institute of Medical Sciences: Prof. (Ms) Shampa Anupurba; Phone: 230-7535 (Department of Microbiology); 230-7516, 9508 (Prof. (Ms) Shampa Anupurba); e-mail: shampa@bhu.ac.in

Vision and Mission: Banaras Hindu University is an internationally reputed temple of learning, situated in the holy city of Varanasi. This Creative and innovative university was founded by the great nationalist leader, Pandit Madan Mohan Malviya, in 1916 with cooperation of great personalities like Dr Annie Besant, who viewed it as the University of India. Banaras Hindu University was created under the Parliamentary legislation - B.H.U. Act 1915. The objectives of BHU are summarized below:

- To promote the study of the Hindu Shastras and of Sanskrit literature generally as a means of preserving and popularizing for the benefit of the Hindus in particular and
of the world at large in general, the best thought and culture of the Hindus and all that was good and great in the ancient civilization of India.

- To promote learning and research generally in Arts and Sciences in all branches.
- To advance and diffuse such scientific, technical and professional knowledge, combined with the necessary practical training as is best calculated to help in promoting indigenous industries and in developing the material resources of the country.
- To promote the building up of character in youth by religion and ethics as an integral part of education.

**Contribution to Tropical Diseases:** Essentially four departments in BHU contribute to Tropical Diseases. These are the Departments of Biochemistry and Zoology of the Faculty of Science, and the Departments of Microbiology and Medicine of the Institute of Medical Sciences. The activities of these four departments are briefly summarized below:

### Department of Biochemistry, Faculty of Science:
Prof. H.P. Pandey (+91 542 2311035; hppandey49@hotmail.com; hpp@bhu.ac.in) carries out research in the area of host parasite relationships with special reference to viral diseases. Prof. (Mrs.) S. Rathaur (+91 542 2317231; surathaur@rediffmail.com) works in the area of immunobiology of filariasis. Her research is concerned with the identification and purification of potential filarial antigens from filarial parasites for their use in serodiagnosis and immunoprotection of filariasis. Dr. Rakesh K. Singh (+91 542 2307323; rakesh_bhu@yahoo.com; rakesh_bc@bhu.ac.in) is involved with host-parasite interactions, immunology (immune response evaluation) and molecular biology of human infectious diseases such as Visceral leishmaniasis and AIDS. His group works on identification and purification of potential leishmanial antigens from *L. donovani* for their use in diagnosis, prognosis and vaccine development.

### Department of Zoology, Faculty of Science:
Dr. Ashok Kumar Maurya, Reader, Department of Zoology (+91 5236927911; akmbhu@gmail.com) works in the area of Parasitology, with particular reference to the taxonomy of adult and larval trematode parasites.

### Department of Medicine, Institute of Medical Sciences:
Prof. Shyam Sundar (Phone: 91-542-2367795, 2368895; Fax: 91-542-2367568; shyam_vns@satyam.net.in; drshyamsundar@hotmail.com) works in the area of Visceral Leishmaniasis. He has carried out projects funded by WHO/TDR, Joint Indo-US Vaccine Action Programme, the Rockefeller Foundation, New York, and the ICMR. He has completed a Phase III multicenter, randomized, controlled, clinical trial to assess the safety and efficacy of injectable paromomycin in patients with visceral leishmaniasis. He has evaluated novel diagnostic tests for visceral leishmaniasis, such as freeze dried DAT, rK39, rK26 dipsticks and KAtex in the field situation. He has carried out a rising dose, Phase II clinical trial of oral miltefosine for treatment of visceral leishmaniasis, as well as a Phase III clinical trial to assess its safety in children. Prof. Madhukar Rai (rai_madhukar@rediffmail.com) also works in the area of visceral leishmaniasis, acting as Co-Principal Investigator with Prof. Shyam Sundar in many of the projects. He is currently carrying out a comparative evaluation of PCR primers in diagnosis of visceral
leishmaniasis and post kala-azar dermal leishmaniasis (PKDL). He is also carrying out a Phase-I, open-label, dose-escalating study to evaluate the safety, tolerability, and immunogenicity of the Leish-IIIf + MPL-SE vaccine in healthy adults in India.

**Department of Microbiology, Institute of Medical Sciences:** Prof. Shampa Anupurba works in the area of tuberculosis, with particular reference to phenotypic and genotypic characterization of drug resistance in *Mycobacterium tuberculosis*. Prof. Gopal Nath (Phone: 2309506(O); 9335058394 (M) gopalanath@gmail.com; gopalanath@sify.com) works in the area of typhoid, with particular reference to chronic typhoid carriers and diagnosis of typhoid fever by using nested PCR in blood, urine and stool samples. Prof. A.K. Gulati (Phone: 0542-2307516, 2307535(O); anilkugulati@rediffmail.com; anilkugulati@gmail.com) works in the area of clinical HIV / AIDS.

[6] Chhatrapati Shahuji Maharaj Medical University (CSMMU) / King George Medical College (KGMC)

**Agency:** Autonomous Medical University

**Established:** 1911 (as KGMC); 2002 (as CSMMU)

**State:** Uttar Pradesh

**Address and Contact Information:** Chowk, Lucknow-226003, Uttar Pradesh, India. **Website:** www.kgmcindia.edu

**Head, Department of Microbiology:** Prof. Mastan Singh; **Phone:** 522-2257569(O); 9453833644 (M); **e-mail:** drmastansingh@rediffmail.com

**Head, Department of Pediatrics:** Prof. G.K. Malik; **Phone:** 522-2325344 (R); **e-mail:** gkmalikneo@yahoo.com

**Vision and Mission:** The institution is committed to the dissemination and advancement of knowledge in biomedical sciences and establishing itself as a centre of excellence in tertiary level health care in Uttar Pradesh.

**Contribution to Tropical Diseases:**

**Department of Microbiology:** The Department of Microbiology came into existence in 1987 and has since contributed immensely to the teaching, patient care services and research in Microbiology. The department handles over 40,000 clinical specimens for various diagnostic procedures per annum. The Department of Microbiology has several functionally independent Divisions. The Division of Bacteriology works on β-lactamase production in different bacteria, as well as serotyping of bacteria including *Salmonella*, *Vibrio* and *Streptococci*. Work on isolation and identification of fastidious bacteria like *H. influenzae* and pneumococci is also being carried out. Research work on GBS, CoNS and
enterococci has been undertaken recently. The Division of Serology caters to various serological tests including VDRL, RPR, WIDAL, ASO titres, CRP and Rh factor. ELISA and immunofluorescence is carried out for dengue, Japanese encephalitis and tuberculosis. The Division of Molecular Biology carries out molecular studies on various pathogens, including *M. tuberculosis*. The Tuberculosis Laboratory carries out routine diagnostics for *M. tuberculosis* and has been identified as Intermediate Reference Laboratory for quality control in RNTCP under Govt. of India/WHO/World Bank. The Division of Virology has made outstanding contributions in understanding pathogenesis of dengue and Japanese encephalitis virus infections. The Division of Parasitology provides facilities for diagnosis of intestinal and blood parasites like malaria and filaria. The National Shigella Centre supplies polyvalent and monovalent antisera and specific antigens of various *Shigellae* to other teaching institutions and hospitals of the country and provides facility of identification and typing of *Shigella* strains referred to the centre. The ICTC Section runs an active Integrated Counselling and Testing Centre for HIV/AIDS since 1999.

There are 8 faculties in the Department of Microbiology. Prof. Mastan Singh, HOD, works in the area of Clinical Bacteriology and Molecular Biology. Prof. Amita Jain (522-2328592(R); amita602002@yahoo.com) area of expertise is Tuberculosis, Clinical Microbiology and Virology. Prof. Vimala Venkatesh (9335912340 (M); venkatesh_vimala@rediffmail.com) works in the area of Viral serology, ICTC/SRL and Molecular Biology. Dr. Jyotsna Agarwal, Associate Professor (9415025630 (M) jyotsna_govil@yahoo.co.in) specializes in the area of Bacteriology and hospital infection surveillance. Dr. Gopa Banerjee, Associate Professor (9415109154 (M) gopabanerjee31@rediffmail.com) specializes in Mycology and works at the National Shigella Center. Dr. K. P. Singh, Assistant Professor (9415010403 (M) dr4kps@yahoo.co.in) specializes in Parasitology and anaerobic Bacteriology. Dr. Raj Kumar Kalyan (9415754912 (M); drrkkalyan1973@yahoo.co.in) and Dr. Prashant Gupta (9415082806 (M); prashantgupta46@hotmail.com), both Lecturers, work in the area of general Microbiology.

**Department of Pediatrics:** The Department of Pediatrics was founded in 1956. The Department provides core undergraduate and postgraduate training in Pediatrics. It also acts as an advisory body to the Medical Department in disease containment and surveillance activities. It imparts training of doctors and Medical Officers. Besides clinical research, the department is also involved in epidemiological and community based research on essential national health issues sponsored by international agencies such as INCLEN, USAID, UNICEF and WHO.

[7] **National Brain Research Centre (NBRC)**

**Agency:** Department of Biotechnology (DBT)

**Established:** 16th December, 2003.
State: Haryana

Address and Contact Information: NH-8, Manesar-122 050, Gurgaon Dist, Haryana, India. Phone: +91-0124-2338920-26; Fax: +91-0124-2338910;
Website: www.nbrc.ac.in

Director: Prof. Subrata Sinha; e-mail: (1) ssinha@nbrc.ac.in; (2) director@nbrc.ac.in

Vision and Mission: The vision and mission of NBRC is to create a “Centre of Excellence in Brain Research” with state-of-the-art facilities, evolve the centre through a networking approach and generate highly trained human resource.

Contribution to Tropical Diseases: Dr. Anirban Basu (Phone: +91 124 233 8922-23, Ext 225; anirban@nbrc.ac.in) and Dr. Pankaj Seth (Phone: +91-124-2338920-26, Ext. 212 Fax: +91-124-2338910/-2338928; pseth@nbrc.ac.in) work in the area of Tropical Diseases in conjunction with neurological disorders. The focus of Dr. Basu’s laboratory is to understand the pathophysiology and pharmacology of infection and inflammation in the Central Nervous System (CNS). Research involves understanding the molecular basis of host-pathogen interaction in viral infection of the brain and the signaling events associated with neuro-inflammation. Dr. Basu’s group have been primarily focused on neuropathology of host pathogen interaction in Japanese encephalitis virus (JEV), causative agent of most common vector-borne viral encephalitis in Asia-Pacific region. Increasing experimental, clinical, and epidemiological studies point to the pivotal role of inflammation in the pathogenesis of acute and chronic neuro-degenerative diseases.

The focus of the Dr. Seth’s NeuroAIDS laboratory is to understand the neurobiology and pathophysiology of various neurotropic viruses, particularly HIV-1. His group has adopted modern cellular and molecular biology approaches to study HIV induced damage to human brain cells and neuropathogenesis. Dr. Seth is using human neural stem cell as an in vitro model. He has found that HIV-1 has clade-specific effects on human brain cells. His group has found a role for glia-neuronal interplay in neuroAIDS. Another aspect of his research involves modulation of human brain cell properties by HIV-1, especially in intravenous drug abusers who are more susceptible to HIV infection.

[8] Indian Institute of Integrative Medicine (IIIM)

Agency: Council of Scientific and Industrial Research (CSIR)

Established: 1941 (as Drug Research Laboratory of J&K state); 1957 (as Regional Research Laboratory of CSIR); 2005 (named as IIIM)

State: Jammu & Kashmir
Address and Contact Information: Post Bag-3, Canal Road, Jammu-180001, Jammu & Kashmir, India. Phone: 0191-2569111, 2569222; Fax: 0191-2569333; Website: www.iiim.res.in

Director: Dr. Ram A. Vishwakarma; e-mail: director@iiim.res.in

Vision and Mission: The vision is to position IIIM as the center of excellence for natural products chemistry, chemical biology, pharmacology and biotechnology to discover new chemical entities (NCEs) as drugs for unmet medical needs and provide scientific rationale and validity to various Indian systems of medicine. The institute aspires to achieve leadership position as a research institute for creating a broad knowledge base, a workforce of dedicated and trained scientists and a technology development center through scientific exploration of secondary metabolites from plants and microbial biodiversity, at the same time generating awareness for their conservation and protection. Some of the mission objectives include (i) aim to be a world-class research institute for natural products based drug discovery, (ii) discovery of new natural product probes for cell biology and immunology, (iii) Provide scientific basis for integration of Indian systems of medicine with evidence-based pharmacology, (iv) focus natural products resources towards clinically validated targets (cancer, inflammation, diabetes and infections) and areas with unmet medical needs (neglected diseases), and (v) use the power and synergy of synthetic chemistry and molecular biology to engineer biosynthetic pathways of drug-like molecules in plants and microbes.

Contribution to Tropical Diseases: Work in the area of Tropical Diseases is carried out by Dr. Inshad Ali Khan. His area of research with relevance to the project involves work on tuberculosis. The specific areas involve identification of new drug targets and immunotherapeutics for \textit{M. tuberculosis} and regulation of \textit{M. tuberculosis} gene expression. Dr. Ram A. Viswakarma works in the area of Medicinal Chemistry, Drug Discovery, Natural Products Chemistry, Glycobiology, and Membrane Biology.

[9] Institute of Microbial Technology (IMTECH)

Agency: Council of Scientific and Industrial Research (CSIR)

Established: 1984

Union Territory: Chandigarh

Address and Contact Information: Sector 39A, Chandigarh-160036, India. Phone: +91-172-2690785, 2690684; Fax: +91-172-2690585, 2690132; Website: www.imtech.res.in

Director: Dr. Girish Sahni; e-mail: (1) director@imtech.res.in; (2) sahni@imtech.res.in
Vision and Mission:

- To provide integrated research, development and design base for microbial technology.

- To undertake basic and applied research and development programmes in established and newly emerging areas of relevant biotechnology including genetic engineering.

- To optimize the existing microbial processes currently available and in use in the country.

- To develop and maintain gene pool resources and genetic stocks of microbial cultures and other cell lines. This could also serve as a reference centre to assist other centres.

- To establish facilities for biochemical engineering, instrumentation development including microprocessor systems, a computer centre and development of mathematical models for process parameters.

- To establish facilities for design of process equipment and bioreactors.

- To impart training in microbiology, microbial technology and biochemical engineering.

- To conduct training and refresher courses for research workers and technologists.

- To establish documentation and information retrieval and dissemination facilities and a data bank to meet the needs of the institute.

- To establish and maintain effective linkages with industry and educational institutions.

- To develop capabilities for producing design and engineering packages for industrial plants.

Contribution to Tropical Diseases: The major contributions of IMTECH in the area of Tropical Diseases involve Tuberculosis, which is the major program, as well as HIV/AIDS, cholera, and general mechanisms of microbial pathogenesis. Research involves predominantly basic research, although some vaccine development efforts are also in progress with regard to tuberculosis, utilizing in-silico derived M.tb antigens as vaccine candidates. Basic research on tuberculosis involves (i) study of novel M.tb hemoglobin molecules, (ii) x-ray crystallography of essential mycobacterial enzymes, (iii) mechanism of drug resistance and the biology of M.tb with emphasis on regulatory/secretory protein(s) involved in the process of signal transduction, (iv) identification and unraveling of the molecular mechanism of functioning of M.tb PhoP-PhoR system, (v) search for interesting partners of proteins that lead to enhanced survival and/or increased virulence in macrophages using yeast two-hybrid system, (vi) study of the interaction of M.tb with its hosts in conjunction with MAP kinase pathway, (vii) study of the mechanism of intracellular utilization of iron by M.tb by infection of macrophages with GFP labeled M.tb and evaluation of mammalian GAPD trafficking in the infected cells using confocal microscopy, biochemical methods and EM, (viii) study
of the apoptotic potential of virulent (M.tb H37Rv) and avirulent (M.tb H37Ra) mycobacteria, role of NF-κB in apoptosis, mechanism of apoptosis and effect of apoptosis on the intracellular growth of M.tb in THP-1 cells, and (ix) cross-talk between macrophages and T-cells in the pathogenesis of TB. The HIV program involves designing of molecules for blocking HIV-1 mediated shape changes in the CD4 receptor as well as comparison of solution structures of neutralizing vs. non-neutralizing antibodies. The cholera research initiative involves quorum sensing signal transduction of non-01, non-0139 strains of *V. cholerae*. Microbial pathogenesis research is targeted at identification of the neo-antigenic determinants on pathogen and infected cell-surface and characterization of the identified molecules biochemically and functionally using monoclonal antibodies generated by employing novel immunization strategies using malaria infected RBCs, and leishmaniasia and mycobacteria-infected macrophages as model systems.

[10] Postgraduate Institute of Medical Education and Research (PGIMER)

Agency: Ministry of Health and Family Welfare, Government of India

Established: 1962

Union Territory: Chandigarh

Address and Contact Information: Sector-12, Chandigarh-160012, India. Phone: EPBAX: +91-172-2746018, 2756565, 2747585; Fax: +91-172-2744401, 2745078; Website: http://pgimer.nic.in

Director: Dr. K.K. Talwar; e-mail: pgimer@chd.nic.in

Vision and Mission:
- Provide high quality patient care.
- Attain self-sufficiency in postgraduate medical education and to meet the country’s need for highly qualified medical teachers in all medical and surgical disciplines.
- Provide educational facilities for the training of personnel in all important branches of health activity.
- Undertake basic community based research.
- Provide service to the community, care of the needy and research for the good of all.

Contribution to Tropical Diseases: The Postgraduate Institute of Medical Education and Research (PGIMER) has contributed to the area of Tropical Diseases largely through the collective efforts of the Departments of Parasitology, Virology, and Experimental Medicine and Biotechnology. The Department of Parasitology provides routine diagnostic parasitology services to Nehru Hospital, PGI, Chandigarh and is actively engaged in academic and research activities in the area of malaria, leishmaniasis and
helminthiasis. The Department of Virology has been identified as the apex referral laboratory for advanced diagnosis of Dengue, JE, Chikungunya and other arboviral infections, under the National Vector Borne Disease Control Programme, Ministry of Health and Family Welfare, Government of India. The Department of Experimental Medicine and Biotechnology carries out research in the area of Tropical Diseases pertaining to HIV/AIDS, TB and diarrheal diseases.


Agency: Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers, Government of India

Established: 1991

State: Punjab

Address and Contact Information: Sector 67, Phase X, S.A.S. Nagar-160062, Punjab, India. Phone: +91-172-2214682-87; Fax: +91-172-2214692; Website: www.niper.ac.in

Director: Prof. K.K. Bhutani; e-mail: director@niper.ac.in

Vision and Mission:
- Toning up the level of pharmaceutical education and research by training the future teachers, research scientists and managers for the industry and profession.
- Continuing education programmes.
- Creation of National Centres to cater to the needs of pharmaceutical industries and other research and teaching institutes.
- Collaboration with Indian industries to meet the global challenges.
- National/International collaborative research.
- Curriculum and media development.
- Study of sociological aspects of drug 'use and abuse', and rural pharmacy.
- Conducting programmes on drug surveillance, community pharmacy and pharmaceutical management.

Contribution to Tropical Diseases: The major Tropical Diseases that are included as research priorities include tuberculosis, malaria and leishmaniasis.

[12] Panjab University

Agency: Autonomous University

Established: 1882
Union Territory: Chandigarh

Address and Contact Information:

Department of Zoology, Panjab University, Sector 14, Chandigarh-160014, Punjab, India. Phone: +91-172-253-4201, 254-1942

Department of Biotechnology, Panjab University, Sector 14, Chandigarh-160014, Punjab, India. Phone: +91-172-253-4085; Fax: +91-172-254-1409; Website: www.puchd.ac.in

Vice-Chancellor: Prof. R.C. Sobti; e-mail: rcsobti@pu.ac.in

Vision and Mission: The University has been incorporated for the purpose, among others, of making provision for imparting education in Arts, Letters, Science and the learned professions and of furthering advancement of learning, the prosecution of original research, with power to appoint University Professors, Readers and Lecturers, to hold and manage educational endowments, to erect, equip and maintain University colleges, libraries, laboratories and museums, to making regulations relating to the residence and conduct of students and to do all such acts as tend to promote study and research.

Contribution to Tropical Diseases: Prof. Sukhbir Kaur, Department of Zoology works in the area of parasitic immunology with special reference to protective and immunodiagnostic antigens of Leishmania donovani, as well as on programmed cell death during visceral leishmaniasis. Prof. Rupinder Tewari works in the area of x-ray crystallography of enzymes derived from M.tb.

[13] Institute of Genomics and Integrative Biology (IGIB)

Agency: Council of Scientific and Industrial Research (CSIR)

Established: 1966 (as Biochemicals Unit); 1977 (renamed as CSIR Centre for Biochemicals); 1993 (renamed as Centre for Biochemical Technology); 26th September 2002 (renamed as IGIB)

National Capital Territory: Delhi

Address and Contact Information: Near Jubilee Hall, Mall Road, Delhi-110007, India. Phone: +91-011-27666156/157, 27667602, 27667439; Fax: +91-011-27667471; Website: www.igib.res.in

Director: Dr. Rajesh S. Gokhale; e-mail: rsg@igib.in

Vision and Mission: To translate concepts developed in basic biological research to commercially viable technologies for health care.
Contribution to Tropical Diseases: IGIB’s major contribution to Tropical Diseases is in the area of tuberculosis, where quite a few scientists are involved with various aspects of TB research. Dr. Rajesh Gokhale is working on the Chemical Biology of M.tb and delineating metabolic pathways and mechanisms employed by M.tb to generate molecular diversity that are crucial for its virulence and pathogenicity. Dr. Bhupesh Taneja is working on structural studies of eukaryotic serine/threonine protein kinases of M.tb. Dr. L.S. Meena is investigating the different kinases and phosphatases of M.tb and their role in the survival of the pathogen inside the host. Dr. Rakesh Sharma works in the area of molecular characterization of the role of metal ions in mycobacteria. Dr. S. Ramachandran focuses on experimental investigations in the signalling of nitrogen metabolism and potential adhesins and their host receptors in M.tb. Dr. Vinod Scaria utilizes bioinformatic tools for genome analysis of M.tb. Dr. Yogendra Singh focuses on understanding how coordination between signaling networks and transcriptional machinery regulates M.tb pathophysiology. He is also studying the regulation and function of mycobacterial kinome and secretome which capacitates the bacterium to become a highly adapted pathogen.

[14] National Institute of Immunology (NII)

Agency: Department of Biotechnology (DBT)

Established: 24th June 1981

National Capital Territory: Delhi

Address and Contact Information: Aruna Asaf Ali Marg, New Delhi-110067, India. Phone: EPABX: 26717121 to 26717145; Fax: +91-11-26742125 and +91-11-26742626; Website: www.nii.res.in

Director: Prof. Avadhesha Surolia; e-mail: surolia@nii.res.in

Vision and Mission: The Institute is committed to advanced research addressing the basic mechanisms involved in body’s defence, host-pathogen interactions and related areas with a view to contribute to the creation of an internationally competitive intellectual knowledge base as a sustainable source of innovative futuristic modalities of potential use in health care.

Contribution to Tropical Diseases: A number of scientists work in the area of Tropical Diseases as part of the Immunity and Infection program of the institute. A major contribution of the institute is the development of a heat-killed Mycobacterium w (Mw) therapeutic TB vaccine, marketed under the trade name “Leprovac”. Prof. Surolia is interested in the identification of new therapeutic targets for Plasmodium falciparum and Mycobacterium tuberculosis. Prof. Basu's research involves targeted intracellular delivery of therapeutic agents to macrophages by attaching them to macromolecular carriers specifically recognized by the scavenger receptors localized primarily on macrophages.
The versatility, specificity and superior efficacy of this novel approach over conventional chemotherapy has been demonstrated in model systems of macrophage-associated diseases such as kala-azar and tuberculosis. Dr. Lalit Garg is interested in targeting the glycolytic enzymes, as potential drug targets to control *M. tuberculosi*. Dr. Akhil Banerjea is involved in the genetic and functional analyses of host and viral genes and their implications for progression of HIV. Dr. Amitabha Mukhopadhyay is interested in endocytosis and intracellular trafficking, as well as host-parasite interactions in relation to *Salmonella* and *Leishmania*. Dr. Rajni Rani is involved with immunological and immunogenetic studies of TB patients undergoing Mw vaccine trial. Dr. Sudhanshu Vrati studies the replication of JEV and the role of the cellular proteins in virus replication. He is also examining the potential of small nucleic acid molecules such as siRNA and DNAzymes for inhibiting JEV replication. He is also involved in the development of newer vaccine candidates for immunization against JEV. He is also interested in the molecular biology of Chikungunya virus as well as the development of a candidate vaccine against the virus. His laboratory is also involved in the field trial of an oral rotavirus vaccine for children. Dr. Sangeeta Bhaskar is involved in vaccine development against tuberculosis. She is studying the immune response and protective efficacy of live MIP/ killed MIP/ BCG in animal models of tuberculosis as well as efficacy and safety of immunomodulator MIP as an adjunct therapy in pulmonary tuberculosis. Dr. Kanwaljit Kaur investigates the role of carbohydrates in host-parasite interactions. Dr. Mohd. Ayub Qadri works on the interaction of *Salmonella typhi* with host cells. Dr. Devinder Sehgal is interested in understanding microbes in relationship to their host. The specific areas include host-pathogen interaction, virulence factors, microbial immunity and molecular microbiology of the bacterial human pathogen *Streptococcus pneumoniae*. Dr. Pushkar Sharma is interested in molecular and cellular dissection of intracellular signaling and trafficking cascades of *Plasmodium falciparum*. Dr. Vinay Kumar Nandicoori is interested in cell signaling and host-pathogen interactions with particular reference to M.tb and its host macrophages. Dr. Sandeep Saxena is studying the DNA replication in *Leishmania donovani*. Leishmania also carry very unusual mitochondrial DNA known as kinetoplast DNA which comprises a giant network of interlocked DNA rings. Kinetoplast DNA is essential for the growth of Leishmania and strategies are being devised to interfere in the replication process. Dr. Agam P. Singh is interested in understanding host-parasite interactions during malaria liver stages development. The focus is to identify *Plasmodium* proteins that modulate the hepatocyte cellular functions and their mechanism(s) of action. He is also interested in identification of the new targets for drug and/or vaccine development for malaria. Dr. Bichitra Biswal is interested in identifying biochemically and structurally characterized potential drug targets from M.tb and to develop inhibitors, using screens of natural or synthetic compounds, against them.

[15] Indian Council of Medical Research (ICMR) Headquarters

**Agency:** Department of Health Research, Ministry of Health and Family Welfare, Government of India
Established: 1911 (as Indian Research Fund Association); 1949 (re-designated as ICMR)

National Capital Territory: Delhi

Address and Contact Information: P.O. Box No. 4911, Ansari Nagar, New Delhi-110029, India; Phone: +91-11-26588895; +91-11-26588980; +91-11-26589794; +91-11-26589336; +91-11-2658707; Fax: +91-11-26588662; Website: www.icmr.nic.in

Director-General: Dr. V.M. Katoch; e-mail: (1) dg@icmr.org.in; (2) secretarydhr@icmr.org.in; (3) vishwamohan_katoch@yahoo.co.in

Vision and Mission: The Council's research priorities coincide with the National health priorities such as control and management of communicable diseases, fertility control, maternal and child health, control of nutritional disorders, developing alternative strategies for health care delivery, containment within safety limits of environmental and occupational health problems; research on major non-communicable diseases like cancer, cardiovascular diseases, blindness, diabetes and other metabolic and hematological disorders; mental health research and drug research (including traditional remedies). All these efforts are undertaken with a view to reduce the total burden of disease and to promote health and well-being of the population.

Contribution to Tropical Diseases: Dr. V.M. Katoch has been involved with studies on tuberculosis and leprosy at JALMA along with collaborators from other institutes, universities and medical colleges. These have led to important new findings and new technologies such as enzyme based methods in 1980s, molecular biology based techniques in 1990s and genomics based methods in the new millennium. These studies have resulted in identification of new genotypes, new diagnostic techniques/molecules for better understanding of molecular basis of drug resistance and mechanisms of pathogenesis of TB, leprosy and other mycobacterial infections. Other major areas where scientists from the ICMR HQ have contributed include HIV/AIDS, malaria, lymphatic filariasis, enteric fever, diarrheal diseases, as well as IEC activities for infectious diseases.

[16] National Institute of Malaria Research (NIMR)

Agency: Indian Council of Medical Research (ICMR)

Established: 1977 (as Malaria Research Centre); 2005 (re-named as NIMR)

National Capital Territory: Delhi

Address and Contact Information: Sector 8, Dwarka, Delhi-110077, India. Phone: +91-11-25307103, 104, 105; Fax: +91-11-25307177, 25307111; Website: www.mrcindia.org
Officer-in-Charge: Dr. V.K. Dua; e-mail: vkdua51@gmail.com

Vision and Mission: The primary mission of the Institute is to find short-term as well as long-term solutions to the problems of malaria through basic, applied and operational field research. The Institute also plays a key role in manpower resource development through trainings/workshops and transfer of technology.

Contribution to Tropical Diseases: The major areas of research carried out over the years are on mosquito fauna surveys, development of genetic and molecular markers for important malaria vectors and parasites, cyto-taxonomic studies identifying major vectors as species complexes and laboratory and field studies to examine the biological variations among sibling species, development of molecular identification techniques for sibling species, monitoring of insecticide resistance through space and time, and preparation of action plans, have yielded valuable information. Field evaluation of new insecticides, bio-larvicides, insecticide-impregnated bed nets, drugs and parasite diagnostic kits have provided new armament to malaria control. Many of these have found place in national malaria control programme. NIMR has a network of well developed laboratories at Delhi carrying out research on all aspects of malaria along with 10 field laboratories in malarious areas, which serve as testing ground for new technologies and help in the transfer of technologies.

[17] Institute of Pathology (IOP)

Agency: Indian Council of Medical Research (ICMR)

Established: 1965 (as Indian Registry of Pathology); 1980 (re-designated as IOP)

National Capital Territory: Delhi

Address and Contact Information: Safdarjang Hospital Campus, Post Box No. 4909 New Delhi-110029, India; Phone: +91-11-26198402; Fax: +91-11-26198401; Website: http://instpath.gov.in

Director: Dr. Sunita Saxena; e-mail: saxenas@icmr.org.in

Vision and Mission: IOP acts as a resource centre for Modern Pathology, Biotechnology, Basic and Translational Research with the additional mandate to integrate research output to the clinical practice bringing lab to bed.

Contribution to Tropical Diseases: In relation to Tropical Diseases, IOP scientists are involved in understanding the process of in vitro differentiation of Leishmania donovani. They have carried out functional genomic studies of virulence related genes in Leishmania - first identification of centrin gene of Leishmania. They have also identified genes associated with drug resistance in kala-azar, and have developed diagnostics for
kala-azar and PKDL. Research is also being carried out with regard to PKDL Immunobiology.

[18] All India Institute of Medical Sciences (AIIMS)

Agency: Autonomous Medical Institution

Established: 1956

National Capital Territory: Delhi

Address and Contact Information: Ansari Nagar, New Delhi-110029, India. Phone: +91-11-26588500; +91-11-26588700; +91-11-26589900; Fax: +91-11-26588663; +91-11-26588641; Website: www.aiims.edu

Director: Prof. R.C. Deka; e-mail: director@aiims.ac.in

Vision and Mission:
- To develop a pattern of teaching in undergraduate and postgraduate medical education in all its branches so as to demonstrate high standard of medical education to all medical colleges and other allied institutions in India.
- To bring together in one place educational facilities of the highest order for the training of the personnel in all important branches of the health activity.
- To attain self sufficiency in postgraduate medical education.

Contribution to Tropical Diseases: Prof. D.N. Rao works in the area of novel delivery system for HIV and malaria vaccine as well as on the role of T-regulatory cells in leprosy. Prof. Y.D. Sharma works on malaria, which has involved the identification of multiple Indian strains of *P. falciparum*, isolation of unique *P. vivax* antigens, molecular epidemiology of drug resistant malaria, as well as molecular characterization of host-parasite interactions. Prof. Jaya S. Tyagi works on tuberculosis, involving the areas of molecular pathogenesis, dormancy, diagnosis, and host-pathogen interactions. The major contribution of Prof. H. Krishna Prasad is the discovery and description of the *HupB* gene (Rv 2986c) of *M. tuberculosis*, a histone-like DNA binding protein. Prof. J. Samantaray’s area of research is malaria diagnostics. Dr. Bimal Kumar Das is interested in the molecular epidemiology of rotavirus as well as diseases caused by *Streptococcus pneumoniae* and *Haemophilus influenzae* with particular reference to India. Dr. Arti Kapil is involved with the study of the gyr A gene of *Salmonella typhi* in India and its sequencing. Prof. Shobha Broor works in the area of diagnostic virology. Dr. Urvashi B. Singh works on molecular typing of *Mycobacterium tuberculosis*. Dr. Madhu Vajpayee works on flowcytometric analysis of lymphocyte subsets and their surface markers in HIV/AIDS patients and HIV/TB co-infected patients. Dr. Rama Chaudhry’s research involves diagnostic bacteriology that includes a number of pathogens such as *Salmonella typhi*. Prof. S.K. Sharma is involved in various clinical trials pertaining to pulmonary tuberculosis. Dr. Sanjeev Sinha works in the area of HIV/AIDS and TB. Prof. N.K.
Mehra is involved with the immunogenetics of TB, HIV/AIDS and leprosy. Prof. Sarman Singh is interested in intracellular pathogens such as M.tb and leishmania. Dr. Purva Mathur is interested in the area of diagnostics for visceral leishmaniasis.

[19] University of Delhi

Agency: Autonomous University

Established: 1922

National Capital Territory: Delhi

Address and Contact Information:

Head, Department of Zoology: Prof. Rup Lal; Phone: +91-11-27667985; Fax: +91-11-27667985; e-mail: ruplal@gmail.com

Head, Department of Biochemistry: Prof. Anil K. Tyagi; Phone: +91-11-24110970; e-mail: aniltyagi@south.du.ac.in

Head, Department of Microbiology: Prof. Rani Gupta; Phone: +91-11-24112503, 24119986, 2411955/ Extn: 240; Fax: +91-11-24115270; e-mail: microsdc@yahoo.co.in; Website: www.du.ac.in

Vice-Chancellor: Prof. Deepak Pental; e-mail: vc@du.ac.in

Vision and Mission: Ever since its inception, a strong commitment to excellence in teaching and research has made the University of Delhi a role-model and path-setter for other universities in the country. Its rich academic tradition has always attracted the most talented students who later on went on to make important contributions to their society.

Contribution to Tropical Diseases: Prof. Virendra K. Bhasin works in the area of antimalarials. Prof. Anil K. Tyagi works in the area of TB vaccine development. Dr. Amita Gupta works on genome-wide cloning, expression and purification of toxin and antitoxin proteins of M.tb and development of reagents, as well as studying the physiological role of the proteins.

[20] University College of Medical Sciences (UCMS), University of Delhi

Agency: Autonomous Medical College of the University of Delhi

Established: 1971
National Capital Territory: Delhi

Address and Contact Information: Dilshad Garden, Delhi-110095, India. Phone: +91-11-22582972-74; Fax: +91-11-22590495; Website: www.ucms.ac.in

Principal: Prof. O. P. Kalra; e-mail: principal@ucms.ac.in

Vision and Mission: UCMS is a constituent College of the University of Delhi and runs various Medical (MBBS/MD/MS) and Para-medical (BSc in Medical Technology, Radiography, Diplomas in Nursing and Medical Laboratory Technology) courses, as well as PhD. The College is dedicated to providing high quality medical education as well as healthcare.

Contribution to Tropical Diseases: Prof. V.G. Ramachandran carries out HIV sentinel surveillance, HIV sero-surveillance and quality assurance evaluation. Prof. (Mrs.) Shukla Das Rudra studies the effector immune responses to common recall antigens and underlying helminthic infections in autoimmune skin diseases before and after immune-suppressive intervention. She also works on molecular characterization of V. cholerae O1 biotype El Tor strains isolated from East Delhi and comparison of their plasmid profile and RFLP pattern with antibiogram. Prof. A. Indrayan works on creation of a HIV database.

[21] Vallabhbhai Patel Chest Institute (VPCI), University of Delhi

Agency: Autonomous Medical Institute of the University of Delhi

Established: 12th January, 1953

National Capital Territory: Delhi

Address and Contact Information: University of Delhi, Delhi-110007, India. Phone: EPABX: +91-11- 27667102 / 27667441 / 27667667 / 27666182; Ext. 100; Fax: +91-11-27666549; Website: www.vpci.org.in/institute.asp

Director: Dr. V.K. Vijayan; e-mail: (1) vpci@delnet.ren.nic.in; (2) patelchest@vpci.org.in

Vision and Mission: The main objectives of VPCI have been to conduct research on basic and clinical aspects of Chest Medicine, to train post graduates in Pulmonary Medicine and allied subjects, to develop new diagnostic technology and disseminate scientific knowledge related to Chest Medicine to other institutions in the country and to provide specialized clinical and investigative services to patients.
Contribution to Tropical Diseases: The contribution of VPCI to Tropical Diseases concentrates on three major aspects of *Mycobacterium tuberculosis*, namely, metabolic studies on mycobacteria, functions and regulation of polyamines in mycobacteria, and on the molecular biology of tubercle bacilli.

[22] B.R. Ambedkar Centre for Biomedical Research, University of Delhi (ACBR)

Agency: Autonomous Centre of the University of Delhi

Established: 31st March, 1991

National Capital Territory: Delhi

Address and Contact Information: University of Delhi, Delhi-110 007, India
Phone: +91-11-27666272, 27667151; Fax: +91-11-27666248;
Website: www.acbrdu.edu

Officiating Director: Prof. Daman Saluja; e-mail: dsalujach@yahoo.com

Vision and Mission: The Centre is dedicated to achieving excellence in postgraduate education and research in the area of Biomedical Sciences.

Contribution to Tropical Diseases: Prof. Vani Brahmachari’s research interest is in the area of functional genomics of *M. tuberculosis*. Prof. Daman Saluja’s laboratory works on NAAT-based diagnosis of infectious diseases. Prof. K. Natarajan’s group has been characterizing the interactions of *M. tuberculosis* with key players of the innate immune system including dendritic cells (DCs), macrophages and the effects thereof on regulating effector T cell responses. Dr. Anuj Katyal’s group is exploring the modulatory role of various cytokines, proinflammatory molecules, oxidative stress and apoptosis in immunopathological conditions during cerebral malaria.

[23] Jawaharlal Nehru University (JNU)

Agency: Autonomous University

Established: 1969

National Capital Territory: Delhi

Address and Contact Information: New Mehrauli Road, New Delhi-110067, India.
Phone: +91-11-26742676, 26742575, 26741557; Fax: +91-11-26742580;
Website: www.jnu.ac.in
Dean, School of Biotechnology: Prof. Rajiv Bhat; Phone: +91-11-26704086, 26704089, 26742533; e-mail: rajivbhat@mail.jnu.ac.in

Dean, School of Life Sciences: Prof. Rentala Madhubala; Phone: +91-11-26704521, 26742630; e-mail: madhubala@mail.jnu.ac.in

Dean, School of Environmental Sciences: Prof. Sudha Bhattacharya; Phone: +91-11-26704308; e-mail: (1) sb@mail.jnu.ac.in; (2) sudhabh@hotmail.com

Vision and Mission: The University shall endeavour to promote the principles for which Jawaharlal Nehru worked during his life-time, national integration, social justice, secularism, democratic way of life, international understanding and scientific approach to the problems of society. Towards this end, the University shall:

- Facilitate students and teachers from all over India to join the University;
- Foster the composite culture of India and establish such departments or institutions as may be required for the study and development of the languages, arts and culture of India;
- Promote in the students and teachers an awareness and understanding of the social needs of the country and prepare them for fulfilling such needs;
- Make special provision for integrated courses in humanities, science and technology in the educational programmes of the University;
- Take appropriate measures for promoting inter-disciplinary studies in the University;
- Establish such departments or institutions as may be necessary for the study of languages, literature and life of foreign countries with a view to inculcating in the students a world perspective and international understanding;
- Provide facilities for students and teachers from other countries to participate in the academic programmes and life of the University.

Contribution to Tropical Diseases:

School of Biotechnology: Prof. Santosh K. Kar works on the innate immune response of humans in lymphatic filariasis, as well as determination of the immunological signature of tuberculosis, and development of soluble form of Curcumin for malaria therapy. Dr. Swati Tiwari’s research interest lies in understanding the importance of the ubiquitin-proteasome pathway in the pathogenesis of various human parasitic diseases such as leishmaniasis.

School of Life Sciences: Prof. Alok Bhattacharya works on the biology of Entamoeba histolytica. Prof. Rentala Madhubala works on Leishmania donovani. Prof. R.N.K. Bamezai works in the area of leprosy and tuberculosis. Dr. Neelima Mondal works on the functional characterization of gyrase enzyme from Plasmodium falciparum.

School of Environmental Sciences: Prof. Sudha Bhattacharya works in the area of Entamoeba histolytica.
[24] International Centre for Genetic Engineering and Biotechnology (ICGEB)

**Agency:** Autonomous inter-governmental organization (Italy-India)

**Established:** 1983

**National Capital Territory:** Delhi

**Address and Contact Information:** Aruna Asaf Ali Marg, New Delhi -110 067, India.
- **Phone:** +91-11-26741358;
- **Fax:** +91-11-26742316;
- **Website:** www.icgeb.org/home nd.html

**Director:** Prof. Virander S. Chauhan; **e-mail:** virander@icgeb.res.in

**Vision and Mission:** The Centre is dedicated to advanced research and training in Molecular Biology and Biotechnology and holds out the prospect of advancing knowledge and applying the latest techniques in various fields, including biopharmaceuticals and agriculture.

**Contribution to Tropical Diseases:** With relevance to the present mapping exercise, ICGEB, Delhi Centre carries out biomedical projects in the areas of HIV/AIDS, tuberculosis, diagnostics and vaccine development for dengue, malaria (both basic research and vaccine and drug development), as well as development of technologies for biopharmaceuticals and for diagnosis of infectious diseases.

[25] LRS Institute of Tuberculosis and Respiratory Diseases

**Agency:** Autonomous Institute under the Ministry of Health & Family Welfare, Government of India

**Established:** 1952

**National Capital Territory:** Delhi

**Address and Contact Information:** Sri Aurobindo Marg, Near Qutub Minar, New Delhi-110030, India.
- **Phone:** EPABX: +91-11-26517826, 26517829, 26517830, 26854929, 26854922, 26855094;
- **Fax:** +91-11-26568227;
- **Website:** http://lrsitbrd.nic.in/Index.htm

**Director:** Prof. D. Behera; **e-mail:** dirlrsi@bol.net.in

**Vision and Mission:**
- Development of a multidisciplinary and cost effective approach for the control and prevention of tuberculosis and other respiratory diseases.
• Determination of standards and maintenance of quality diagnosis and treatment of tuberculosis and other respiratory diseases.
• Information, Education and Communication for the well being of the community.

**Contribution to Tropical Diseases:** The Institute acts as an apex Institute in the country for prevention, control and treatment of tuberculosis and allied diseases. It promotes National Tuberculosis Control Programme in the country and formulates strategies which are socially acceptable and economically feasible in order to assist and strengthen the programme. It also provides facilities for training, teaching and research activities in the area of tuberculosis and other respiratory diseases.

[26] National Centre for Disease Control

**Agency:** Directorate General of Health Services, Ministry of Health and Family Welfare, Government of India

**Established:** 1909 (as Central Malaria Bureau at Kasauli, Himachal Pradesh); 1927 (renamed as Malaria Survey of India); 1938 (shifted to Delhi and renamed Malaria Institute of India); 30th July, 1963 (renamed National Institute of Communicable Diseases); 30th July 2009 (renamed National Centre for Disease Control)

**National Capital Territory:** Delhi

**Address and Contact Information:** Directorate General of Health Services, 22 Sham Nath Marg, New Delhi-110054, India. **Phone:** +91-11-23913148, 23946893 (PS to Director); +91-11-23971 272/060/344/524/449/326 (Board Numbers); **Fax:** +91-11-23922677; **Website:** www.ncdc.gov.in

**Director:** Dr. R.L. Ichhpujani; **e-mail:** (1) dirncd@nic.in; (2) dirncd@gmail.com; (3) dirncd@del3.vsnl.net.in

**Vision and Mission:** To provide training and service and to carry out operational research in the field of communicable diseases and their prevention and control in the country.

**Contribution to Tropical Diseases:** The NCDC advises the Government on issues related to prevention and control of communicable diseases in the country and initiates enquiries and undertakes epidemiological investigations and operational research on communicable diseases. It trains research workers and personnel in Epidemiology. It publishes scientific results, technical guidelines, training manuals and bulletins. It organizes workshops to provide training on topics of topical interest like Epidemiology. The NCDC provides referral diagnostic services for various communicable diseases, some of which are ordinarily not available in hospitals and medical colleges. It acts as a nodal point for testing and devising control strategies formulated on a pilot scale before wider application. It actively participates in planning, guiding and evaluation of the
National Disease Surveillance Programme, Yaws Eradication Programme and provides support to Global Polio Eradication Programme.

**Zone-3**
- Rajasthan
- Gujarat
- Daman & Diu
- Dadra & Nagar Haveli
- Madhya Pradesh
- Chhattisgarh

**Institutions relevant to Tropical Diseases from Zone-3**

[1] **Regional Medical Research Centre for Tribals (RMRCT)**

**Agency:** Indian Council of Medical Research (ICMR)

**Established:** 1984

**State:** Madhya Pradesh

**Address and Contact Information:** RMRC Complex, Nagpur Road, P.O. Garha, Jabalpur, PIN-482003, Madhya Pradesh, India. **Phone:** +91-761-2370800, 2370818; 9302421003; **Fax:** +91-761-2672835; **Website:** www.rmrct.org

**Director:** Dr. Neeru Singh; **e-mail:** (1) director@rmrct.org; (2) nsmrc@hotmail.com; (3) neeru.singh@gmail.com

**Vision and Mission:** To improve health, nutrition and educational awareness of tribals through basic, applied and operational research to levels that they are no longer considered under-privileged communities of the country.

**Contribution to Tropical Diseases:** RMRCT is attempting to estimate the magnitude of health problems to tribals posed by infectious diseases such as malaria, tuberculosis, leprosy, diarrhoea, filariasis, venereal diseases, poliomyelitis, and measles.

[2] **Desert Medicine Research Centre (DMRC)**

**Agency:** Indian Council of Medical Research (ICMR)

**Established:** 27th June, 1984

**State:** Rajasthan
Address and Contact Information: Pali Road, Jodhpur-342005, Rajasthan, India. Phone: +91-291-2722403; Fax: +91-291-2720618; Website: www.dmrcjodhpur.org

Director-in-Charge: Dr. Bela Shah; e-mail: director@dmrcjodhpur.org

Vision and Mission:

- To undertake and promote research on health problems specific to desert areas.
- To study the changing patterns of health problems especially in view of various developmental activities taking place in the region.
- To strengthen the scientific and technical expertise of state as well as local health agencies.

Contribution to Tropical Diseases: The DMRC works in the area of Japanese encephalitis, dengue, malaria and tuberculosis. Culex pseudosvishnui and Culex tritaeniorhynchus, vector of JE, hitherto considered to be abounding in rice growing areas, were reported for the first time from Rajasthan. Scientists at the Centre explained the mechanism of dengue virus retention in Nature through demonstration of transovarial transmission (TOT) of dengue virus in Aedes aegypti up to seven generations under laboratory conditions. The scientists have also demonstrated a 200 kD protein in the mid-gut of mosquitoes that was refractory to dengue virus. The dynamics of desert malaria has also been demonstrated. Opium addiction associated susceptibility to pulmonary tuberculosis, as well as the problem of silico-tuberculosis in stone quarry workers has also been investigated.


Agency: Defence Research and Development Organization (DRDO), Ministry of Defence, Government of India

Established: Originated in 1924; came into existence in 1947

State: Madhya Pradesh

Address and Contact Information: Gwalior, India. Website: www.drdo.res.in/labs/drde/index.html?d=Search+DRDO+Website&select=22

Director: Dr. R. Vijayaraghavan

Vision and Mission:

- Be a center of excellence in handling hazardous materials and microorganisms.
- To design and develop state-of-the-art detection and protection technologies against hazardous materials and microorganisms.
Contribution to Tropical Diseases: With relevance to Tropical Diseases, DRDE has developed the following Diagnostic kits:

- Latex Agglutination Antigen Detection Kit - for diagnosis of meningococcal meningitis in humans.
- Dengue Dipstick ELISA Kit - for diagnosis of dengue.
- Typhigen Kit - for diagnosis of typhoid.
- Antigen Detection DOT ELISA Kit - for diagnosis of falciparum malaria.

[4] SMS Medical College and Allied Hospitals

Agency: Government of Rajasthan

Established: 1947

State: Rajasthan

Address and Contact Information: Jawaharlal Nehru Marg, Jaipur-302004, Rajasthan, India. Website: http://smsmedicalcollege.webs.com

Principal & Controller: Dr. Ashok Panagariya; e-mail: principalsmsmc@yahoo.co.in

Vision and Mission: The SMS Medical College conducts its activities with the common objective of imparting healthy medical education and research as well as providing state-of-the-art treatment to the needy people of the state.

Contribution to Tropical Diseases: The major contribution of SMS Medical College and Allied Hospitals to Tropical Diseases is by way of offering treatment to patients suffering from T.B. and other chest diseases. The Chest & T.B. Hospital was established in the year 1938 as “King George V Sanitarium” after which its name was changed to Chest & T.B. Hospital. This hospital is now known as “Hospital for Chest Diseases and Tuberculosis“. This hospital is one of the important departments of Sawai Man Singh Hospital. This hospital is one of the renowned institutes in North India for chest and reparative diseases. Patients not only from Jaipur but also from 34 districts of Rajasthan, Madhya Pradesh, Uttar Pradesh, Haryana and Delhi come here for consulting the highly qualified team of doctors.

[5] Indian Institute of Science Education and Research (IISER)

Agency: Autonomous Institute

Established: 2008
State: Madhya Pradesh

Address and Contact Information: Transit Campus: ITI Campus (Gas Rahat) Building Govindpura, Bhopal-460023, Madhya Pradesh, India. Phone: +91-755-2601096/4092300; Fax: +91-755-4092392; Website: www.iiserbhopal.ac.in

Director: Prof. Vinod K. Singh; e-mail: vinodks@iit.ac.in

Vision and Mission: The prime focus of IISER Bhopal is to integrate science education and research with a motive of attracting bright students and world class faculty. The Institute is committed to imparting high moral and ethical values and creating concern and awareness for society and the environment.

Contribution to Tropical Diseases: IISER Bhopal, much like the other IISERs, primarily lays stress on basic research. Only two scientists carry out research in the area of Tropical Diseases. For example, Dr. Vikas Jain carries out basic research on the biology of Mycobacterium tuberculosis, while Dr. Himanshu Kumar is interested in the molecular mechanisms of host-pathogen interactions.

Zone-4
- Orissa
- Andhra Pradesh
- Tamil Nadu
- Puducherry
- Andaman & Nicobar

Institutions relevant to Tropical Diseases from Zone-4

[1] Institute of Life Sciences (ILS)

Agency: Department of Biotechnology (DBT), Government of India

Established: 11th February, 1989 (under the administrative and financial control of DST, Government of Orissa); August 2002 (brought under DBT, Government of India)

State: Orissa

Address and Contact Information: Nalco Square, Chandrasekharpur, Bhubaneswar-751023, Orissa, India. Phone: +91-0674-2301900, 2300137, 2301460, 2301476, 2300129; Fax: +91-0674-2300728; Website: www.ilsc.org

Director: Dr. B. Ravindran; e-mail: balaravi@ils.res.in
**Vision and Mission:** The ILS vision is to acquire insights into the biology of pathogens, pathogenesis of disease progression and evolution of pathogens in the context of their relationship to human genetics. The research programme of ILS strategically plans to address issues on infectious disease biology in experimental as well as human models. The mission is to use cutting-edge technology in modern biology to acquire insights into pathogen biology, immune-regulation and protective immunity and inflammatory processes at cellular and molecular levels. Keeping in view diverse host responses to different prevalent pathogens, ILS proposes to undertake investigations on disease spread by taking a 'Systems Biology' approach that would assist in developing mathematical models for computational analysis of infections in human communities.

**Contribution to Tropical Diseases:** Dr. B. Ravindran works on the immunology, pathogenesis and biology of pathogens causing malaria and helminthic diseases in human and experimental models, their transmission and natural history and interactions with other infectious pathogens. Dr. Durg V. Singh’s primary focus is to understand the evolutionary mechanism and processes involved in the emergence of pathogenic *V. cholerae*, sulfamethoxazole (SXT)-related integrating conjugative element (ICE) and to characterize those pathogenic genes and their protein products that are expressed during various stages of the infectious process/preservation. His group is also involved in the purification and characterization of secretogenic toxin produced by candidate cholera vaccine strains as well as non-cholera-producing *V. cholerae* strains.

[2] **Regional Medical Research Centre (RMRC), Bhubaneswar**

**Agency:** Indian Council of Medical Research (ICMR)

**Established:** 1981

**State:** Orissa

**Address and Contact Information:** Chandrasekharpur, Nandankanan Road, Bhubaneswar-751023, Orissa, India. **Phone:** +91-0674-2301332; **Fax:** +91-0674-2301351; **Website:** http://icmr.nic.in/pinstitute/Bhubaneswar.htm

**Director:** Dr. S.K. Kar; **e-mail:** (1) skk@icmr.org.in; (2) shantanukar@hotmail.com

**Vision and Mission:** RMRC conducts interdisciplinary research on locally prevailing communicable and non-communicable diseases such as filariasis, malaria, viral hepatitis, tuberculosis, diarrheal disorders, hemoglobinopathies and allied disorders, tribal health and nutrition in the state and neighboring areas. It provides support to the state Health Departments and National programmes in disease surveillance activities in the form of epidemic investigation and diagnosis, evaluation and training; and provides HRD activities in the form of training and research to post-graduate students for Ph.D / MD degrees, M.Sc. dissertation and short-term training to doctors and technicians from state health departments and NVBDCP, Delhi.
**Contribution to Tropical Diseases:** In relation to Tropical Diseases relevant to the project, RMRC works in the area of filariasis, malaria and diarrheal diseases.

In the area of filariasis, RMRC undertakes studies to find out the dynamics of disease progression for disease management; to develop an intervention strategy through clinical trials with emphasis on drug delivery mechanism, advocacy, monitoring and evaluation; to understand the immunological and molecular basis of host parasite interaction to develop immunodiagnostic / immunoprophylactic tools as R&D activity. In the area of malaria, RMRC carries out molecular characterization of incriminating parasites; therapeutic efficacy of commonly used anti-malarials and alternative treatment regimens for resistant parasite; studies on identification of genetic factors in humans involved in natural resistance to malaria infection; studies on identification of sibling species and genetic structure of malaria vectors using molecular markers; studies on application of remote sensing and GIS in epidemiology of malaria to develop strategy for vector control.

In the area of diarrheal diseases, RMRC undertakes studies on hospital and field based surveillance system for diarrheal diseases to monitor spectrum of enteric pathogens; molecular epidemiology and genetic characterization of *V. cholerae* strains and other diarrheal pathogens.

---

[3] National Institute of Science Education and Research (NISER)

**Agency:** Department of Atomic Energy (DAE), Government of India

**Established:** 2007

**State:** Orissa

**Address and Contact Information:** Institute of Physics Campus, P.O. Sainik School Bhubaneswar, Orissa-751005, India. **Phone:** +91-0674-2304000; **Fax:** +91-06742302436; **Website:** http://niser.ac.in

**Director:** Prof. T.K. Chandrashekar; **e-mail:** director@niser.ac.in

**Vision and Mission:** National Institute of Science Education and Research (NISER) is envisioned to be a unique institution of its kind in India. NISER will strive to be recognized as a Centre of Excellence in science education and research in four basic sciences (Biology, Chemistry, Mathematics and Physics) and in related areas. The aim of this special institute is to nurture world class scientists for the country who will take up challenging research and teaching assignments in universities, R&D laboratories and various industries. The exemplary teaching and research attributes of its faculty will inspire strongly motivated bright young students to dedicate their lives for scientific research.
Contribution to Tropical Diseases: Dr. Trailokya Nath Naik, Visiting Professor at NISER (until 20.07.2010) is a virologist, who has specialized in the area of rotavirus. He has carried out the genomic characterization of several rotavirus strains originating from various parts of the Indian subcontinent, including eastern India, Bangladesh and the Car Nicobar islands.

[4] National Institute of Malaria Research, Rourkela Field Station

Agency: Indian Council of Medical Research (ICMR)

Established: 1988

State: Orissa

Address and Contact Information: Sector 5, Rourkela-769002, Orissa, India. Phone: +91-661-4647300; Fax: +91-661-4641207; Website: www.mrcindia.org/rourkela.htm

Officer-in-Charge: Dr. S.K. Sharma; e-mail: (1) mrclrkl@dataone.in; (2) suryaksharma@gmail.com

Vision and Mission:
- Conduct applied field research on malaria.
- Develop and demonstrate appropriate disease vector control methods.
- Study socio-economic aspects of malaria with particular reference to sustainability of interventions developed.
- Facilitate transfer of technology to users.

Contribution to Tropical Diseases: The highlights of the work done by the NIMR Field Station at Rourkela, as well as ongoing projects in the area of malaria are given below:

- Bio-environmental control of malaria.
- Field trials of insecticide treated mosquito nets (ITMN).
- Comparative evaluation of bio-efficacy and persistence of mosquito nets treated with deltamethrin tablet formulation against malaria vectors *An. fluviatilis* and *An. Culicifacies* and its impact on malaria transmission in malaria endemic tribal area of Sundargarh district.
- Mosquito breeding in riceland agro-ecosystem with reference to malaria.
- Genetic diversity of *P. falciparum* and *P. vivax* in India: Development of microsatellite markers.
- Field trials of bio-larvicides.
- Bio-ecology of malaria vectors in Orissa.
- Vector bionomics in different ecotypes of Sundargarh district.
- Malaria transmission dynamics and field studies of *P. falciparum*.
- Development of field site for malaria vaccine trials.
• Malaria prevalence among pregnant women and children.
• Field testing of malaria diagnostic kits.
• Socio-economic aspect of tribal malaria.
• Malaria clinic.
• Assessment of therapeutic efficacy of chloroquine and sulfadoxine-pyrimethamine in uncomplicated *P. falciparum* malaria in India.
• Health education and training programme.

[5] University of Hyderabad

**Agency:** Central University, wholly financed by the University Grants Commission (UGC)

**Established:** 2\textsuperscript{nd} October, 1974

**State:** Andhra Pradesh

**Address and Contact Information:** P.O. Central University, Hyderabad-500046, Andhra Pradesh, India. **Phone:** EPABX: +91-040-23130000; **Website:** www.uohyd.ernet.in

**Vice-Chancellor:** Prof. Seyed E. Hasnain; **e-mail:** vc@uohyd.ernet.in

**Vision and Mission:** To disseminate and advance knowledge by providing instructional and research facilities in such branches of learning as it may deem fit and by the example of its corporate life, and in particular to make special provisions for integrated courses in humanities and science in the educational programmes of the University and to take appropriate measures for promoting inter-disciplinary studies and research in the University.

**Contribution to Tropical Diseases:** The Departments of Biotechnology, Biochemistry and Animal Sciences have made contributions in the area of Tropical Diseases. Prof. P. Prakash Babu works on the mechanism of cell death and cell survival signals in various experimental models, including that for cerebral malaria. Dr. Vaibhav Vindal and Dr. Niyaz Ahmed work in the area of tuberculosis. Prof. Anand Kumar Kondapi has purified a glycoprotein from human placenta that possesses anti-HIV activity. Dr. Mrinal Kanti Bhattacharyya works on the molecular genetics of *Plasmodium falciparum*. Dr. Sharmishta Banerjee works in the area of molecular pathogenesis of *Mycobacterium tuberculosis*, HIV and M.tb-HIV co-infection. Prof. Manjula Sritharan works on host-pathogen interactions with reference to iron acquisition in pathogenic mycobacteria and *Leptospira* spp. Dr. Radheshyam Maurya’s research areas are infection, immunity and diagnostic aspects of visceral leishmaniasis.
[6] Institute of Life Sciences (ILS)

Agency: An Associate Institute of the University of Hyderabad

Established: 2007

State: Andhra Pradesh

Address and Contact Information: University of Hyderabad Campus, Gachibowli, Hyderabad-500046, India. Phone: +91-40-66571500; Fax: +91-40-66571581; Website: www.ilsresearch.org

Director: Prof. Javed Iqbal; e-mail: jiqbal@ilsresearch.org

Vision and Mission: An Associate Institute of the University of Hyderabad, the Institute of Life Sciences (ILS) is a not-for-profit institute that aims to conduct innovative research in unifying areas of chemistry, biology and chemical biology. The goal of ILS is to create and foster a research culture where chemists and biologists work together to generate original ideas, and generate experimental data which can lead to novel therapies for human disease and an improvement in the quality of life. Training future generations of scientists working at the interface of chemistry and biology is an integral part of the mission of ILS.

Contribution to Tropical Diseases: Dr. Ritta Mathew works on the biology of *Mycobacterium tuberculosis*, with particular interest in the area of bacterial persistence in latent stage by targeting the electron / energy metabolic pathways. Another research interest is targeting quorum sensing by inhibiting biofilm formation in mycobacteria. Dr. Nasreen Z. Ehtesham works in the area of nutrition and its relationship with tuberculosis. She aims to understand the underlying mechanism of macrophage immune modulation during micronutrient deficiency and identification of markers of sterilization for tuberculosis. Demographical evidences suggest a positive correlation of micronutrient deficiency and occurrence of infectious diseases like tuberculosis. Experiments carried out in her laboratory have shown a direct relationship between micronutrient deficiency and TB disease status in humans.

[7] Centre for Cellular and Molecular Biology (CCMB)

Agency: Council of Scientific and Industrial Research (CSIR)

Established: 1st April, 1977

State: Andhra Pradesh
Vision and Mission: The Centre for Cellular and Molecular Biology (CCMB) is a premier research organization in frontier areas of modern biology. The objectives of the Centre are to conduct high quality basic research and training in frontier areas of modern biology and to seek potential applications of the work; and promote centralized national facilities for new and modern techniques in the inter-disciplinary areas of biology.

Contribution to Tropical Diseases: Dr. Raghunand R. Tirumalai is interested in understanding the molecular basis of pathogenesis of *Mycobacterium tuberculosis*. Dr. Amitabha Chattopadhyay investigates the role of membrane cholesterol in leishmaniasis. Dr. Sunit Kumar Singh works on the neurological aspects of HIV infection and JE / dengue infections. Dr. Puran Singh Sijwali is working on proteases and virulence proteins of malarial parasites to identify novel anti-malarial drug targets and to understand the pathogenesis of lethal *Plasmodium falciparum* malaria. Dr. Tushar Vaidya is interested in understanding host-pathogen interactions that dictate the outcome of infection, using the pathogen *Leishmania donovani* as a model system. Dr. Shailendra K. Saxena’s main research interests involve understanding the epidemiology and molecular mechanisms of host-defense during human viral infections and to develop new predictive, preventive and therapeutic strategies for them, using Japanese encephalitis virus, HIV, and chikungunya as model systems. Dr. Somdatta Sinha works on bioinformatics in the area of theoretical biology, nonlinear dynamics and complex systems with a view to understand the logic and design of biological processes. She has contributed in the area of HIV and malaria.

[8] Center for DNA Fingerprinting and Diagnostics (CDFD)

Agency: Department of Biotechnology (DBT), Government of India

Established: 26th March, 1996

State: Andhra Pradesh

Address and Contact Information: Bldg. 7, Gruhaloka, 5-4-399 / B, Nampally, Hyderabad-500001, Andhra Pradesh, India. Phone: +91 - 040 - 2474 9321/22/23; Fax: +91 - 040 - 2474 9448; Website: www.cdfd.org.in

Director: Dr. J. Gowrishankar; e-mail: (1) director@cdfd.org.in; (2) lbg@cdfd.org.in

Vision and Mission:
- To establish DNA diagnostic methods for detecting genetic disorders and to develop probes for such detection.
• To use DNA fingerprinting techniques for the authentication of plant and animal cell material, cell lines and to develop new probes where necessary for such purposes.
• To provide training in DNA fingerprinting techniques and offer consultancy services to medical institutions, public health agencies and industry in the country.
• To undertake basic, applied and development R&D work.
• To collaborate with foreign research institutions and laboratories and other international organizations; and establish affiliation with recognized universities and institutions.
• To acquire or transfer technical know-how from/to entrepreneurs and industries and, to register patents, designs and technical know-how in the interest of the Centre.
• To carry out DNA profile and related analysis in civil cases like paternity disputes, immigration, and exchange of newborns in hospitals, for various agencies including private parties, on appropriate payment.
• To provide DNA fingerprinting and related analysis and facilities to crime investigation agencies.
• To assist police personnel, forensic scientists, lawyers and the judiciary in understanding the evidential value of the DNA profile analysis and related techniques in crime investigation and family matters.

**Contribution to Tropical Diseases:** Dr. Sangita Mukhopadhyay’s current research interest is *Mycobacterium tuberculosis* immunology where she is investigating how various putative virulent proteins help the bacillus in establishing successful infection by counteracting the protective immune responses mounted by the host. Dr. Abhijit A. Sardesai is exploiting the sophisticated genetic tools that the bacterium *E. coli* offers to delineate the functions of ORFs from the bacterium *M. tuberculosis*, involved in cytoplasmic protein folding. Dr. Shekhar C. Mande carries out structural and functional studies on *M. tuberculosis* heat shock proteins.

[9] National Institute of Pharmaceutical Education and Research (NIPER)

**Agency:** Ministry of Chemicals and Fertilizers, Government of India

**Established:** 2007

**State:** Andhra Pradesh

**Address and Contact Information:** Balanagar, Hyderabad-500037, Andhra Pradesh, India. **Phone:** +91-040-23073741; +91-040-23423749; **Telex:** +91-040-23073751; **Website:** www.niperhyd.ac.in/index.aspx

**Project Director:** Dr. Ahmed Kamal; **e-mail:** ahmedkamal@iict.res.in

**Vision and Mission:** National Institute of Pharmaceutical Education and Research
NIPER is a National level institute in Pharmaceutical Sciences with proclaimed objectives of becoming Centre of Excellence for advance science and research in pharmaceutical sciences. Presently, Indian Institute of Chemical Technology (IICT), Hyderabad a premier CSIR Research Laboratory, is the Mentor Institute for NIPER, Hyderabad. This is being developed as a National Centre to cater to the needs of pharmaceutical academia and the industry. Very soon, it is likely to become the Centre of Excellence for Advance Studies and Research in Pharmaceutical Sciences. Hence, the government has awarded the status of “Institute of National Importance” to it. This institute will play an important role in the Human Resource Development for the ever growing Indian pharmaceutical industry, which has been in the forefront of India’s science based industries with wide ranging capabilities in this important field of drug manufacture.

**Contribution to Tropical Diseases:** Dr. Ramakrishna Sistla works in the area of anti-infectives. Dr. N. Shankaraiah is interested in design/synthesis of novel chemical entities for drug discovery by innovative strategies, combinatorial chemistry, and asymmetric synthesis including exploration of new useful methodologies for organic synthesis.

[10] Indian Institute of Chemical Technology (IICT)

**Agency:** Council of Scientific and Industrial Research (CSIR)

**Established:** 1944 (as Central Laboratories for Scientific & Industrial Research); 1956 (renamed as Regional Research Laboratory, Hyderabad); 1989 (renamed as IICT)

**State:** Andhra Pradesh

**Address and Contact Information:** Uppal Road, Hyderabad-500607, Andhra Pradesh, India. **Phone:** EPABX: +91-040-27191234; **Website:** www.iictindia.org

**Director:** Dr. J. S. Yadav; **e-mail:** yadav@iict.res.in

**Vision and Mission:**
- To become an innovative global R&D organization in the field of chemical sciences and technology with reference to industrial and specialty chemicals.
- To be an institution of international excellence in basic research in organic chemistry and adjacent chemical and engineering sciences.
- To establish balance between innovation and discovery research.
- Provide globally competitive environment friendly technologies.
- Achieve world class expertise in the frontier areas of chemical sciences and technology.
- Competence to offer knowledge-based technological services.
Contribution to Tropical Diseases: The Biology Department has contributed in the areas of filariasis and malaria by developing computer software for vector management and disease control.


Agency: Indian Council of Medical Research (ICMR)

Established: 1956

State: Tamil Nadu

Address and Contact Information: Mayor V. R. Ramanathan Road, Chetpet, Chennai-600031, Tamil Nadu, India. Phone: (Board): +91-44-2836 9500; Fax: +91-44-2836 2528; Website: www.trc-chennai.org

Director-in-Charge: Dr. Vasanthapuram Kumaraswami; e-mail: icmrtrc@vsnl.com

Vision and Mission:

- To be the best research centre for TB/HIV in the world.
- Fight TB/HIV with knowledge, compassion and commitment for lasting results.
- Empower governments with technical resources, build capacities and share knowledge.
- Forge partnerships locally, nationally, regionally and globally.

Contribution to Tropical Diseases: TRC is an internationally recognized institution in TB research. It is a Supranational Reference Laboratory and WHO Collaborating Centre for TB Research and Training. It is also an Internationally Certified Institute for Excellence in Research (ICER). TRC contributes actively towards both research and clinical services in the area of TB as well as TB/HIV co-infection.

[12] Centre for Research in Medical Entomology (CRME)

Agency: Indian Council of Medical Research (ICMR)

Established: 1985

State: Tamil Nadu

Address and Contact Information: 4-Sarojini Street, Chinna Chokkikulam, Madurai-625002, Tamil Nadu, India. Phone: +91-0452-2520565; Fax: +91-0452-2530660; Website: http://icmr.nic.in/pinstitute/crme.htm
Officer-in-Charge: Dr. B.K.Tyagi; e-mail: bk_tyagi@sify.com

Vision and Mission: The Vision and Mission of the Centre for Research in Medical Entomology (CRME) is to conduct research on various medico-entomological disciplines especially involving the control of vector-borne diseases such as Japanese encephalitis, lymphatic filariasis, dengue, chikungunya and malaria.

Contribution to Tropical Diseases:

- Surveillance and development of early-warning systems for epidemic outbreaks of vector-borne diseases.
- Stratification of vector-borne diseases.
- Survey of haematophagous arthropods.
- Development of control strategies for vector-borne diseases.
- Technology transfer to the user agencies.


Agency: Affiliated to the Government of Tamil Nadu and the UGC

Established: 6th February, 1966 (as Madurai University); 1978 (renamed as MKU)

State: Tamil Nadu

Address and Contact Information: Palkalai Nagar, Madurai-625021, Tamil Nadu, India. Phone: +91-0452-2459166; Fax: +91-0452-2458449;
Website: www.mkuniversity.org

Vice-Chancellor: Dr. R. Karpaga Kumaravel; e-mail: (1) vcmku@rediffmail.com; (2) vcmku@mkuniversity.org

Vision and Mission: “To seek truth is knowledge” (Tirukkural)

Contribution to Tropical Diseases: At MKU, the School of Biotechnology and School of Biological Sciences contribute in the area of Tropical Diseases. Prof. K. Dharmalingam carries out genome analysis of M. leprae and immunology of leprosy. Prof. S. Krishnaswamy carries out structural analysis of the outer membrane protein OmpC from Salmonella typhi and E. coli. He is also interested in understanding the structural interaction of S. typhi OmpC with the antibodies specific to OmpC. Prof. Ramasamy Pitchappan works in the area of immunology of infectious diseases afflicting humans.
[14] Bharathidasan University

Agency: Affiliated to the UGC

Established: 1982

State: Tamil Nadu

Address and Contact Information: Palkalaiperur, Tiruchirappalli, Tamil Nadu, India. Phone: +91-431-2407071; +91-431-2407074; Website: www.bdu.ac.in

Vice-Chancellor: Dr. K. Meena; e-mail: vc@bdu.ac.in

Vision and Mission: "We will create a brave new world" – in the words of great revolutionary Tamil Poet Bharathidasan, after whom the University has been named.

Contribution to Tropical Diseases: The Department of Biotechnology of the School of Life Sciences contributes to the area of Tropical Diseases. Dr. K. Balakrishnan works in the area of immunology of infectious diseases, with particular reference to TB and leprosy.

[15] Anna University Chennai

Agency: Affiliated University

Established: 4th September, 1978

State: Tamil Nadu

Address and Contact Information: Chennai-600025, India. Phone: +91-44-22203566 (Centre for Biotechnology); Fax: +91-44-22350299 (Centre for Biotechnology); Website: www.annauniv.edu

Vice-Chancellor: Prof. Dr. P. Mannar Jawahar

Prof. P. Kaliraj, Director, Centre for Biotechnology, Anna University, Chennai-600025, India. Phone: +91-44-22203566; Fax: +91-44-22350299; e-mail:pkaliraj@annauniv.edu

Vision and Mission: “Progress through knowledge”

Contribution to Tropical Diseases: The Centre for Biotechnology contributes in the area of Tropical Diseases. Prof. P. Kaliraj works in the area of molecular pathogenesis and genomics filariasis. Prof. R.B. Narayanan also works in the area of filariasis. Prof. K. Sankaran works on enteropathogens such as Shigella and entero-invasive E. coli. Dr.
Anuradha Dhanasekaran is interested in the transcriptional control and gene regulation in filariasis.

[16] Indian Institute of Technology Madras (IITM)

Agency: Ministry of Technical Education, Government of India

Established: 1959

State: Tamil Nadu

Address and Contact Information: I.I.T. Post Office, Chennai-600036, India. Fax: +91-44-2257 0509; Website: www.iitm.ac.in

Director: Prof. M.S. Ananth

Vision and Mission:
- To be an academic institution in dynamic equilibrium with its social, ecological and economic environment striving continuously for excellence in education, research and technological service to the nation.
- To create and sustain a community of learning in which students acquire knowledge and learn to apply it professionally with due consideration for ethical, ecological and economic issues.
- To pursue research and disseminate research findings.
- To provide knowledge-based technological services to satisfy the needs of society and industry.
- To help in building national capabilities in science, technology, humanities, management, education and research.

Contribution to Tropical Diseases: The Department of Biotechnology contributes to the area of Tropical Diseases. Prof. Mukesh Doble works in the area of Drug Design and QSAR for TB drug development. Dr. S. Mahalingam works on the molecular pathogenesis of HIV.

[17] National Institute of Epidemiology (NIE)

Agency: Indian Council of Medical Research (ICMR)

Established: 2nd July, 1999

State: Tamil Nadu
Address and Contact Information: Second Main Road, Tamil Nadu Housing Board Ayapakkam, Ambattur, Chennai-600077, India. Phone: +91-44- 26820517 / 26821600; Fax: +91-44- 26820464 / 26820355; Website: www.nie.gov.in

Director-in-Charge: Dr. V. Kumaraswami; e-mail: (1) directorne@dataone.in; (2) kumaraswami@gmail.com

Vision and Mission: National Institute of Epidemiology will emerge as a Centre of excellence in the field of epidemiology in the country. It would be an apex body on epidemiology and would concentrate on goal-oriented programmes of National relevance in relation to public health practice, operational research, health systems research, training and other emergent areas from time-to-time.

Contribution to Tropical Diseases:
- Generation of quality epidemiological data.
- Development of public health surveillance system.
- Applied field research.
- Epidemiology of communicable and non-communicable diseases.
- Clinical / field trials.
- Clinical trials registry.
- Epidemiology resource.
- Epidemiology base for public health programmes.

Leprosy
- Third resurvey of the Leprosy Vaccine Trial (LVT) population has been completed.
- Geographical Information System (GIS) was utilized to study the spatial autocorrelation of leprosy prevalence in the LVT trial area.
- Follow-up of 1,595 Pauci-Bacillary (PB) cases with 2-5 lesions and 1,263 single lesion cases recruited for the multi-centric clinical trial of single dose of Rifampicin, Ofloxacin and Minocycline (ROM) for PB leprosy cases is underway.
- Modification in the simulation model for leprosy transmission and control to make it user-friendly for programme managers is nearing completion.

HIV/AIDS: A study to assess gender differences in HIV risk behavior among 206 STD clinic attendees has revealed a strong need for tailoring HIV preventive intervention for each gender separately. Data collection from 511 STD clinic attendees of the Government General Hospital, Chennai was completed to study their attitude towards HIV testing.

[18] Christian Medical College (CMC)

Agency: Christian Medical College Vellore Association

Established: 1900
State: Tamil Nadu

Address and Contact Information: Ida Scudder Road, Vellore-632004, Tamil Nadu, India. Phone: +91-0416-2222102, 2281000, 2286001, 3070000; Fax: +91-0416-2232035, 2232103; Website: www.cmch-vellore.edu

Director: Dr. Suranjan Bhattacharji; e-mail: directorate@cmcvellore.ac.in
Principal: Dr. George Mathew; e-mail: princ@cmcvellore.ac.in

Vision and Mission: The Christian Medical College, Vellore, seeks to be a witness to the healing ministry of Christ, through excellence in education, service, and research.

Contribution to Tropical Diseases: The Department of Microbiology and the Department of Clinical Virology contributes to the area of Tropical Diseases.

The Department of Microbiology is primarily involved in TB research as well as research on other Chronic Obstructive Pulmonary Diseases (COPD). The Department has acted as a Reference Laboratory for (July –December 2009) South Asian Pneumococcal Network Alliance (SAPNA) and World Health Organization under International Clinical Epidemiology Network (INCLEN). It has carried out the following studies:

- Demonstration projects on iLED-based fluorescence microscopy for TB detection.
- Disease burden, clinical profile, practice, patterns and outcomes of MDR TB-Phase II MDR TB study.
- Prevalence and incidence of tuberculosis infection among nursing and allied health students in a south Indian teaching hospital, as assessed by QuantiFERON – TB-Gold Interferon assay and Tuberculin Skin test.
- Prospective study of etiological factors (bacteria and viruses) causing acute exacerbation of chronic obstructive pulmonary disease (COPD).

The Department of Clinical Virology has three primary functions:

- Patient-care related diagnostic services.
- Academic teaching.
- Research activities.

The Department has a Retrovirus Laboratory which carries out rapid tests, ELISAs and Western blots for HIV-1, HIV-2 and HTLV-I. The laboratory also does HIV viral load tests, CD4 estimations and HIV-1 drug resistance assay. The Cell Culture Laboratory offers a wide range of culture and antibody detection assays inclusive of virus neutralization and indirect immunofluorescence assays. A variety of viral agents (including opportunistic and neurotropic viruses) are also detected by molecular methods. The major research activities involve the area of neurotropic and opportunistic viruses, influenza surveillance, hantavirus, HIV, hepatitis virus and human papilloma viruses.
[19] National Institute of Malaria Research, Chennai Field Station

**Agency:** Indian Council of Medical Research (ICMR)

**Established:** July, 1986

**State:** Tamil Nadu

**Address and Contact Information:** NIE Campus, 2nd Main Road, TNHB, Ayapakkam, Chennai-600077, India. **Telefax:** +91-44-26820600; +91-44-26821700; **Website:** www.mrcindia.org/chennai.htm

**Officer-in-Charge:** Dr. Alex Eapen; **e-mail:** alexeapen@yahoo.com

**Vision and Mission:** The NIMR Chennai Field Station was set up with the primary objective to develop an eco-friendly, cost effective and sustainable intervention technology for control of urban malaria with Chennai as a role model. Other research objectives included were mainly related to the understanding of transmission dynamics of malaria in an urban environment. The research findings at the Centre were also intended to strengthen the intervention operations of the local health authorities by providing necessary scientific inputs.

**Contribution to Tropical Diseases:** The research activities being pursued at the NIMR Chennai Field Station are highlighted below.

- Bio-environmental control of malaria.
- Seven-point action plan for malaria control.
- Malariogenic stratification of Dindigul town, Dist. Dindigul, Tamil Nadu.
- GIS-based malaria surveillance system for Dindigul.
- Field evaluation of *Bacillus sphaericus* and *Bacillus thuringiensis* vs. *israelensis* in waterways in Chennai city.
- Rainwater harvesting and its implication on vector breeding in Chennai.
- Drug resistance status in *Plasmodium falciparum*.
- Therapeutic efficacy of chloroquine for the treatment of *Plasmodium vivax* malaria.
- Evaluation of Parasight – F diagnostic kit in the detection of *Plasmodium falciparum*.
- Evaluation of ICT malaria Pf/Pv immunochromatographic test in India.
- Evaluation of Hilmilin (an Igr compound) against *Culex quinquefasciatus* in unused domestic wells.
- Evaluation of mosquito repellent action of neem oil upon topical application.
- Workshops and health education programmes.
[20] Vector Control Research Centre (VCRC)

Agency: Indian Council of Medical Research (ICMR)

Established: 1975

Union Territory: Puducherry

Address and Contact Information: Medical Complex, Indira Nagar, Puducherry-605006, India. Phone: +91-413-2272396; +91-413-2272397; Fax: +91-413-2272041;
Website: http://vcrc.res.in

Director: Dr. P. Jambulingam; e-mail: pcsaja@yahoo.com

Vision and Mission: World free of vector borne diseases through pursuit of excellence in research, manpower development, service, consultancy, networking and partnership approach.

- Develop intervention strategies for control of vector borne diseases.
- Development of newer tools for the control of vector borne diseases.
- Development of epidemiological surveillance tools for vector borne diseases.
- Take a lead role in transfer of research findings to operational settings.
- Develop methods for rapid response and disaster management with reference to vector borne disease outbreaks.
- Generate evidence-based information system for policy formation/changes.
- Networking of all partners by establishing and strengthening local / state / national / international linkages.
- Promote healthy environment by empowering community with the knowledge on transmission risk reduction.
- Undertake human resource development activities to meet local / state / national / international needs.
- Provide a platform for free expression of all ideas and concepts that are likely to alleviate suffering from vector borne diseases.

Contribution to Tropical Diseases: Research at the Vector Control Research Centre (VCRC) addresses the following areas:

- Environment and vector borne diseases.
- Vector ecology and behavior.
- Vector population dynamics.
- Bio-control agents for mosquito control.
- Chemical agents for mosquito control.
- Molecular / immunological / genetic markers and diagnostics.
- Disease epidemiology and dynamics.
- Disease pathogenesis, pathology and progression.
- Socio-economic burden and impact of vector borne diseases.
• Prevention, management and control of infection and morbidity.
• Monitoring and evaluation of intervention for vector borne diseases.
• Optimization of intervention strategies.
• Development of tools for effective community health management.
• Development of tools for decision support.

[21] Regional Medical Research Centre (RMRC), Port Blair

Agency: Indian Council of Medical Research (ICMR)

Established: 1983

Union Territory: Andaman & Nicobar Islands

Address and Contact Information: Post Bag No.13, Port Blair-744101, Andaman & Nicobar Islands, India. Phone: +91-3192-251158, 251043, 251159; Fax: +91-3192-251163; Website: www.rmrc.res.in

Director: Dr. P. Vijayachari; e-mail: (1) pcticmr@sancharnet.in; (2) vijayacharip@yahoo.com

Vision and Mission: The Regional Medical Research Centre, Port Blair conducts research on communicable and non-communicable diseases prevalent in Andaman and Nicobar Islands with special emphasis on the health problems of the indigenous tribes. Local technical manpower development is another important facet of the Centre’s mandate.

Contribution to Tropical Diseases: RMRC contributes in the area of Tropical Diseases that are relevant to the project. These include diarrheal diseases, viral hepatitis, tuberculosis, lymphatic filariasis and other vector borne diseases including chikungunya, malaria and other health problems of the indigenous tribes of these Islands. The Centre detected the first reported outbreak of cholera in Andaman and Nicobar Islands (caused by the seventh pandemic strain of Vibrio cholerae Ogawa biotype El Tor). Identified subsequent outbreaks due to V. cholerae Inaba. The Centre studied the transmission dynamics of diurnally sub-periodic Wuchereria bancrofti transmitted by Ochlerotatus niveus in the Nancowry group of islands.
Zone-5
- Maharashtra
- Goa
- Karnataka
- Kerala
- Lakshadweep

Institutions relevant to Tropical Diseases from Zone-5

[1] National Chemical Laboratory (NCL)

Agency: Council of Scientific and Industrial Research (CSIR)
Established: 1950
State: Maharashtra

Address and Contact Information: Dr. Homi Bhabha Road, Pune-411008, India.
Phone: +91-20-25902600; Fax: +91-20-2590 2601; Website: www.ncl-pune.org

Director: Dr. S. Sivaram; e-mail: director@ncl.res.in

Vision and Mission:
- To be a globally recognized and respected R&D organization in the area of chemical sciences and engineering.
- To become an organization that will contribute significantly towards assisting the Indian chemical and related industries in transforming themselves into globally competitive organizations.
- To become an organization that will generate opportunities for wealth creation for the nation and, thereby, enhance the quality of life for its people.
- To carry out R&D in chemical and related sciences with a view to eventually deliver a product, process, intellectual property, tacit knowledge or service that can create wealth and provide other benefits to NCL’s stakeholders.
- To build and maintain a balanced portfolio of scientific activities as well as R&D programs to enable NCL to fulfill the demands of its stakeholders, present and future.
- To create and sustain specialized knowledge competencies and resource centers within NCL which can provide support to all stakeholders of NCL.

Contribution to Tropical Diseases: Dr. Dhiman Sarkar is interested in identifying novel targets, development of assays for High Throughput Screening (HTS) to get lead molecules against tuberculosis and malaria. Dr. Mala Rao works on enzyme inhibitors as therapeutic agents, for example, aspartic protease inhibitors, cysteine protease inhibitors and their interaction with HIV-1 protease. Dr. Shubhada Ratnakar Thengane is interested in biodiversity, chemodiversity, and molecular characterization in medicinal plants. Dr.
Pankaj Poddar is interested in chemical / biological synthesis of functionalized nanomaterials and their polymer composites.

[2] National Centre for Cell Sciences (NCCS)

Agency: Department of Biotechnology (DBT), Government of India

Established: 11th March, 1986

State: Maharashtra

Address and Contact Information: NCCS Complex, University of Pune Campus, Ganeshkhind, Pune-411007, Maharashtra, India. Phone: +91-20-25708000; Fax: +91-20-25692259; Website: www.nccs.res.in

Director: Dr. G.C. Mishra; e-mail: gemishra@nccs.res.in

Vision and Mission: Acceleration of research in modern biology to create new knowledge and technologies for human welfare. This will be achieved through (i) basic research in modern biology, (ii) human resources development, and (iii) serving as a National cell repository.

Contribution to Tropical Diseases: NCCS contributes to Tropical Diseases by pursuing a theme emphasizing on “Infection and Immunity” that aims to elucidate and dissect the interaction between infectious agents and the immune system. Dr. G.C. Mishra works on the immunobiology of T cell activation. Dr. Yogesh S. Shouche is currently studying genetic regulatory circuits and virulence factors in Aeromonas culicicola, a new species of bacterium of the mid-gut flora of the mosquito Culex quinquefasciatus. He also studies gene regulation in mosquitoes in relation to development and host-parasite interaction. Dr. Debashis Mitra works in the area of HIV/AIDS. His areas of interest include (i) role of viral regulatory proteins Tat and Nef in HIV pathogenesis and differential gene expression studies in HIV-1 infected cells, (ii) immune response to HIV infection towards generation of DNA vaccine, and (iii) identification of anti-HIV activity in plant extracts and marine animals. Dr. Bhaskar Saha works in the area of immuno-parasitology, using Leishmania as a model system. His interests include (i) leishmania-macrophage interaction, (ii) development and regulation of regulatory T cells in leishmaniasis, and (iii) DC subsets in leishmaniasis and regulation of T cell response. Dr. Samit Chattopadhyay works in the area of HIV/AIDS, the specific area being epigenetic regulation during HIV transcription. Dr. M.S. Patole has projects involving cloning of house-keeping enzyme genes from Leishmania spp.

Agency: Indian Council of Medical Research (ICMR)

Established: October, 1992

State: Maharashtra

Address and Contact Information: Post Box No. 1895, 73, ‘G’-Block, MIDC, Bhosari, Pune-411026, India. Phone: +91-020-2733-1200; Fax: +91-020-2712-1071; Website: www.nari-icmr.res.in/index.php

Director: Dr. R.S. Paranjape; e-mail: (1) rparanjape@nariindia.org; (2) hivnet@vsnl.com

Vision and Mission:
- To achieve control of HIV spread and to provide care to HIV infected population (Care, Treatment and Vaccine).
- To build a research capability of distinction to face the challenge of growing HIV/AIDS in India.
- To establish research initiatives having an interface with intervention and policy development to prevent and control the spread of the HIV/AIDS epidemic.

Contribution to Tropical Diseases: NARI carries out both basic as well as applied research on all aspects of HIV/AIDS, including clinical management of HIV infected patients.


Agency: Indian Council of Medical Research (ICMR)

Established: 1952 (as Virus Research Centre); 1978 (re-named as NIV)

State: Maharashtra

Address and Contact Information: 20/A, Dr. Ambedkar Road, Post Box No. 11, Pune-411001, India. Phone: +91-020-26127301 / +91-020-26006290; Fax: +91-020-26122669/ +91-020-26126399; Website: www.niv.co.in

Director: Dr. A.C. Mishra; e-mail: (1) mishraac@icmr.org.in; (2) acm1750@rediffmail.com

Vision and Mission: Pursuance of high quality applied and basic research in the areas of epidemiology, molecular biology, immunology, diagnostics, vaccinology, prevention and
control strategies for viruses of public health importance, by creating a Centre of Excellence, safe workplace and risk-free environment through the establishment of state-of-the-art laboratories and development of appropriate human resources.

**Contribution to Tropical Diseases:** NIV carries out research on a wide variety of viruses of Public Health importance. The major areas that the institute concentrates its activities include (i) outbreak response, (ii) diagnostics and kit supply, (iii) surveillance of humans, mosquitoes, birds and poultry, (iv) basic and applied research, and (v) supply of laboratory animals.

[5] **Microbial Containment Complex (MCC)**

**Agency:** Indian Council of Medical Research (ICMR)

**Established:** 1978

**State:** Maharashtra

**Address and Contact Information:** Sus Road, Pashan, Pune-411021, India.  
**Phone:** +91-120-25880982, +91-120-25889194; **Fax:** +91-120-26122669;  
**Website:** www.icmr.nic.in/pinstitute/mcc/mcc.html

**Scientist F:** Dr. D.T. Mourya; **e-mail:** (1) mouryadt@icmr.org.in; (2) mouryadt@vsnl.net

**Vision and Mission:**
- Self-reliant, fully prepared and competent Nation to meet all natural and man-made threats due to highly pathogenic viruses.
- Providing reliable diagnosis, effective prophylactics, vaccines and other strategies for prevention and control of viral diseases by creating centers of scientific excellence, safe workplace and risk-free environment.

**Contribution to Tropical Diseases:**
- Establishment of containment laboratories to facilitate study, storage and safe handling of highly infectious and novel viruses, such as SARS, Hantaan and Nipah.
- Establishment of a National Virus Repository and Serum Bank.
- Providing teaching and training programs on bio-safety and bio-containment.
- To establish rapid response teams to investigate epidemics of viral origin.
[6] Indian Institute of Science Education and Research (IISER)

Agency: Ministry of Human Resource Development, Government of India

Established: August 2006

State: Maharashtra

Address and Contact Information:

Campus I: First floor, Central Tower, Sai Trinity Building, Garware Circle, Sutarwadi, Pashan, Pune-411021, India. Phone: +91-20-2590-8001; Fax: +91-20-2589 9790

Campus II: 900, NCL Innovation Park, Dr Homi Bhabha Road, Pune-411008, India. Phone: +91-20-2589 8021/8023; Fax: +91-20-2589 8022; Website: www.iiserpune.ac.in

Director: Prof. Krishna N. Ganesh; e-mail: director@iiserpune.ac.in

Vision and Mission:

- Establish scientific institutions of the highest caliber where teaching and education are totally integrated with state-of-the-art research.
- Make learning of basic sciences exciting through excellent integrative teaching driven by curiosity and creativity.
- Entry into research at an early age through a flexible borderless curriculum and research projects.

Contribution to Tropical Diseases: Dr. Hosahudya N. Gopi works in the area of peptides and hybrid miniproteins, inhibitors for HIV-1 and host cell interactions. Dr. Saikrishnan Kayarat carries out structural studies on essential Mycobacterium tuberculosis proteins. Dr. Sanjeev Galande works in the area of epigenetics, chromatin biology, regulation of gene expression, and nuclear organization and function.

[7] University of Pune

Agency: Autonomous University under the UGC

Established: 10th February, 1948

State: Maharashtra

Address and Contact Information: Ganeshkhind, Pune-411007, India. Phone: +91-020-25601099/25696061/25690062/25696064/25696065; Website: www.unipune.ac.in
Vice-Chancellor: Dr. R.K. Shevgaonkar; e-mail: puvc@unipune.ac.in

Vision and Mission:
• Becoming a vibrant Knowledge Centre and a Centre of Excellence in teaching, research and extension activities.
• Bringing about conservation, creation advancement and dissemination of knowledge.
• Creating technologically equipped thought and action leaders in a wide range of spheres by providing value-based and high quality education.
• Generating cutting edge research and innovations and enabling empowerment through social and regional inclusion.
• Increasing global linkages by attracting international students and establishing collaborative programmes with educational institutions of repute.

Contribution to Tropical Diseases: The Department of Biotechnology contributes to the area of Tropical Diseases. Prof. J.K. Pal works on molecular mechanisms of regulation of protein synthesis during stress, differentiation and apoptosis in mammals and in leishmanial parasites. Prof. Ashok S. Kolaskar works on the bioinformatics aspects of virus research.

[8] King Edward Memorial Hospital and Seth Gordhandas Sunderdas Medical College

Agency: Municipal Corporation of Greater Mumbai

Established: 1926

State: Maharashtra

Address and Contact Information: Acharya Donde Marg, Parel, Mumbai-400012. India. Phone: +91-22-2410 7000; Fax: +91-22-2414 3435; Website: www.kem.edu

Dean: Dr. Sanjay N. Oak; e-mail: sanjayoak@kem.edu

Vision and Mission: King Edward Memorial Hospital and Seth Gordhandas Sunderdas Medical College began their march to fame with a spirit of nationalism and an urge to serve, educate and innovate. Institutional priorities have been medical relief, medical education and research. Unremitting zeal, devotion and professional competence of the medical and paramedical personnel have ensured that on completion of study, our young doctors do not want to play God, but they act as a tool in the hands of God to serve humanity.

Contribution to Tropical Diseases: KEM has contributed in the areas of diagnostics for HIV, TB and malaria. An international collaborative study involving molecular
characterization of Group A and G *Streptococcus* is in progress. Training / awareness programs in the area of Tropical infectious diseases are carried out regularly.

[9] **National Institute of Immunohaematology (NIIH)**

**Agency:** Indian Council of Medical Research (ICMR)

**Established:** 1957 (as Blood Group Reference Centre); 1982 (re-named as Institute of Immunohaematology); 5th February 2008 (re-named as NIIH)

**State:** Maharashtra

**Address and Contact Information:** 13th floor, New Multistoreyed Bldg, KEM Hospital Campus, Parel, Mumbai-400012, India. **Phone:** +91-22-24138518, 24138519, 24111161; **Fax:** +91-22-24138521; **Website:** www.niih.org.in

**Director:** Dr. Kanjaksha Ghosh; **e-mail:** (1) director@iihicmr.org; (2) kanjakshaghosh@hotmail.com

**Vision and Mission:** Doing both cutting edge and operational research in haematology and transfusion medicine with a view to push the frontier of human knowledge and using this knowledge for the benefit of our countrymen in particular and humanity in general, through innovation, improvisation, indigenization, synthesis of ancient wisdom with modern science and by dissemination of the knowledge thus gained.

**Contribution to Tropical Diseases:**
- Provide training in methodology of blood grouping and blood banking.
- Preparation and supply standard blood grouping reagents.
- Working as a reference centre for the unsolved problems of cross matching.
- Preparation and maintenance of a list of rare blood groups.
- Conduct basic and applied research in the area of Immunohematology.

[10] **Enterovirus Research Centre (ERC)**

**Agency:** Indian Council of Medical Research (ICMR)

**Established:** 1981

**State:** Maharashtra

**Address and Contact Information:** Haffkine Institute Compound, Acharya Donde Marg, Parel, Mumbai-400012, India. **Phone:** +91-022-24134130; **Fax:** +91-022-4156484; **Website:** www.icmr.nic.in/pinstitute/evrc.htm
Director: Dr. J.M. Deshpande; e-mail: (1) deshpandejm@icmr.org.in; (2) erc@bom3.vsnl.net.in

Vision and Mission: The Enterovirus Research Centre (ERC) conducts research on diseases caused by Enteroviruses, especially paralytic poliomyelitis, acute flaccid paralysis, acute hemorrhagic conjunctivitis, aseptic meningitis / encephalitis and acute gastroenteritis caused by enteric viruses such as rotavirus, norovirus and enteroviruses.

Contribution to Tropical Diseases:
- Epidemiology of poliomyelitis leading to understanding of the virus transmission patterns for development of policies and strategies for disease control and eradication.
- Studies on poliomyelitis vaccines such as immunization schedules, vaccination campaigns, evaluation and improvements of vaccine delivery systems.
- Assistance to the Global Polio Eradication Program through laboratory support for disease diagnosis, understanding disease transmission by molecular epidemiology studies, evaluation of program progress, designing, testing and validating newer assays, participating in introduction of newer vaccine formulations and contributions to national policy on polio eradication.

[11] Advanced Centre for Treatment, Research and Education in Cancer (ACTREC)

Agency: Department of Atomic Energy (DAE), Government of India

Established: 1952 (as Indian Cancer Research Centre); 1966 (re-named as Cancer Research Institute and amalgamated with Tata Memorial Hospital); August 2002 (re-named as ACTREC and shifted to Navi Mumbai)

State: Maharashtra

Address and Contact Information: Kharghar, Navi Mumbai-410210, India. Phone: +91-22-2740 5000; Fax: +91-22-2740 5085; Website: www.actrec.gov.in

Director: Dr. R. Sarin; e-mail: drrajvssarin@rediffmail.com

Vision and Mission:
- To provide treatment to cancer patients.
- To carry out both basic as well as clinical research in all aspects of cancer.
- To provide education to the general public with regard to cancer.

Contribution to Tropical Diseases: The Virology Laboratory at ACTREC contributes to the area of Tropical Diseases. Dr. Robin Mukhopadhyaya works in the area of basic virology research, with particular reference to HIV, Human Papilloma Virus (HPV) and Human Herpes Virus – 6 (HHV-6).
[12] Tata Institute of Fundamental Research (TIFR)

Agency: Department of Atomic Energy (DAE), Government of India

Established: 1st June, 1945

State: Maharashtra

Address and Contact Information: Homi Bhabha Road, Mumbai-400005, India.
Phone: +91-22-2278 2000; +91-22-2280 4610; +91-22-2280 4611;
Website: www.tifr.res.in

Director: Prof. Mustansir Barma; e-mail: barma@theory.tifr.res.in

Vision and Mission: "It is the duty of people like us to stay in our own country and build up outstanding schools of research such as some other countries are fortunate to possess."

Contribution to Tropical Diseases: The Department of Biological Sciences contributes in the area of Tropical Diseases. Prof. Gotam K. Jarori works on structure-activity relationship (SAR) in proteins. Currently his group is investigating some of the proteins from *P. falciparum* with an objective to understand basic parasite biology and to identify novel drug and vaccine targets against malaria. Prof. Shobhona Sharma works on the biology of the malarial parasite. Since immunity to malaria develops slowly after repeated attacks, and manifests itself mainly in adults, a major focus of Prof. Sharma’s work has been to molecularly dissect out the protective responses present in the immune adults residing in endemic areas of India, such as Orissa. She has also found the presence of age-dependent sexual dimorphism in clinical susceptibility to the disease, after analyzing data from Mumbai city, which is less endemic for malaria. She also works on the glucose utilization by the parasite and on the membrane properties of parasite-infected RBCs.

[13] Indian Institute of Technology Bombay (IITB)

Agency: Ministry of Technical Education, Government of India

Established: 1958

State: Maharashtra

Address and Contact Information: Powai, Mumbai-400076, India. Phone: +91-22-2572-2545; Fax: +91-22-2572-3480; Website: www.iitb.ac.in

Director: Prof. Devang Khakhar; e-mail: director@iitb.ac.in
Vision and Mission:
- To be the fountainhead of new ideas and of innovations in technology and science.
- To create an ambience of academic excellence in which new ideas, research and scholarship flourish and from which the leaders and innovators of tomorrow emerge.

Contribution to Tropical Diseases: The Department of Biosciences and Bioengineering contributes to the area of Tropical Diseases. Prof. Rinti Banerjee works in the area of nanoparticles as drug and growth factor carriers, as well as various drug delivery systems using liposomes and gels for delivering anti-tubercular drugs. Dr. Swati Patankar works in the area Molecular Parasitology. Her research interests include (i) Transcription regulation in the malaria parasite *Plasmodium falciparum*, (ii) Bioinformatics analysis of *P. falciparum* genome sequence to uncover candidate non-coding RNAs, (iii) Screening natural product libraries for novel anti-malarial agents, and (iv) Choice of translation initiation sites in *P. falciparum*.

[14] Mahatma Gandhi Institute of Medical Sciences (MGIMS)

Agency: Kasturba Health Society

Established: 1969

State: Maharashtra

Address and Contact Information: Sevagram, District Wardha, Maharashtra-442102, India. Phone: +91-07152-284341 to 355 (16 lines); Fax: +91-07152-284333; Website: www.mgims.ac.in

Dean: Dr. Shakuntala Chhabra; e-mail: dean@mgims.com

Vision and Mission: To evolve an integrated pattern of medical education and healthcare by using rural medical college and hospital as a base for delivery of such a system.

Contribution to Tropical Diseases: The Department of Pediatrics provides services in all areas of Pediatrics, including well baby, cardiology, neurology, nephrology, asthma and high risk neonatal follow-up clinics to cater the respective subgroups of children with special needs. In the area of Tropical Diseases, the Department has a 60 bedded ward dedicated to Diarrhoea Treatment and Training Unit. It also has a 10 bedded Neonatal ICU and 8 bedded pediatric ICU with 4 ventilators and a formally trained pediatric intensive care specialist. The Department also pursues Teaching and Research activities. The Jamnalal Bajaj Tropical Disease Research Centre (JBTDCR) is exclusively dedicated to Tropical Diseases. The Centre works in the area of Filariasis and Tuberculosis with particular reference to immunodiagnostics and vaccine development.
[15] International Institute for Population Sciences (IIPS)

Agency: Ministry of Health and Family Welfare, Government of India

Established: July 1956 (as Demographic Training and Research Centre); July 1970 (re-named as IIPS); 19th August, 1985 (declared “Deemed University”)
State: Maharashtra

Address and Contact Information: Govandi Station Road, Deonar, Mumbai-400088, India. Phone: +91-22-2556-3254/55; +91-22-4237-2400; Fax: +91-22-2556-3257; Website: www.iipsindia.org

Director & Chief Vigilance Officer: Dr. Faujdar Ram; e-mail: (1) director@iips.net; (2) fram@iips.net

Vision and Mission:
- To position IIPS as a premier teaching and research institution in population sciences responsive to emerging national and global needs based on values of inclusion, sensitivity and rights protection.
- The Institute will strive to be a Centre of Excellence on all population and relevant issues through high quality education, teaching and research. This will be achieved by (i) creating competent professionals, (ii) generating and disseminating scientific knowledge and evidence, (iii) collaboration and exchange of knowledge, and (iv) advocacy and awareness.

Contribution to Tropical Diseases: Apart from the teaching activities, the Institute also conducts a large number of research projects on various aspects of population. The Institute also undertakes evaluative studies and large-scale surveys. Emphasis is given on studies related to inter-relationship of various social and economic variables of the components of population change such as Fertility, Mortality and Migration. The research projects of the Institute are mostly funded by the Ministry of Health and Family Welfare, Government of India and also by the State Governments, World Bank, United Nations Population Fund, World Health Organization, International Labor Organization and other Government and Non-Government organizations. Some of the research activities carried out by Prof. Subrata Lahiri and Dr. Usha Ram of the Department of Public Health & Mortality Studies are related to Tropical Diseases.

[16] Indian Institute of Science (IISc)

Agency: Autonomous Institute

Established: 27th May, 1909

State: Karnataka
Address and Contact Information: Bangalore-560012, India. Phone: +91-80-2293 2004/2228/2001; Fax: +91-80-2360 0683/0085; Website: www.iisc.ernet.in

Director: Prof. P. Balaram; e-mail: diroff@admin.iisc.ernet.in

Vision and Mission: The Indian Institute of Science (IISc) was conceived as a 'Research Institute' or 'University of Research' by Jamsetji Nusserwanji Tata, in the twilight years of the 19th century.

Contribution to Tropical Diseases: The Departments of Biochemistry and Microbiology & Cell Biology, and the Molecular Biophysics Unit contribute to the area of Tropical Diseases. The Department of Biochemistry is interested in understanding and preventing various diseases, including Malaria and Tuberculosis. The Department of Microbiology & Cell Biology has made pioneering contributions towards understanding the biology of *Mycobacterium tuberculosis*. The Molecular Biophysics Unit is currently engaged in frontline research in contemporary Molecular Biophysics and Structural Biology. The research activities in the Unit focus on the structure, conformation and interactions of bio-molecules, with the main objective of explaining biological activity in molecular terms.

[17] National Centre for Biological Sciences (NCBS)

Agency: Autonomous Centre under the aegis of TIFR Council of Management

Established: October, 1991

State: Karnataka

Address and Contact Information: Tata Institute of Fundamental Research, GKV, Bellary Road, Bangalore-560065, India. Phone: +91-80-23666001 / 02; 23666018 / 19 +91-80-67176001 / 02; 67176018 / 19; Fax: +91-80-23636662;
Website: www.ncbs.res.in

Director: Dr. K. VijayRaghavan; e-mail: vijay@ncbs.res.in

Vision and Mission: To carry out fundamental research in the frontier areas of biology.

Contribution to Tropical Diseases: Dr. Satyajit Mayor carries out research in the area of Tropical Diseases. Dr. Mayor is interested in understanding pathways of antigen presentation for loading onto MHC class II, and endocytic mechanisms related to virus induced immune evasion. The virus under investigation is HIV.
[18] Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR)

Agency: Department of Science and Technology (DST), Government of India

Established: 1989; 2002 (declared “Deemed University” by the UGC)

State: Karnataka

Address and Contact Information: Jakkur, Bangalore-560064, India. Phone: +91-80-22082750; Fax: +91-80-22082766; Website: www.jncasr.ac.in

President: Dr. M.R.S. Rao; e-mail: mrsrao@jncasr.ac.in

Vision and Mission: To pursue and promote world-class research and training at the frontiers of Science and Engineering covering broad areas ranging from Materials to Genetics.

Contribution to Tropical Diseases: Prof. Hemalatha Balaram works in the area of Molecular Parasitology and Protein Engineering. She studies the enzymes hypoxanthine guanine phosphoribosyltransferase and adenylosuccinate synthetase, involved in purine salvage in the malarial parasite, Plasmodium falciparum. She has also been studying enzymes involved in hemoglobin degradation and glycolysis. Enzymes of these essential pathways are of interest as targets for anti-malarial chemotherapy. Prof. Namita Surolia works in the area of Molecular Parasitology. She is interested in the biology of the malarial parasite. Some of the ongoing projects include: (i) deciphering whether Plasmodium protein kinases contribute to virulence, (ii) association of severe / non-severe malaria pathogenesis with variant surface antigen sequences, (iii) apicoplast interactome analysis by ‘Systems-Biology’ approach, (iv) knock-out approach to know essentiality of various apicoplast genes for parasite survival, and (v) molecular epidemiology of malaria. Prof. Tapas Kundu's group is working on the mechanism of transcription regulation through chromatin in humans, with special reference to diseases. He is interested in small molecule modulators of histone-modifying enzymes, which may serve as lead compounds for the treatment of AIDS, amongst other diseases. Prof. Udaykumar Ranga works in the area of Molecular Virology, his particular interest being HIV. Some of his current research projects include: (i) study of the molecular epidemiology of HIV-1 in India, (ii) analysis of the pathogenic properties of subtype-C strains of India, (iii) optimization of DNA vaccines by engineering molecular adjuvants, (iv) development of immune and molecular diagnostic techniques for HIV, and (v) evaluation of an Indian traditional therapy as an AIDS intervention strategy.
National Institute of Mental Health and Neuro Sciences (NIMHANS)

Agency: Autonomous under the Ministry of Health and Family Welfare, Government of India and Government of Karnataka

Established: 19th Century (as Lunatic Asylum); 1925 (re-named as Mental Hospital); 1954 (All India Institute of Mental Health established); 27th December, 1974 (Mental Hospital and All India Institute of Mental Health amalgamated into NIMHANS); 14th November, 1994 (NIMHANS declared “Deemed University by the University Grants Commission)

State: Karnataka

Address and Contact Information: Hosur Road, Bangalore-560029, India. Phone: +91-080-26995001/5002, 26564140, 26561811, 26565822; Fax: +91-080-26564830; Website: www.nimhans.kar.nic.in

Director-Vice-Chancellor: Dr. P. Satish Chandra; e-mail: (1) vc@nimhans.kar.nic.in; (2) psatish@nimhans.kar.nic.in

Vision and Mission:
- Evolve strategies to offer diagnostic and therapeutic facilities to all corners of India in the field of Mental Health and Neurosciences utilizing the advances in information technology and to be the nodal center.
- Establish training facilities and impart knowledge in the field of Mental Health and Neurosciences to all the developing countries by Institutional and Distance Learning.
- Establish state-of-the-art diagnostic and therapeutic facilities in neurological disorders with special reference to genetically transmitted disorders and Vaccinology of Tropical Infectious Diseases and be the Nodal Center for the Country in Research and Development.
- Develop strategies for Disaster Management and Psychological Rehabilitation.
- Integrate physical and metaphysical aspects of Neuroscience Research.
- Participate in Neuroscience and Behavioural Research related to Space, Atomic Energy and Transplantation.
- Be part of World leadership in the field of Neuroscience and Behavioural Science.

Contribution to Tropical Diseases: Prof. Jayashree Ramakrishna is interested in socio-cultural aspects of health education interventions, reproductive health, HIV/AIDS, qualitative and action research. Prof. P. Satishchandra and Dr. A. Nalini are interested in the neurological aspects of HIV/AIDS (Neuro-AIDS). Prof. R. Ravikumar is interested in bacterial infections such as tuberculosis in immunocompromised individuals. Dr. Shripad A. Patil is interested in Immunology of autoimmune diseases of the central and peripheral nervous system including leprosy, as well as development of immunodiagnostics for chronic infectious disease of CNS with special reference to CNS TB meningitis. Dr. S.
Nagarathna is interested in delineating cryptococcal meningitis in AIDS patients with clinical correlation by studying mortality and morbidity, as well as rapid modes of isolation of *M. tuberculosis* using PCR, and Bactec. Prof. S.K. Shankar and Dr. Anita Mahadevan are interested in the neuropathology of viral infections with special reference to HIV/AIDS. Prof. Prabha S. Chandra and Dr. Ramachandra are interested in HIV in conjunction with mental health. Dr. A. Thirumooorthy is interested in the psychosocial problems of HIV/AIDS. Prof. V. Ravi is interested in HIV diagnosis, development of kits, antiretroviral therapy, as well as in Japanese encephalitis. Dr. Anita S. Desai is interested in the laboratory diagnosis of viral infections of the nervous system, as well as in molecular virology of neurotropic viruses to understand pathogenesis.

[20] National Tuberculosis Institute (NTI)

**Agency:** Ministry of Health and Family Welfare, Government of India

**Established:** 1959

**State:** Karnataka

**Address and Contact Information:** Directorate General of Health Services, ‘AVALON’, No. 8, Bellary Road, Bangalore-560003, India. **Phone:** +91-080-3441192, 3441193, 3447951; **Fax:** +91-080-3440952; **Website:** http://ntiindia.kar.nic.in

**Director:** Dr. Prahlad Kumar; **e-mail:** ntiindia@blr.vsnl.net.in

**Vision and Mission:** Formulation of TB Control Programmes best suited to a country like India, where the TB problem is large and the resources are meager.

**Contribution to Tropical Diseases:**
- The NTI is designated as WHO Collaborating Centre for TB Research and Training since June, 1985.
- Organization of training activities in TB control for medical and paramedical personnel, in accordance with policies and procedures consistent with the WHO-recommended DOTS strategy.
- Monitoring and supervision of TB Control Programme in the country.
- Planning, coordination and execution of TB research in epidemiology, surveillance of drug resistance and operations for control strategies relevant to regional and national programme delivery.
- Dissemination of information on TB and its control by tapping the potentials of the existing Library and Information Dissemination Services.
[21] St. Johns Research Institute (SJRI)

Agency: SJRI is a part of John’s National Academy of Health Sciences, which is run by the CBCI Society for Medical Education

Established: 2004

State: Karnataka

Address and Contact Information: St. John’s National Academy of Health Sciences, Bangalore-560034, India. Phone: +91-80-25532037, 22065059; Fax: +91-80-25501088; Website: www.sjri.res.in

Dean: Dr. A.V. Kurpad; e-mail: a.kurpad@sjri.res.in

Vision and Mission:
- To improve the health of communities and patients through research into population health and clinical problems in India.
- To make a significant impact on lifestyle related disorders and infectious diseases in India through basic and clinical research, promotion of evidence based health care and population health research initiatives.

Contribution to Tropical Diseases: Dr. John Kenneth Philip J is interested in mycobacterial diseases and their prevention. Prof. Reynold Gracio Washington is interested in the following areas: (i) community and population based behavioral and biological research related to HIV and STI, (ii) evidence based HIV prevention and care intervention programming, and (iii) monitoring and evaluation of healthcare services, training and capacity building initiatives in reproductive health, including STI and HIV. Dr. Anita Shet is interested in infectious diseases affecting children, particularly HIV and tuberculosis, and dengue. She is also interested in disease pathogenesis in HIV, HIV drug resistance, and interaction between nutrition and infection. Dr. Prem Mony is interested in the HIV epidemiology, with particular reference to mortality surveillance. Dr. Divya Rajaraman is interested in the health policy aspects of HIV/AIDS.

[22] Dorabji Tata Centre for Research in Tropical Diseases

Agency: Sir Dorabji Tata Trust

Established: 26th May, 2000

State: Karnataka

Address and Contact Information: Innovation Center, Indian Institute of Science Campus, Bangalore-560012, India. Phone: +91-80-23466006-8; Telefax: +91-80-23466006, 23314314; Website: www.tatacentropdis.org
**Principal Executive:** Lt. Gen. D. Raghunath (Retd.); **e-mail:** (1) sdtc265iisc@vsnl.net; (2) sid@csic.iisc.ernet.in

**Vision and Mission:** Alleviation of Tropical Diseases in India through basic and applied research, as well as training of scientists and clinicians in the area of Tropical Diseases.

**Contribution to Tropical Diseases:**
- To carry out basic and applied research in the area of Tropical Diseases and other emerging health disorders with a view to developing methods of diagnosis, newer drugs and vaccines.
- To provide a support mechanism and facilities for interaction between scientists and clinicians and others interested in carrying out R&D and allied activities for the alleviation of Tropical Diseases.
- To provide and create facilities for R&D and training for clinicians and scientists in the area of Tropical Diseases.
- To interact with industry through the Society for Innovation and Development (SID) to develop products and processes for the alleviation of Tropical Diseases.

[23] **National Institute of Malaria Research, Bangalore Field Station**

**Agency:** Indian Council of Medical Research (ICMR)

**Established:** October, 1992

**State:** Karnataka

**Address and Contact Information:** Malaria Research Centre Field Station Epidemic Disease Hospital, Old Madras Road, Bangalore-560038, India. **Phone:** +91-80-5362115; **Website:** www.mrcindia.org/bangalore.htm

**Assistant Director and Officer-in-Charge:** Dr. S.K. Ghosh; **e-mail:** (1) ghoshmrc@vsnl.net; (2) mrcbg1@vsnl.net

**Vision and Mission:** The main objective was to transfer of technology on bioenvironmental control of malaria to the State Health Department, Government of Karnataka.

**Contribution to Tropical Diseases:**
- Outbreak investigation of malaria.
- Study of mosquito fauna.
- To identify suitable bio-environmental intervention strategies including engineering methods.
- Mosquito control in Bangalore city.
- Malaria control in Mangalore city.
- Geographical Information System (GIS) to identify mosquito breeding habitats in district Tumkur.
- Operational feasibility of use of larvivorous fish for control of malaria in a high risk area of Karnataka State.
- Extensive micro level geographical reconnaissance (GR) in all the malaria problematic villages.
- Evaluation of the impact of DDT indoor residual spraying being used in malaria control programme on the disease prevalence.
- Stratification of Karnataka based on An. culicifacies and An. fluviatilis sibling species prevalence by: (i) polytene chromosome and (ii) PCR.
- Comprehensive longitudinal epidemiological and entomological studies (at least for one transmission season).
- To develop strategies for integrated control of vectors of Malaria, JE and Dengue in Karnataka.
- Workshops, training, and interaction with NGOs.

[24] Rajiv Gandhi Centre for Biotechnology (RGCB)

Agency: Department of Biotechnology (DBT), Government of India

Established: 1990 (as Centre for Development of Education, Science and Technology); 1991 (renamed as Rajiv Centre for Development of Education, Science and Technology); 18th November, 2002 (re-named as RGCB)

State: Kerala

Address and Contact Information: Thycaud PO, Poojappura, Thiruvananthapuram-695014, Kerala, India. Phone: +91-471-2341716; 2347975; 2348104; 2348753; 2345899 Fax: + 91-471-2348096; Website: www.rgcb.res.in

Director: Prof. M. Radhakrishna Pillai; e-mail: (1) director@rgcb.res.in; (2) mrpillai@rgcb.res.in

Vision and Mission: To be an international hub of biotechnology, providing the right combination of research and development with the dedication, transparency and creativity of a truly academic research center combined with the power of innovation, IPR driven programs and business transformation to deliver discovery for India. This will be accompanied by another highly profitable and critical spin-off i.e. highly trained manpower. The specific Mandates are highlighted below:

- Translational R&D in cancer, medical and plant biotechnology.
- Training of specialists in biotechnology.
- Fostering and promoting collaboration and joint ventures between academia, industry and government.
• Providing the state and country with a world-class biotechnology research infrastructure.
• Service to the public through application of biotechnology expertise in areas of molecular medicine, diagnostics, forensics and genetic engineering.

Contribution to Tropical Diseases: One of the major research goals of the Mycobacterium Research Group is to understand the local strains of *M. tuberculosis*. The group isolates acid-fast bacilli from patients and characterizes them by biochemical and genetic methods. The local isolates form the raw material for most of the studies, where comparisons are made to strains from other parts of the country. Studies also involve host-pathogen interactions at different levels using various biochemical and genetic tools. Search for novel antimycobacterial molecules from natural sources is another major interest of the group. Synthetic molecules are also screened for their anti-mycobacterial activity. The key focus of research of the Molecular Virology Group include genetic characterization of the local isolates of chikungunya and dengue viruses and understanding the effect of gene level alterations in viral virulence and pathogenicity, development of rapid diagnostic assays for early and sensitive detection of these infections, and development of virus inhibitor screens to identify potential anti-viral molecules from natural products. The Cholera and Environmental Biology Group studies environmental strains of *Vibrio cholerae* with respect to virulence and multiple drug resistance. Another area that the group is focusing on is metagenomics. Dr. K. Santhosh Kumar of the Chemical Biology Group is involved in developing synthetic peptides that inhibit HIV entry into cells by blocking co-receptors such as CXCR4.

[25] Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST)

Agency: Department of Science and Technology (DST), Government of India

Established: 1974

State: Kerala

Address and Contact Information: Thiruvananthapuram-695011, Kerala, India. Phone: +91-471-2443152; Fax: +91-471-2446433; Website: www.sctimst.ac.in

Director: Dr. K. Radhakrishnan; e-mail: director@sctimst.ac.in

Vision and Mission:
• Promotion of biomedical engineering and technology.
• Demonstration of high standards of patient care.
• Development of post-graduate training programs of the highest quality in advanced medical specialties and biomedical engineering and technology.
Contribution to Tropical Diseases: Prof. T.K. Sundari Ravindran works in the area of women’s health with special reference to reproductive and gender issues. Prof. V. Ramankutty works in the area of epidemiology of HIV/AIDS. Prof. K.R. Thankappan works in the area of Public Health on a variety of topics, including HIV/AIDS and TB. Dr. P. Sankara Sarma works in the area of Biomedical Statistics on a variety of topics, including HIV/AIDS.
6. Strengths

This chapter deals with the strengths of an organization based on the expertise of the scientific faculties; the infrastructure in the form of facilities, services etc. provided by the institution; the various training programs conducted in regular basis; workshops/meetings organized in the Tropical diseases areas; any clinical research/ clinical trials performed; the details of basic research carried out; any products developed in the form of vaccines, drugs and diagnostics etc.

The necessary information was collected in the following manner:
Specific questionnaire was made and sent to the Institutional Heads and Principal Investigators; Websites of the organizations; Their Annual Reports; Publications of the Investigators etc.
It has included the above mentioned details of 85 Institutes of all five Zones of concern.

Zone 1

1. The Indian Institute of Chemical Biology

Thirty nine Project(s) handled in the Institute on Tropical Disease in last 10 years on Leishmaniasis and Cholera and 15 (Major) + 5 (Associated) Scientists working on Tropical Diseases.

Facilities:

**Bioinformatics Division** works on: To develop and conduct original research programmes on *in silico* biology in genome analysis and metagenomics; to facilitate and enhance application of bioinformatics in life science research and to provide bioinformatics related technical support services to the national community of users. to organize long-term/short-term training programmes. **Computer Division** provides scientific and Technical Support.

**Central Instrumentation:** It has Electron Microscopes (Transmission and Scanning), NMR, LC / MS Mass and FAB Mass Spectrometer; UV/IR Spectrophotometers, Ultra Centrifuges and Super Speed Refrigerated Centrifuges; Surface Plasmon Resonance Analyzer, CD Spectropolarimeter, Microcalorimetry Facility, Atomic Force Microscope, X-ray Diffractometer, Automated 2D Gel Handling system, Robotic Workstation, Protein Microarrayer with Analyzer, Laser Scanning Confocal Microscope, Cell Sorters and Analyzers, Whole Animal in vivo Imager, Microinjector based Cell Manipulation System, Real-time Live Cell Laser Confocal System *etc.*, It has developed simple instruments like a cell fusion apparatus.

Also, there is Engineering Services Unit, well updated library, Animal house in International Standard of CPCSEA.

**Project Monitoring & Evaluation Division** is formed recently to aid in the effective management of the institute’s intramural, networked, grant-in-aid as well as collaborative R&D projects.
**Intellectual Property Management Cell; Dr. Tanmoy Mukherjee** is heading matters relating to IPR issues of the scientists working in IICB and liaison with Intellectual Property Management Division of CSIR, New Delhi. It has prepared a comprehensive and up-to-date patent database of the Institute. IPM cell is working in close association with Business Development Group and technology transfer.

**New Development:** The result on chaos synchronization has been recently published depicting a robust method of synchronization, antisynchronization and amplification of chaos in coupled system under mismatch.

**Scientific Expertise:**

**Dr. Subrata Adak** is interested in Oxidative stress responses in Leishmania.

**Dr. U Bandyopadhyay** works on the exploration of *P. falciparum* proteome to identify new drug target Biochemistry and Molecular Biology of malaria parasite; Host-Parasite interaction and the assessment of organ dysfunction and apoptosis during malarial infection.

**Dr. D. Mandal** has Current Research Interest in understanding the functional role of Transmembrane Proteins and Enzymes of Leishmania. Biochemical and Molecular characterization of the transporter involved in metabolites and ion translocation. Evaluation of Drug resistance mechanism of Leishmania.

**Dr. Tripti Dey** has Research Interest in Host-parasite interaction; Developmental regulation of glycosyltransferases and glycoconjugates and their role in parasite virulence; Protective efficacy of leishmania glycoproteins and glycolipid vaccines against visceral leishmaniasis

**Dr. R Bhadra** works on CTX prophages, genome diversity and evolution of new pathogenic Vibrio cholerae clones; Molecular basis of stringent response in *V. cholerae* and the role of (p)ppGpp in regulation of gene expression related to growth, virulence and biofilm formation; Molecular studies on replication origins of *V. cholerae* and its use for various purposes; Molecular basis of survival and growth of *V. cholerae* cells under nutritional competition; cold shock response and cold shock proteins of *V. cholerae* and Comparative genomics of Shigella dysenteriae.

**Dr. R Chowdhury** works on Stress response and regulation of virulence gene expression of *V. cholerae*; Epigenetic regulation of gene expression. Global role of DNA methylation in gene expression; Growth Advantage in the Stationary Phase mutants of *V. cholerae* and their virulence properties

**Dr. N Ali** has developed Diagnostic tools for kala-azar and PKDL. Also works on Mechanism of immune regulation and drug induced immunomodulation in Indian kala-azar and PKDL. Evaluation of vaccination strategies and protein- and DNA-based candidate antigens. Studies on immune stimulation pathways by liposomal vaccines. Cationic liposome based combination therapy with existing drugs and novel compounds.

**Dr. S. Bandyopadhyay** works on Immune Responses in Visceral Leishmaniasis.

**Dr. S. Roy** is working on Antigen presentation in leishmaniasis; Host response to antimony resistant versus antimony sensitive leishmania parasites; Seroimmunoproteomics to identify host protective antigens.

**Dr. C. Mandal** works on to understand the mystery of glycosylation of biomolecules modified specifically in patients with visceral leishmaniasis and their potential
applications in medical research through: Exploration of modified sialoglyconjugates induced on immune cells and plasma/sera of both host and parasites; Proteomics of these purified clinically important molecules to identify host protective molecules; Development of antigen based diagnostic tool and their biological role in VL.

**Dr. P. Das** works on Macrophage biology in relation to disease pathogenesis using VL; Comprehensive cyclic nucleotide signaling in the infectivity of a eukaryotic intracellular pathogen like Leishmani; Immunomodulators of natural origin for effective therapy against macrophage-associated diseases.

**Dr. Hemanta Mazumder** has Current Research Interest on: Biochemistry of DNA Topoisomerases of L. donovani; Cloning and characterization of the genes of Type I and Type II DNA Topoisomerases of L. donovani. Programmed cell death in unicellular parasite L. donovani; Development of therapeutic agents targeted against DNA Topoisomerases and Molecular Biology of Kinetoplast DNA

**Dr. Samit Adhya** has Isolated for the first time internationally, a multi-protein complex from L. tropica inner mitochondrial membranes that is functional for tRNA import in vitro; identifying and characterizing the functions of the many subunits of this complex. He has developed a highly efficient protocol for conditional knockdown of L. tropica proteins using long antisense RNA, as well as a new method for purifying bacterially expressed parasite proteins in functional form. The Leishmania RNA Import Complex induces import of cytosolic tRNAs into human mitochondria which is functional in supported translation of mRNAs in mitochondria containing a patient-derived mutation in the organellar tRNALys gene. As a result, the respiratory function of cybrid cells carrying a tRNALys mutation was restored to near-normal levels. This novel concept of ‘complex therapy’ will be the subject of intensive investigations in the coming years.

## 2. National Institute of Cholera and Enteric Diseases

**Name of the Tropical Disease(s) handled are:** Diarrhoeal Diseases caused by (Rotavirus, Cholera, amoebic dysentery, Giardiasis, Shigellosis and Enterotoxigenic E.coli); Typhoid/Paratyphoid and HIV/AIDS. 34 scientists are working on tropical diseases.

**Infrastructure and services:** sophisticated and modern equipped laboratory for basic science research and also having good setup for conducting Phase-I, Phase-II and Phase-III vaccine trial. **Laboratory facilities** such as Bacteriology, Biochemistry, Pathophysiology, Immunology, Virology, Microbial Genetics, and Vibrio Phage Reference Laboratory are located in the institute. A separate **computer section and tissue culture laboratory** are there.

**Major equipment** available in the Institution: **Biosafety Level-3 Laboratory facility**, Transmission Electron Microscope, Scanning electron microscope and atomic force microscope, FACS, DNA Sequencer, DNA micro-array, Ultra centrifuge, Spectrophotometer, ELISA Reader, Fluorescent spectrophotometer, Liquid scintillation counter, HPLC system, Low pressure chromatography system, electrophoresis system, Thermal cyclers, Pulsed field gel electrophoresis, Confocal microscope, Flowcytometer,
Ussing's chamber, ABI Prism Automatic DNA sequencing apparatus, Hybridization ovens, UV cross linkers, Real Time Thermal cycler and ELISPOT Reader. **Animal facility, Library, Data Management facility and Training facilities are there.**

**Hospital facilities:** Two state government hospitals, the Infectious Diseases Hospital, Beliaghata, and Dr. B.C. Roy Hospital for Children, Kolkata with indoor and outdoor facilities are used for hospital based research and training purposes. **Field practice area:** in urban and rural have been set up for community based observations and intervention studies and are also used for field based training programmes. Besides, the Institute has huge field practicing areas mainly comprising of urban and semi-urban population for several vaccine trials in collaboration with National and International organizations. Several others are under consideration.

**Services offered are:** Cholera Antisera Supply, Bioinformatics Centre, clinical Laboratory, Outbreak Investigation, WHO Vibrio Phage Typing Centre, Training on Clinical management, Laboratory diagnosis, Molecular epidemiology of diarrhoeal diseases, Research & training on diarrheal diseases (WHO collaborative centre), Reporting to State Govt. regarding cholera etc. under Integrated Disease Surveillance Project (IDSP) at NICED, NACO HIV Reference Laboratory, NACO Regional Institute (East) for HIV sentinel Surveillance, NACO- Consortium for quality testing, NACO-early infant diagnosis, NACO- Integrated Counselling & Testing Centre.

**New Product(s) developed:**
Production of supply of *Vibrio cholerae* O1 and O139 antisera:
Antisera for the identification of *Vibrio cholerae* serogroups O1 (Ogawa and Inaba serotypes) and O139 were prepared and supplied free of cost to the needed laboratories for diagnostic purpose.

**New Process(es) developed:**
- **a)** PCR for the detection of *Vibrio fluvialis* showed 100% sensitivity for all the *V. fluvialis* strains tested with 10 ng DNA was found to give a positive result. VF-toxR primers can differentiate between *V. fluvialis* and *Aeromonas* strains and would be useful for rapid identification of *V. fluvialis* strains and may play a role in establishing the public health and clinical significance of this organism.

- **b)** **Modified technique** for isolation and identification of *V. cholerae* from aquatic sources by use of the enrichment subsequently followed by culture and PCR techniques exploiting the information of prevalence of *V. cholerae* along with their virulence.

- **c)** **PCR-based method for typing of ETEC on basis of CFA of enterotoxigenic E. coli (ETEC), useful for epidemiology of diarrhea.** Specific primer sets were designed against 10 common colonization factors e.g. CFA/I, CS1, CS2, CS3, CFA/III (CS8), CS4, CS5, CS6, CS14 and CS17 for their detection. Also, modified version of this method, in a multiplex format for quicker analysis during surveillance and epidemiological studies and important for vaccine development purpose and in tracking the movement ETECs round the globe.
d) **Phage typing scheme for cholera:** O1 and O139. A total of 24 phages specific for *V. cholerae* classical, O1, O139 and non O1 non O139 are maintained in the phage bank. Being the national centre, 1000-1500 strains of *V. cholerae* are sent to this institute from 30-40 institutions per year from different parts of the country and abroad. Phage typing, biotyping and serotyping results are sent to these institutes from NICED as the only institute in India working on cholera phages.

**Prototypes(s) developed:**
Establishment and evaluation of PFGE for *Vibrio parahaemolyticus* for PulseNet International use. PCR based detection of *V. cholerae* targeting *ompW*. Improvement of RT-PCR for detection of etiological agents of viral gastroenteritis.

**Clinical Trials:** 22 trials have been successfully completed.

**Clinical Trials ongoing:** Safety and immunogenicity of a killed whole cell oral cholera vaccine amongst infants aged 10 weeks to 6 months when concomitantly with EPI vaccines. NICED is also planning a phase II safety trial of a live oral cholera vaccine (VA 1.4) in collaboration with Society for Applied Studies funded by Department of Biotechnology followed by a large scale Phase III study on 1,30,000 populations.

**The Division of Bacteriology** does isolation and identification of enteric bacteria from stool specimens collected from the hospital/community through systematic surveillance, vaccine trial studies, confirmation and serotyping of enteric bacteria such as *Vibrio parahaemolyticus*, toxigenic *V. cholerae*, diarrhoeagenic *E. coli*, *Shigella* sent by other institutions, and outbreak investigations to detect the possible etiological agents. The basic research components include molecular typing of bacterial strains, detection of virulence genes, antimicrobial susceptibility patterns, detection of resistance mechanisms and novel toxins. Several new molecular/immunological based detection techniques have also been developed and evaluated at the NICED. The recently emerged hybrid El Tor variant strains of *V. cholerae* has been characterized and tracking of its spread in different states of India has also been made.

**Dr. S. Basu** is interested in the genetic and biochemical mechanisms related to bacterial pathogenesis in the gut. Presently her focus is to study the involvement of gut organisms in neonatal sepsis with emphasis on *E.coli* and *Klebsiella pneumoniae*.

**Dr. S. Datta** is involved in research, training and teaching with respect to microbiological aspect of diarrhoeal disease caused especially by *Shigella*, enteroaggregative *E. coli* and *S. Typhi* and water bacteriology. She has interests in antimicrobial resistance of enteric pathogens, mechanism of drug resistance and antibacterial activity of bioactive products; took part in the clinical trial study of Typhoid vaccine; “Evaluation of H2S strip test used for drinking water quality monitoring” and was involved in the evaluation of solar disinfection method of drinking water (SODIS).

**Dr. H. Koley** to understand signal transduction pathways in immune and inflammatory cells during diarrhoea and also to study the nature of protection against diarrhoeal pathogens like *V. cholerae* and *Shigella* in different animal model

**Dr. A. K Mukhopadhyay**, Current research interests include diversity, evolution and biology of *V. cholerae* in the context of molecular pathogenesis, strain evolution and prevention measures.
Dr. G. B Nair has been working on enteric pathogens with particular emphasis on Vibrio cholerae, the causative agent of the disease cholera; the heat-stable enterotoxin of V. cholerae; molecular epidemiology of V. cholerae in the Department of Microbiology.

Dr. R. K Nandy works on for better understanding of pathophysiological, immunological, and molecular biological aspects of V. cholerae in relation to its molecular mechanism of pathogenesis and nature of protective antigens; molecular epidemiology of pathogenic V. cholerae; characterization of virulence factors, protective antigens.

Dr. S. K Niyogi has been working on antimicrobial resistance, molecular epidemiology, and pathogenesis of enteric pathogens with particular emphasis on Shigella spp, S. typhi, Vibrio spp, projects in the field of diarrhoeal diseases.

Dr. A. Palit research is focused on population and molecular analyses of environmental isolates of V. cholerae and E. coli, to gain insights into the interplay between environmental and human disease reservoirs, and genetic factors that make certain lineages of this organism highly virulent to humans.

Dr. T. Ramamurthy working on enteric pathogens with particular emphasis on V. cholerae, diarrheagenic E. coli, Salmonella spp and Shigella spp including their antimicrobial resistance mechanisms.

Dr. B. L Sarkar successfully developed a phage typing scheme for V. Cholerae 01 biotype ElTor; the phage typing scheme for Vibrio cholerae O139; research on cloning and sequencing of phage DNA, phage therapy in animal model and surveillance studies in aquatic environs.

Division of Biochemistry is focused on: Demonstration of V. cholerae cytolysin/hemolysin as a unique pore-forming toxin with specific carbohydrate-binding activity which interacts nonspecifically with synthetic and membrane vesicles by its surface amphipathicity and not through its lectin domain. The lectin domain is recruited by the toxin to interact with non-carbohydrate cytoskeletal proteins to insert into the membrane bilayer. Mechanism of unfolding of VCC monomer and refolding to transmembrane oligomeric channel in lipid-water interface of the target membrane. Development of a PCR-based identification system of the enterotoxigenic E.coli as an alternative to the existing serological identification scheme. Characterization of the Colonization Factor Antigen in terms of genetic regulation, subunit composition and domain organization. Elucidation of the role of chitinase and chitin-binding proteins of V. cholerae in colonization of the human gut and survival in its ecological niche.

Dr. K. K Banerjee works on structure-function relationship of V. cholerae cytolysin/hemolysin and the mechanism of membrane permeabilization by the pore-forming toxin. by investigating the molecular basis of these processes as a model.

Dr. N. S. Chatterje currently interested in host-pathogen interaction via molecular biology of bacterial pathogens and the mechanisms by which they interact with hosts; characterize different adhesins/colonization factors and study the regulation of their gene expression; identify and characterize the host receptors involved in bacterial colonization, study host host receptor and pathogen’s colonization factors’ interaction and understand the molecular mechanisms of colonization.
Division of Clinical Medicine has the clinical trial set up in two hospitals; Scientists are engaged for targeting improved management of different types of diarrhea, dysentery and typhoid fever; on disease progression, complications, atypical clinical presentations, pathogenesis and complications. Vaccine trials (i) Phase I trial of Measles Aerosol Vaccine, (ii) Phase II trial on Oral Cholera Vaccine VA 1.3 and (iii) Phase IIIA trial on Rotavirus Vaccine were performed by this division. Inter-Divisional collaborative research activities of Bacteriology, Virology, Parasitology and Immunology divisions were also supported by us.

This division is actively involved for Human Resource Development by conducting teaching cum training programmes and workshops for under-graduate and post-graduate medical students, International & National WHO Fellows, medical professionals from International Universities, health professionals of National level and Professional Bodies of National & International level.

Better formulations of ORS eg. rice-based ORS, pop-rice based ORS, glycine fortified ORS, hypo-osmolar or reduced osmolar ORS were also studied; conducted supplementation studies of Zinc, Zinc + Vitamin A, Zinc + other micronutrients & vitamins as an adjunct therapy to ORS among children.

Documentation of the efficacies of (i) Doxycycline, Norfloxacin, Erythromycin, Azithromycin and Cefuroxime for the treatment of cholera (ii) Nalidixic Acid, Norfloxacin, Ciprofloxacin and Furazolidone for the treatment of dysentery (iii) Ciprofloxacin, Furazolidone, Ceftriaxone for the treatment of multi-drug resistant typhoid fever, better probiotics were the achievements of this division.

Scientific Expertise:

Dr. S. S. Das initiated research on several aspects of the mucosal innate immune responses, to identify new virulence factors of S. typhi and to explore the role of microRNAs in the pathogenesis of hepatitis B and HIV-1 infection are also underway.

Dr. M. K Bhattacharya identified quinolones for the first time as a drug of choice for treatment of multi-drug resistant S.typhi.; investigated a number of Cholera and Shigella epidemics; responsible for investigating any outbreak or epidemic.

Dr. U. Mitra studies on oral rehydration therapy, supplementation of micronutrients in acute diarrhoea, studies on bacillary dysentery, typhoid fever, probiotics, oral attenuated human rotavirus vaccine (Rix 4414) in healthy infants and low osmolality low sodium ORS in children with diarrhoea.

Data Management Division

Dr. B Manna working on epidemiological field studies and Hospital based Clinical studies with particular emphasis on biostatistics and research methodology in collaboration with International agencies; successfully completed large community based Typhoid Vaccine effectiveness Trial with a total population of 60,000 and oral cholera vaccine efficacy trial with over 100,000 population in urban slums of Kolkata.

Dr. K. Rajendran in Bio-Statistics in the field Diarrhoeal diseases of Bio-medical Research includes design the research proposal, data management, Statistical Analysis of Epidemiological studies, Clinical Trails, Microbiological Studies, Vaccine Trails etc...
Epidemiology Division works on epidemiology of diarrhoea - observational, intervention and operational research projects like micronutrient supplementation and albendazole administration to children and its impact on growth and diarrhoeal incidence.

Dr. Alok Deb worked and supervised in studies related to Haemophilus influenzae type b infections in children, HIV in migrant workers and cholera vaccination in infants; technical expert in various project development WHO/TDR meetings and as a consultant of diarrheal disease program of Institute for One World Health, USA; identifying data gaps in important public health areas and conducting methodologically sound studies.

Dr. S. Ghosh is interested in any types of epidemiological research, observational, analytical, intervention and operational research studies; facilitated many training course on Control of Diarrhoeal Diseases and 19 training course on Immunization Strengthening Project conducted by Ministry, working in Manipur, Nagaland and Mijoram for HIV sero-prevalence among injecting drug users.

Dr. Suman Knungo is conducting several field trials, conducting demographic studies and identifying potentials predictors of risk factors for enteric and other diarrhoeal diseases in urban slum setting; protocol designing, implementation of operating procedure, adherence to GCP and training of the field personnel. Does placebo-controlled, double-blind, single oral dose study to determine the safety and immunogenicity of typhoid vaccine (oral live S. typhi (Ty2 aroC:ssaV)) in healthy paediatric and adolescent subjects, in the official slums of Kolkata, and Surveillance for dengue fever in eastern Kolkata, phase II trial of a live oral cholera vaccine.

Dr. S. Panda working in the field of HIV prevention and care in South Asia with clinical and epidemiological research, intervention design, evaluation and advocacy; since 1998 onwards has been involved in formation of the “Society for Positive Atmosphere and Related Support to HIV/AIDS” (SPARSHA), a community based organization of ‘People Living With HIV/AIDS and their Friends’. This made an innovative model of reduction of stigma and discrimination around HIV/AIDS, which has only recently started receiving appreciation for its ‘well ahead of time’ thinking. SPARSHA-Nepal has been functioning as an independent organization and carrying out commendable work in the areas of capacity building through developing training modules and HIV care.

Dr. K Sarkar working in the field of HIV/AIDS

Dr. Dipika Sur works in various projects of public health importance like prevalence of HIV, health sector preparedness and response to floods, rationality of prescribing habits of physicians. Her present research interests include projects on epidemiology of diarrhoea - observational, intervention and operational research projects like micronutrient supplementation and albendazole administration to children and its impact on growth and diarrhoeal incidence; Phase III community based typhoid, cholera, measles vaccine trials as also probiotic intervention study; collaborating with University of Maryland for a multi centric study on diarrhoeal disease burden case control study.

Division of Electron Microscopy does Kleinschmidt’s protein monolayer technique of DNA, partial denaturation mapping of DNA, protein-free spreading methods of DNA and RNA, immunoelectron microscopy, ferritin labelling, ultramicrotomy, darkfield EM and electron diffraction, cryoelectron microscopy, tomography, environmental scanning electron microscopy and atomic force microscopy. This laboratory, for the first time, showed the filamentous nature of RS1-KmΦ phage of V. cholerae; morphology of
different choleraphages and their DNA; constructed partial denaturation maps of DNA of vibriophages. Also the structure of several hemagglutinins of V. cholerae and Shigella dysenteriae has been determined using negative staining methods. Now the 3-D structures of these molecules are being worked out using cryoelectron microscopy. Hydrodynamic properties of the flagella of Vibrios; Fimbriae or pili play a vital role in the attachment of bacteria to the human intestinal cell wall. These have been studied extensively in different serovars of V. cholerae and E. coli. Presence of a capsular layer in a new strain of Vibrio cholerae has been confirmed with the help of ferritin labelling method.

**Dr. A. N Ghosh** is interested in research on cryoelectron microscopy and 3-D image reconstruction of protein molecules, on the studies of vibriophages and on nanobiotechnology.

**Dr. D. R Saha** has interest is to look for the pathomorphological changes in the gut mucosa histologically and ultra structurally caused by different enteric pathogens causing diarrhea & other gastro intestinal illness Fecal leucocyte, an indirect evidence of inflammation of gut mucosa from choleric stool samples was done; A retrospective study of surveillance stool samples from 1996-2004 was carried out.

**Division of Immunology:** to study mucosal immune regulation by two proteins: porin, of the Gram negative bacteria, Shigella dysenteriae type 1, and hemolysin, a pore-forming toxin released by V. cholerae; TLR-mediated recognition of the molecule by immune cells, triggering of downstream signaling pathway upon recognition, and finally, the immune outcome elicited by the signal transduction.

**Dr. Tapas Biswas** has experience in biochemical, cellular and molecular immunology; the modulation of the mucosal immune system by a pore-forming protein, porin from Shigella dysenteriae type 1; Toll-like receptor mediated regulation of mucosal immune response to establish the macromolecule as an adjuvant; Vibrio cholerae hemolysin (HlyA), a pore-forming toxin in association with Dr. K. K. Banerjee, Division of Biochemistry. HlyA and its oligomer are used to study the differential regulation of antigen-presenting cells, such as macrophages and B-1 cell populations.

**Division of Pathophysiology** understanding of pathogenesis of different diarrhoeagenic bacteria, development of candidate vaccine, Super ORS and use of proper antibiotics against diarrhoea. The studies in rat perfusion model have shown that hypotonic ORS made by lowering sodium is much more effective than by lowering glucose. A large number of students have been trained in this laboratory for their Ph.D./ M.Sc./ M.Tech. Program. Several collaborative projects are also going on with many National and International Scientists of different Organizations and Institutes.

**Dr. M. K Chakarabarti** has contributed in the understanding of pathogenesis of different diarrhoeagenic bacteria, development of vaccine, Super ORS and use of proper antibiotics against diarrhoea. His current research interest is investigation of receptor specificity and signal transduction of different bacterial toxins.

**Dr. Amit Pal** has been working on the enterotoxigenicity of cholera toxin gene negative V. cholerae non-O1, non-O139 strains. He has three Ph. D students working under him. At present he is working as a visiting researcher at the Department of Molecular Biology Umea University, Sweden.
The Division of Parasitology integrates research into the mechanisms of parasitic diarrheal diseases at the molecular and cellular levels with epidemiological studies. Research efforts are founded on understanding the mechanism of rRNA processing in Giardia; Total genomic DNA library of Giardia has been prepared in this department for pursuing different types of molecular studies on this organism. This division is the eastern node as well as the Central Unit of a parasitic network proposed under Indo-US joint collaboration for training and manpower generation and quality control of parasitic diagnosis across India.

Dr. S. Ganguly has major focus on the molecular analyses of rRNA biogenesis; Study the effects of oxidative stress on microaerophilic Giardia at its cellular, genome, proteome and metabolomic level, molecular diagnosis of enteric parasites, molecular epidemiology of Coccisides and other enteric parasites in immunocompromized patients.

The Division of Virology plays a key role in the surveillance to understand the etiological role of different diarrhoeagenic viruses in and around Kolkata; molecular phylogenetic analysis of the circulating enteric viruses in and around Kolkata with focus on Rotaviruses, Caliciviruses (Norovirus and Sapovirus), Astroviruses, Picobirnaviruses and Adenoviruses; Analysis of the signaling mechanisms during Rotavirus-host cell interactions: Study of host cellular proteins required for viral replication and pathogenesis.

Scientific Expertise:

Dr. Sekhar Chakrabarti is actively involved in the molecular characterization of HIV; the prevalence of HIV-1 subtype C among the Injecting Drug Users in Manipur; Indian HIV-1 is phylogenetically different from other HIV-1 strains; to construct a vaccine candidate using the Indian strain. Recently, phase I clinical trial with the candidate vaccine based on the MVA containing all the HIV-1 genes has been completed. 

Dr. B. Ganesh does Detection and molecular characterization of emerging diarrhoeagenic viruses in the communities from the suburbs of Kolkata of public health importance. Molecular characterization of the diarrhoeagenic viruses detected in the communities from the suburbs of Kolkata

Dr T. Krishnan has contributed in the area of molecular virology including electron microscopy and ultra structural studies of rotaviruses; reported the Adult Group B rotavirus infections in Kolkata in 1999 for the first time outside China and have recently again reported an intergenogroup recombinant Norovirus from Kolkata in 2008. They have also shown that human picobirnaviruses and astroviruses are associated with acute watery diarrhoea in Kolkata.picobirnaviruses and enteric adenoviruses to compare the genetic diversity of the strains in our country with those reported from other parts of the world.

Dr. M. Chawla-Sarkar is studying innate immune response and intrinsic cellular defenses activated by viruses in host and mechanisms evolved by viruses for evading these responses with focus on Rotaviruses. Identification of cellular protein with anti viral function or the viral-encoded inhibitory proteins which help viruses to evade immune responses has implications in designing next generation anti-viral drugs.
3. Bose Institute

Five Scientists are working on Tropical Diseases and following 7 Project(s) have been handled in the Institute on Tropical Disease in last 10 years:

a) Signal transduction mechanism in murine macrophages during visceral leishmaniasis.
b) Immunomodulatory role of glycolipid against visceral leishmaniasis (VL)
c) Molecular Biology of Mycobacterial plasmid replication
d) Tuberculosis diagnostics.
e) Role of TNF and FLIPs in Mycobacterium tuberculosis-induced macrophage apoptosis
d) Shigellosis
e) Molecular Biology study in Entamoeba histolytica.

Infrastructure and Services:
Institute is equipped with, Confocal microscope, Imager, Fluorescence microscope, Inverted Phase Contrast Microscope, DNA sequencer, Protein sequencer, Ultracentrifuge, Gel-Doc system, MALDI-TOF, GC-MS, FACS, Real-Time PCR, HPLC, FPLC, Electron Microscope, NMR, Nano Second Spectroflurimeter, CD Spectropolarimeter, Stopped Flow Spectrometer, Peptide Synthesizer, Capillary Electrophoresis, FPLC, Phosphor Imager, GelDOC & Imaging Densitometer, Liquid Scintillation Counter etc.
Scientists, outside institute are paying nominal charges for using the facilities.

Sophisticated Analytical Instrument Facility (SAIF) is one of the first four such facilities set up by the DST; provides the necessary training for various instrumentation services to the students of different Organizations and different industries. It holds workshops, seminars, Symposiums etc. on different instrumentation services.
There are service centres such as Regional Sophisticated Instrumentation Centre, Central Instrumentation Facility, DIC, Library, Workshop etc. The wide ranging and comprehensive base of available scientific infrastructure also comprises of the A. J. C. Bose High Altitude Research Centre at Darjeeling and experimental field stations at Falta and Madhyamgram in West Bengal for scientists.
Well equipped Library with online and journals, CD Rom etc are available.
A JC Bose unit and Museum of his scientific belongings is a prized possession for display by the Institute.

Long time Expertise: The institute was actively involved in pioneering discovery of Cholera Toxin and its role in the pathogenesis of Cholera by Prof. S. N. De. This led to breakthrough in understanding of the molecular mechanism of toxin-receptor interaction in microbial pathogenesis

Department of Microbiology: Dr. Sujoy K. Das Gupta is investigating the Molecular Biology of Mycobacterial plasmids and phages for Mtb; replication protein; ‘Genomics of Mycobacteriophages’ like Gp50, Gp56; discovered a primitive RecA like protein (D29 Gp65) having just the ATPase core which acted as an exonuclease. He is developing peptide based diagnostic tools for TB using mimotopes of common Mycobacterial antigens.

Division of Molecular Medicine: Prof. Subrata Majumder is interested in: Signal transduction mechanism during host pathogen interaction by the L donovani, the interplay
of host immune responses, immunomodulation and the development of therapeutic targets against VL and Tuberculosis. The involvement of different PKC isotypes, role of TNF-α induced neutrophil signaling and the importance of ceramide studied in VL and TB. The siRNA mediated silencing of CCR5; a chemokine receptor in *L. donovani* entry is an effective means of restricting the parasitic entry. Besides these, the ceramide generated due to *L. donovani* infection displaced cholesterol from the lipid raft of the macrophage membrane thereby disrupting the raft architecture and affecting the antigen presenting ability of the cell.

4. Calcutta School of Tropical Medicine

CSTM has 15 departments and 51 sanctioned clinical and non clinical teaching positions. The institute offers the **following courses**: MD in Tropical Medicine, Diploma in Tropical Medicine and Health / DTM&H, MSc in Medical Biotechnology and Diploma in laboratory technology/DLT. It also provides training programs ICTC technicians. The institute will initiate two new courses: MD (Infectious Diseases) and MSc (Immunology) in the near future.

**Services:** It provides routine OPD services through the Charmichael Hospital, to offer clinical care in the area of Tropical Diseases, like kala-azar, helminthic & protozoal infections, malaria and to HIV / AIDS patients. It acts as a referral centre for these diseases. It possesses a Center of Excellence in HIV, and the department of tropical medicine runs Anti Retroviral Treatment center. The nutritional status of patients on ART and the related factors such as virus load and immunological status of patients underlying the delayed response to ART, failing to respond to ART. It is also serving as a Regional Training Center for Eastern and North Eastern States of the country.

**Department of Microbiology** including the units of Protozoology, virology and Helminthology provides routine clinical and diagnostic services to patients throughout the year on malaria, kalaazar and serves as a referral center for protozoal infections. It is also recognized as a Center of Sentinel Surveillance for HIV/AIDS, JE and dengue. It has also taken a leading role in the outbreak investigations as well as in the public awareness programs. It has **Research Work on**: Modification of conventional liquid Medium for Rapid detection of growth of Mycobacterium tuberculosis.

**Public health and field work:**  
Bacteriology and Serology Unit work like water Bacteriology and Stool culture, Blood culture etc. during out break of diarrhoea and fever in different districts of West Bengal. They have performed epidemiological investigation of Cholera outbreak in South 24 Pgs following “Cyclone Ayla”.

**Department of Microbiology (Protozoology Unit) works on basic research:**  
“Studies on drug resistant malaria in Jalpaiguri” ; “Prevalence of DHFR and DHPS mutation and its association with sulphadoxine pyrimethamine resistance of *P.falciparum* in West Bengal”; Comparative Efficacy Of As + Sp And As + Lumefantrine In Treatment
Of Uncomplicated P. falciparum Malaria in Kolkata, West Bengal; "Prevalence of Plasmodium falciparum Chloroquine Resistant Transporter (Pfert) Gene Mutations And Its Association With In-Vivo Choloquine Resistance In West Bengal” Prevalence of CQ resistance malaria in a tertiary care hospital; Therapeutic efficacy of Artisunate + Mefloquine in Uncomplicated P. falciparum

Department of Tropical Medicine has the Research Activities:

Teaching Activities:
Post graduate students of M. D. (Tropical Medicine), D.T.M. and H. students of West Bengal University of Health Sciences;
Training of Community Medicine post graduate students from Medical College & All India Institute of Hygiene & Public Health;
Conducting Fellowship in HIV Medicine course in collaboration with Medical College, Kolkata & CMC, Vellore and Maulana Azad Medical College, New Delhi;
NACO ART Training for Medical Officers and Specialists;
Training of nurses and counselors;
Training of Overseas medical students and doctors.

Drs. B Saha, S K Guha, N Pramanik, R P Goswami, S Mallick, M Rahaman, D Modak, D Gonjhu from the department are engaged in:
Trainer for various Government programs for training on various issues on HIV/AIDS for doctors/counselors/nurses; Training workshop for capacity building of State/District Level Programme Officers and Municipal Health Officers on Dengue (30.03.09), Training workshop for Medical Officers of Calcutta Municipal Corporation on Vector Borne Diseases,
GFATM training program-Training of Trainers-Nurses, District Level Officers, BMOH, Superintendents-Howrah District-‘Malaria-Clinical features, Investigation, Diagnosis and Management’ – 26.11.09, NACO Training Programmes for Medical Officers/Specialists ART centers, Medical Colleges, DOTS, STM and Fellowship in HIV Medicine.

Dr. R. P. Goswami is the In-Charge of Endoscopy Unit of Carmichael Hospital for Tropical Diseases,

Center for Excellence in HIV has Research Activities on: Cross-sectional study of the nutritional status of patients on ART; Rapid situation analysis of ART eligibility from Pre-ART register; A prospective study on the effect of nutritional counseling on nutritional status of patients starting first line ART; Study of factors responsible for
delayed ART initiation among People Living with HIV/AIDS with CD4<250/uL ; Prospective study of immunologic and virologic status of HIV patients failing first line ART; Determination of factors associated with ART drug adherence among HIV positive patients in India – A multi centric study ; Randomized, control trial of impact of ‘Early’ (2 weeks) vs. ‘Late’ (4 weeks) initiation of antiretroviral therapy in HIV/TB co-infected patients-a pilot study; Prospective, randomized control trial of the impact of nutritional counseling and macronutrient and micronutrient supplementation on the health status of patients staring first line ART.

National AIDS Control Programme is recognized as a National Reference Laboratory for quality Assurance and Quality Control of HIV testing of the ICTCs PPTCT Blood Banks of West Bengal and State Reference Laboratories of West Bengal, Sikkim, Bihar and Chhattisgarh.
This department is also recognized as Centre of Sentinel Surveillance for HIV/AIDS and JE and surveillance centre fore DBS for HIV/AIDS, diagnosed by using commercial available ELISA Test Kits. HI test for JE are done with of mouse brain antigen prepared in-house. Attempts to isolate Arbo-Viruses are done from acute serum samples of patients using suckling mice model.

Outbreak Investigations
Have conducted investigations for DENGUE/CHIK/JE out breaks in different district

Department of Medical Entomology works on:
Studies on Dengue and its vector in urban and rural surroundings.
In search of Malaria in endemic area in Kolkata.
Routine research work:
Maintenance of colony of different types of Mosquitoes
Maintenance of colony of Phlebotomus Argentipes

Department of Dermatology, STD & Leprosy and Leprosy Training Center has routine In and Out patient care facilities. It has organized one clinical meeting of the State Branch of National Body of Dermatology. Research works are carried out on several aspects of Leprosy.

Department of Hematology has the Research Activities:
Hematological aspects in HIV infected patients
Bone marrow morphological assessment in HIV infected patients
Study of coagulation abnormality in HIV infected patients
Initiation of Network facility: The School has started research networks with the Indian Statistical Institute, NICED and ICMR headquarter and Internationally with McGill University, Canada and London School of Hygiene and Tropical Medicine.
The faculties: (As mentioned in the chapter on Profiles of the Institute).They all are engaged in the activities of the Centre related to Tropical diseases.
5. Rajendra Memorial Research Institute of Medical Sciences

Field of Research are: Drug, Vaccines and Diagnostics along with Vector control, Nutritional aspects, Application of Bio-informatics tools, Epidemiology of VL/PKDL.


Work done for Vaccine:

<table>
<thead>
<tr>
<th>Leishmaniasis</th>
<th>DNA based</th>
<th>LeishVax</th>
<th>Initiated</th>
<th>LeishDNAVAX study in progress</th>
</tr>
</thead>
</table>

Work done For Diagnostics:

|----------------------------------|-----------------|---------------------------------|-------------------------------------|-----------------------------|

Work done For Drug:

<table>
<thead>
<tr>
<th>Potential anti-leishmanial drugs</th>
<th>Clinical trials in different phases</th>
<th>Miltefosine, Paromomycin, Amphomule</th>
<th>WHO/TDR DNDi, Bharat Serum Ltd</th>
<th>Several trials already completed</th>
</tr>
</thead>
</table>

International Recognition: is a declared WHO reference centre for Leishmania Parasite and Sera Bank.


Meetings/ Seminars/ Trainings organized:
1. Training to German doctors’ belonging to Charite and the Medical Faculty of Humboldt University, Berlin on various aspects of Leishmaniasis; April 2007.
3. Training on “Molecular Immunology & Parasitology” was imparted to PG Students of Dept. of Zoology, University of Calcutta May 2007.
5. WHO/TDR sponsored Principal Investigators’ meeting for protocol discussion of “Combination therapy study” June 2007.
8. One-day training course on various aspects of Kala-azar was imparted to students of M.Sc. Final year from Dept. of Zoology, Patna university Dec. 2007.

Scientists and the Field of Specialization:
Dr. Pradeep Das- studies Microbiology and the Field of specialization - Parasitology with special emphasis on enteric parasites.
Dr. Narendra Kumar- Presently working in the field of social aspect of Kala-azar in the state of Bihar; Knowledge, attitude and practices in relation to Kala-azar in rural Bihar. Women’s perception about Kala-azar. Mother’s perception on social aspect of Filariasis in a rural community of Bihar. Awareness about Kala-azar. Study of role of migration in relation to distribution of Kala-azar in Bihar. Control action plan for Kala-azar in endemic areas of Bihar.
Dr. Prabhat Kumar Sinha-: works on clinical and pathological aspects of Leishmaniasis; Clinical drug trials in Kala-azar, Epidemiology of HIV.
Dr. Neena Verma- Clinico-pathological studies on PKDL. Immuno-histochemical staining technique on PKDL. Epidemiological studies on infection dynamics of Kala-azar in an endemic area of kala-azar in Bihar. Drug trial on PKDL & VL.
Dr. V.N.R. Das- Investigates the field of Clinical & Epidemiological aspects of Viseral Leishmaniasis, PKDL and HIV; Drugs trial on Kala-azar, PKDL & HIV. Epidemiology on Kala-azar & PKDL. HIV infection, visceral leishmaniasis and Guillain - Barre syndrome in same patient: a case report. Phase 4 trial of miltefosine for the treatment of Indian VL. A pilot study on the status of LF in a rural community of Bihar.
Dr. Anil Kumar Gupta- works on Long-term preservation of l. donovani promastigotes on blood agar slants. L.donovani: Immunomodulatory role of 63 KDa leishmania antigens in the promotion of IFN-gamma response (VL vs HIV-VL co-infection). Towards identifying immunogenic targets in VL: role of 17 kDa and 63 kDa phosphoproteins. Relevance of direct agglutination test for detection of sub-clinical infection among contacts of kala-azar and non- kala-azar households.
Dr. Vahab Ali- is interested in Isolation, purification of lipophosphoglycan from L. donovani promastigotes of non-pathogenic strain and its in vitro efficacy; Characterization of two isotypes of L-threonine dehydratase from e. histolytica. A retromer-like complex is a novel Rab7A effector that is involved in the sorting of the virulence factor cysteine protease in the enteric protozoan parasite E. histolytica. An intestinal parasitic protoist e. histolytica possesses the non-redundant NIF system for the iron-sulfur cluster assembly under anaerobic conditions. Molecular, cellular and functional characterizations of a novel ICAM-like molecule of the immunoglobulin superfamily from leishmania mexicana amazonensis.
Dr. Sanjeeva Bimal and Dr. Krishna Pandey – have studied comparative evaluation of direct agglutination test and rK-39 RICH in early detection of sub clinical infection among contacts of kala-azar patients and controls: a Community based study. HIV, Visceral leishmaniasis and Parkinsonism combined with diabetes mellitus and hyperuricaemia: Inhibition of ABC transporters abolishes antimony resistance in leishmania infection. L. donovani: Role of CD2 on CD4+ T-cell functions in VL. Hypcholesterolemia and increased triglycerides in paediatric visceral leishmaniasis. VL & TB in patients with HIV co-infection.
**Dr. Chandra Sekhar Lal** - works on Biochemistry of VL and HIV patients, isoenzyme characterization of leishmani parasit, host-parasit biochemistry, parasite culture, HPLC, GLP of clinical Biochemistry, clinical trial of antileishmanial drugs, antioxidants mechanisms etc.

**Dr. Naween Kumar** - KalaAzar, Malaria. HIV infection, pneumonic patch with TB and hepatitis-A case report. VL- the Bihar (India) perspective. Magnitude of unresponsiveness to sodium stibogluconate in the treatment of VL in Bihar. HIV-1 infection VL, Koch’s chest and tuberculous meningitis in the same patient-a case report.


**Dr. Vijay Kumar** - Zoology, common work with other investigators.


**Dr. Sreekant Kesari** - Vector control in leishmaniasis, Evaluation of dot-immunoblot assay to detect leishmanial antigen in naturally infected phlebotomus argentipes; Estimation of efficacy of malathion against the vector of Indian kala-azar, with the help of bioassay and HPLC analysis. An entomological field evaluation of larval biology of sandfly in Kala-azar endemic focus of Bihar--exploration of larval control tool. Life budget analysis of Phlebotomus papatasi Scopololi: a suspected vector of Kala-azar in India.

**Dr. Roshan Kamal Topno** does Epidemiology; VL in pregnancy - the role of amphotericin B.

---

6. **Regional Medical Research Centre (RMRC), Dibrugarh**

The goal of is to promote biomedical research in north-eastern states of India and build up technical man power, making a network of health facilities of the region and to collect information about traditional system of medicine with a multidisciplinary approach like: Diseases having priority in National Health Programmes; Diseases common in two or more states of the north-eastern region; exploration of traditional knowledge; Research on mosquito-borne diseases, HIV & drug abuse, Trematode infections & Haemoglobinopathies and Nutrition.
**International Recognition:** WHO recognized centre for training in malariology for Medical officers & Laboratory technicians. Recognized centre for PhD/masters programme under Indo-US RISE programme.

**Major Achievements:** Declared by the Govt. of India as a Centre of Excellence; Developed forest malaria control module; Patented on herbal anti malarial product and applied for two others as (i) mosquito repellent (ii) Mosquitocidal; developed early warning system for JE; First in the world to describe three new mosquitoes; established lung fluke as a major public health problem in NE India; Developed a new diagnostic kit for lung fluke disease; First to established the presence of all four species of malaria parasite in Northeast; Developed screening assays both in-vivo and in vitro for anti-malarial drugs;

Started MSc Biotechnology and Bioinformatics course in collaboration with Dibrugarh University.

Recent Northeast initiative of ICMR has boosted biomedical Research in the region and the activities; will also strengthen laboratories with state of the art equipments and help in building technical manpower in the region. This will open opportunities to young postgraduate for pursuing doctoral courses and contribute to scientific development.

**Facilities: Molecular area:** PCR (Real time and standard), pulse field gel electrophoresis; Automated DNA work station; Western blotting; DNA sequencing, proteomics; Cell line culture; Flowcytometry; 2-D electrophoresis, MALDI TOF TOF, Microarray, PFGE, Protein spotter and picker, Microscopes (compound, inverted, dark field, Fluorescent and con-focal.

**Infrastructure:** Well equipped Laboratory with basic and state of art facilities including BSL-3 facility, Recognized animal house for animal resources and experimentation; Centre for bioinformatics, Library; Microbiology: Automated bacterial identification system, Bacti-alert for mycobacteria (TB) isolation and drug sensitivity.

**Analytical:** Well equipped Biochemistry laboratory with anions, cations estimation, autoanalyzer, HPLC, variant system; Mutagenicity testing with eukaryotic and prokaryotic models; ion chromatograph, electrophoresis, PAGE, Automated ELISA system.

Microbiology lab for isolation, identification and drug sensitivity testing for enteric bacteria and TB, Xenodiagnosis of arboviral infection in mosquitoes.

**Support services:** Well equipped animal experimentation facility with CPCSEA recognized Animal house; Mosquito colony; Good library and other IT facilities; Medicinal plant garden; BSL-III Laboratory.

**Teaching/Trainings & Services:** To generate bio-medical HRD through term training and M.Sc. in Biotechnology and in Bioinformatics, Ph.D. and MD programmes; Summer course/hand on trainings to graduate/post graduate students; Training in Malariology and JE for Medical Officers and Laboratory Technicians; Helping the different state health authorities in mitigating disease out breaks; Providing diagnostic services in Malaria,
Arboviral diseases, various helminthic infections like Paragonimiasis, Cysticercosis (NCC), etc.

37 Project(s) handled in the Institute on Tropical Disease in last 10 years on Parasitic (Malaria, Filariasis, Kala-azar, Helmithiasis Viz: Paragonimiasis, Neurocysticercosis, Non human schistosomiasis, Intestinal helminth); Bacterial (TB, streptococcal pneumonia, MRSA, Rheumatic fever and RHD) and Viral (JE, Dengue)

10 Scientists working on Tropical Diseases

New Process developed as Diagnostic kit for lung fluke disease.

Diagnostics work done:
Malaria, Filariasis, JE, Dengue; ELISA based HIV diagnosis; Trematode infections and other intestinal parasites; Taxonomy of Mosquitoes and Trematodes of public health importance.

Entomology: Mosquito ecology and vector biology; Insecticide bioassays; Mosquito sporozoite ELISA; Mosquito blood meal analysis; Vector control.

Investigators are: Dr. J. Mahanta, Dr. P.K. Chelleng, Dr. Prafulla Dutta, Dr. Pradyumna Kishore Mohapatra, Dr. Anil Prakash, Dr. Santanu Kumar Sharma, Dr. D.R. Bhattacharyya, Dr. Dipankar Biswas, Dr. H.K. Das, Dr. Abdul Mabood Khan, Dr. Kanwar Narain, Dr. Anil Chandra Phukan, Dr. Prasanta K. Borah, Dr. Siraj Ahmed Khan, Dr. G.K. Medhi.

They are basically engaged in following research activities:


Pulmonary paragonimiasis and smear negative pulmonary tuberculosis: A diagnostic dilemma. Paragonimus and paragonimiasis: A new focus in Arunachal Pradesh. Clinical presentation of malaria during an outbreak situation. Entomological observations on dengue vector mosquitoes following a suspected outbreak in certain parts of Nagaland with a note on their susceptibility to insecticides. A focus of LF in a tea garden worker community of Central Assam. Cholera epidemic in rural area of north-east India. Rotavirus associated acute diarrhoea in hospitalized children in Dibrugarh, north-east India. Plasmodium ovale: First case report from Assam, India. Resurgence of malaria in
North-east India. Entomological observation on dengue vector mosquitoes following a suspected outbreak of dengue in certain parts of Nagaland with a note on their insecticide susceptibility. Clinical outcome and neurological sequelae in serologically confirmed cases of JE patients in Assam, India. Influence of environmental factors on indoor resting Culex quinquefasciatus in tea agro ecosystem of Assam, India.

**Technologies ready for Transfer:**

<table>
<thead>
<tr>
<th>Name of Technology</th>
<th>Commercial Applications</th>
<th>Scale of Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Development of ELISA diagnostic system for paragonimasis</td>
<td>Diagnosis of Paragonomiasi Cases and differential of haemoptysis</td>
<td>Laboratory diagnosis</td>
</tr>
<tr>
<td>II Development of an early warning system for Japanese encephalitis in Assam</td>
<td>Early warning of occurrence (time, place state) of JE</td>
<td>Developed only specific to Dibrugarh District</td>
</tr>
</tbody>
</table>

**R&D activities and priorities:**

I. Development of ELISA diagnostic system for paragonimasis; II. Development of an early warning system for Japanese encephalitis in Assam.

In diagnostics, malaria platform development and helminthiasis kit development are done.

In drugs, Malaria screening and product development; TB screening; HIV screening; Helminthiasis target screening, manufacturing and Filaria screening are ongoing efforts.

**7. Indian Institute of Technology Kharagpur**

**Courses offered are:** UG; M.Tech, Integrated MSc.-Ph.D. Programme; Revised UG Curriculum; M.Tech Programmes for Teachers of AICTE-Recognized Degree-Level Programmes of Engineering Institutions. Master of Medical Science & Technology, Master of Science - by research (MS), PhD, DSc.

**Instrumentation Facilities are:** Sonicator, Turbidometer, UV cross linker, UV-VIS spectrophotometers; Vertical, horizontal and tube gel electrophoresis systems; Ultra low freezers, Ultra centrifuges, Therapeutic recombinant protein production, Stereo and inverted tissue culture microscopes, Rotating locular counter current chromatograph; PCR machine, Air-lift bioreactor, Atomic absorption spectrophotometer, ELISA reader, Hybridizer; Atomic absorption spectro photometer, Fermenters with controller, FPLC, Gene gun, HPLC, Mass cloning in bioreactor etc.

**Technology developed:** Preloaded Syringe for storage and enhanced pressure delivery of viscous chemically reactive drug
Workshop organized as: A short term training programme in the area of Bioinformatics to create awareness among the researchers, teachers and limited number of final year M.Sc. / Ph.D / M.Tech / B.Tech students for using bioinformatics tools and their applications in genome and proteome research. The training is primarily targeted to acquaint them in the frontier areas of following: - Biological data bases and sequence analysis tool; Molecular modelling and Drug designing; Genomics and Proteomics.

This IIT has many areas of research and concerned departments. However, for the current project mandate, it has only one investigator involved in the area.

Prof. A.K. Das, Department of Biotechnology is interested in Structural Biology and Protein Chemistry. He does crystallographic study of M.tuberculosis; Structural Bioinformatics; Understanding the signalling mechanism from the crystal structures of the two component system proteins and protein phophatases from M. tuberculosis; Crystal Structure determination of a beta carbonic anhydrase from (mCA) from M. tuberculosis; Crystal structure determination of hypothetical secretory proteins from Mtb.

8. Indian Institute of Technology Guwahati

It has most of the basic infrastructure in place, laboratories, classrooms, etc. Other facilities include a campus computer network on a Gigabit Ethernet backbone; All faculty and staff members of the institute are provided with PCs With Internet and e-mail facility. The Central Library, The Central Instruments Facility also caters the needs of the other researchers working under various Universities, Research Institutes, and Industries situated in the northeastern region. These equipment are of inter / multidisciplinary like, NMR, Spectrometer, Scanning Electron Microscope, Confocal Laser Scan Microscope, Electron Spin Resonance Spectrometer, Transmission Electron Microscope, Liquid Chromatography Mass Spectrometer, Vibrating Sample Magnetometer.

Department of Biotechnology: It is one of its kinds in the whole North-Eastern India providing an excellent research environment and imparting quality education through its B.Tech and PhD programmes. Major thrust areas of the department include Biochemical engineering, Mammalian cell culture, Plant Biotechnology, Microbial Biotechnology, Nano-biotechnology, Computational Biology, Bioinformatics and Proteomics. Summer Training in biotechnology based industries and research institutions at the end of third year and B.Tech Project in the final year.

Equipments: 2D electrophoresis system by IEF, Ultracentrifuge, Auto Tensiometer, Bilologic LP system with Fraction Collector, UV visible absorption spectrophotometer, Steady state Fluorometer, Hybridization oven, PCR System, Mini Submarine Electrophoresis Unit, High speed centrifuge, Gel Doc. System, Atomic Force
Microscope, Inverted Fluorescent Microscope, Biolistic Gun, Bioreactors, Bioinformatics and Computation Biology Facility etc.

**Facility of the Department: Biochemical Engineering:** courses in chemical process calculations, fluid mechanics, chemical engineering thermodynamics equilibrium stage operations and chemical reaction engineering; courses in Industrial Microbiology, Biocatalysis, Enzyme Reaction and Kinetics, Environmental Engineering, Bioseperation engineering and Biochemical engineering (theory and lab).

A new parasite culture facility is developed.

**Programs concluded**
- qip short-term course on advances in drug discovery on (20th-24th july 2009)
- qip short-term course on approaches to the screening of bioactive molecules from natural resources on (13th-17th july 2009)
- qip on engineering aspects of enzyme and microbial processes (june 4th-8th, 2007)
- qip on rdna technology (summer 2006)

**National Symposium on:** Entrepreneurship in Biotechnology: Scope & Prospects in North East India on 20-21 January 2007.

**Scientists:**

**Dr. Vikash Kumar Dubey** has done three projects; works on Antileishmanial drug discovery; Protein folding and aggregation; Proteases; Environmental proteomics, Studies on Trypanothione Reductase; Deciphering the molecular mechanism underlying the activity of antitumor agents as antileishmanial agents and their potential for therapy. Modeled structure of trypanothione reductase of *L. infantum*.

**Product(s) developed:**
He has identified potent inhibitors of Trypanothione reductase, a drug target enzyme of leishmaniasis, they have modeled binding modes of selected tricyclic compounds and quinone derivatives, using AutoDock4; and experimentally validated. Moreover, the possible molecular mechanism for antileishmanial activity of the Iridoid glucosides from *Nyctanthes arbor-tristis* was shown to be inhibition of TryR and resulting redox imbalance; the first report of iridoid class of compounds as inhibitors; which may be further developed as affordable drugs.

**Teaching responsibilities:** Concepts and Methods in Proteomics; Biochemistry Laboratory; bioinformatics and Computational Biology; Biophysics; Biotechniques; Enzymology; Modern Biology Tutorials

**Event organizer** on QIP-STC ON Advances in Drug Discovery. July 20-24, 2009

**Dr. Vishal Trivedi** has done one projects, interested in Intracellular Signaling in *P. falciparum*. Intracellular Signaling in *P falciparum* infected Red blood Cells. Role of Kinase(s) and phosphatases in parasite survival. Molecular Mechanism of Drug Resistance; Role of Oxidative stress in cyto-adherence of infected RBC to the brain endothelial cells. Determination of Biochemical and genetic factors underlying anti-malarial action of clotrimazole. Molecular Modeling, Design and Synthesis of Macrophage Phagosome-Lysosome Fusion Activators in Development of anti-malarials.
1. Central Drug Research Institute

Infrastructure, services and expertise are available to develop a drug right from its concept to market and their chemical and biological evaluation which is spread over 14 R&D Divisions and 13 Technical Services Divisions/Units.

Major facilities:
Medicinal & Process Chemistry: Comprises Combinatorial chemistry set-up, Multiple organic synthesizer, High pressure reactor, Short path distillation equipment, Luwa continuous falling film evaporator, Nauta multipurpose reactor, Stirred tank reactor, QSAR & molecular modeling, Fabrication of glass apparatus etc.
Molecular & Structural biology: Comprises state-of-the-art equipment for cloning, expression and purification of proteins, Modern X-ray diffractometers, Computer graphics laboratory, electron & confocal microscopes, Automated DNA sequencer, Bioinformatics & Computational biology, DNA Microarray system, etc.
High throughput screening assay system: Fully automatic robotic system with liquid handler, micro plate readers, incubators, shaker, washer & filtration unit for quicker screening of large number of test samples.
Sophisticated analytical Instruments: Includes most advanced instruments like Open access LC-MS, MALDI-TOF-MS, LC-MS-MS, Joel JMS 600H High resolution MS, 600 MHz NMR, FT-NMR Open System, FT-NMR with HR MAS, SBFTIR with microscope, Scanning & transmission electron microscopes, Circular Dichrograph, etc.
Safety & Clinical Development: State-of-the-art GLP compliant facility for pre-clinical safety/toxicity evaluation of biopharmaceuticals comprising Auto track system, Water maze system, Telemetry system, Software based 16 channel data acquisition & analysis system, Intracellular recording system, Eco-friendly Rhesus monkey rehabilitation/breeding facility

Opportunities and Services
CDRI focuses on developing New Drugs, Diagnostics and Vaccines and state-of-the-art technologies for clients in India and abroad and associated fundamental research. It has close commercial relationship with Pharmaceutical Industry and other R & D Organisations involved in the area of biomedical Research which goes a long way in developing a strong drug research base in the country and in making India a stronghold in biomedical research opportunities. They offer collaborative as well as contract commercial opportunities in following areas of.
Advisory Consultancy Services: Trouble shooting problems identified by industries
Contract Research: CDRI undertake Research work as per the requirement of contracting party with negotiable Terms & Conditions.
Collaborative Projects: CDRI collaborates with Industry / R&D organizations through Sharing of benefits as per agreement.
Product/Technology Licensing: Drugs/Diagnostics/Vaccines developed by CDRI and technology for industrial production of known drugs.
Modern Drug Discovery Facilities: Combinatorial chemistry, proteomics, high throughput screening, Laboratory animals, Structural biology, medicinal chemistry facilities can be availed on payment basis.

Analytical Services: Sophisticated instruments facility can be availed at nominal charges.

Biological Screening: *In vitro* & *in vivo* tests of compounds against various disease models at nominal charges.

Animal Facility Biometry and Statistics Division Computer Division Library are the other major important areas here.

Information Services: Current information, current awareness / document delivery / technical query services on drugs & pharmaceuticals.

Human resource development:

Scientists training programme: CSIR launched a scheme of providing training to the laboratory scientists in business development activities. Under this scheme scientists from CDRI have undergone training programme

Hands on training Courses of short duration in various disciplines against payment; comprise both lectures and practical with emphasis on practical R&D aspects. Employees of industries / institutions / academics can avail training of short duration comprising theory/practical on advanced techniques.

Career in R&D: JRF/SRF/RA/SRA/Post docs can pursue proficiency in various disciplines of biomedical research at molecular level.

Advanced Training Programmes for Post Graduate Students: Under this programme the institute conducts different kinds of training of short duration in various disciplines (listed below) against payment. The courses comprise both lectures and practicals by our eminent scientists with emphasis on practical R & D aspects in a particular discipline.

The Institute focuses on Malaria, Leishmania, TB and Filaria; handled 71 projects in last 10 years; 44 scientists are working on tropical diseases.

New Products Developed

1. *α, β*- Arteether (antimalarial)
   
Arteether is a semi synthetic derivative of artemisinine, the active constituent of the plant, *Artemisia annua*. CDRI conducted extensive preclinical, toxicological and other regulatory studies in which the drug was not only found to be very safe but also proved to be a fast acting, blood schizontocidal agent which attacks at the erythrocytic stage of malaria in blood. Extensive clinical trials were conducted at 7 centres in malaria prone areas of India. Over 500 patients showed excellent response and the recrudescent rate was very low. Arteether has been developed by CDRI and is being prescribed to the patients as second line of treatment for chloroquine-resistant *P. falciparim* malaria including cerebral malaria.

The DCGI has allowed the drug exclusively for use in hospitals and nursing homes. for use only in severe *P. falciparum* malaria including cerebral malaria as a second line treatment for chloroquine resistant cases. It is not recommended to be used as a first line treatment for malaria to avoid its overuse which may lead to the emergence of resistance against this drug once again.
CDRI has licensed the drug to Themis Chemicals Ltd., Mumbai which is marketing it under the trade name E-Mal as an injectable formulation. Post marketing surveillance data on 400 patients received from clinicians from 6 states has validated the efficacy and safety of Arteether in uncomplicated/complicated cases of P.falciparum malaria. No drug related side effects have been observed so far.

2. Elubaquine (anti-relapse antimalarial)
Elubaquine, which is a primaquine derivative, is without any side effects that have been observed with primaquine. It has been licensed to Nicholas Piramal India Ltd., Mumbai for marketing which had introduced Elubaquine along with chloroquine into the market as a combination pack under the trade name Aablaquine. The objective of the combined therapy is to control *P. vivax* malaria more effectively by providing initial cure and thereafter preventing relapses by use of this combination pack.

3. PCR Based Diagnostic Probe for Tuberculosis
A novel DNA fragment of *M. tuberculosis* useful in early diagnosis of TB coupled with PCR technology has been developed. Laboratory process know-how for the preparation of specific DNA probes and oligonucleotide primers were developed and licensed to Biotron Health Care Ltd., Mumbai for commercialization.

New Process Developed
**Artemether (antimalarial)** is the methyl ether of dihydroartemisinin, which has high efficacy, quick and reliable action, and low toxicity and is especially effective in malaria caused by chloroquine resistant strains of *Plasmodium falciparum*. Process technology for bulk production of Artemether was developed by CDRI and licensed to Ipca Laboratories, Mumbai, which is being marketed under a trade name Larither.

Clinical Trials completed & ongoing
**Arteether (Blood schizontocidal antimalarial):** Arteether is being marketed by Themis Medicare Ltd. under the trade name E-mal. Phase IV (post marketing surveillance) studies were conducted during 1999-2001 in more than 400 patients and report submitted to DCG(I). Tolerance & efficacy to arteether was found good and no drug related side effects were reported.

**Arteether for Paediatric Use in children:** Clinical trials in children suffering from *P. falciparum* malaria were initiated in 2004 in different medical centres viz. Regional Malaria Research Centre, Dibrugarh, IGH, Rourkela, Medical College/CRPF Base Hospital, Guwahati/MRC, Sonpur, Medical College, Jabalpur, Medical College, Jodhpur. The multicentric clinical trials for efficacy in 235 children suffering from *P. falciparum* concluded in 2006. A presentation on clinical trials was made at DCG(I) office. Comments from DCG(I) received for use in Paediatric patients. Reply is being prepared.

**Compound 97/78 (Antimalarial):** It is an endoperoxide derivative being developed as a fully synthetic substitute to arteisinine derivatives for treatment of malaria. The compound has completed preclinical efficacy and regulatory studies and has been licensed to Ipca Labs, Mumbai for further development and commercialisation. Presently, Phase I Single dose trial has been completed in 50 subjects at PGI, Chandigarh. Data analysis is under progress.
Scientific Expertise:
Dr. R K Tripathi works on Viral Infection: In vitro screening of anti-HIV (anti-RT) compounds and in vivo (mice) screening model for anti-Dengue virus compounds. Also, wants to understand the viral and host protein-protein interaction responsible for immune evasion. He has developed a mammalian two hybrid model to study HIV-1 Nef and PACS-1 interaction in eukaryotic cells (HEK293 cells) which activates the pathway in HIV-1 infected cell for MHC-1 down regulation, may act as potential target for developing alternative HIV-1 therapy.

Dr. Saman Habib studies the aspects of malaria apicoplast biology using molecular approaches as a site for drug intervention against malaria. (a) Understanding the mechanism of DNA replication and organization of the P. falciparum apicoplast; (b) Investigation of apicoplast ORFs, selected apicoplast-targeted proteins and their structure-function analysis; c) Translation in the Plasmodium apicoplast. Investigation of the role of human genetic variation and susceptibility to severe P.falciparum malaria in India.

Dr. A. A. Sahasrabuddhe-- is investigating role of actin-cytoskeleton/ microfilament system in L. donovani; characterizing actin-cytoskeleton based cellular processes in these parasites; focusing on functional aspects of actin-network proteins accommodating actin, coronin, ADF/cofilin and myosin in L. donovani (dd8)

Dr. Bijoy Kundu - Design and synthesis of combinatorial libraries of small organic molecules and peptides of biological interest for malaria, filarial and leishmaniasis.

Dr. P.M.S. Chauhan of Medicinal chemistry of (Antimalaria, Antileishmania, Antifilaria, Antituberculosis), Synthetic organic chemistry / Combinatorial chemistry.

Dr. Y. S. Prabhakar studies Theoretical aspects of drug design and modeling of compounds of biological interest; physicochemical aspects of organic compounds; Software development for chemistry and drug research; QSAR Study on Tetrahydroquinoline Analogues as Plasmodium Protein Farnesyltransferase Inhibitors. Molecular surface features in modeling the HIV-1 RT inhibitory activity of 2-(2,6-disubstituted phenyl)-3-(substituted pyrimidin-2-yl)-thiazolidin-4-ones. Topological descriptors in modeling the antimalarial activity of 4-(3’,5’-disubstituted anilino)quinolines.


Dr. S. K. Singh - Presently working on carbon and nitrogen metabolism of MTb H37Rv

Dr. S. K. Puri- works on Malaria Chemotherapy, Immunoprophylaxis, Drug Resistance; Antimalarial drug Development, Drug resistance, Experimental Malaria models.

Dr. K. Srivastava- is interested in drug Development, Model Development and Host-Parasite Relationship and In vitro Culture of P. falciparum: Development of New Antimalarial Agents- Lead Identification and Model Development.

Dr. Renu Tripathi- studies on Drug development for malaria, pathogenesis, immunology and Molecular biology

Dr. RK Sethu--works on Chemotherapeutic studies in Malaria.

Dr. A. Dube- works in in the area of chemotherapy and immunology of experimental helminthic (15 years) and Leishmanial (12 years) infections; Chemotherapy and Immunology of visceral leishmaniasis;
Dr. Suman Gupta- has studied chemotherapy & Immunology of helminthic infections chemotherapy & immunodiagnois of leishmaniasis; Drug & Diagnostic Research for Leishmaniasis.

Dr. Uma Roy- has done Biochemistry & Biotechnology; Fermentation Technology, Microbiology; Biochemistry and Molecular Biology of Parasites

Dr. Neena Goyal studies Leishmaniasis and Parasite biochemistry and molecular biology

Dr. N. Singh- works on Molecular Parasitology; Malaria and Molecular Biology of Leishmania.

Dr. S. Bhattacarya-works on development of in vitro and in vivo models, molecular and immunobiological studies including characterization and purification of protective and diagnostic filarial antigens, development of antifilarial agents from natural and synthetic source. Currently works on Immunobiology, chemotherapy and molecular biology of filarial parasites.

Dr. P.K. Murthy- is expert in drug Development, Model Development and & Immune pathology of lymphatic Filariasis.

Dr. B. N. Singh-Regulation of kas operon genes expression in mycobacteria; Screen system for target based screening of anti-mycobacterial drugs; Functional genomics of sigma factors using knockout mutants of M. smegmatis; Differential expression of sigH paralogs in M. smegmatis.

Dr. R. Srivastava- works on Micobial and Molecular Genetics, vaccine research, Biotechnology; Pathogenesis of Virulence Factors of Cholera Bacteria and Biology of Latent Mycobacteria

Dr. S. K. Sinha- works on Biochemistry and immunology of mycobacterial infections.

Dr. K. K. Srivastava- studied Microbial Genetics, Post-translational modifications in Mycobacteria

Dr. V. Chaturvedi- has specialization on microbiology and immunology of mycobacterial infections and TB Drug Discovery

Dr. Manju Y. K- has done Drug research (microbiology) and molecular biology of M.tuberculosis and M. avium sub sp paratuberculosis; Host-pathogen interactions in persistent mycobacterial infections Molecular strategies to overcome intrinsic drug resistance in mycobacteria

Dr. A. K. Dwivedi- works on Drug standardization, drug delivery systems and development of local contraceptive agents

Dr. G. K. Jain- ha studied Quality Control, Biopharmaceutics, Dosage Form Development & Drug Delivery Systems Pattern profiling and PCA based standardization of Multi-component Herbal Preparations of Medicinal value; Development of Bioanalytical Procedure for NCEs; High-throughput Pharmacokinetic Screening of Candidate Molecules using LC/MS/MS Techniques

Dr. Amit Mishra- works on Antigen Delivery, Transdermal Delivery of Drugs & Antigens & Inhalation Delivery Systems.


2. Central Institute of Medicinal and Aromatic Plants

National Facilities are: National Gene Bank for Medicinal and Aromatic Plants which comprises of Medicinal & Aromatic Plants Herbarium, Conservatory, Gene Banking and Repositories of Extracts and Chemicals Supported by CSIR & DBT, Govt. of India; It is NABL accredited Laboratory for Biological Testing; and CIMAP has achieved International Environment Accreditation.

CIMAP is committed to provide Quality, Environment and Health & safety Policies. It has Knowledge Repository.

Symposia, Seminar and Training Courses organized:
The Fifth International Conference on Vetiver (ICV-5) Schedule for SIDBI-sponsored trainings for the year 2010-11 Entrepreneurial Training for women.

Technology ready for transfer: Development of edible vaccine by plant Molecular Biology and genetic Engineering for HIV/AIDS

Equipments: Automated DNA/RNA synthesizer, MALDI-TOF-TOF & Proteomics station, Microarray-DNA chip construction and detection system, Real time PCR and sequence detection system, 2D preparative protein purification system, Electrophoresis workstation; Class II Biosafety cabinets, Biosafety level II containment facility, Automated TB drug sensitivity workstation, UV-Vis spectrophotometers, Radio TLC analyzer, Animal isolators, Biotechnology and plant tissue culture laboratories for transgenic & bioreactors, Transgenic greenhouse, Pilot plants for up scaling of extraction and phytomolecule/drug isolation, Advanced stage fractionation columns, High volume rotary evaporators and downstream processing equipment, NMR, LC-MS/MS system, Atomic absorption Spectrometer, GC-MS; GLC; STEM.

R&D performance areas

- Bioprospection & development of technologies for therapeutic, nutraceutical, agrichemical & health care product
- Transforming R&D leads into technologies and products
- Basic research in selected medicinal and aromatic plants for future exploitation
- DNA fingerprinting, functional genomics, proteomics & molecular biology
- Drug discovery & natural product bioevaluation (in vitro and in vivo) facilities
- Manav, the concept conservatory of plants against human diseases
- Taruvar, the medicinal tree conservatory
- Ayush, the conservatory of traditional and Indian systems of medicine
- IP portfolio including novel molecules and bioactivities for antimicrobial and Antimalarials from Artemisia annua and drug derivatives: artemisinin, arteether, artemether, artesunate, DHA
- Artemisia annua package enabled pharma companies to produce artemisinn at a globally competitive price
- Herbal disinfectants, mosquito repellent formulation.
Scientific Expertise:
Dr. Ajit K. Shasany works on: Leishmaniasis, Salmonella and Filaria. Details are: AFLP analysis is useful for distinguishing Leishmania species of visceral and cutaneous forms; Identification of genetic markers in Sodium Antimony Gluconate sensitive and resistant Indian clinical isolates of L. donovani through amplified fragment length polymorphism. Th1-stimulatory poly proteins of soluble L. donovani promastigotes ranging from 89.9-97.1 kDa offers long lasting protection against experimental VL; Low molecular weight proteins of outer membrane of S.typhimurium are immunogenic in Salmonella-induced reactive arthritis revealed by proteomics; Immunization with inflammatory proteome of Brugia malayi adult worm induces a Th1/Th2- immune response and confers protection against the filarial infection.
Dr. Arvind Singh Negi works on Medicinal Chemistry; Semi - Synthetic modification of phyto molecules for biological activities. Presently working on anti-TB aspects.

3. National JALMA Institute for Leprosy & Other Mycobacterial Diseases

About 30 intramural and 25 extramural projects handled on Tropical Disease in last 10 years on Leprosy, Tuberculosis, HIV infections/AIDS and Filariasis. 20 Scientists working on Tropical Diseases

Infrastructure and services
OPD and in patient services including physiotherapy and re-constructive surgery for leprosy patients; Microscopic diagnostic centre, treatment as per RNTCP guidelines for TB; Nationally accredited laboratory for microscopy, culture and drug susceptibility testing for TB; FIND’s LPA testing facility for MDR TB as well as demonstration of fluorescent microscopy for TB; BSL -3 facility for humans as well as animal experiments; NACO’s surveillance centre for HIV testing and ART monitoring centre for AIDS treatment ; National facility for animal mouse foot pad for testing of drug resistance in leprosy; National as well as WHO recognized molecular testing facility for drug resistance in leprosy; National facility for aerosol infection in guinea pigs for TB; National repository for mycobacterial diseases; Well equipped laboratories for immunology, electron microscopy, histopathology and immune-histochemistry including in situ hybridization and PCR detection; Proteomic facility; DNA sequencing facility; Micro array laboratory; Protein sequencing facility; Model rural health research unit for operational research and utilization of local health services.
It has Satellite field centre at Banda; New treatment regimen for PB leprosy which includes the addition of Clofazimine to standard PB regimen. – This is well accepted and has fewer incidences of reaction and relapses after stoppage of therapy. WHO has adopted this regimen as uniform treatment regimen for all types of leprosy cases; Addition of immunotherapy (Mw) with chemotherapy in borderline patients for faster granuloma clearance and reducing the incidences of reactions. Highly effective, safe in faster clinical, bacteriological and histological clearing of bacilli and granuloma in tissues. Being used in combination with MDt and available in market; Developed JALMA flap for restoration of volume of first web space in muscular atrophy associated with ulnar
nerve paralysis in leprosy. Developed new methods for early diagnosis of leprosy using amplification of RLEP, 16S gene region and established it in slit skin smears, biopsy specimens and also in tissue sections using in situ PCR.
Developed in house PCR RFLP based method to differentiate mycobacterial isolates. Developed a new system to demonstrate strain variations in *M leprae*. Established the presence of live *M leprae* bacilli in the environment.

**New Process (es) developed:**
- Designed the partial micro array chip for leprosy (metabolic pathways and virulence) and TB (efflux pumps and quinolones resistance)
- System developed for molecular diagnosis of Kala Azar which has been established at RMRC, Patna
- Developed in house PCR RFLP based method to differentiate mycobacterial isolates (*M tuberculosis*, *M avium*, *M fortuitum* and other pathogens)
- Developed new methods for early diagnosis of leprosy using PCR, real time PCR, *in situ* hybridization, *in situ* hybridization with PCR, amplification of RLEP, 16S gene region and established it in slit skin smears, biopsy specimens and also in tissue sections using *in situ* PCR

**Clinical trials:**
- UMDT study for all type of leprosy patients – 1st phase of Multicentric study completed with follow-up of 5 years post MDT. second phase with more MB patients and 8 to 10 years of post treatment follow-up initiated.
- Addition of supervised doses of once a month minocycline + ofloxacin to standard MB MDT in MB patients with 3 years follow-up completed. Longer follow-up of cases being undertaken to estimate relapses after 5-10 years of post treatment follow-up.
- Completed 10 years of post treatment follow-up of BL/LL patients treated with immunotherapy (both BCG and Mw)+ MDT
- Undertaking Phase IV clinical trials (DBT sponsored Multicentric, double blind, FDA approved studies) of use of immunomodulator Mw as an adjunct to chemotherapy in Cat I and Cat II tuberculosis.

At NJILM, R&D activities are: Diagnostics (early diagnosis and detection of drug resistance and Mechanisms of pathogenesis and drug resistance that may lead to identification of new targets. For TB, targets of Gene and antigens discovered, platform of ISH, PCR, RT-PCR, PCR- RFLP done. Similarly, for Leprosy genetic targets and PCR, ISH, IHC are made for which evaluation and field trial are going on. PCR diagnosis of drug resistance in TB has been transferred to several collaborating medical colleges and Universities. Patented a PCR-RFLP assay to identify pathogenic mycobacteria.

4. **Sanjay Gandhi Postgraduate Institute of Medical Sciences**

**Academic Courses and Programs are** well-established ongoing DM/MCh/PDF/PDCC/and Senior Residency (Hospital Services) training programs in various specialties.
Facilities: Library and Computer Divisions, The Department of Microbiology is involved in hospital infection control programme and provides bacterial culture facility and serological tests for diagnosis of infectious diseases. The Institute has a 600-bed hospital and the following departments: Cardiology, Cardiovascular and Thoracic Surgery, Endocrinology, Endocrine Surgery, Gastroenterology, Surgical Gastroenterology, Medical Genetics, Clinical Immunology, Nephrology, Urology, Neurology, Neurosurgery, Anesthesiology, Microbiology, Nuclear Medicine, Pathology, Radiology, Radiotherapy and Transfusion Medicine.


The Department of Microbiology alone with the following faculties carries out work on tropical diseases:

Prof. T.N. Dhole is interested in Vector borne viral diseases like JE/Dengue.
Prof. K.N. Prasad works on Infections in AIDS, transplants and CAPD patients. Bacterial GI infections in AIDS/HIV: clinical significance and diagnosis.
Prof. J. Kishore has expertise in Virology: molecular diagnosis & molecular epidemiology of newly emerging viruses e.g. dengue and parovirus B19, enteroviral conjunctivitis. Also, Transplant virology & microbial serology.
Dr. Ujjala Ghoshal has areas of interest: Parasitology and GI microbiology particularly small bowel bacterial flora. Diagnosis of amoebic liver abscess; Comparative evaluation of antigen detection, antibody detection and PCR.
Vijaya Lakshmi Nag works on Mycobacteriology & HIV; Epidemiology & drug resistance in HIV; Epidemiology & drug resistance in M. tuberculosis; Non tuberculous mycobacteria
Dr. R. S.K. Marak is interested in Uropathogens and antimicrobial resistance.

5. Banaras Hindu University

Facilities: The Computer Center provides quality service, has an International Centre with required facilities. The University Science Instrumentation Centre Level-II as central facility is a non-vocation academic department. It serves as: repair and maintenance of equipments.

Equiments are:
Atomic Force Microscope; Multiphoton Confocal Microscope as National Facility. Hydrogen Energy Centre; Transmission and Scanning Electron Microscopes; Rotating anode X-ray generator and diffractometer with cryogenic attachment; CAD-CAM Laboratory; Materials Testing Facilities ; Chemical Analysis and Characterization Instruments (GCMS, FTIR, etc); Animal Houses.

The Departments of Biochemistry and Zoology of the Faculty of Science and the Departments of Microbiology and Medicine of the Institute of Medical Sciences are involved in the area of tropical diseases. The activities of these four departments are briefly summarized below:
Department of Biochemistry, Faculty of Science:
It has basic infrastructural facilities for teaching and research in various areas on clinical Biochemistry, infectious diseases and parasitic immunology, Plant Biochemistry and Enzyme Technology etc., leading to Ph.D. degree in Biochemistry.
Three Projects handled in the department on Lymphatic Filariasis in last 10 years.
Three faculty members are working on Tropical Diseases.

Prof. H.P. Pandey works on host parasite relationships associated with viral diseases. Dr. Rakesh K. Singh work son host-parasite interactions, immune response evaluation, molecular biology of VL and AIDS with main focus on identification and purification of potential leishmanial antigens from *L. donovani* to be used in diagnosis, prognosis and vaccine development.

Prof. (Mrs.) S. Rathaur has expertise in Filarial Immunobiology & Molecular Biology. The details are:

**Diagnostics:** identified SchSp70, Glutathione peroxidase, Leucine aminopeptidase Acetyl cholinesterase; that can be harnessed as a cogent diagnostic marker for the detection of LF infection. Purified antigens from bovine filarial parasite as well as recombinant antigens from *B. malayi* have shown high specificity and sensitivity when tested against different category of filarial patient’s sera (in ELISA) collected from endemic region.

**Platform development (stages):** one recombinant antigen has been prepared from *B. malayi* library in collaboration with German laboratory; can be used for identification of filarial infection in humans having no symptoms of disease.

**Chemotherapy:** proposed a new combination drug treatment for LF and also evaluating new compounds for the betterment of the disease treatment. Combination of DEC plus aspirin induced mitochondrial mediated apoptosis in filarial parasite Evaluation of antifilarial effect of Chalcones; Evaluation of an antifilarial herbal adulticides.

**Target Discovery:** Potential of glutathione transferase and prostaglandin synthase as drug target for Filariasis.

**Screening:** Bovine filarial parasite has been used for screening of new compounds as antifilarial drugs.

**Product development:** Certain derivatives of chalcones showing antifilarial activity. Identified an herb showing potent antifilarial activity against bovine filarial parasite.

**Vaccine:** identification and designing of vaccine candidates for LF like Glutathione-S-Transferase; Collagenase, a metallo protease; Cathepsin B as a drug/vaccine candidate.

**Target Discovery:** Potential of parasitic glutathione-s- transferase and proteases as vaccine for Filariosis; purified from bovine filarial parasite has strong protective potential (80%) against *B. malayi* when injected to jirds. Identified immunogenic in GST likely to be more potential than whole of the GST. **Manufacturing:** Recombinant GST has been produced in collaboration with German Partner. **Bioinformatics:** Structural modeling and simulation studies; maldi mass sequencing of GST.

**Epidemiology** - Bancroftian filariasis in the Varanasi region of north India: an epidemiological study; LF in Varanasi region of north India: A population showing high risk for elephantiasis.
Department of Zoology, Faculty of Science: teaching and quality research programmes to cover wider and the newly emerging areas and has been recognized as Centre of Advanced Study in Zoology. A major emphasis is on hands-on training in diverse current laboratory methods to B.Sc. Details of the Facilities are: Animal House; Museum; Departmental library; Laboratory: B.Sc., M.Sc.-I, M.Sc.-II Labs; well equipped Research Laboratories, Central facility under UGC COSIST & DST-FIST, Computer lab. with networking to all research labs., National facility for confocal microscopy .

Dr. Ashok Kumar Maurya deals with Parasitology, especially taxonomy of adult and larval trematode parasites.

Department of Medicine, Institute of Medical Sciences:

10 Project(s) handled in the department on Tropical Disease in last 10 years on Visceral Leishmaniasis. 3 faculty members are working on Tropical Diseases. Infrastructure and services – Flowcytometry, tissue culture, PCR, Real-time PCR, Parasite culture, Animal House, Uninterrupted power supply.

Prof. Shyam Sundar has expertise in VL; completed 54 clinical trials e.g Single-dose liposomal amphotericin B for VL in India; Short-Course Paromomycin Treatment of VL in India; Safety and Efficacy of High-Dose Infusions of a Preformed Amphotericin B Fat Emulsion for Treatment of Indian VL; a Phase III multicenter, randomized, controlled, clinical trial to assess the safety and efficacy of injectable paromomycin in patients with VL and many more. He has evaluated novel diagnostic tests e.g. freeze dried DAT, rK39, rK26 dipsticks and KAtex in the field situation etc.

Prof. Madhukar Rai is carrying out a comparative evaluation of PCR primers in diagnosis and post kala-azar dermal leishmaniasis as well as a Phase-I, open-label, dose-escalating study to evaluate the safety, tolerability, and immunogenicity of the Leish-IIIf + MPL-SE vaccine in healthy adults in India.

Department of Microbiology, Institute of Medical Sciences: has the facilities like: library, UGC advanced immunodiagnostic training & research centre; central animal house, good facility for microbial detection, isolation, identification; sensitivity testing and also molecular diagnostic PCR based facility, centre of experimental medicine & surgery, A 324 bedded Trauma Block, Electron Microscope; Integrated Disease Surveillance Project, Increase of number of Departments in the Ayurveda, Faculty from 8 to 14. Starting of ART Centre, Elevation of ART Centre to Centre of Excellence, Starting of PCR Lab in Microbiology. Tele medicine to set up suitable linkages with identified district hospitals in the state of Uttar Pradesh Information System-LAN.

6 projects were done on following of the Tropical Disease(s) by 7 scientists:
Chronic typhoid carrier aspect, Diarrhoeal diseases specially V.cholerae and campylobacter jejuni, Filariasis and Taeniasis in Helminthic diseases.

1 New Process developed on Better isolation technique for S.Typhi from blood, preparing for patent

Courses: MBBS, MD/MS, PhD, DM/MCH and graduation and post graduation degrees in Ayurveda.
Scientific Expertise:
**Prof. Shampa Anupurba** has interest in phenotypic and genotypic characterization of drug resistance in *M. tuberculosis*.
**Prof. Gopal Nath** has expertise in typhoid, focusing on and diagnosis of typhoid fever by using nested PCR in blood, urine and stool sample chronic typhoid carriers.
**Prof. A.K. Gulati** works in the area of clinical HIV / AIDS.

**Prof. T. M. Mohapatra** has informed that some minor state level projects were sanctioned to Department of Skin & VD.

**Name of the Tropical Disease(s):** Leishmaniasis, TB, Amoebiasis, Filariases, Malaria and AIDS. 15 faculties are working on TD.

Infrastructure and services - Adequate services are provided in the Hospital & Laboratory (both diagnostic & research). 2 clinical trials completed.

6. **Chhatrapati Shahuji Maharaj Medical University/King George Medical College**

**Courses Offered** are: MBBS/MD/MS, Diploma Courses, Superspeciality courses (DM/ MCh), PhD Admissions, MD PhD Admissions, MPhil in Translational Health Science Admissions 2009

**Workshop on:** Tendon Transfers in Leprosy and Hand Surgery held in presence of eminent clinicians and As many as 21 leprosy patients all hailing from economically weak sections were operated on.

**Worlds AIDS Day celebrated** by the Department of Medicine on December 2007: to disseminate Awareness and knowledge about HIV/AIDS. The Antiretroviral therapy Center, Medicine OPD, Medicine Department, C.S.M. Medical University organized an awareness quiz in which approximately 100 HIV patients actively participated and were benefited with the information given.

**Services:** The University has the Gandhi Memorial & Associated Hospitals attached to it with various departments and their respective wards. There is separate buildings for the Tuberculosis & Chest Diseases, Medicine etc.

**Facilities:** The KGMCICE was started as the Clinical Epidemiology Unit (CEU) in the late 1980s, when the college was selected by the International Clinical Epidemiology Network (INCLEN) as one of its constituent institutions. It trains a handful of teachers/trained clinicians who are then expected to train others.

**Department of Microbiology**

It performs the teaching, patient care services and research in Microbiology. Department handles over 40,000 clinical specimens for various diagnostic procedures per annum. The department has the following functionally independent divisions like Bacteriology, Serology, Molecular Biology, Tuberculosis laboratory, Virology Division, Parasitology, National Shigella Center, Hospital Infection surveillance and ICTC.
Facility: The ICTC runs an active Integrated Counselling and Testing Centre for HIV/AIDS since 1999. It runs under guidelines provided by NACO and UPSACS. It also serves as a reference and confirmation laboratory for about ten district level testing centers. It is also one of the biggest laboratory testing centres for the state for yearly sentinel surveillance activity carried out by NACO through respective SACS. The ICTC also provides CD4 testing facilities to HIV/AIDS patients. With increasing number of patients on ART this has become an important and well-utilized facility.

Courses: There are 3 seats (MCI recognized) annually for MD (Microbiology) course and 8 for PhD course. Summer training is also offered to M Sc. Microbiology students.

It has the following 8 faculties working in the relevant area.

Prof. Mastan Singh has expertise in Clinical Bacteriology and Molecular Biology.
Prof. Amita Jain works on Tuberculosis, Clinical Microbiology and Virology.
Prof. Vimala Venkatesh has experience in viral serology, ICTC/SRL and Molecular Biology.
Dr. Jyotsna Agarwal is the specialist in Bacteriology and hospital infection surveillance.
Dr. Gopa Banerjee has worked at the National Shigella Center.
Dr. K. P. Singh, has expertise in Parasitology and anaerobic Bacteriology.
Dr. R. K. Kalyan and Prashant Gupta work in the area of general Microbiology.

Department of Pediatrics has only one faculty named Dr Shally Awasthi who works on Pediatric Epidemiology, clinical Epidemiology, Nutrition and Infectious Diseases, acute respiratory infections, and clinical trials.

7. National Brain Research Centre

Number of Project(s) handled in the Institute on Tropical Disease in last 10 years are: Dr. Pankaj Seth: 3 and Dr. Anirban Basu: 3 on the Tropical Disease(s): JE and HIV.

Infrastructure and services
It has state-of-art laboratory facilities for cell and tissue culture and animal facility; biosafety culture hoods, CO2 incubators and autoclave machines; two bio-safety level -2 plus (BSL-2+) safety hoods; a dedicated room with Biosafety hood in the animal house for the purpose of JEV infections in mice models, supported by a full time veterinarian. It also has DELCon library consortia, Distributed Information Centre,

Courses Offered: PhD and integrated PhD.
Seminar: Microarray Training Programme.
New Principle/Theory developed: Minocycline could be used as a therapeutic measure for JE.
Clinical Trials: The process to conduct clinical trial of Minocycline as a therapy for JE patients is initiated. DGCI’s approval is pending.

Scientific Expertise:
Dr. Anirban Basu - Minocycline as a therapy in JE: This invention relates to the treatment of JE by using the anti-inflammatory/neuroprotective effect of minocycline, a semisynthetic tetracycline, with the objective: to test the potential of minocycline for
treatment of JE patient; to use anti-inflammatory/neuroprotective effect of minocycline; to develop a cost effective drug for socio economically backward part of the country. It has been shown that minocycline protects Neuro2a cells from JEV mediated cell death. **Dr. Pankaj Seth** of the neuroAIDS laboratory works to understand the neurobiology and pathophysiology of various neurotropic viruses, particularly HIV-1 through modern cellular and molecular biology approaches to study HIV induced damage to human brain cells and neuropathogenesis. He has expertise in: Human Neural Stem Cell as a *in vitro* model; HIV-1 has Clade specific effects on human brain cells; Role of Glia-Neuronal Interplay in NeuroAIDS; Modulation of human brain cell properties by HIV-1 and Drugs of abuse.

### 8. Indian Institute of Integrative Medicine

The expertise of IIIM has been developed in the area of natural products, nature like and synthetic products with modern scientific tools to reduce the burden of both chronic and infectious diseases, the institute became more focused towards integrative medicine. 4 Project(s) handled in the Institute on Tropical Disease in last 10 years on TB, Malaria, Leishmania.  
**Infrastructure and services:** BSL-3 facility, Flowcytometers; Mass Spectrometry; Nuclear Magnetic Resonance Spectrometry, Animal House, Digital Information Resource Center, Library; Super Critical Extraction, cGMP compliant pilot extraction, formulation and packaging facility, Fermentation, Hardening Facility etc are available.  
**One product developed** as Risorine is a combination of currently used anti-TB drugs isoniazid and rifampicin mixed with a new ingredient piperine and the efficacy of the rifampicin gets boosted, the dosage comes down, the efficacy increases and the patient gets cured in a shorter span of treatment. In a multi-centric clinical trial of PTB, more than 90% of the patients treated with Risorine were cured. Risorine is the outcome of Public Private Partnership of IIIM with Cadila Pharmaceuticals Ltd.  

**Scientists:**  
**Dr. Inshad Ali Khan has the Research Area:** Anti-infective research with reference to identification of plant derived pharmacophores. Antimicrobial resistance and microbial efflux pumps. New drug targets and immunotherapeutics for *M.tuberculosis*. Regulation of *M. tuberculosis* gene expression.  
**Scientific contribution:**  
Identification of piperine as bacterial efflux pump inhibitor. Development of topical antibacterial formulation consisting of a combination of known antibacterial agent and bacterial efflux pump inhibitor. This formulation has shown better efficacy than the original formulation in mice model of skin infection.  
**Dr. Subhash Singh** works on PK and drug metabolism of antivirals.  
**Dr. Ram A. Viswakarma**, the recently appointed current director, moved from NII, New Delhi had experience in membrane protein Chemistry of Leishmania. Now he works in the area of Membrane Biology, Medicinal and Natural Products Chemistry, Drug Discovery, Glycobiology etc.
9. Institute of Microbial Technology

Facilities Available:
Fermentation: Lab-to-pilot-scale fermentors of capacities varying from 2 to 1,500 litres for continuous and batch fermentation, high-capacity homogenizers, centrifugal separators, ultra filtration, rotary vacuum filter, spray drier; Large-scale down stream processing equipment.
Tissue & Cell Culture: Facility with multiple, independent units containing laminar flow hoods, CO2 incubators, LN2 storage facilities, inverted and upright microscopes with photography and fluorescence attachments, FACS, and stocks of nearly 100 different cell lines.
CRDD (Computational Resources for Drug Discovery) is an important module of the in silico module of OSDD; provides computer resources related to drug discovery on a single platform. The Bioinformatics Center & Biocomputing has developed following web servers: Identification of Subunit Vaccine candidate, Genome annotation, Protein structure prediction, functional annotation.
Microbial Type Culture Collection: Facility for maintenance, preservation and identification of Microorganisms, the collection holds over 5,000 cultures of bacteria and fungi and is now recognized as an International Depositary Authority (IDA).
Animal House: Experimental animal facility providing several high-quality inbred strains of mice for immunological work, as well as rabbits and hamsters.
Protein & DNA Analysis: Automated protein sequencer, amino acid analyzer, semi-automated peptide synthesizer and manual solution-phase synthesis, HPLCs, FPLCs, microbore and pilot-scale protein purification systems, Automated DNA sequencers, thermal cyclers, Real Time PCR, DNA electroporator’s; MALDI-TOF Mass spectrometer; Protein spot-picking workstation; DNA microarray-analyzer; Gel scanning, imaging and phosphorimager.
Microscopy: Optical microscopes; Confocal microscope with spectral imaging; SEM & TEM X-ray Cystallography: Rotating anode X-ray generator, image plate and microscope. Spectroscopy: UV/Vis Absorption spectrophotometer, Spectrofluorometer, FT-IR Absorption Spectrophotometer and Atomic absorption spectrometer.
Library and Intellectual Property Management: State of the art patent databases like Scifinder, Delphion, Derwent & Micropatent.

Tropical diseases Research work is: Malaria, Cholera, Leishmaniasis, TB and HIV/AIDS in which 22 scientists are engaged.
Tech Transferred:
Vaxipred- A Software tool for vaccine design: IMTECH in collaboration with bioinformatics company BioMantra, launched an immuninformatics software tool ‘Vaxipred’ for computer aided vaccine design. This software tool is an integrated version of 14 different immuninformatics based software programmes discovering antigens of pathogens; has been licensed to National Institute for Biologicals, Noida.

Development of a Live, Oral, Recombinant Vaccine for Cholera
IMTECH in collaboration with NICED and IICB developed this this candidate vaccine; gives full protection in animal studies and completely safe toxicologically, is undergoing phase III human volunteer studies.
Scientific Expertise:

**Dr. Pradip K Chakraborti** – works on Peptide Deformylase as A Tool For Development Of Mycobacterial Specific Inhibitors; to know the mechanism of drug resistance and the biology of this microorganism with special emphasis on regulatory/secretory protein(s) involved in the process of signal transduction; identification/characterization of essential gene(s) in this bacterium. Thus, our long-term goal is to utilize the results of basic research towards identifying new drug target(s), which may lead towards development of novel antimycobacterial agents. He has developed a heterologous expression system for androgen receptors in yeast, could be utilized as a rapid, easy and sensitive screen for identifying novel androgen agonists useful in patients with AIDS.

**Dr. Pushpa Aggarwal** has done molecular analysis of whiB like genes of MTb H37RV.

**Dr. K. L Dikshit**’s research interest is focused on novel hemoglobins of M tuberculosis, functions of hemoglobins in cellular metabolism and pathogenicity of tubercle bacillus that include role of hemoglobins in nitric oxide detoxification through a unique mechanism, and facilitation of cellular respiration in conjunction with terminal oxidases. Therefore, the role of different hemoglobins of Mycobacterium tuberculosis at molecular level to explore their distinct functions during pathogenic and latent phase will be known.

**Dr. K. Rajagopal** works on In-silico derived Mtb Antigens as Vaccine candidates In post genomic era, to analyze the whole genome of MTb using available immuno informatic and general bioinformatics tools, in order to identify novel potential vaccine candidates. The major objective of this project is to validate these in-silico derived vaccine candidates by wet lab practices and characterize (biochemically and biophysically) these experimentally validated antigens.

**Dr. S. Karthikeyan**: is determining the 3D structure of macromolecules by X-ray Crystallography; other biophysical and biochemical techniques to understand the structure-function relationship and molecular mechanism of important proteins essential for survival and growth of bacteria. Molecular characterization, structure-function relationship of enzymes that is useful for industrial purpose.

**Dr. S. Roychaudhuri** focuses on the quorum sensing signal transduction of non-O1, non-O139 strains of V. Cholera to understand the interplay between various regulatory molecules of this sensory network. Thus far, several strains of diverse serogroup have been identified which harbour defect in the regulatory proteins and give rise to altered phenotype. Also involved in deciphering the outcome of host- pathogen interaction through amoeba-bacteria model system.

**Dr. D. Sarkar** has research interest on to identify and unravel molecular mechanism of functioning of Mtb PhoP-PhoR system; investigate the origins of binding specificity in protein complexes, and probe the determinants of complex formation using biochemical assays. PhoP may be capable of adopting different orientations as it binds to a vast array of genes to activate or repress transcription.

**Dr. C Sharma**- has main aim to search for interacting partners of proteins that lead to enhanced survival and/or increased virulence in macrophages using yeast two-hybrid system, will be confirmed later by various cell biological techniques. Also, studying the interaction of Mycobacterium with their hosts like the effect of Eis protein on signaling of the host. Eis protein disturbs the cross regulation of T-cells and it modulates the
MAPK pathway and subsequent release of cytokines like TNF-α, IFN-γ, IL-4 and IL-10 etc.

Dr. Ashish- works on Designing molecules which will block HIV-1 mediated shape changes in the CD4 receptor: The high scoring molecules will be tested experimentally for their binding efficacy and specificity. He has seen that Asymmetric conformation of neutralizing antibody IgG1 b12 is retained in solution and promotes 1:1 binding with HIV-1 gp120.

Dr. G. Varshney – investigating intracellular infections- finding target molecules on the surface of pathogen and infected cells using monoclonal antibodies in malaria and tuberculosis, leishmania and characterize these molecules using immunological, bioinformatics and molecular tools.

Dr. M Raje- It is known that Intracellular M.Tb utilizes several mechanisms to acquire iron by hijacking the host trafficking pathways; he is studying these aspects by infecting macrophages with (GFP) labeled M.Tb and evaluating mammalian GAPDH trafficking in these infected cells using, Confocal microscopy, biochemical methods and EM.

Dr. S. Majumdar- has study on the apoptotic potential of virulent (MTb H37Rv) and avirulent (MTb H37Ra) mycobacteria, role of NF-kB in apoptosis, mechanism of apoptosis and effect of apoptosis on the intracellular growth of Mtb in THP-1 cells. Also studying the effect of NF-kB dependent proteins on autophagy formation in mycobacterial infection.

Dr. J. N Agrewala- has shown that costimulatory molecules play a potential role in immuno-suppression in leprosy patients. Also, on TB pathogenesis where a coordinated cross-talk between macrophages and T cells is essential for protection and wish to explore associated problems. He is working on: in-silico drug development and development of bioinformatics tools-methods/algorithms & databases for various biological problems especially related to viruses and MTb; Validation and Characterization of Mtb vaccine candidates discovered using in-silico techniques.

10. Postgraduate Institute of Medical Education and Research

Achievements: research for the rural and community related environment and health problems like diarrhoea, TB, malaria, amoebiasis, HIV, leprosy, etc.

Various modern techniques are available to conduct studies like flow cytometry, chromatography (HPLC, FPLC), molecular biology, and genetic studies.

WHO designated Centres include: Quality Control in Clinical Chemistry (Biochemistry). And Clinical Parasitology

The Institute has been recognized by National AIDS Control Organisation and has a voluntary testing and counseling centre, provides free drugs for treatment of HIV patients. The Department of Parasitology was recognized as a member of the Partners for Parasite Control under the Programme for Control of Neglected Tropical Diseases, by WHO; and sponsored under FIST Program, DST.

15Project(s) handled in the Institute on Tropical Disease in last 10 years on Malaria, Leishmaniasis, Helminthiasis and HIV/AIDS. 4 Faculty Members in the department of Parasitology are working in the area.
Facilities: Equipments are: Real Time PCR, 2 D Gel Electrophoresis, CO2 a & BOD incubator, Biosafety cabinet, Spectrophotometer, Fluorescent Microscope, Distillation plant, Microcentrifuge, Thermocycler, Gel Doc System

Services: (i) Diagnostic for parasite diseases are routinely provided to the patients, Nehru Hospital, attached to PGIMER and to other Govt. Institutions on demand.
(ii) Academic Training is provided to M.D. (Microbiology) Residents, from other allied departments, M.Sc. (MLT), B.Sc. (MLT) and B.Sc. Nursing students. Junior faculty members, Residents and Technical staff members from other Govt. Institutions are also being deputed to the department of Parasitology for short term training.

Expertise:
Prof. Nancy Malla works on Trichomoniasis & Helminthiasis; their ImmunoDiagnosis, pathogenesis, immune responses, control, experimental models and epidemiology.
Prof. M.L. Dubey is interested in Haemoparasitic infections: - Malaria, leishmaniasis.
Prof. R. Sehgal works on intestinal parasitic infections.
Dr. Sumeeta Khurana is engaged in Diagnostic Medical Parasitology, Opportunistic parasitic infections.

Department of Experimental Medicine and Biotechnology provides diagnostic and Laboratory Services; works on Functional Genomics/RNomics, Genetic polymorphism and Mutation Detection, Genetic engineering, Nutrigenomics and Glycoproteomics; a state of art small animal facility, with gene knockout and transgenic animal model systems for various human diseases.

Scientific expertise:
Dr. Deepak Kaul, works on Host-susceptibility to M. Tuberculosis and HIV-1 infection.
Dr. Madhu Khullar, Nutrigenomics
Dr. Anuradha Chakraborti, has done Proteome Analysis of a Food Borne Pathogen Enteroaggregative E.coli under Acid Stress; Molecular cloning, sequencing and expression of adhesin gene of enteroaggregative E.coli towards development of a specific probe.
Dr. Veena Dhawan, does Physiology
Dr. Sujata Ghosh, has done Purification and characterization of distinct type of mannose sensitive fimbriae from Salmonella typhimurium; Interaction of a rat intestinal brush border membrane glycoprotein with type - I fimbriae of Salmonella typhimurium
Dr. Alka Bhatia, works on Experimental medicine and Biotechnology, pathology
Dr. Dibyajyoti Banerjee, studies Experimental Medicine.

The department of virology provides lab services and research work; an “Apex referral laboratory for advanced diagnosis of dengue, JE, chikungunya and other arboviral infections” for other government institutions sporadically or during epidemics”, under National Vector Borne Disease Control Program, 29 tests being approved for routine viral diagnosis done by the department. It has viral serology, Arboviruses lab, Tissue culture, molecular virology lab, DNA/RNA lab and central instrumentation lab etc., in which patient related tests are done.
8 Project(s) handled on Tropical Disease in last 10 years on: Rotavirus, Dengue, JE and 2 Scientists working on Tropical Diseases.

Training: workshops on diagnosis of Vector borne viral diseases for the medical and para medical staff from the sentinel surveillance laboratories of the various states; conducts the external quality control on the tests carried out by these laboratories.

Rotavirus & Pneumonia: The diagnostic services and collaborative work on surveillance.

Dr R K Ratho working in the area of arboviral infections, Dengue and JE.

Dr B. Mishra has work in Dengue/ JE /; Respiratory viruses.

11. National Institute of Pharmaceutical Education and Research

Facilities: Central Instrumentation Laboratories with NMR, GC-MS, GCMS, Head Space GC, LC-MS, Powder XRD, MALDI TOF-TOF MS, FTIR with ATR & microscope, UV-VIS spectrophotometers, CHNS-Elemental analyzer, Polarimeter, Circular Dichroism, Atomic Absorption Spectrophotometer, Analytical and preparative HPLC systems, DSC, TGA, Spectrofluorimeter, Capillary Electrophoresis, Lyophilizer and Ultra Centrifuge etc. Each department also has a separate specialized instrument laboratory with, microwaves reactor, GC and HPLC systems, protein purification system, HPTLC, MPLC, spray dryer, humidity and thermostatic chambers, automated dissolution apparatus, laser particle size analyzer, electrophoresis and immunoblot apparatus, rotapress, fluidized bed dryer, capsule filling machine, strip packing machine, ampoule/vial washing and filling machines, tube filling machine, sparkler filter.

Computer Centre and Library and Information Centre, Central Animal Facility-conducts the certificate course every year to train the internal investigators on humane handling, care and use of laboratory animals which may be extended to outsiders on payment basis if requested.

National Bioavailability Centre is capable of conducting bioequivalence studies in healthy human volunteers with sophisticated equipments required to carry out the in vitro and in vivo analysis of samples; accredited by WHO and is one of the two centres in the world for conducting bioequivalence studies of the fixed dose combination formulations of antitubercular drugs. The centre, in close collaboration with hospitals around Chandigarh, is also involved in conducting pharmacokinetic studies in patient population.

Impurity Profiling and Stability Testing Laboratory as per the latest international regulatory requirements, equipped with thermostatically controlled humidity chambers with computerised data recording facilities.

Technology Development Centre undertakes sponsored projects for the development of economically viable processes for bulk pharmaceutical chemicals of synthetic or natural products origin, conventional and novel dosage form.

Pharmacological and Toxicological Screening Facilities are there.

Computer Aided Drug Design Laboratory, also imparts training in molecular modeling.

Peptide Synthesis and Research Laboratory
**Combichem Research Laboratory** The fully automated Multiple Organic Synthesiser with on-line analytical facility will enable high speed solution and solid phase synthesis of libraries of molecules.

**Conferences/Workshops/Training**
Workshop on Documentation Requirements for Pharma Industry, August 2010
Third summer school on Nanotechnology in Advanced Drug Delivery (August, 2010)
Hands-on Practical Training on HPLC and GC and Atomic Absorption Spectroscopy Training and Continuing Education Programs

**Name of the Tropical Disease(s) handled by it are:** Malaria, Leishmaniasis, TB.

**Scientific Expertise:**
**Dr. K. K Bhutani** has handled Two Projects in last 10 years which are: GP-286 and SP-183 on Leishmaniasis and HIV for drug discovery and development.
**Dr. S. K. Guchhait** works on Design and synthesis of heterocyclic compounds as antileishmanial agents (Inhibitors of Topoisomerase I and II, and Kinases.
**Dr. Sanjay Jachak** Screening of medicinal plant extracts for antimycobacterial activity, characterization of antimycobacterial and anti-diabetic natural products.
**Prof.P.P. Singh** does teaching and Research: Chemotherapy, immunology, bioimmunotherapy and pathogenesis of TB, malaria, leishmaniasis and amoebiasis; biotechnology; inflammation; mechanisms in host defense;
**Dr. Sushma Singh** work on L. donovani, sirtuins and Leishmania metabolism, Leishmanial MAP kinases, signal transduction in macrophages, drug targets, drug resistance.
**Dr. Chaaya Iyengar Raje** works on Multifunctional proteins with relevance to infection, Host Pathogen interaction. Iron metabolism and Immune signalling.
**Prof. A.K. Chakraborti** studied Design and synthesis of antiprotozoal,
**Prof. K.P. R. Kartha** is investigating Synthesis of antitubercular, antimalarial and antidiabetic agents.
**Prof. Rahul Jain** Design and synthesis of broad-spectrum anti-malarial agents; Design and synthesis of new quinoline and peptide-quinoline conjugate class of compounds as anti-tuberculosis agents; Solid phase synthesis of antibacterial, anti-mycobacterial, antimalarial peptides; Ring-substituted 8-aminoquinoline analogs as antimalarial agents and process for their preparation.
**Project on anti-HIV AIDS:** a multi-institutional on ‘Identification of anti-viral compounds with potential for development of microbicides to prevent HIV infection and transmission’ with (NCCS), Pune. The laboratories of Dr. Inder Pal Singh and Prof. K. K. Bhutani and Dr. D. Mitra of NCCS are working on Indian medicinal plants and also chemically modifying natural products to find newer lead compounds active against HIV. More than 300 samples tested and few hits have been obtained; being pursued further and patented.
**Projects on Leishmaniasis** which involves discovery of antileishmanial agents from Indian medicinal plants; active compounds isolated include phenyl propanoids from
*Alpinia galangal* and cubebin from *Piper cubeba*. 15 compounds were synthesized and evaluated against the promastigote and amastigote form of *L. donovani*.

12. Panjab University

**University Institute of Pharmaceutical Sciences** has attained the status of Centre of Advanced Study by the UGC, the only one in Pharmaceutical Sciences in the country.

**Infrastructural Facilities:** Well equipped laboratories; state-of-the-art Central Library; Central Animal House; Museum-cum-Herbarium; Medicinal Plants Garden; Aseptic Lab; Advanced research and analytical instruments.

**Projects done in the area of:** Development and characterization of ART based prolonged release drug delivery systems for treatment of AIDS and Development of drug loaded solid lipid nanoparticles for treating cerebral TB.

**Department of Zoology:**

**Infrastructure and services**

- SDS-PAGE, Electroelution and Immunoblotting apparatus, Thermocycler , ELISA reader, 2-D gel electrophoresis system, HPLC, Real time PCR, Gel Documentation System, Nanodrop spectrophotometer.

**Dr. Sukhbir Kaur** works on visceral leishmaniasis; handled 4 projects in last 10 years.

**Dr. Parveen Rishi** works on: Expression of Iron regulated outer membrane protein in *S. typhi* grown on solid media. *S. typhi* OMPs induced immunomodulation of peritoneal macrophages. Also, Correlation between congo red binding and contact haemolysin production in Shigella species. Factors affecting production and activity of Shigellae hemolysin. Factors affecting hemolysin production and congo red binding in Salmonella enterica serovar Typhimurium DT 98. Modulatory effect of Salmonella LAP-LPS on murine macrophages.

13. Institute of Genomics and Integrative Biology

**Expertise in Respiratory Disease Biology:** using clinical, genetic, molecular and drug development approaches to tackle Tuberculosis. **Chemical & Systems Biology:** Research carried out on *M. tuberculosis*. **Following Seven Project(s)** handled in the Institute on Tuberculosis in last 10 years:

- Latent *M. Tuberculosis*: New Targets, Drug Delivery systems, Bioenhancers and therapeutics; Development of versatile, portable software for Bioinformatics ; Integrated in Sililico Analysis of Surface Proteins from selected Microbial Pathogens: Identification, Structure Modeling, Scanning for active & Binding Sites, Docking Analysis of Ligands and Small Molecules ; To understand the role of GTP Binding proteins in the survival and pathogenesis of mycobacterium tuberculosis H37Rv ; NWP38: Identification and Validation of Drug targets for selected pathogens; Drug Target Development using in-silico biology; Open Source Drug Discovery (Inter Agency Project)
8 Scientists are working on Tropical Diseases namely: Dr. Rajesh Gokhale, Dr. Yogendra Singh, Dr. Rakesh Sharma, Dr. S Ramachandran, Dr. Debasis Dash, Dr. Laxman Singh Meena, Dr. Vinod Scaria, Dr. Anshu Bhardwaj, Dr. Bhupesh Taneja.

Infrastructure and services: R&D Support Units:
Planning Monitoring & Evaluation Division; Intellectual Property Management Cell; Business Development & Marketing; Computer Services & Network; Library; Animal House; National Facility for Biochemical and Genomic Resources; Central Instrumentation Facility; Facility for Peptide Synthesis & Peptide Sequencing; In-house Maintenance; BSL 3 Facility; Zebrafish Facility for Functional Genomics Research; Basic molecular biology
One New Product developed: SEAPATH, a unique software tool specially designed to overcome functional problems for prediction of virulent proteins. It focuses on identifying adhesins or adhesin like proteins from sequenced genomes in major pathogenic organisms. This tool would be a major breakthrough for rapid drug development.

14. National Institute of Immunology


Infrastructure and services:
Flow cytometer, Confocal microscope, Electron microscope, Mass spectrometer, Nuclear magnetic resonance, X-ray crystallography, Peptide synthesis & sequencing, DNA sequencing, Aerosol containment facility, Mouse genetic engineering, Animal facilities

40 Project(s) handled in the Institute on Tropical Diseases in last 10 years on: Tuberculosis, Leishmaniasis, Japanese Encephalitis, HIV/AIDS, Rotavirus, Pneumonia and Meningitis, Japanese Encephalitis, Malaria, Typhoid and Enterotoxigenic E.coli. 15 scientists are working on these areas.

Process Development: Technology for Vero cell cultured JEV vaccine has transferred to M/S Panacea Biotec Ltd, New Delhi, scaled up there in GMP condition for producing the clinical grade material for human trial.

Product Development: Technology for an ELISA kit for the diagnosis of JEV infection has been developed jointly with NIMHANS and KGMC and transferred to M/S Xcyton Diagnostics Ltd, Bangalore which is available in the market as JEV-CheX.

“Immuvac” or Mycobacterium W is the Leprosy therapeutic vaccine used in India which was developed in NII. It is used for multi-bacillary leprosy cases. NII has licensed the technology for the vaccine to Cadila Pharmaceuticals to manufacture and marketing. The study is also ongoing to explore its efficacy for treatment of tuberculosis and it is useful in management of HIV as it improves CD4 count significantly in symptomatic HIV+ve individuals.

Scientific Expertise:
Some of the significant work is described here; rest may be seen in the Chapter of Profile of Institutes.
Prof. A. Surolia has demonstrated that in the malarial parasite, apicoplast was acquired through the process of secondary endosymbiosis. The endosymbionts lose most of their genome to the host, Hence, the genomically encoded proteins such as Nucleus Encoded Apicoplast Targeted (NEAT) protein have to be retargeted to the apicoplast, its site of action. The NEAT protein contains a bipartite signal sequence, one for targeting the endoplasmic reticulum and the other targeting the apicoplast. Ideally, an antimalarial agent molecule could be made to disrupt the process. 15-deoxyspergualin, can inhibit trafficking of NEAT protein to the apicoplast.

Dr. Chandrima Shaha has target developed and plans for kit and chip development for leishmaniasis. Future endeavors will be primarily confined to areas on identification of biomarkers and development of diagnostic kits for Leishmaniasis. One cell surface protein identified by her has been tested with patient sera and has shown promising results for diagnosis.

Dr. Satish Gupta, is engaged in extracting anti-HIV molecules from plant sources, in collaboration with the National Botanical Research Institute. Some of these molecules are active to the extent of 90% or more in the cell-based assay systems.

Dr. Ayub Qadri, has identified that lysophospholipid sensing triggered flagellin secretion from pathogenic salmonella, and how live salmonella escapes destruction within the hostile environment of the host.

Dr. Sudhanshu Vrati has expertise in work on tissue-culture Japanese encephalitis vaccine; candidate JE DNA vaccine evaluation in rhesus monkeys; the 35 nucleotide synthetic oligopeptide with DNAzyme activity that protected mice against lethal JE infection; and the clinical trials with the indigenously developed candidate rotavirus vaccine in children.

TB vaccine effort: Dr. Sangeeta Bhaskar has developed the Antigens from whole cell lysate of MiP (Mw) in Laboratory scale.

Malaria vaccine effort: Dr. Agam P. Singh has identified vaccine targets based on liver stage expression.

15. Indian Council of Medical Research Headquarters

It is the apex body for the formulation, coordination and promotion of biomedical research, is one of the oldest medical research bodies in the world. Infectious diseases and excessive population growth have continued to constitute the major priorities to be addressed in medical research throughout the past several decades.

In Communicable Diseases, new infrastructure is as follows:
Units of NIV were established at Gorakhpur, UP and Allapuzzha, Kerala to address arboviral infections especially (JE). The civil work on BSL-4 facility at MCC done; BSL-3 labs at Pune, Kolkata, Chennai, and Dibrugarh. NARI accredited by WHO to carry out anti-retroviral drug resistance testing – (the only one in South East Asia). NIV designated as H5 reference laboratory for South-East Asia. RMRI, Patna identified as WHO reference center for leishmania parasite and serum bank.

New tools: Diagnostics: Dengue antigen capture ELISA in infected and desiccated Ae aegypti mosquitoes evaluated. Storage at room temperature upto 4 weeks does not affect reactivity.
Giemsa staining method was found to be effective and simple alternate to PCR for confirming the presence of *Wolbachia spp* in mosquitoes.

An immunodiagnostic assay developed for detection of *P.vivax* antigen.

Evaluated rapid diagnostic tests for malaria, resulting in their introduction in the programme.

Two step DNA–IT 52 PCR assay to differentiate the 5 individual sibling species of *An. culicifacies* developed.

Developed a highly sensitive and species specific PCR for diagnosis of Kala-azar and Post Kala-azar Dermal Leishmaniasis; validated in endemic area in large number of samples & US patented.

Developed ELISA and other immunological tests for KA and PKDL diagnosis.

Identified a novel antigen that has potential as a diagnostic as well as prognostic agent for KA.

**Drugs:** Five clinical trials with new artemisinin combinations successfully completed for malaria. Combination therapies for VL evaluated (Ambisome, Miltofosine and Paramomycin). Efficacy and safety of 3 and 4 months moxiflox containing regimen for pulmonary TB are underway. Efficacy of combined immunotherapy and chemotherapy in pulmonary tuberculosis is being evaluated.

**Vaccines:** Two Phase-I studies for HIV vaccines were completed, AAV at NARI, Pune and MVA based vaccine at TRC, Chennai. The vaccines were found to be safe. Based on better immunogenicity, MVA is now being used in Pune and Chennai in a prime-boost approach, where priming is done with a DNA based vaccine. Conducted Phase-III trial of rotavirus vaccine. Phase-II trial of bivalent killed whole cell oral cholera vaccine VA 1.3 completed. Phase-III launched.

**Processes, methods and strategies**

Established an animal product free culture medium for propagation of leishmania promastigote at RMRI using plants’ extracts. Methodology to assess Health Related Quality of Life of filarial patient for evaluating mobility management developed. Risk map for lymphatic filariasis transmission created for Tamil Nadu on GIS platform for delimitation of areas. Co-administration of albendazole and DEC has been shown that it is operationally feasible, safe for community use and has an edge over DEC alone in terms of reducing new infections of lymphatic filariasis. DEC fortified common salt has been demonstrated to a potential supplementary strategy to MDA for elimination of persistent foci of lymphatic filariasis. Process/technology for production of mosquito larvicide, *Bacillus thuringiensis var israelensis* was transferred to a commercial manufacturer. SRES – Malathion is three times more effective than DDT spray in vector control. Use of GIS and RS for prediction of kala azar epidemics.

**New courses:** The first batch of MPH students admitted at the ICMR School of Public Health, NIE, Chennai. Train the trainer’s workshop on Forensic Epidemiology at TRC/NIE, Chennai was held. Post graduate diploma in Medical Entomology revived.

**New Registries Repository:** Clinical Trial Registry of India launched in July 2007, 150 trials registered. A repository of leishmania isolate started at RMRI, Patna

**Investigation of outbreaks:** Acute Encephalitis syndrome in Eastern Uttar Pradesh, Gorakhpur area, occurred with JE as a cause in less than 20% of cases. Enterovirus as causative agent being investigated.

**Promising leads:** Drugs and Clinical management
Novel drug efflux proteins of *M.tuberculosis* as potential therapeutic/diagnostic targets; New proteins of *M. leprae* as potential therapeutic target; a DNA chip for identification of genes associated with growth and persistence of MTB in granuloma formation for development as potential therapeutic agents; New tissue schizontocidal and gametocytocidal drug in the treatment of malaria; Method to quantify embroyogenesis in adult filarial parasites *S.digitata* can be need as a tool for drug development. Understanding role of nitric oxide and CD 36 deficiency in pathogenesis of severe falciparum malaria can help to develop an adjunct therapy against severe falciparum. Naphthoquinone analogues for macrofilaricidal activity. Identification and use of CD2 antigen in combination therapy along with conventional anti-leishmanial drug in VL. An in-vitro assay for testing anti-HIV activity of new molecules

**Diagnostics** : A novel PCR-RFLP assay for identification of pathogenic mycobacteria; Development of electrophysiological parameters for easy diagnosis of nerve damage; Standardized methods of isolation of DNA of *M. leprae* from skin smears; Use of RLEP and real time RT-PCR to detect live *M. leprae* from soil and water; A process for the preparation of primers useful for detection of *M.tuberculosis* ; Pot method for detection of AFB; Development of quadruplex PCR to identify different sero-groups of *V.cholerae* ; New technique for simultaneous detection of sporozoite, blood meal and identification of sibling species from a single mosquito to evaluate vector competence of other anophelines in malaria transmission; ELISA based diagnostic technology for rotavirus; A process for diagnosis of infective (L3) stage larvae of *Wuchereria bancrofti* in vector mosquito *Culex quinquefasciatus* ; Developed an antigen capture ELISA test of JE; Identified few plants’ extract as replacement of fetal calf serum/blood/blood products and animal products free media for the propagation of Leishmania parasites ; Developed PCR based diagnosis for VL from urine samples; identified cholesterol and triglyceride as nutritional marker related to severity of VL infection; Dot-blot assay found useful tool for detecting leishmanial antigen in naturally infected *P. argentipes*.

**Disease Control Interventions** : A new plant based insecticide for mosquitoes control; A new botanical formulation for mosquito control; Developed a model of malaria control in Betul using indoor residual spray by synthetic pyrethroids and replacing chloroquine by second line drug (SP+Pyrimethamine) along with intensive surveillance for on spot diagnosis using Rapid Diagnostic Test and use of larvivorous fishes. The intervention helped in significant reduction in malaria cases and was found successful. A cyclic lipopeptide of *Bacillus subtilis* sp. *subtilis* (VCRC B471) with potential to kill mosquito stages; Controlled release formulation of an indigenous IGR DPE-28; macrofilaricidal activity of the fruit extract of *Trachyspermum ammi* against adult filarial worm; New bacterial culture media for the production of mosquito pathogenic bacilli using industrial wastes; A process for the preparation of mosquito larvicidal formulation from *Bacillus thuringiensis* var. *israelensis* ; A process for the preparation of mosquito larvicide (*B.sphaericus*) ; Expanded polystyrene bead application as an adjunct to the mass drug administration to bring about long-term reduction and sustenance in vector density/transmission rates gravid mosquito-trap; mosquitocidal ovitraps; and multi-angles viewer for easy rotation of specimen.
Use of GIS and RS for prediction of kala-azar epidemic: Vaccines: A DNA based multi epitope HIV 1 subtype C vaccine, ready for pre-clinical trials; Generation of HIV-1 sub-type C based DNA vaccine candidates and assessment of prime-boost immunization strategy in mouse model; Identification of a novel protective antigen (Dssd1) against LF: a potential vaccine candidate antigen; Use of chimeric T-helper B cell peptide in JE vaccine development; Process for isolating a non toxinogenic V. cholerae strain; In collaboration with CDC, Atlanta, 6+2 plasmid-based recombinant virus for the H5N1 strain from Maharashtra has been prepared using reverse genetics technology; Identified genes exhibiting stage-specific expression in clinical isolates of Leishmania donovani by AP-PCR and genomic microarrays. Generated centrin knockout mutant of L. donovani cell-line as a potential vaccine candidate. This mutant parasite was granted US patent for its vaccine potential. Identified genes (P27, P43, ASS, PSA) involved in differentiation process of the parasite from L. donovani promastigote to amastigote stages. These gene transcripts were demonstrated in human tissue. Studies ongoing for their functional characterization


Scientific expertise:

Dr. Vishwa Mohan Katoch – May refer to the Chapter on Profiles of Institutes.

Dr. Reeta Rasaily Works on Pneumonia, Shigellosis, In vitro activity of cefpodoxime, an expanded-spectrum cephalosporin, against Salmonella enterica serotype typhi. HIV infection among transport workers operating through Siliguri–Guwahati national highway, India.

Dr. Rajnikant Breeding pattern of malaria vector An.culicifacies in rice fields of Kheda, Gujarat; Malaria associated with the construction of the Sardar sarovar Project for water-resources development, in Gujarat, India; Dynamics of Anopheles culicifacies transmitted malaria in the absence of effective zooprophylaxis in a riverine settlement in Gujarat, India; Studies on aquatic plants in relation to anopheline breeding

Dr. Lalit Kant works in The reliability and validity of the Modified Condom Outcome Expectancy Scale (MCOES) among an international sample of HIV-negative partners of people living with HIV/AIDS; HIV estimates: Method and sensitivity of forecasting; Campaign against HIV/AIDS: Youth as a force for change; Children with HIV/AIDS: Challenges and Opportunities; Turning point in HIV/AIDS Research: vision of Hope.

Dr. Bontha Veerraju Babu is expert in Clinicians’ attitude on mass drug administration under the programme to eliminate lymphatic filariasis: a qualitative study from Orissa; Lymphatic filariasis among children in Orissa.

Dr. Anju Sharma works on some web-based resources for HIV/AIDS

Dr. Divya Srivastava Malaria research 1980-2004 and the burden of disease; Mapping of Malaria Research from India on the basis of Indian Science abstracts. An initial findings. In: Book of Papers of Third International conference on Webometrics, Informetrics, Scientometrics, Science & Society and Eighth COLLNET meeting etc.
16. National Institute of Malaria Research

It is developing new and innovative practical methods of malaria control through research activities on vector biology and control, genetics, cellular and molecular biology, parasitology, biochemistry, pharmacology and epidemiology.

A field unit in Delhi was also opened to control mosquito nuisance and malaria and to coordinate the activities of the field units.

Another important mandate for NIMR is man power development and transfer of technology to the end users.

NIMR has a network of 10 field units located in various parts of India each one having different ecological and epidemiological paradigm.

Achievements: NIMR has made Guidelines for diagnosis and treatment of malaria; has Integrated Disease Vector Control Project; Protocols for Uniform Evaluation of Insecticides for use in Vector Control and the Malaria Parasite Bank: A National Repository.

It deals with the following areas:

Vector biology
1. anopheline surveys and their identification
2. mapping and distribution of malaria vectors and other indian anophelines using gis and rs
3. bionomics of malaria vectors in india
4. species complexes in malaria vectors in india
5. genetics of malaria vectors
6. insecticide resistance monitoring and biochemical mechanisms
7. vector evolutionary genomics
8. insectary

Parasite biology
1. malaria parasite bank
2. malaria parasite diagnostics
3. characterization of human malaria parasites
4. relapse pattern in plasmodium vivax
5. drug resistance
6. parasite evolutionary genomics
7. screening of natural/synthetic compounds for anti-malarial activity

Epidemiology
1. malaria epidemic investigations
2. estimation of true malaria burden in india
3. malaria during pregnancy
4. clinical drug trials
5. development of field sites for malaria vaccine trial
6. impact of climate change on vector borne diseases with emphasis on malaria
7. malarialogic stratification
8. gis-based malaria information management system [removed]
9. surveys of human genetic markers in malaria endemic areas
10. health impact assessment of development projects with reference to mosquito borne diseases
11. situation analysis of malaria in five selected pilot areas in the country for the implementation of roll back malaria initiative
12. malaria clinics at headquarters and field units
13. studies on other vector borne diseases

Integrated vector management
1. bioenvironmental control in different paradigms
2. field evaluation of conventional and new insecticides
3. studies on the reliance of ddt, hch and malathion in vector control programme
4. insecticide -treated nets and curtains
5. long-lasting insecticidal nets and materials
6. larvivorous fish in mosquito control
7. evaluation of biolarvicides
8. evaluation of igr compounds
9. evaluation of repellents, herbal and fungal products
10. use of expanded polystyrene beads for mosquito larval control

Information, education and communication
1. health education
2. trainings organized
3. conferences and workshops held
4. human resource development

Services
• Field and laboratory testing
• Vector control agents: insecticides, biolarvicides, personal protection agents
• Long tem and short term training courses in Mariology, Malaria Entomology and Comprehensive Vector Control.
  • Tailor-made training programmes for individual/small group according to their specific need
  • Biological Resource - Insectary

Specialized trainings
• Identification of mosquitoes- BN Nagpal
• Species complexes in malaria vectors and cytotomy- Nutan Nanda
• Molecular markers for identification of malaria vectors- OP Singh/KRaghavendra
• Insecticide resistance- K Raghavendra/PK Mittal
• Biochemical basis of insecticide resistance- K Raghavendra
• Efficacy of larvicides and imagocidals - T Adak/PK Mittal/CP Batra
• ELISA technique for sporozoite detection- T Adak/OP Singh
• Dissection of mosquitoes, age grading of mosquitoes- T Adak/OP Singh
• Rearing techniques for mosquitoes - T Adak/KRaghavendra
• Comprehensive vector control - CP Batra/Nutan Nanda
• Culture of malaria parasites- CR Pillai
• Drug resistance in malaria- in vitro- CR Pillai/Shukla Biswas/Usha Devi
• Therapeutic efficacy of antimalarials- Neena Valecha
• Malaria parasite diagnostics- Microscopy: CR Pillai ; Rapid diagnosis: Neena Valecha; Molecular assay: Hema Joshi
• Blood grouping, G6PD deficiency Haematoglobinopathy: Hema Joshi
Clinical Trials:
7 are completed and 3 are ongoing.

Seminar: EMBO Global Exchange Lecture Course on Molecular and Evolutionary Genetics of Malaria on 21 November – 04 December, 2010

Scientific Expertise is:
Dr. V. K. Dua is the Scientist F & Officer-in-charge, based in Field Station at Haridwar has expertise in Malaria - change in therapeutic efficacy, Insecticide and larvicidal effects of certain chemicals against mosquitoes, Monitoring of chloroquine resistant malaria etc.

Dr. T. Adak works on Vector Biology and Control, Vector-Parasite Interactions
Dr. Neena Valecha has deal with Clinical Pharmacology/Drug Trials in Malaria, Rapid Diagnostics in Malaria, Primary Screening of Antimalarials.

Dr. R. C Dhiman has experience in Climate and Malaria, Remote Sensing, Epidemiology
Dr. M. S. Malhotra has work on Monitoring and evaluation of national malaria control programme, Information Education & Communication (IEC), Production of films on Malaria and related subjects, Roll Back Malaria (social aspects), Biological Control of Malaria by Fish

Dr. A. Sharma works on Protein Biochemistry
Dr. Shukla Biswas is expert in Immunoparasitology, Immunodiagnosis, Drug Resistance

Dr. M. M. Shukla worked on Epidemiology of malaria

Dr. O.P Singh works on Molecular characterization of malaria vectors with special reference to cryptic species

Dr. Vas Dev has experience in Epidemiology & Control of malaria with focus on ITN’s; Vector Bionomics & disease relationships; Genetics and Cytogenetics of Insect Disease Vectors & Pests.

Dr. B. N Nagpal works on Vector Bio-ecology, GIS and RS in malaria, Mosquito Taxonomy

Dr. Ashwani Kumar has expertise in Vector Biology and Control, Epidemiology of Malaria.

Dr. A. M. Reetha works on Vector Biology and Control. Epidemiology of Malaria.

Drs. M. C. Sharma and Dr. H. C. Srivastava work on Epidemiology of Malaria

Drs. C.P Batra, A. K. Mishra and R. M. Bhatt work on Vector Biology and Control

Dr.P K Mittal works on Insecticide resistance and vector control

Dr. S. K. Sharma is expert in Malaria epidemiology in tribal areas; Malaria vaccine trial site preparation

Dr. N. Nanda has experience in Cyto-taxonomy of Malaria Vectors

Dr.K. Raghabendra works on Insecticide Resistance in Anophelines and Management; Molecular Entomology

Dr. R. Saxena is expert in Computer Science, Geographical Information System

Dr. Arup Das works on Molecular Evolutionary Genetics, Population and Comparative Genomics, Computational Biology and Bioinformatics of Malaria parasites, host and vectors

Dr. A. R. Anvikar has expertise in Microbiology.
Dr. P. K. Atul works in the area of Veterinary Science
Dr. N. Mishra works on
Dr. J. Das works on Immunobiology of Malaria and allergic airway inflammation
Dr. M. K. Das works on
Dr. R. Singh works on Functional Genomics and System Biology
Dr. C. R Pillai works on Immunoparasitology, Parasite cultivation and screening of antimalarials.

17. Institute of Pathology

Major achievements are:

Human resource Development: is actively engaged in organizing training courses as well as conducting PhD and DNB programmes. The Institute conducts one and a half year of Pre PhD course work as a prerequisite for registration to PhD. The Post Graduate level training programme, i.e. Diplomate National Board (DNB) in the specialty of Pathology is being continued at the Institute since 1992.

Scientific Expertise:
Dr. Poonam Salotra- has handled 4 Project(s) on Visceral and Cutaneous Leishmaniasis in last 10 years and the Title of the projects are:
Diagnostics of Visceral Leishmaniasis and Post Kala azar Dermal Leishmaniasis;
Development of Live attenuated vaccine by gene knockout approach;
Drug resistance in field isolates from Visceral Leishmaniasis patients;
Evaluation of Host immunodeterminants in the pathogenesis of kala azar, PKDL and Cutaneous Leishmaniasis.
She has demonstrated Species specific patented PCR, and QPCR Standardized and validated in endemic area for Leishmania diagnosis and for monitoring cure. Also, developed sensitive and specific molecular and immunological tests based on recombinant and indigenous antigens for KA and PKDL. Potential of recombinant Lepp12 (rLepp12) antigen both as a diagnostic and prognostic marker specific for KA was established. It was also identified that the L. donovani species was responsible for Indian Mucosal Leishmaniasis and recently developed Quantitative PCR assay for assessment of parasite load in the lesion tissues of VL and CL patients

New Processes developed: Centrin knockout parasite as vaccine candidate
PCR method for diagnosis of Kala azar and PKDL.

Dr. Ranvir Singh works on Leishmaniasis as a co worker with Dr. Salotra. He has done Genetic fingerprinting and identification of differentially expressed genes in isolates of leishmania donovani from Indian patients of post-kala-azar dermal Leishmaniasis. Earlier he had work on Leprosy.
Dr. Aruna Singh Mittal worked on Correlation of HIV infection with hepatitis B and syphilis. In: HIV/AIDS Research in India. Use of PCR and restriction endonuclease digestion; Incidence of HIV infection & its predictors in blood donors in Delhi. Earlier she had work on Leprosy.

18. All India Institute of Medical Sciences


National Conference on Infectious Diseases, JLN Auditorium, AIIMS, New Delhi on 17th - 18th April, 2010.

Technology developed: DNA recombinant technology, immunology and electron microscopy are used to study leprosy, malaria, TB, diarrhea. For Control of Diarrheal disease, two types of super oral rehydration solutions based on amino concentration which WHO has introduced in the Global Diarrheal Disease Control Programme. AIIMS has developed an algorithm for the treatment of persistent diarrhea, which the WHO introduced in 1994. The bacterium responsible for 50% of the cases of persistent diarrhea was discovered and provisionally named Enteroaggregative E.coli.

The role of zinc deficiency in diarrheal disease was cited by the "Time Magazine" in 1996 as good news for child health. It has made a highly sensitive and specific ELISA system for detecting HIV antibodies. AIIMS has been one of the Reference Centres for HIV/AIDS since 1986, and the National HIV Reference Centre since 1992.

In Malaria, By using modern DNA technologies it has now become possible for the first time in India to study the strains of the parasite responsible for an epidemic. Also, developed a rotavirus vaccine in collaboration with the Department of Biotechnology, which is ready for phase-1 trials. Early and sure diagnosis of TB through a PCR test, useful for extrapulmonary TB, gives the diagnosis within 24-48 hours of receiving the sample. For Leprosy,

- Development of an anti-leprosy vaccine which is undergoing trials in Kanpur district.
- Trials of interferon in the treatment of leprosy.
- Use of DNA technology to identify genes of diagnostic significance.
- Development of tests that identify patients at risks of developing life-threatening reactions.

Scientific expertise:

1. Department of Microbiology.
   A) Prof. Rama Chaudhry

Seven Project(s) handled on Tropical Disease in last 10 years on Typhoid & Paratyphoid; and Atypical Pneumonia. Her areas are:
Cloning and Expression of *Mycoplasma pneumoniae* P1 gene and its fragments to study their role in cytadherence; Development of multiplex real time quantitative PCR assay to detect *Chlamydia pneumoniae*, *Legionella pneumophilla* and *M. pneumoniae* in community acquired pneumonia; Molecular approaches for the diagnosis of typhoid fever and Drug Resistant S. Typhi; Development of molecular techniques for detection of food borne pathogens and Role of super antigenic activity of *M. pneumonia* proteins. 

**New Product developed:** Recombinant protein of *Salmonella* Typhi and *M. Pneumoniae*

**New Process developed:** Standardization of PCR for salmonella sp. detection in clinical samples and food.

**Training Conducted:** CME and Workshops on Mycoplasma and Food borne Pathogens.

**B) Dr. Arti Kapil**

3 Project(s) handled on Tropical Disease in last 10 years on Typhoid and Paratyhoid fever on the following area:

Multi Center study on Antimicrobial Resistance, Monitoring of Salmonella Typhi and Salmonella Paratyphi A – An attempt to make national guidelines on antibiotic policy to treat Enteric fever; Rapid diagnosis of enteric fever using latex agglutination kit; Mechanisms of resistance to Ciprofloxacin in *Salmonela typhi* ; Study of mutations in DNA gyrase gene of *Salmonella typhi* in Indian isolates; Clinico- Epidemiologic and Molecular Characterization of Extended-Spectrum Beta Lactamase Producing *Klebsiella* spp., *E. coli* & *Enterobacter* spp causing Nosocomial and Community Infections.

**2. Department of Biochemistry - Prof. D. N. Rao,**

Research Area is:

They explored the functional involvement of T regulatory cells in M. lepraepathogenesis; role of T regulatory cells, vs effector T cells vs cytokine profile (both transcriptional & translational level), signalling pathways of T cell receptor and finally identifying the miRNA of T regulatory cells in leprosy patients. 

On the multiple antigen peptide approach for developing immunogen for p. vivax malaria using protective epitopes and inbuilt adjuvant in nano particles.

**3. Department of Laboratory Medicine-**

**Prof. Sarman Singh** handles TB, Leishmaniasis and Waterborne Infectious Diseases (Giardiasis, amoebiasis), helminthiasis and worked on the followings:

<table>
<thead>
<tr>
<th>Collection of well-characterized clinical samples and strains of <em>M. tuberculosis</em> and development of molecular techniques for the detection of drug resistant strains</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expression, Characterization &amp; purification of recombinant kinesin like protein of VL &amp; PKDL and developing test methods using the above antigen.</td>
</tr>
<tr>
<td>Screening of marine products for in-vitro anti-Mycobacterial activity</td>
</tr>
<tr>
<td>Comparative Evaluation of various in-vitro methods for diagnosing pulmonary and extra-pulmonary TB</td>
</tr>
<tr>
<td>Rapid and accurate diagnosis of Tuberculosis using a novel set of primers directly from clinical samples</td>
</tr>
<tr>
<td>Proteomic analysis of <em>M. tuberculosis</em> during the stage of acquisition of resistance to Isoniazid and Rifampicin</td>
</tr>
<tr>
<td>The role of TNFαβγγγ and the success of anti-tubercular therapy in Immune</td>
</tr>
</tbody>
</table>
Restoration Disease in HIV/MTB co-infected patients responding to ART

Proteomic analysis of the *M. tuberculosis* during the stage of acquisition of resistance to the Isoniazid and Rifampicin

Genotyping of *Mycobacterium tuberculosis* isolates from Delhi & determining their Transmission Dynamics using Mol. methods.

A novel multiplex PCR for simultaneous identification and discrimination of M. tuberculosis complex, M. avium complex and other NTM ....clinical specimens

Detection of Hepatitis A, E, Salmonella, *E. histolytica* and *Giardia lamblia* from drinking water samples using novel multiplex PCR.

Isolation and purification of active compounds with anti-leishmanial activity of Unani Medicinal Plants

Doctor’s Office Diagnostic Instrument for detection of MTB

Animal studies on Chimeric Vaccine for the Prophylaxis of Leishmaniasis and TB

**2 new products developed:** Rapid Kala-azar detection kit is commercialized;

**6 new processes developed** on Molecular and serological processes.

**2 New Principle/Theory** developed as:

1. That Indian visceral leishmaniasis is caused by several genotypes of *L. donovani*
2. That *L. donovani* strains causing VL are genotypically different from PKDL causing strains.

4. **Jai Prakash Narayan Apex Trauma Center**

Dr. Purva Mathur - Microbiology Division of Department of Laboratory Medicine, 3 Project(s) handled on Tropical Disease in last 10 years on Leishmaniasis and Malaria e.g. Evaluation of peripheral blood polymerase chain reaction for diagnosis and prognosis of visceral leishmaniasis.

**Developed a PCR for diagnosis of Leishmaniasis.**

5. **D/O Biotechnology**

Prof. Jaya S. Tyagi - For TB Diagnostics, target developed as proof of principle established for DevR as dormancy target. Validation is pending.

R&D activities, priorities and vision for future: Improved smear microscopy, molecular diagnostics, POC tests – for various settings and PTB/EPTB; drugs effective against dormant TB, drug resistant TB; understanding host pathogen interactions (especially dormant Mtb related); TB systems biology; effective vaccines for various populations.

**Transferred USP technology** to a pharmaceutical Company.

Prof. H. Krishna Prasad works on: Immunology of tuberculosis; Zoonotic Tuberculosis; Characterization of human and bovine mycobacterial isolates; Anti-mycobacterial Vaccine for cattle. R&D activities and priorities: Rapid, reliable, diagnostic assays for tuberculosis for pauci-bacillary extra-pulmonary samples. Immunological basis of resistance / susceptibility to TB; Characterization of mycobacterial strains; TB vaccine target discovered and developed.

1 diagnostic assay patented.

**Technologies ready for transfer:**
<table>
<thead>
<tr>
<th>Name of Technology</th>
<th>Commercial Applications</th>
<th>Scale of Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-PCR for identification of <em>M. tuberculosis</em> and <em>M. bovis</em> in clinical samples</td>
<td>Potentially useful in screening diary products; Meat and meat products; besides laboratory based test for diagnosis of clinical samples.</td>
<td>Research and Laboratory; has been published; patent application has been filed and processed.</td>
</tr>
<tr>
<td>Visual format assay for detection and identification of <em>M. tuberculosis</em> and <em>M. bovis</em> in clinical samples.</td>
<td>Direct detection and identification of mycobacterial pathogens within 3hrs, using molecular beacons.</td>
<td>Research and Laboratory; has been published.</td>
</tr>
<tr>
<td>Concentration of Tubercle bacilli in extra–pulmonary samples</td>
<td>Useful in microbiology labs for enhancing detection and isolation of mycobacteria from clinical samples.</td>
<td>Research and Laboratory; has been published</td>
</tr>
</tbody>
</table>

**Prof. Y.D. Sharma** has expertise in malaria, identified multiple Indian strains of *P. falciparum*, isolated unique *P. vivax* antigens. He has also done molecular epidemiology of drug resistant malaria and molecular characterization of host-parasite interactions.

**Prof. Shobha Broor** works in the area of diagnostic virology.

**Prof. S.K. Sharma** has experience in pulmonary tuberculosis with special reference to several clinical trials.

**Dr. Urvashi B. Singh** works on molecular typing of *M. tuberculosis*.

**Dr. Bimal Kumar Das** works in the molecular epidemiology of rotavirus; diseases caused by *Streptococcus pneumoniae* and *Haemophilus influenzae* in India.

**Dr. Madhu Vajpayee** works in HIV/AIDS patients and HIV/TB co-infected patients; does flowcytometric analysis of lymphocyte subsets and their surface markers.

**Dr. Sanjeev Sinha** has expertise in the area of HIV/AIDS and TB.

**Prof. N.K. Mehra** has knowledge about the immunogenetics of leprosy, TB, HIV/AIDS.

### 19. University of Delhi

It is the premier university of the country of high standards in teaching and research and attracts eminent scholars to its faculty.

It has very good Library and Computer facilities. Instrument available for Centre facility are: DNA Sequencer, High speed Centrifuge RC-6, Lyophilizer, Real-time PCR, FPLC Protein Purification System, Cyclometer, Hybridization Oven, Transilluminator ‘UVP, Scintillation counter Nikon Microscope-CDS etc.

**D/O Zoology only has relevant work by Dr. Virendra K. Bhasin** in the area of Biology of Parasitism: Malaria Biology with interest in Molecular Biology of the parasite and Immune-response of the host organisms. He is using continuous in vitro cultures of *P. falciparum* and in vivo rodent malaria models. Currently looking for novel lead artemisinin-based combinations by repurposing the FDA approved drugs and newly synthesized biological active motifs which augment antiplasmodial activity of artemisinin.
Also, evaluating the effect of some natural phytochemicals against parasites and cells of immune system.

University of Delhi South Campus
Central Instrumentation Facility (CIF), a state-of the art laboratory facility set up to provide high quality service, innovative solutions and cutting-edge technologies in Genomics (Sequencing, Real time analysis), Proteomics (Maldi TOF/TOF, UPLC, CD Spectrophotometry), Imaging (Confocal Microscopy) and Microbial Identification (Biomerieux and Biolog systems). It has Virtual Learning Environment and Library.

Department of Biochemistry: Deals with research projects of both basic and applied aspects in different areas of human diseases with its focus on macromolecular delivery, vaccine development and diagnostics. Specific thrust areas include studies on gene regulation and pathogenesis of *M. tuberculosis*, identification and validation of new drug targets against TB, development of vaccine against TB, production of monoclonal antibodies using hybridoma technology for a variety of applications, phage display based identification of immunodominant epitopes for disease identification such as AIDS, and tuberculosis, functional genomics, targeted delivery of drugs, toxins and genetic materials using liposomes and nanoparticles as carriers for the treatment of infectious diseases, Structural and molecular understanding of protein folding and stability, regulation of ligand binding in novel haemoglobin, study of haemoglobin disorders, structure-function relationship in dopamine β-hydroxylase. **Department has Bioinformatics Sub-Centre and a National DNA Sequencing facility**

Prof. Anil K. Tyagi handled following 7 projects on TB in last 10 years:

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development and evaluation of candidate DNA vaccines for protection against tuberculosis</td>
<td>Three years</td>
</tr>
<tr>
<td>Evaluation of protective efficacy of recombinant BCG constructs as candidate vaccines against tuberculosis and hepatitis</td>
<td>Two years</td>
</tr>
<tr>
<td>Protein tyrosine phosphatases from <em>Mycobacterium tuberculosis</em> and their role in pathogenesis</td>
<td>Three years</td>
</tr>
<tr>
<td>Development of a heterologous prime boost immunization approach for an effective TB vaccine</td>
<td>Three years</td>
</tr>
<tr>
<td>Studies on the role of <em>virS</em> gene in the pathogenesis of <em>Mycobacterium tuberculosis</em></td>
<td>Three years</td>
</tr>
<tr>
<td>A Virtual Centre of Excellence (COE) for Co-ordinated Research on Tuberculosis: Development of Alternate Strategies</td>
<td>Five years</td>
</tr>
<tr>
<td>Development of mice model of latent tuberculosis and evaluation of immunotherapeutic potential of DNA vaccines as an adjunct to chemotherapy against tuberculosis</td>
<td>Three years</td>
</tr>
</tbody>
</table>

Dr. Vijay K. Chaudhary works on Protein Engineering and Immunodiagnostics of TB. Dr. Amita Gupta. Of Microbiology department does genome-wide cloning, expression and purification of toxin and antitoxin proteins of M.tb and development of reagents, and also studying the physiological role of the proteins.
20. University College of Medical Sciences

Department of Microbiology,
The College runs various medical and paramedical courses; Annual admission MBBS: 150, MD/MS: 71; besides PhD courses in Medical Faculty; Paramedical courses are: BSc (Medical Technology), Radiography. Diploma course in Nursing (GTB Hospital), and Medical Laboratory In-service Training;
Guru Teg Bahadur Hospital is the associated teaching hospital with more than 1000 beds.

Facilities are: Library, Animal House, Hospital Laboratory Services, Medical Illustrations and photography Unit, Medical Education Unit, Skill Laboratory, Telemedicine, Central Laboratory, Pathology Laboratory, Microbiology and Biochemistry Lab.

Other activities
Pathology: The Blood Bank is upgraded to Regional Blood Transfusion Centre which provides facilities including of blood components to the population of East Delhi; blood is collected and issued after screening for HBsAg and HIV. It has started testing HIV positivity by a high sensitive technique using RT-PCR for HIV RNA (NAT).

Anaesthesiology: Organized first training workshop on External Quality Assurance Programme for HIV for Lab. Technical Staff from ICTCs and Blood banks under SRL, UCMS & GTBH, 29-30 Sep 08.

Consultancy:

Work on Tropical Diseases- 2003-2010
Projects – Department of Microbiology
HIV/AIDS; In-Vitro Host-Pathogen Interaction during Oropharyngeal Candidiasis in HIV Infected and Diabetic Patients; Investigation of Cytomegalovirus (CMV) Reactivation in HIV Infected Patients Receiving Antiretroviral Therapy; Cytomorphological Patterns in Lymph Node Tuberculosis and Their Correlation with Bacterial Density; Abdominal Tuberculosis: Clinico-Pathological Profile, Current Management Practices, and Outcome in Patients Undergoing Laparotomy at GTB Hospital Delhi Prevalence of Multi-Drug Resistance Tuberculosis in Attendees at a Tertiary Care Hospital of East Delhis impact of an Information, Education and Communication Intervention on Directly Observed Treatment, Shortcourse Delivery in a Tuberculosis Unit of Delhi
Dengue- Bhatia MS, Srivastava S. Catatonia in dengue fever - A letter to editor.
Typhoid- Dr. P Chhabra on Coverage of Typhoid Vaccine in Urbanized Village in East Delhi and Dr. MMA Faridi on Typhoid Vaccines.

Diarrhoea- Das S, Saha R, Singhal S. Enteric pathogens in North Indian patients with diarrhea.

Dr. Shukla Das
Three Projects handled on Tropical Disease in last 10 years on Cholera and diarrheagenic Enteropathogens as:

i. Cholera outbreaks in Delhi – a diverse profile.

ii. Molecular characterization of Vibrio cholerae O1 biotype E1 Tor strains isolated from east Delhi and comparison of their plasmid profile and RFLP pattern with antibiogram.

iii. Enteric pathogens in North Indian patients with diarrhea.

21. Vallabhbhai Patel Chest Institute

Twenty-one Scientists are working on Tropical Diseases: TB; HIV/AIDS; and Pneumonia.

Infrastructure and services
It consists of the Viswanathan Chest Hospital along with 12 other departments (Biochemistry, Biostatistics, Cardiorespiratory Physiology, Clinical Biochemistry, Medical Mycology, microbiology, Pathology, Pharmacology, Physiology, Radiodiagnosis and Imaging, Respiratory Allergy and Applied Immunology, Respiratory Medicine and Respiratory Virology); have been engaged in patient care services as well as conducting research activities through various sponsored agencies.

The animal House and Library are also there. The Hospital has several Departments/Facilities provided the state-of-the-art diagnostic and treatment services.

Specialized investigations available at VCH

Pulmonary function tests, Arterial blood gases, Bronchoscopy, Bronchoalveolar lavage, CT scans, Ultrasound examinations, X-rays, Electrocardiogram, Echocardiogram, Polysomnograms (Sleep Laboratory), HIV testing, Serum IgE test, Allergy Skin tests, HBs Ag test, Flowcytometry, Clinical Pathology, Clinical Biochemistry (including Autoanalysers), Mycological and Serological services, Bacteriology and Mycobacteriology (including BACTEC 460 TB Systm and Drug Suscepptibility), Clinical Pharmacology, etc.

Training and Meetings organized: The 8th CME on “Diagnostic Bronchology” was held on 29th June 2008 and a Workshop on “Smoking Cessation” was organized on 15th October 2008. A National Seminar on “Emerging Trends in Nitric Oxide Research: Impact on Health, Disease and Drug Development” was conducted on 12th January 2009. The 34th Workshop on “Respiratory Allergy Diagnosis and Management” was organized by VPCI in collaboration with the Institute of Genomics and Integrative Biology, Delhi, from 16th-19th February 2009. The Institute is engaged in postgraduate medical
education. PhD programme in subjects related to chest medicine and allied sciences and a diploma course in chest diseases.

Scientific Expertise:
Dr. B. Menon, is developing diagnostic tests of Real Time PCR targeting IS6110 for extra-pulmonary TB that can be used to make rapid and accurate diagnosis from clinical samples which can help in proper treatment of such cases.

Prof. H.G. Raj and Prof. S.K. Bansal are engaged in Metabolic studies on mycobacteria; Functions and regulation of polyamines in mycobacteria; Molecular biology of tubercle bacilli.

Prof. Mridula Bose has R&D activities and priorities on tuberculosis, discovered a lead molecule which may serve as a potent anti-tubercular drug candidate in near future. The initial screening of this compound on H37Rv using widely accepted MABA and BACTEC technique has shown promising results.

Dr. Mandira Varma: has developed a PCR restriction highly specific and sensitive and easy to perform assay targeting the hsp65 gene, to differentiate M. tuberculosis complex from NTM directly from clinical samples. The gap is limited options for test validation. She has used direct susceptibility testing - a simple, cheap and technically feasible method of smear positive sputum samples to PNB for early identification of M. tuberculosis. This can be adapted for Level II laboratories especially in developing countries. Also,

a) Spoligotyping, MIRU typing and IS6110 typing of M. Tb strains isolated from patients.

b) Assessment of rapid molecular assays to detect drug resistant, multidrug resistant and extensively drug resistant M. tuberculosis isolates

D/O microbiology: Prof. S.S. Thukral and Dr. Malini Shariff has the major Activities and Achievements like: Immunological studies in TB; Studies on a new anti-tuberculous antibiotic; The host parasite relation in TB; Role of macrophage activation in the tuberculosis; Study of RFLP pattern of M.tuberculosis isolate; Studies on dysregulation of homeostasis of blood T -lymphocyte subpopulations in chronic multibacillary pulmonary tuberculosis patients refractory to treatment; Isolation, identification and molecular characterization of native plasmids from clinical isolates of M. avium-intracellulare; In vitro drug sensitivity study of AFB positive isolates from chronic respiratory patient by broth dilution method; Nitric oxide dependent killing of MTb by human mononuclear phagocytes from fresh cases of TB and patients with drug resistant TB; Prevalence of drug resistance in a cohort of category I and category II patients of pulmonary tuberculosis.

Inter-departmental collaboration with the Department of Respiratory Medicine shows: Studies on aerobic and anaerobic bacterial respiratory pathogens; Secondary bacterial flora in cases of PTB, using transtracheal aspirates; Usefulness of fibroptic bronchoscopy in the diagnosis of PTB; Studies on the incidence of plasmid mediated antibiotic resistance in gram negative bacterial clinical isolates; Bacterial etiological profile of adult community acquired pneumonia; Incidence of virulence factors in clinical isolates of K pneumoniae; Development of a simple and rapid serum bactericidal assay and its evaluation in clinical isolates of K.pneumoniae; Studies on the incidence of 3rd generation cephalosporins (3GC) resistance in K. pneumoniae; Plasmid encoded serum resistance in K. pneumoniae; To study the effect of acrylamide concentration on the
SDS-PAGE protein patterns of K. pneumoniae; Epidemiologic typing of K. pneumoniae by SF-REA of whole-cell DNA and Characterization of nosocomial isolates of K. pneumoniae using SF-REA of whole-cell DNA.

22. B.R. Ambedkar Centre for Biomedical Research

Courses: a M.Sc. - Ph.D. combined program in Biomedical Sciences was started in 1998. IGIB and Dr. B.R. Ambedkar Centre for Biomedical Research had also signed a MOU in 1998 for conducting joint academic programs viz. Integrated MSc-PhD, MSc, MPhil and PhD Programs, as well as collaborative research. Likewise, Defence Institute of Physiological and Allied Sciences and Institute of Nuclear Medicine and Allied Sciences had formalized a MOU for conducting collaborative research and academic activities. V.P. Chest Institute (DU), G B Pant Hospital, Maulana Azad Medical College, Lady Harding Medical College, Jamia Hamdard as well as other Departments of Delhi University i.e. Zoology, Chemistry, Anthropology, Computer Science, V.P. Chest Institute and Microbiology are also supporting academic activities pursued at ACBR.

Research Facilities: latest state of art scientific instruments like: FT-IR, Circular Dichroism (CD), HPLC, GLC, UV-Vis-Spectrophotometers, LCMS-Qstar XL, Fluorimeter, Gel Documentation System, Real Time PCR, Deep freezer, ultra microtome, biopac, stereotoxic machine, Phosphoimager, Mammalian and Bacterial Cell Culture Facility, PCR Machines, Fluorescent Microscope, Multiplate Readers. The Animal House Laboratory supports the Center's animal based research through a comprehensive program of animal care and the toxicological research, the Center has one of the best computer facilities to carry out bioinformatics and in silico modeling of Protein & Drug Designing in the University of Delhi.

Scientific expertise:
Prof. Vani Brahmacari works on the area of functional genomics of *M. tuberculosis*. Collaborates with Prof. Mridula Bose at VPCI. The on going project is broadly focused on the genetic and expression plasticity in *M. tuberculosis* using clinical isolates. Presently the major focus is the mammalian cell entry (mice) operons.
Prof. Daman Saluja’s laboratory works on NAAT-based diagnosis of infectious diseases.

Prof. K. Natarajan is interested in the interactions of MTB with dendritic cells, macrophages and the effects on regulating effector T cell responses. *M. tuberculosis* expresses antigens as a function of infection that employ different and yet complementary mechanisms to keep the immune responses suppressed thus contributing to long term establishment of infection by calcium mobilization in infected cells. By deciphering calcium homeostasis in infected cells they have developed a new approach to treating M&XDR *MTb* infections in mice and guinea pigs. He aims for deciphering innate and adaptive immune responses during bacterial and viral infections including HIV-TB co-infections using multiple approaches.
Dr. Anju Katyal's group is studying the modulatory role of various cytokines, proinflammatory molecules, oxidative stress and apoptosis in immuno-pathological
conditions during cerebral malaria; the critical role of these pathways and individual molecules in the pathogenesis of these clinical conditions. Also, Role of Th 2 cytokines and IgE in Immuno-pathogenesis of cerebral malaria; Pathophysiology of Cerebral ischemia/Cerebral hypoxia; Role of Calcium antagonists in malaria infection-host parasite relationships are current areas of interest.

23. Jawaharlal Nehru University

The Facilities: The University Science Instrumentation Center is providing in-house facilities of Design / development / fabrication and maintenance of sophisticated scientific instruments and the training of researchers / teachers and technical staff of the University involved in the technical activities. Few of them are: Electrophoresis apparatuses and combs, Power supplies, Fumigation chambers, laminar flow benches, Animal/Plant sample holders, Pre-amplifiers, Radiation Chambers (Optical/Laser/x-rays/Gamma rays), Temperature controlled baths and cryostats, Gas flow position sensitive radiation detectors, Optical bench components, Vacuum feed-through manipulators and Magnetic Bottle for plasma studies etc. JNU has several schools for courses and PhDs. The relevant are:

School of Biotechnology: Research Facilities: “state-of-the-art” instrumentation facilities: Central Instrumentation Facility; Recombinant Product Development Facility of GLP standard; Spectroscopic Facility; Microcalorimetric Facility; Microscopic Facility; Protein production and purification Facility; Biosafety Level 3 Facility.

Prof. Santosh K Kar works on TB, HIV and Filariasis. Title of the projects is:
Evaluation of Innate and Adaptive Immune response of endemic normal and asymptomatic microfilaremic individuals to recombinant parasite antigens in Lymphatic filariasis.
Longitudinal Study of TB patients and their healthy PPD positive house hold contacts for determining the immunological signature.
Diminished monocyte function in microfilaremic patients with lymphatic filariasis and its relationship to altered lymphoproliferative response.
Setaria digitata adult 14- to 20-kDa antigens induce differential Th1/Th2 cytokine responses in the lymphocytes of endemic normals and asymptomatic microfilariae carriers in bancroftian filariasis.
Prediction of exposed domains of envelope glycoprotein in Indian HIV-1 isolates and experimental confirmation of their immunogenicity in humans.
Tetracycline treatment targeting Wolbachia affects expression of an array of proteins in Brugia malayi parasite.

School of Life Sciences:
The Central Instrument Facility houses sophisticated specialized equipment for research works of students and the faculty; the researchers from other Schools and Centers of the University as well as from other Universities and Institutes in Delhi and other parts of the country. Also it has animal house, Library, Computer facilities etc.
**Prof. Rentala Madhubala** works on visceral Leishmaniasis, dealing with the projects on:
Global Infectious Diseases training grant; A ubiquitin-conjugated-Leishmanial gene (ORFF) as a DNA vaccine against both antimonial-susceptible and -resistant strains of *L. donovani*; Characterization of Hypusine pathway in *L. donovani*; Development of novel lead compounds for antimonial resistant *L. donovani*; Evaluation of drug resistance in *L. donovani* by Implementing a novel Cell Death assay; Functional characterization of Leishmania genes by tetracycline-responsive repressor/operator system; Polyamine biosynthetic enzymes as drug targets in *L donovani*, characterization of the molecular mechanisms of paromomycin transport in *L donovani* and determination of the paromomycin sensitivity of visceral leishmaniasis clinical isolates; Structure based drug development against malaria and leishmaniasis. Molecular and Biochemical mechanisms of Pentamidine resistance.

**New Principle/Theory developed:** Biomarkers for drug resistance in *L. donovani*.

**Dr. Swati Tiwari** works on the ubiquitin-proteasome pathway in the pathogenesis of leishmaniasis.

**Prof. Alok Bhattacharya** works on the biology of *Entamoeba histolytica*.

**Prof. R.N.K. Bamezai** is experienced in the area of leprosy and tuberculosis.

**Dr. Neelima Mondal** studied the functional characterization of gyrase enzyme from *P. falciparum*.

**Prof. Rajiv K. Saxena** has worked in the general area of Immunology with special interest in the activation of Natural Killer lymphocytes, lung immunity to tuberculosis infection and influence of air borne pollutants on the immune system

**School of Environmental Sciences:**

**Prof. Sudha Bhattacharya** has expertise in the area of *Entamoeba histolytica*. Many studies are also focused on host - parasite interaction using *Entamoeba histolytica* as a model. Cloned DNA fragments from *Entamoeba histolytic* has been developed as a probe to carry out epidemiological and diagnosis of amoebiasis.

---

**24. International Centre for Genetic Engineering and Biotechnology**

**Achievements:**

a) New pathways for Tuberculosis therapy- A recent study undertaken by the Mammalian Biology: Immunology Group, in collaboration with the AIIMS, focuses on new pathways for TB therapy. 44 human proteins critical for TB’s survival inside the human body have been isolated. If a therapy that suppresses the production of these proteins, can be created, TB may be arrested.

b) The Bill and Melinda Gates Foundation awarded grants for an electronic nose for TB and a malaria vaccine where attempt will be made to develop a blood-stage malaria vaccine that uses a combination of two proteins found among a wide diversity of malaria parasites. Their goal is to stimulate antibodies that would stop parasite infection of red blood cells by blocking multiple pathways of invasion.
c) Genzyme and ICGEB had Collaboration to Advance Treatments for Neglected Diseases, will initially focus on the development of **new, improved treatments for malaria**.

d) The **protein-based malaria vaccine** being developed at the Centre.

**International Symposium:**

**TB Diagnostics: Innovating to Make an Impact; December 16 - 17, 2010**

This will provide an opportunity to take stock of deliverables in the area of TB diagnostics against the backdrop of advances made in the basic biology of the disease.

**Infrastructure and services**


**Ongoing clinical trial**: development of vaccines for both the malaria parasites that infect humans. Having identified the key molecules, they developed procedures to prepare these target antigens. These recombinants vaccines were formulated with appropriate adjuvants and after extensive experiments in animals for both immune responses and toxicology studies, have reached to the phase-I clinical trial stage. Recently they have received necessary approvals from DCGI and has started Phase-I trials.

**New Methods Developed**

1. Method for preparing VLP and use thereof as a candid vaccine for Hepatitis E.
2. A process describing transformation of the solution phase heme-histidine rich protein based antimalarial drug discovery method to the solid phase

**New Products developed**

1. Anti-tuberculosis drug molecules for treatment of tuberculosis.
2. Pharmaceutical composition containing calcium channel blockers for treating drug sensitive and drug resistant tuberculosis.
3. Virus like particle vaccine produced in E-coli.
4. Soluble protein from malaria parasite
5. Recombinant Dengue Multiepitope (r-DME) Protein as Diagnostic Intermediates
6. Antimalarial vaccine comprises microneme and rhoptry proteins of malaria parasite
7. Falcipain-2 proregion peptide that inhibits falcipain-2 proteolytic activity.
8. Development of an asparagines rich Plasmodium falciparum merozoite protein as Malaria vaccine.
9. A fusion protein malaria vaccine consisting of PfMSP-119 and PfMSP-311 and a process for preparation and expression of fusion protein
10. Antimicrobial peptides, specifically De novo designed and synthesized novel cationic peptides for use as antibiotics.
11. Antibiotics potential of De novo designed didehydrophenyalanine containing conformationally constrained cationic amphipathic peptides and peptidomimetics.
12. De-novo designed cationic amphipatic antibacterial peptides.
14. Development of MY MIV based gene silencing vectors
**R&D activities:** successfully established High Throughput Screening methods to investigate antimalarial activity of compounds from the plant and marine sources. Finally several molecules have been discovered which show potent action (IC50 < 1 ?g/ml); homogeneity to determine their chemical structures and synthesis of promising molecules toward drug trials is on.

Targeting the host protein as possible anti TB drug development targets. A genome-wide siRNA screening of human targets in cells infected with MTb has been completed recently. These targets will be further explored for their potential as drug targets.

**A diagnostic kit for dengue,** based on a novel multiple epitope based recombinant protein has been developed and the technology transferred to an Indian company for further development and marketing. In collaboration with University of Turku, Finland efforts are also being made to develop a unique 3-in-1 assay for the **simultaneous detection of HIV, HCV and HBV infections** based on genetically engineered proteins, for use in blood bank settings.

**The malaria vaccine program.**

**Dengue vaccine program** is based on a fusion recombinant protein with neutralizing epitops from all four types of Dengue viruses. The subunit vaccine is being developed by the VLP approach as well as with other adjuvants.

**In TB vaccine program,** identified proteins that are presented to the immune system very early in the infection and these are being tested in animal models in BSL-3 level

Synthesis of several conformationally restricted peptides based on the major B-cell epitopes from the gp41 protein of the HIV which are also being tested in their potential for providing viral neutralizing antibodies is ongoing.

<table>
<thead>
<tr>
<th>Technologies ready for transfer:</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dengue diagnostic reagents (Dengue virus and virus specific antibodies)</td>
<td>Dengue diagnostic kit</td>
<td>Lab scale ready to transfer to the industry</td>
</tr>
<tr>
<td>HIV-diagnostic antigens (HIV1&amp;2) for detection of antibodies to HIV.</td>
<td>HIV diagnostic kit</td>
<td>Lab scale ready to transfer to the industry</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Technologies transferred:</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of Technology</td>
<td>Year of Transfer</td>
<td>Transferred To</td>
</tr>
<tr>
<td>Anti Dengue IgM &amp; IgG</td>
<td>2005</td>
<td>Zephyr Biomedicals</td>
</tr>
<tr>
<td>Dengue specific antigens and monoclonal antibodies(REAGENT)</td>
<td>2009</td>
<td>Diagnostic Enterprise, Himachal Pradesh</td>
</tr>
</tbody>
</table>

**Scientific Expertise:**

**Dr. Kanury V. S. Rao** is interested in understanding the regulatory parameters that influence the outcome of an immune response; the mechanisms controlling plasticity in receptor-initiated signaling pathways. They measure the kinetic and quantitative contributions of various intermediates in the signaling pathways and then monitor how these contributions are modulated in response to specific perturbations within the network. They want to derive both quantitative and qualitative measures of signal output.
under conditions where the receptor is differentially activated to eventually understand how such information processing impacts on the gene expression profile.

**Dr. Gobardhan Das** has shown that M. tb alters the expression of co-stimulatory molecules to ensure that the state of anergy occurred in a protective Th1 cell where a biased Th2 response is prevailed in susceptible hosts. They want to study the role of TLRs in the modulation of innate and adaptive immune responses during the mycobacterial infection; investigating the molecular basis of susceptibility and resistance in murine models of TB and the activity of different Th subsets in reporter knock-in and knock-out animals and their co relation with disease progression.

**Dr. Pawan Sharma** works on M. tuberculosis, macrophages, innate immunity, vaccine development; study the role of Mtb proteins in immunomodulation of the macrophage; the effect of ESAT-6 on macrophage signaling pathways; status of ERK1/2; The macrophage activator LPS induced phosphorylation of ERK1/2 in both cytoplasm and the nucleus proving that the effect of ESAT-6 was not a property of the RAW264.7 cell line.

**Prof. V. S. Chauhan** has Research interests in malaria vaccine and drug development, has developed procedures to prepare recombinant vaccine target antigens and with industrial partners, vaccine formulation has been developed for clinical trial, in India. His work on understanding the mechanism of actions of antimalarial drugs like chloroquine and artemisinin has led to the development of high throughput screens for malaria drug discovery. Also work on the area of design, synthesis and utility of conformationally defined peptides. This work has proven useful in the design of antibiotic peptide, anti amyloid and in self assembling systems.

**Dr. Paushali Mukherjee** works on Blood stage malaria, dendritic cell, CD4+ T cells, B cells, immunological memory. They have shown that P. falciparum free merozoites and iRBCs distinctly regulate the sCD40L-induced maturation of human monocyte-derived DCs and define the outcome of CD40-CD40L interaction on cytokine production.

**Dr. Asif Mohmmed** is Interested in Characterization of novel drug targets for *P. falciparum*; Antigen discovery, identification and characterization of novel *P. falciparum* proteins involved in red cell invasion; protein trafficking machinery in the malaria parasite.

**Dr. Chetan Chitnis** works on Characterization of *P. falciparum* proteins as novel drug targets and vaccine candidates; understanding the basic biology of red cell invasion and cytoadherence by malaria parasites and development of malaria vaccine candidate antigens for clinical trials.

**Dr. Pawan Malhotra** has expertise in Plasmodium secretory proteins, Merozoite Surface Protein-1, PfRhopH3, Falcipain-2, a malaria cysteine protease, PfSel1 and PfSel2 proteins. Identification of ligand complex(s), the invasive form of malaria parasites at asexual blood stages of *P. falciparum*; Analysis of extracellular secretory antigens at asexual blood stages of *P. falciparum*. Identified regulatory small RNA species in *P. falciparum*.

**Dr. Dinkar Sahal** is interested in Novel antibiotics by de novo design, novel antimalarial drugs from nature; Designing antibacterial Peptides; Novel antimalarials from nature.

**Dr. Deepak Gaur** He is testing and validating the vaccine potential of a family of parasite proteins i.e Malaria Blood Stage antigens expressed on the surface of the merozoite of the parasite and play a direct role in binding with the target erythrocyte.
Specific antibodies would be raised against the functional domains of these proteins and test their ability to block erythrocyte invasion by different parasite clones. Preclinical validation of the antigens alone and in combination is currently being done.

**Dr. Syed Shams Yazdani** – interested in development of malaria vaccine. Leading candidates are a conserved, functional binding domain region II of P. vivax Duffy binding protein (PvRRII), a conserved binding domain of P. falciparum, Erythrocyte Binding Antigen-175 (PfF2) and a 19-kDa C-terminal conserved domain of P. falciparum Merozoite Surface Protein-1. A process for the production of these three potential malaria vaccine candidates has been developed at a 10L fermentation scale.

**Dr. Renu Tuteja** – has Research Interests on Malaria parasite, parasite biology, nucleic acid metabolism, translation, protein translocation, unwinding. Also working on the enzymes (helicases) involved in nucleic acid metabolic pathways.

**Dr. Navin Khanna**: Current research focuses on genetically engineered biomolecules of medical use. Primary contribution is in the development of novel recombinant designer proteins as inexpensive, highly sensitive and specific diagnostic intermediates for viral infections, like, HIV and Dengue virus. Diagnostic kits based on these proteins have been commercialized. Other research interests include anti dengue compounds from natural sources and development of experimental Dengue tetravalent subunit vaccine in yeast.

**Dr. S. Swaminathan**- is developing an adenovirus-vectorised dengue vaccine; developed an experimental adenovirus vaccine vector expressing a single chimeric tetravalent antigen. This adenovirus vector can elicit neutralizing antibodies to all four dengue virus serotypes; evaluating the protective efficacy of this vaccine using dengue virus-sensitive interferon a/b and g receptor knock-out mice. Also, developing dengue diagnostics; initiated a programme to screen herbal sources for antiviral efficacy; exploring the utility of RNA interference to attenuate dengue virus replication.

**Dr. Anand Ranganathan**- works on MTb and novel methods for directed evolution of proteins in fields of de novo protein design, synthesis of peptidomimetics based on the selection of de novo protein target inhibitors, with a special emphasis on using the technique in order to generate inhibitors for protein targets in pathogenic organisms, especially M. tuberculosis.

**Dr. Amit Sharma** takes a multi-disciplinary approach towards understanding malaria parasite proteins and focus on critical parasite processes like invasion of liver and red blood cells, nucleosome assembly, gametocytogenesis and cytoadherence. The laboratory has elucidated crystal structures of key proteins from the sporozoite, asexual and sexual parasite stages.

**Dr. Arulandu Arockiasamy**- is interested in understanding the mechanistic details of ion movement and protein translocation across inner membranes of bacterial pathogens, primarily M. Tb. Since (60%) of the currently available drugs in the market target membrane proteins, basic structure-function understanding of these proteins and their complexes could provide valuable contributions to improve human health.

**Dr. Neel Sarovar Bhavesh**- expertise in NMR spectroscopy to understand the structure, dynamics, function and folding of important Biological macromolecules like; Intrinsically Unstructured Proteins complexes; Protein-protein and Protein-RNA interactions ; Development of NMR methodologies etc.

**Dr. Dinesh Gupta**- uses computational biology tools; developed ProtRepeatsDB, a database of different types of protein repeats in genomes; using artificial intelligence
based methods to predict cyclin sequences and virulence proteins. He has done large scale molecular modeling of P. falciparum proteins. Based on comparisons of the modeled proteins with host proteins, an ortholog of prokaryotic hslV, a parasite specific protease PfHslV has been identified as a new drug target. Currently, is designing inhibitors for the protein using in silico techniques.

**Dr. Shahid Jameel** deals with the biology and pathogenesis of HIV, especially the mechanisms through which small viral proteins modulate the host cell environment; studied effects of the HIV Nef protein on costimulatory pathways and the Vpu protein on antigen presentation. The Group has also studied the distribution of viral genotypes towards a more rational design of viral vaccines and characterizing the immune response in HIV-infected patients in India.

**25. LRS Institute of Tuberculosis and Respiratory Diseases**

Thirty two project(s) handled in the Institute on Tuberculosis in last 10 years on with 15 Faculty members working on them. Ongoing current Projects are: Implementation of Telemedicine, Post treatment sequel in MDR patients, Mw vaccine.

**Research Activities** on the diagnosis, monitoring and evaluation of various newer therapeutic modalities like drugs and vaccines besides studying the immune pathogenesis and development of TB and other respiratory diseases on the proteomics and genomics to achieve the above objectives. The facility will focus on discovering antigens, antibodies and immunological biomarkers, HIV-TB co-infection, MDR-TB and XDR-TB and on developing cost-effective devices for rapid detection TB.

**Infrastructure and services:** Patient (Hospital); Research Lab; Clinical Service laboratories, Computer Section, Fiber-Optic Bronchoscopy Laboratory, Health Education Section, ICTC, Library, Medical Laser, Nursing Section, Sleep Laboratory etc.

5 Clinical Trials completed and ongoing.

The Institute undertakes TB Control activity, treatment services, DOT-cum-Microscopy centre, the DOTS Plus strategy etc.

**Dr. Khalid Umer Khayyam: Epidemiologist:** Department is running RNTCP in provision of DOTS to all categories of TB patients; facilitating the RNTCP modular training of DTOs and STOs from different parts of the country on a continuous basis; Training of Trainers; Tarining of NGO staffs and private Practitioners; regular teaching activities of post graduate students, nursing staff and for nursing students both from within and outside the Institute. The department also has organized various **workshops** on involvement of NGO and PPs in DOTS and DOTS-Plus.

It does regular diagnosis, TB surveys, Surveillance of Drug resistance, Knowledge dissemination in an urban slum, Respiratory problem in school children and air pollution, School children and Tobacco consumption. To determine reasons for default and fate of defaults under DOTS-Plus, To study profile of patients dying using DOTS Plus treatment and as certain possible reasons. IEC activities are done at each DOT centre with Department of Community Medicine of St. Stephen hospital. Collaboration has been
done with ICGEB and Jamia Hamdard for research work of M.Sc and Ph.D students. LRS-RNTCP achieved the cure rate of 89% and the sputum conversion rate of smear positive patients of 89%. DOTS were given to a total number of 1930 patients that included 1009 of Category-I, 460 of Category-II and 461 of Category-III. LRS is a part of National DOTS-Plus Programme, covers a population of 6 million for screening the MDR in its National Reference Laboratory and a population of 4 million for providing DOTS-Plus treatment. The suspects for MDR are subjected to culture and sensitivity free of cost by the LRS Microbiology Lab which is the national reference laboratory for TB. Patients with proven MDR are enrolled in the programme; are treated with daily supervised regimen for a period of 2 years with the second line drugs free of cost.

Department of Internal Medicine: Dr. Upasana Agarwal- runs a daily medicine OPD; runs a free ART Centre, Comprehensive HIV care facilities, free CD 4 testing, treatment and prophylaxis of opportunistic infections, patient and family counseling as well as pre-ART support and care services. The centre follows stringent recording and reporting procedures to NACO. achievement : 5 new HIV research projects, an international research collaboration with University of Western Australia, pioneers in immune reconstitution disease; organized a 2 week international collaborative training program with SEARCH, Thailand on advanced HIV training of teams involved in HIV care in India.

Department of Microbiology: Dr. V. P. Myneedu deals with Mycobacteriology, Bacteriology & Mycology, Serology, Training Laboratory. It does Specimen Collection, Sputum Smear Microscopy, culture, Tests for Mycobacteria, Sensitivity and BACTEC Tests. Serology for HIV, and Widal test. The department is equipped with latest laboratory equipments like fluorescent microscope, Binocular microscope and BACTEC 460 TB system, ELISA reader, GLC and PCR system, state of art bio safety laminar flow cabinets and bio-safety Lab-III. It has been identified for expansion for conducting research under RNTCP. It is a National Reference Laboratory, certified by CDC, Atlanta, USA, for its quality in Drug Sensitivity Testing for M. TB. Also, conducts training programmes for WHO fellows, paramedical personnel.

Department of Paediatrics: Dr. Sangeeta Sharma- has a 34 bedded paediatric wing providing both domiciliary and institutional care, for the children suffering from TB or other chest diseases and HIV etc. provides specialist services for referrals.

Department of Pathology: Dr. Kumud Gupta - provides services through Haematology, Histopathology & Cytology labs; equipped with fully automatic analyser. In Cytology lab diagnostic work mainly includes samples of bronchial washings, BAL, Bronchial brush smears, TBNA, Sputum, Pleural fluid, peritonial fluid and fine needle aspiration etc. In Histopathology lab diagnostic work mainly includes specimens of bronchial biopsy, TBLB, pleural biopsy and resected lung specimens etc.

Department of Physiology: Dr. Rupak Singla -is equipped with computerised complete pulmonary functions tests machine, separate spirometer. The department is also equipped with body plethysmograph and oscilloscope to carry out airway resistance and
conductance studies. Bronchial provocation tests are also done in the laboratory. The patients from chest clinic are evaluated for confirmation of diagnosis, assessment of severity and response of treatment, research activities

**Radiology- Dr. Devesh Chauhan** is providing diagnostic imaging services with state of art diagnostic equipments like: Spiral CT Scan (GE) with Dry Laser Camera & Automatic Film Processor, Ultrasound machine, Heliophos-D, 500mA X-ray machine + Fluoroscopy unit; Nanomobile 100mA Portable X-ray Machine Automatic X-ray Film Processor Computed Radiography System, new computed radiography system for providing digital radiography to patients free of cost and CT SCAN. Department is also involved in teaching activities to DNB students and HIV fellowships.

**Department of TB & Respiratory Diseases: Dr D. Behera, Dr Rohit Sarin and Dr Rupak Singla** are involved in teaching, training and research in the field of TB & Respiratory Diseases. The faculty of the department assists the government of India in developing strategies for TB control and in implementation of the same. The department provides inpatient care to TB, lung cancer and other non-TB respiratory diseases patients and free anti-retrovirus treatment to patients suffering from TB-HIV co infection. It has Emergency Services and OPD unit. It provides training, CME, seminars, conferences on different aspects of diagnosis and management of TB and respiratory diseases, OG DNB (Respiratory Medicine) Course and Research Activities.

**Department of Tuberculosis Control and Training – Dr. Rohit Sarin-** The department is responsible for conducting all training activities relating to the RNTCP. One of the main objectives of the Institute is to impart training to the various personnel on different aspects of tuberculosis as well as on the National TB Programme and the Revised Strategy. Organising workshops, seminars, CME programmes and symposiums to the formulation of the Revised Strategy in the country. The training is imparted to the nursing students

**Department of Thoracic Surgery: Dr. R. K. Dewan; Dr. Anula Sisodia**- are engaged in surgery for complications of pulmonary TB; teaching and training UG & PG medical students, practicing physicians; organized for the 5th National Conference on Bronchology in 1999 and CT-CME cum workshop in November 2007; collaborating with other departments in various research projects also. It is the only center in New Delhi devoted exclusively to the care of general thoracic surgical patients with wide referral base M.Ch. (CTS) trainee students from GB Pant Hospital, New Delhi and All India Institute of Medical Sciences are being posted on a regular basis in the department for training and teaching in thoracic surgery. It has a new OT fully equipped with latest equipments. **It offers Post graduate DNB (Respiratory Medicine) Course.**

**26. National Centre for Disease Control**

**Facilities are:** library, divisions of epidemiology and parasitic diseases; Division of Microbiology, Division of Zoonosis, Centre for HIV/AIDS and related diseases, Centre for Medical Entomology and Vector Management, Division of Malariology and
Coordination, Division of Biochemistry and Biotechnology and Integrated Disease Surveillance Project; The headquarters of National Vector Borne Disease Control Programme, animal house, fish hatcheries.

The Institute has 8 out-station branches located at Alwar, Bengaluru, Kozikode, Coonoor, Jagdalpur, Patna, Rajahmundry and Varanasi.

The Centre for AIDS & Related Diseases was established as a National Reference Laboratory as per NACO guidelines in the year 2002, working as: Apex Laboratory for External Quality Assessment Scheme for HIV testing under NACP-III; National Reference Centre HIV/AIDS; Quality Control Unit; Immunology Unit; AIDS Associated Opportunistic Infections Unit; Sexually transmitted diseases Unit; Molecular Biology Unit; Voluntary Confidential Counseling and Testing Centre; Central Blood Collection; Storage and supply of HIV test kits; Training and Manpower Development; Training for medical and supportive personnel from all over India in the field of laboratory diagnosis of HIV infection and biosafety; Regular visits by faculty members of AIDS Division to various states of India to conduct training workshops in the field of laboratory diagnosis of HIV infection and biosafety.; Training of midlevel supportive workers as well as faculty members in the field of quality control of HIV Serology and Laboratory biosafety; Formulation of guidelines for networking of National Quality Control Programme, holding meeting with the state AIDS programme Officers as well as microbiologists of institutions; 

**Trained 2 WHO fellows** from Maldives and 3 from DPR Korea at Centre for AIDS & Related Diseases from in 2006.

**Organised 3 days workshop** on “External Quality Assessment Scheme” in December 2006 and 2007. Three weeks training workshop in 2007 on STI for 15 Epidemiologists. laboratory personnel from AFTC, Delhi Cantt, were trained on Laboratory diagnostic procedure in HIV/AIDS.

4 B.Sc/M.Sc (Microbiology/Biotechnology) students had completed their 6 months project work on HIV/AIDS, 2007. 12 B.Sc./M.Sc students from different universities undergone their 1/2 months summer training on laboratory diagnostic techniques on HIV/AIDS, 2007. **Some Manuals/documents prepared under National AIDS Control Programme.** **Research Projects are on:** Immunological & Virological Studies in HIV infection; Monitoring of antiretroviral drug resistance for protease gene in HIV infected patients.

**Biochemistry and Biotechnology Division:** Dr. S.T. Pasha involved in disease diagnosis during epidemics and outbreak, operational research, manpower development, advisory role and other multifarious activities towards prevention and control of epidemic prone disease of larger public health importance Of non-communicable diseases/ in biotechnology of Dengue, HIV, Cholera, MDR TB, Malaria.

**Workshop:** A 4 days workshop for Laboratory Technicians working in IDD Cell of different states was conducted from 6 – 9 August 2007 under NIDDCP. Participants from 12 States including North-East attended the workshop.

**Centre for Epidemiology** engaged in strengthening epidemiological services through training, surveillance, Field Epidemiology Training Programme; outbreak investigation & post-disaster health assessment services, and operational research. It coordinated the
National Surveillance Programme for Communicable Diseases; led to the Integrated Disease Surveillance Project; trains for identified states to implement IDSP. It has conducted several operational research studies; It is a WHO Collaborating Centre for Epidemiology & Training; the National Focal Point for International Health Regulations. The Ministry of Home Affairs has identified NICD as the nodal institute for health component of bioterrorism. A 4-week Regional Training course on prevention and control of communicable diseases for paramedical personnel.

Master of Public Health (Field Epidemiology) course has been started. It does water quality management services in different places.

Faculty: Dr S. Venkatesh, Engaged in capacity building and research, developed curriculum and planned the MPH (Field Epidemiology) course, Coordinated with WHO/SEARO for establishment of Regional Sub-unit on CSR and with National Board of Examinations for development of public health training.

Dr Uma Chawla, Supervises the Outbreak Monitoring cell, interested in vaccine-preventable diseases and water-borne diseases. Implemented MOU with Department of Drinking Water Supply on field-based water quality monitoring and surveillance.

Dr Avdhesh Kumar, Working on Health Legislations with focus on implementation of International Health Regulations and drafting of new legislation on public health emergencies. Interested in disaster epidemiology, and avian influenza. Carrying out Operational Research study on networking of Infectious Disease Hospitals in disease surveillance.

Dr S.K. Jain, Coordinator for Field Epidemiology Training Programmes, working on viral encephalitis and typhus fevers, has done a project on Epidemiology of Road Traffic Accidents as part of WHO Fellowship at NIMHANS, Bengalooru.

Dr J.A. Khan, Working on vector-borne diseases, especially dengue/DHF and Chikungunya, and zoonotic diseases. Coordinates work related to health aspects of bioterrosim and the work of NICD Branches attached to Epidemiology Division.

Dr S.K. Misra, Involved in training programmes, supervising field work. Interested in non-communicable diseases.

Division of Parasitic Diseases: to prevent and control parasitic diseases by conducting desired operational research, imparting requisite training to the in service health personnel and providing diagnostic and morbidity relief services to the community. Presently, it works on: Lymphatic filariasis; Soil-transmitted helminths & Intestinal parasitic infections; Guinea Worm Eradication Programme; Food borne Trematodiases. It has drafted and implemented the National Filaria control programme of the country. More than 400 research publications on LF have been contributed. It was recognized as a WHO collaborative centre for training in the field from 1982-1986. Presently, support by way of LF training of health personnel to ‘National Filaria Elimination Programme’. Operational research relating to mass drug administration; development of drug delivery strategies in urban areas and feasibility of co-administration of DEC with albendazole; commercially available diagnostic tools is being evaluated for their efficacy against the traditional night blood smear are done. It is a “Diagnostics Reference Laboratory” for LF and provides service in this regard to the hospital referred patients.
STH surveys using Kato-Katz techniques and standard sampling methodology is being carried out in the various ecological zones of country.

Centre for Medical Entomology and Vector Management involving Dr. V.K. Saxena, Dr. Kaushal Kumari, Dr. B.P. Das, Dr. L.J. Kanhekar, Dr. R. Katyal, Dr. T.G. Thomas,

Dr. Roop Kumari has the Major activities as: Entomological investigations of outbreaks of vector-borne diseases in the country. Risk assessment of vector borne diseases in areas affected due to natural disasters; Laboratory and field investigations of biological control agents against arthropods of medical importance; Maintenance of a reference collection museum of preserved specimens of arthropods. Organize various ad-hoc and regular training courses on vector-borne diseases and their control. Maintenance of fish hatcheries of larvivorous fishes.

Research work carried out on: Dengue, JE vector ecology and surveillance; Ecology & dynamics of Culex quinquefasciatus, a vector of filariasis in Varanasi; Breeding ecology of Kala-azar vector P. argentipes in Bihar; Susceptibility status of Kala-azar vector P. argentipes to various insecticides in Bihar

Activities are: Mosquito blood meal analysis; Virus- Antigen detection lab for Dengue & JE from mosquitoes.

Division of Microbiology- routine activities of Laboratory based surveillance of diseases like Cholera, TB; Monitoring the drug resistance of some important bacterial pathogens like Vibrio cholerae, Salmonella species, Mtb and Shigella sp. Provision of referral services for identification and characterization of V. cholerae, Salmonella, Mycobacteria, Enteroviruses, etc. Provision of diagnostic referral services for tuberculosis, Cholera and other diarrhoeal diseases, Enteroviruses, Maintenance of different Cell Lines; storage and supply of diagnostic reagents. Preservation of standard strains of V. cholerae O1, VC 0139, EHEC, ETEC, Salmonella, Mycobacterium, etc. which are supplied to various Institutes on demand. Evaluation of diagnostic reagents Various diagnostic kits from DCG(I). Trainings: WHO assisted antimicrobial resistance monitoring for middle level microbiologists (1999-2000); basic microbiological techniques for district level laboratory technicians (1999-2000); WHO assisted Laboratory Diagnosis of Common Childhood Infections, with special emphasis on Acute Bacterial Respiratory Infections, 2001.

Training Division carries out work on Kala-azar, Arboviral infections to provide referral diagnostic services technical support to State Governments for outbreak investigations, operational research and trained manpower development in the field of zoonotic diseases and their control. The division also participates in teaching and training activities organised by the Institute from time to time in connection of various National Health programmes. For isolation of the Dengue, JE, has culture facilities of C6/36 cell lines and vero cell lines. It has also the Leishmania Laboratory is self sufficient in preparation and standardisation of antigen and reagents for serological procedures like
ELISA, DOT-ELISA, IFA and CIEP. It supplies antigen in India as well as to other countries like Nepal. Provides consultation services for the treatment of kala-azar patients, is constantly engaged in development of rapid field tests in the diagnosis of kala-azar. **Facilities are:** Tissue culture Labs, **Central Animal Housing Facility**, Training of manpower, Comparative evaluation of rK39 ELISA and IFA for sero-diagnosis of Kala-azar.

**Division of Malariology** supports the National Anti Malaria Programme, WHO collaborative centre for training in Malariology for WHO fellows from SEAR countries and International Training Course in Malariology, 2000. **Statistical Monitoring and Evaluation Cell** Provide Statistical Support to the Faculty, Ph.D. Scholars and Staff. The expertise is:

**Sh. K. C. Meena**, Preparation of weekly reports based on data compiled in the unit relating to cases and incidence rate of cholera-Delhi.; To assist in the duties related to admission/affiliation of MPH(Fe);  
**Shri S. D. Sharma**, Compilation and analysis of Morbidity / Mortality data on communicable diseases and outbreaks in different parts of the country. Preparation of weekly and daily report of these diseases, Compilation and analysis of month and hospital wise sentinel surveillance data  
**Shri L. P. Meena**, Collection of water sample and testing of water for RC during summer months. Assisting others to cases and incidence rate of cholera-Delhi.  
**Mrs. Shashi Kochhar / Mrs. Sharda Manchanda**, does Compilation of data relating to incidence of cholera (O1 and O139 cases) in Delhi based on daily lab reports received from Division of Microbiology, zone wise classification of cases and preparation of weekly reports. Periodic updating of zone wise list of areas of Delhi.

**Zone 3**

1. **Regional Medical Research Centre for Tribals**

Twenty five Project(s) handled in the Institute on Tropical Disease in last 10 years on: Malaria, Diarrhoea Disease, Tuberculosis, Dengue, Lymphatic filariasis. 7 Scientists are working on Tropical Diseases.  
**Infrastructure and services**  
**Facilities developed as:** Malaria/vector borne disease laboratory  
Equipments available: Binocular and inverted light Microscope, ELISA Reader- Detection of antigen/ antibody for Malaria, Dengue & Filaria, Thermalcycler - Amplification and detection of the DNA, DNA Sequencer- Sequencing of genes, Flow cytometer, Cell harvester, Liquid Scintillation Counter - Estimation of Radio active incorporation in cultured cells, Culture facilities for Plasmodium falciparum, Multiplex system - Cytokines estimation  
**Genetics Laboratory**  
Electrophoresis, Gel documentation, HPLC, Automatic blood cell counter
Microbiology Laboratory
BS II and III cabinet, Gel electrophoresis, Walk in incubator, Western blot apparatus, PCR.
The center now has a well equipped quality assured mycobacteriology laboratory undertake TB laboratory as well as field work. The Central TB Division, Govt. of India has recognized the centre as one of the sentinel site for National TB prevalence survey under Millennium Development Goals through supply of equipments, vehicle for TB work. Financial support of Rs. 15 million has been received from WHO through Model DOTS Project.

HIV laboratory has FACS counter; Liquid nitrogen plant, Cold room, Deep Freezer

Services:
Integrated Counseling and Training Centre (ICTC) and State Referral Laboratory (SRL) for HIV: an ongoing activity pertaining to HIV testing and counseling. It started in 1987; recognized as State Referral Laboratory. Under this it participates in External Quality Assurance Scheme whereby samples from different ICTC’s and Blood banks of the state are tested for quality controls. Trainings are also organized under EQAS for laboratory technicians and medical officers.
Malaria clinic: The centre also runs malaria clinic in the adjoining NSCB Medical Collage, Jabalpur.

Resource sharing: Infrastructure and laboratory facilities to the other institutes/university and also to the state administrative/health authorities like: floccytometer facility was utilized by High Security Animal Disease Research Laboratory, Bhopal for studies pertaining to animal viral disease.
The Centre is involved in investigating outbreaks of arboviral diseases and conducting entomological surveys for diseases like dengue. The presence of dengue vector, i.e. Ae. aegypti is documented since 1966 and more recently the entomological surveys have demonstrated presence of this mosquito in the area further studies conducted in 2006 to 2008. It was noted that over all house, Breteau and container indices (HI, BI & CI) were high for this mosquito. The serological tests on the serum samples collected from suspected patients 37 cases were positive for Dengue IgM (RMRCT annual reports 2007, 2008).
With all this background and keeping in mind the ever changing scenario of emerging and reemerging arboviral diseases the centre has initiated the proposal for establishing ICMR’s viral diagnostic laboratory in this part of the country

Technical support/advocacy
The centre from time to time extends advocacy/technical support to the state government in studying and management of various epidemics outbreaks and other health problems.

Library is very well equipped and Web site developed

Achievements:
The centre is consolidating the initial achievements and diversifying into advanced research on genetic disorders and infectious diseases particularly among the tribal population. Being predominantly engrossed in bio-medical research, the centre is also not lagging behind in undertaking IEC, social and behavioural research on health. The centre has completed successfully 25 years since its inception.
Scientific expertise:

Dr. Neeru Singh  directing field and laboratory investigation of malaria outbreak, malaria in pregnancy, evaluation of various diagnostic test available, biomarkers of malaria and evaluation of various national programme on malaria. Research specializations in Malariology: Epidemiology and vector control. (Tribal malaria and forest malaria), Cerebra malaria associated neurological disorders in India; Preparation of a field site for Malaria Vaccine trial in and around Jabalpur.

Dr. V. G. Rao  is Working mainly on infectious diseases prevalent in the region like TB particularly A study on pulmonary TB amongst the tribal population, the first from across the state of Madhya Pradesh has been successfully completed.

Based on the work done, papers have been published in the reputed national as well as international journals. Research findings were also presented at various national and international conferences / workshops / meetings.

Dr. Jyothi Bhat has research interest in TB.

Dr. P. V. Barde- Research specialization is: Arbovirology, Virus vector interactions, viral diagnosis and Biosafety.

Gyan Chand- Anopheline Composition and Malaria Transmission in district Surguja. Breeding preferences of dengue Vector *Aedes aegypti* in Jabalpur city. Knowledge attitude and practices towards malaria in tribal community of Baiga Chak, district Dindori; I tribal Health. The usefulness of a new rapid diagnostic test, the First Response® Malaria Combo (pLDH/HRP2) card test, for malaria diagnosis in the forested belt of central India.

2. Desert Medicine Research Centre

Forty seven Project(s) handled in the Institute on Tropical Disease in last 10 years on the following Tropical Disease(s): Malaria, Dengue, HIV/AIDS, TB, Leishmaniasis, Typhoid, JE.

Ten Scientists working on Tropical Diseases;

Infrastructure and services: BSL-2 laboratory. Bio-safety cabinet level-2, Refrigerated centrifuges, PCR, RTPCR, SDS-PAGE equipment, 2-D Electrophoresis, Gel documentation system, Cryo microtome, Inverted Microscope, dissecting microscope, Elisa Reader Fluorescence Microscope, DNA sequencer, spectrophotometer, etc.

Training in vector borne diseases, virology and Biosafety and culture sensitivity to staff of Government Medical Department and M.Sc students of Biotechnology and Microbiology

New Principle/Theory developed: Discovered Trans ovarian transmission of dengue virus first time from India and published this as the possible mechanism of retention of virus in nature.

Scientific Expertise:

Dr. Vinod Joshi works on Dengue Fever and Dengue Hemorrhagic Fever; Persistence of transovarial transmission of dengue-3 virus by 7 generations of vector *Aedes aegypti*,

170
was demonstrated experimentally as a first report of the world. Surveillance design for dengue vectors and Predictors and determinants of dengue; Reported 200 kDa as blocking protein against TOT of dengue virus. Reported peri-urban foci of dengue vectors in tree holes and TOT taking place within the fauna as possible contributing source of dengue virus into endemic foci. Based on the observations reported, mosquito foci containing dengue virus vertically, were eliminated and control of dengue was demonstrated in Jodhpur town since the year 2008.

Studied epidemiology of desert malaria and reported “Introduction, transmission and aggravation” epidemiology of disease in desert ecosystems. Developed software for forecasting malaria epidemics. The findings were provided to NVBDCP, through the DG, ICMR.

**Capacity Strengthening and Research Academic activities**
- Developed laboratory of Virology & Molecular Biology; Established BSL-2 level laboratory setup, mosquito cell lines, virus isolations using Immunofluorescence, cell line inoculation and mice inoculation.
- Calotropin, a New Bio Larvicide as first plant extracted against vector of dengue, has ovicidal action against eggs of Aedes aegypti. The technology has been developed up to laboratory scale and an Indian patent has been filed.

**Dr. Murli L. Mathur** has experience on: Drug Resistance in Cases of TB in Jodhpur district: sputum samples of symptomatic quarry workers and cases of pulmonary TB were examined, inoculated on LJ medium and for culture. The positive cultures were then subjected to drug sensitivity tests at Microbiology laboratory of Dr. S. N. Medical College, Jodhpur. Primary drug resistance to isoniazid was observed in 16.7%, to rifampicin in 6.7%, to streptomycin in 16.7% and to ethambutol in 6.7% samples. MDR in cases without any history of previous antituberculous treatment was found in 3.3% cases. Acquired MDR was found in 38.2% cases.

**Study of Blood Glutaraldehyde Test:** carried out on blood samples collected from subjects attending District TB Clinic, Jodhpur and sensitivity and specificity of the test was observed to be better during winter months as compared to summer months and decided to keep the blood at 2-8 °C, soon after collection, till the test was carried out. Then the test was carried out at 22 °C and showed better results. Blinding was also maintained. BGT Test was more than 80% sensitive and more than 90% specific for diagnosis of new cases of PTB, a simple, easy, inexpensive, rapid and reliable blood test. Sensitivity of test was very low in cases who had already consumed antituberculous drugs for 2 weeks or more. This test was also studied by us in HIV positive subjects; however its sensitivity and specificity were too low in HIV positive subjects.

**Study of BCG Test:** BCG Test is nearly 100% sensitive except in cases with immunosupression, it is not specific for tuberculous disease, but possibility of use of its high negative predictive value in excluding TB, was assessed in the present study in sputum negative adult suspects. In children it is already known. The results showed that BCG Test was positive in all sputum positive cases indicating 100% sensitivity and 16.3% of sputum negative suspects of PTB were negative to BCG test. This shows the possibility that BCG Test may be useful in excluding diagnosis of tuberculosis in this proportion of adult sputum negative suspects of PTB.
Dr. Karam V. Singh Studies on: a) the insecticidal efficacy of some indigenous plant extracts from a perennial herb *Solanum xanthocarpum* has larvicidal properties of against vectors of malaria and dengue/DHF in arid zone. The fruit extract was 12.5, 9.7 and 16.4 times more toxic than root extract to An. *culicifacies*, *An. stephensi* and *Ae. aegypti* at LC₉₀ level respectively. The water quality and temperature are two important parameters to be considered while planning control strategies using these control agents.
b) The inheritance of synthetic pyrethroids resistance in *An. stephensi* revealed that the susceptibility of vector species reduces after each exposure and it was found 14.9 times reduced just in 8th generation indicating towards fast development of synthetic pyrethroid resistance in vector population. Simultaneously the knock down resistance was also recorded in subsequent generations. The experiments with DDT exhibited cross-resistance to cyfluthrin, indicating towards a common mechanism of resistance. DDT spray background affected the susceptibility of DDT only not of other insecticides, however, synthetic pyrethroid background, unlike DDT, affected the susceptibility of malathion also indicating that both the insecticides might have some common mechanism of insecticide action. It was also determined that the correlation of susceptibility status of DDT was found proportionate to the duration of gap of insecticide spray in case of both *An. stephensi* and *An. culicifacies* in the areas under DDT spray, indicating towards inversion of resistance.
c) to develop an alternate method of surveillance and control of *A. aegypti*. Efficacy of non-lethal and lethal ovitraps was evaluated and findings were compared with the conventional methods. Both types of ovitraps are the most suitable means for the surveillance of *Ae. aegypti* population in the arid situations.
d) Surveillance of pyrethroid resistance in *Anopheles stephensi* strains of Rajasthan and studies on genetic and biochemical mechanisms of pyrethroid resistance is being carried-out.
e) In another ongoing study on the Development of molecular markers for the identification of Biological forms of *An. stephensi*.

3. Defence Research and Development Establishment

Apart from Defense and associated toxicological problems as the major thrust areas of the laboratory, it works on synthetic and analytical chemistry, protective devices, pharmacology and toxicology, microbiology, entomology, biochemistry, biotechnology, virology and electron microscopy etc.

**Facilities:**

PCR, UV, IR, NMR, GLC, HPLC, GC-MS Surface characterization, Environmental and Vibration testing equipments; molecular typing, Static and dynamic system assemblies for acute or sub acute toxicity studies, equipments for inhalation studies on aerosols, particulates, dusts and smokes ; Automatic Chromatographic System; IgM antibody detection ELISA; etc.

Product developed: It has developed Dengue virus isolation and Diagnostic Kit and Antigen Detection for Falciparum Malaria; Latex agglutination antigen detection kit-for diagnosis of pneumococcal meningitis in human beings ; Dengue kit ; Typhigen kit.
Programmes conducted: During 2006-07
CEP Course on “Recent Trends in Chromatography"
CEP Course on "Recent Advance in diagnostic virology"
CEP Course on "Role of Toxic Metals in Defence Electronics and their Safety"

Production & supply of reagents/ kits/ biological/standard reference materials:
Sandwich dot-ELISA kit for simultaneous detection of Leptospira, S. typhi/ S. paratyphi A; P. falciparum and P. vivax antigens; Rapid kits for dengue sero-diagnosis; Weil-Felix antigen and Widal antigen.
It does outbreak investigation support; serotyping, antibody detection by DOT-ELISA, western blot & molecular diagnosis for unknown pathogens.

Referral Facilities at DRDE:
For Enteric bacteria S. typhi, V. cholera, Shigella sp. following are done:
Isolation; Identification; Serotyping; Antimicrobial susceptibility testing; PCR;
Molecular typing; Antigen detection for V. cholerae, Shigella sp., Salmonella sp.
Dengue diagnosis: IgM ELISA, Dengue cholerae, Shigella sp., Salmonella sp.
Malaria Diagnosis: Microscopy, Antigen detection ELISA, Culture for P. falciparum
Filaria Diagnosis: Microscopy

Scientific Expertise:
Dr. M. M. Parida has developed product on Dengue and JE diagnostics. Platform developed for dengue and JE diagnostics as Flow through IgM detection; kit and chip developed for the same diseases as: Recombinant protein based indirect antibody capture IgM and IgG microplate ELISA kits; for JE, MAB based NS1 Ag ELISA kits. The proposed kits have undergone limited series trials through multicentric evaluation at various hospitals and research centres viz; NIIMS, NIMHANS, PGIMER, SGPGI, CIIMS, etc.
R&D activities and priorities are:
   a) Rapid and Real-Time detection of Emerging viruses of public health and BW importance – RTPCR, Multiplex PCR, Real-Time PCR, RTLAMP
   b) Molecular Characterization and Complete genome sequencing of circulating viruses causing epidemics
   c) Microbial Forensic through Molecular Epidemiology & Sequence phylogeny for trafficking origin and source of bio threat agents.
   d) Host induced gene expression profile through Micro Array to find suitable disease associated biomarker
   e) Clinical Proteomics

4. SMS Medical College and Allied Hospitals

This is the oldest college in Rajasthan and one of the premier medical college of India conducting its activities with a common objective of imparting healthy medical education & research as well as providing state of art treatment to the needy people. The college has a total of 32 departments and eight hospitals attached to it. The college offers Under
Graduate, Post Graduate, Diploma, M.Ch., DM, M.Sc (Med), PhD, and Nursing courses with various disciplines of medicine and allied sciences. It has Real Time PCR Biotechnology lab, a Basic Genetic Lab. Luminous of recent incidents of TB and Multi-drug resistance has also been looked into. The SMS has been recognized as the first DOT Centre in the country and also provides state-of-art Tubercular Research Lab.

SMS has one of the important departments of Hospital for Chest Diseases and Tuberculosis which is headed by Dr. N. K. Jain. This is one of the renowned institutes in North India for chest and reparative diseases with all the requisite facilities pertaining to the chest and TB diseases like Biochemistry, Microbiology- sputum examination, Fluorescent microscopy, and culture and Radiology.


29th January 2004 - C.M.E. on Involvement of Medical Colleges in RNTCP.

5. Indian Institute of Science Education and Research, Bhopal

This institute has been established recently and recruited faculties who have worked in the areas they are interested in. The newly recruited faculties are from abroad and other scientific organizations that have research interests in tropical diseases.

IISER is a degree granting autonomous institution at both undergraduate and postgraduate levels, and to perform cutting edge research in frontier areas of basic sciences with a prime focus to integrate science education and research, with a motive of attracting bright students and world class faculty.

IISER, Bhopal has the Biology laborator for under graduate studies; it is being developed to conduct basic and advanced experiments in the areas of microbiology, biochemistry, cell biology and molecular biology. Laboratory is equipped with; Laminar flow, pH meter, Electrophoresis system, microscope, micropipettes, spectrophotometer, centrifuge and autoclave, PCR High speed and ultracentrifuges, Biosafety cabinet, -20 and -86 0C freezers, Automatic sonicator, Gel Doc system, Electrophoresis system, Protein purification system, Microscope, Radioactivity counter.

It is a newly opened institute started in the second half of 2008 and most of the faculty members in Biology department have joined only recently (2009-2010). Much of the research, therefore, has not yet been done in the area of Tropical diseases. However, three members are involved in this area. The Institute is functioning from a transit campus and therefore, not much work is being carried out there. The new campus is coming up soon by summer of next year. It is planned to:
1. Build an animal facility to study bacterial disease in animal model system
2. Set up a BSL-3 facility for our research on various pathogens.
Scientific expertise: Dr. R. Mahalakshmi works on membrane proteins of M. tuberculosis.
Dr. Sunando Datta is working on Entamoeba histolytica.
Dr. Vikas Jain, is interested in M. tuberculosis biology. He has worked earlier on M. smegmatis stringent response. Currently, working on the mycobacteriophage and its affects on Mtb physiology.
Dr. Himanshu Kumar- To understand the molecular mechanisms of host-pathogen interactions; How far have we reached in tuberculosis vaccine development.

Zone 4

1. Institute of Life Sciences, Bhubaneswar

There were eleven Projects handled in the Institute on Malaria, Filaria, and Cholera in the last ten years. There were four Scientists working on them.

Infrastructure and services of the institute are:
Confocal Microscope, FACS, ELISA-Reader, Centrifuge, PCR, Atomic Absorption Spectro Photo-Meter, Automated DNA Sequencer, Inverted Microscope, Liquid Nitrogen Plant, Liquid Scintillation Counter, FPLC, GC, Lypholyzer, Realtime DNA engine/thermal cycler, Gene pulser x cell, French pressure cell etc.
The research interests of the faculty are in three major areas: (a) Infectious Disease Biology, (b) Gene Function and Regulation and (c) Translation Research and Technology Development. Industrial Collaborations have been established to tap commercial potential of laboratory science.

New Products: Three new PCRs were developed

Vaccine development of Malaria: Immuno modulation and engineering of immunity to malaria in disease endemic regions and clinical trial such as immunomodulatory properties of weekly Chloroquine administration during high transmission season with an objective to modulate and potentiate parasite specific CTL responses to liver stage parasites in order to develop acquisition of natural immunity to exo-erythrocytic stage parasites in naturally exposed population are underway.
Ten Flow cytometry based assays on helminthiasis and fialriasis drugs R&D were developed and patented. These assays allow high-through put screening for drugs that induce apoptosis of developing embryo in nematodes. Developments of Drugs that induce apoptosis and block embryogenesis are expected to be the only viable approach for control of worm infections. The ten assays developed and patented by ILS are expected to assist in such drug discovery.

Scientific Expertise:
Dr. Durg V. Singh focuses on evolutionary mechanism and processes involved in the emergence of pathogenic V. choleare, SXT-related ICE and characterization of those pathogenic genes and their protein products that are expressed during various stages of infectious process/ preservation using a number of molecular biology techniques. He is also interested to study pathogenic factors elaborated during infection and regulatory
proteins that coordinate pathogenic events, host stimuli that effects expression of these genes; and purification and characterization of secretogenic toxin produced by candidate cholera vaccine strains/ non-cholera-producing V. cholerae strains.

**Dr. B. Ravindran** has the area of interest in Immunology, Pathogenesis and Biology of pathogens causing Malaria and Helminthic diseases in human and experimental models, their transmission and natural history and interactions with other infectious pathogens. He also works on specificity of the immune response to malaria in adults living in endemic areas, protective immunity in human lymphatic filariasis, Pentoxifyline adjunct prognosis in human cerebral malaria in adults, human Bancroftian filariasis, their immunological Markers of morbidity and infection.

**Technologies ready for transfer:** A high throughput method for detecting apoptosis of embryonic stages of metazoan helminthic parasites.

A method for preparing a water dispersible glyceryl monooleate magnetic nanoparticle formulation and use of the same.

A novel pararetrovirus based hybrid promoter DNA fragment.

---

### 2. Regional Medical Research Centre, Bhubaneswar

The centre focuses its research activities on lymphatic filariasis, malaria and micronutrient deficiency disorder, diarrhoeal disorders, Haemoglobinopathies and Viral hepatitis, TB culture facility to identify MDR and related research issues and Virology laboratory for identification and isolation of viruses from diseases appearing in epidemic form with viral etiology.

**Infrastructure Available**

UV-Vis Spectrophotometer, High speed centrifuge, Thermocycler, Real Time PCR, PFGE, ELISA reader, Blood cell analyzer and Automated biochemistry analyzer, Automated DNA sequencer, Flow cytometer, Ultracentrifuge, HPLC, FPLC Protein Array, β and γ Counter, CO₂ incubator, Tissue culture facility, Malaria parasite culture facility, Insectarium, Animal House and OPD facility for diagnosis and treatment of patients at Capital Hospital, Bhubaneswar.

**Services Rendered to State:**

Filariasis: support to the state Government and National Vector Borne Diseases Control Programme in terms of evaluating the Mass Drug Administration programme to eliminate the LF and helps in treating the filarial patients at filarial OPD at Capital Hospital, Bhubaneswar.

Malaria: technical support for investigation of malaria epidemics, monitoring drug resistance, evaluation of efficacy of insecticide impregnated nets and organizing workshops for the Medical Officers of different PHCs /Peripheral hospitals on diagnosis and management of severe malaria; **training** on malaria surveillance procedures to the Malaria Technical Supervisors of Orissa, Chhattisgarh and Jharkhand.

Cholera: The centre has investigated all the diarrhoeal outbreaks/epidemics since 1993. The timely isolation and reporting of the causative organisms have enabled the Govt. to implement adequate control measures; Regular surveillance on diarrhoeal disorders.
The **strength and achievements** of research on lymphatic filariasis, malaria and diarrhoeal disorder are as follows:

A) Lymphatic Filariasis

Currently five scientists (Dr S.K.Kar, Clinical Epidemiology; Dr (Mrs) N Mahapatra, Medical Entomology, Dr A K Satapathy, Immunology, Dr R K Hazra, Molecular Entomology and Dr B.Dwibedi, Clinical Science) are working on finding out the dynamics of disease progression for disease management, development of an intervention strategy with emphasis on drug delivery mechanism, advocacy, monitoring and evaluation and towards understanding the immunological and molecular basis of host parasite interaction to develop immunodiagnostic/ immunoprophylactic tools. Their studies also involve application of remote sensing and **GIS in epidemiology of filariasis**.

**Major achievements**

(i.) The center has standardized the tissue tonometry for assessing the progress of lymphedema due to filariasis.

(ii) For the first time the center described lymphatic nodules as a clinical manifestation in bancroftian filariasis

(iv) A unique strategy of mass drug distribution (MDA) has been developed for improvement of compliance of single dose DEC for elimination of LF in urban areas.

(v) A single step PCR method has been developed for the combine detection of human filarial parasites, *B. malayi* and *W. bancrofti*.

(vi) The potential of *Culex vishnui* in transmission of filaria has been established.

(vii) Field efficacy of *Bacillus sphaericus* in controlling *Culex quinquefasciatus* has been demonstrated

(viii) The role of ALT2 and CPI2 recombinant antigens as anti-microfilarial agent has been described.

(ix) Immuno-epidemiological studies indicated that patent filarial infections need not necessarily lead to development of chronic disease.

(x) DssdI and Lipid antigens were identified as vaccine candidate antigens against filariasis

(xi) Demonstrated a very strong association between polymorphism of endothelin-1 and TNFR receptor II and development of hydrocele or elephantiasis in patients infected with *W. bancrofti* endemic population

(xii) The *S digitata – M coucha* model is found amenable to perform chemotherapeutic and immunobiological investigations in experimental filariasis.

(xiii) XID mice are found to be highly susceptible to *Brugia malayi* infections unlike other immuno-competent mice. This has offered a model to study development of immunity in filariasis.

**Training:** PhD courses, dissertation works on malaria and other communicable diseases. to MSc and MD students; conducted a DBT sponsored laboratory training program for three weeks in Nov. 1992 on immunological concept in tropical parasitic diseases and hosted a CME programme on Immunoparasitology in November 2002.

B) Malaria
Currently six scientists (Dr N Mahapatra, Dr M R Ranjit, Dr A Mahapatra, Dr A K Satapathy, Dr (Mrs) A S Kerketta, Dr R K Hazra) are working on malaria. The main area of research is to carry out molecular characterization of \textit{P. falciparum} and \textit{P. vivax} isolates, therapeutic efficacy of commonly used antimalarials and alternative treatment regimens for resistant parasites, studies on identification of genetic factors in human involved in natural resistance to malaria infection, studies on identification of sibling species and genetic structure of \textit{An culicifacies}, \textit{An annularis} and \textit{An fluviatilis} using molecular markers, studies on application of remote sensing and GIS in epidemiology of malaria and studies on behavioral and social aspects of community towards malaria treatment and control.

\textbf{Major achievements}

(i) Described a new variant of G6PD enzyme called “G6PD Orissa” among tribal and non-tribal populations of India.
(ii) Identified Pentoxifylline as an adjunct drug for treatment of cerebral malaria.
(iii) Identified a novel allele in the intron 4(VNTR) of endothelial nitric oxide synthase (eNOS) in our population.
(iv) Demonstrated the association of NO against development of cerebral malaria and role of Angiotenssin II and/or eNOS polymorphism in high production of NOx.
(v) Developed a single tube PCR method to identify mosquito species, presence sporozoite and kind of blood meal taken by the vector mosquito.

C) Cholera
Dr B B Pal is working in the field of Diarrhoeal disorders on diagnostic and molecular epidemiology of \textit{V. cholerae} from the clinical and environmental samples. He is conducting Quadriplex PCR assay simultaneous for detection of biotype, serotype, toxigenic potential and central regulating factor of \textit{V. cholerae}. His research also includes finding the incidence of bacterial enteropathogens among hospitalized diarrhoea patients from Orissa, India.

\textbf{Scientific Expertise:}

Dr. S. K Kar works on parasitology and immunology. He has developed a unique methodology for detecting the spread of chloroquine-resistant strains of \textit{P. falciparum}, emergence of nalidixic acid resistant vibrio cholerae O139 in Orissa and identification of its responsible protein component. He is studying lymphatic filariasis among children in Orissa. He is involved in mapping risk prone areas of kala-azar in parts of Bihar through a RS and GIS approach. He also conducts immunohistochemical staining of dermal lesions in diagnosis of (PKDL) in comparison to Biospy imprint smear & culture.

Dr. Namita Mahapatra has works on Multiplex PCR assay for the detection of Anopholes fluviatilis species complex-human host preference and \textit{P. Falciparum} sporozoite presence, using a unique mosquito processing method. She also studies host feeding patterns of malaria vectors of Orissa and conducts retrospective analysis of epidemiological investigation of JE outbreak occurred in Rourkela.

Dr. Dasarathi Das works in Immunology of lymphatic filariasis. His work includes a clinico-epidemiological perspective of lymphatic filariasis in Satyabadi block of Puri district, Orissa. He is studying the disappearance of malaria vector Anopheles sundaicus from Chilika Lake area of Orissa State in India. His research involves filarial hydrocele management in global programme pertaining to elimination of LF and a survey of
Bancroftian filariasis for micro filarial and circulating antigenaemia in two village of MP; Albendazole sulfoxide concentrations in plasma of endemic normals from a LF endemic region using liquid chromatography.

**Dr. A.S.Kerketta** worked on Clinicians' attitude on mass drug administration under the programme to eliminate LF: a qualitative study from Orissa, India. Assessment of the therapeutic efficacy of chloroquine in the treatment of uncomplicated P. falciparum malaria in a tribal block of the Kalahandi district of Orissa. A survey on foot care practices among filarial lymphoedema patients from Orissa, India.

**Dr. Amarendra Mahapatra**, studies high burden of malaria during pregnancy and a need of social science intervention. His research involves a flow cytometry based method for studying embryogenesis and immune reactivity to embryogenic stages in filarial parasites. He also works on malaria control in India.

**Dr. M. R Ranjit** works on Parasitology and Epidemiology such as CCTTT pentanucleotide microsatellite in iNOS promoter which influences the clinical outcome in P.falciparum infection. He also studies precontrol observation on LF and geo-himinites in two coastal districts of Orissa; the Pfcrt (K76T) point mutation and its usefulness for monitoring chloroquine resistance.

**Dr. A. K Satapathy** researches protective immunity in human filariasis, their role for parasite specific IgA responses. He also studies human bancroftian filariasis and is developing immunological markers of morbidity and infection. His work also involves understanding cocomitant parasitism of Bancroftial filarias and intenstinal helminths and their response to albendazole.

**Dr. R. K Hazra** focuses on the development and evaluation of a single step multiplex PCR method for simultaneous detection of B. malayi and W. bancrofti. He is involved in retrospective analysis of epidemiological investigation of JE outbreak in Rourkela. He researches knowledge and beliefs about elephantiasis and hydrocele of LF and some socio-demographic determinants in an endemic community of Eastern India. He uses multiplex PCR assays for the detection of Anopheles fluviatilis species complex-human host preference and P falciparum sporozoite presence, using a unique mosquito processing method. Dr. Hazra also studies host feeding patterns of malaria vectors in Orissa.

### 3. National Institute of Science Education and Research

NISER has both teaching and research labs of each of the schools (Biology, Chemistry, Mathematics and Physics) and they are growing rapidly. NISER also uses the lab facilities of Institute of Physics.

**Teaching and Training:** An integrated 5-year M.Sc. programme in the core and emerging branches of Basic Sciences which in turn will be integrated with Ph.D and employment in various R & D organizations and industry in the country. Integrated M.Sc.+ Ph.D programme after B.Sc. from other Universities; PhD etc. Disciplines like computer science, engineering sciences and earth and planetary sciences will also be included at appropriate stages.
The facilities: a modern library, computer centre, modern laboratories to acquire skills to perform experiments, to innovate, to fabricate and to conceive new experimental techniques etc. are proposed.

Trailokya Nath Naik, Visiting Professor; has Specialisation in virology, molecular genetics, phylogenetic analysis of rotaviruses with genotypes G1, G2, G9 and G12 in Bangladesh; the evidence for a close relationship between rotaviruses from children and adults, whole genomic characterization of a human rotavirus strain B219 belonging to a novel group of the genus Rotavirus, human group A rotavirus P[8] Hun9-like and rare OP354-like strains are circulating among diarrhoeic children in Eastern India. He has worked on Increase in prevalence of human group A rotavirus G9 strains as an important VP7 genotype among children in eastern India and The post-tsunami outbreak of diarrhoeal diseases in Car Nicobar Island, India, was caused by human group A rotavirus G2 strains.

Currently, many of the Visiting Professors (4) have completed their contractual period this year and have left NISER. Dr. Naik has also completed his tenure on 20th July, 2010.

4. National Institute of Malaria Research, Rourkela Field Station

The institute focuses on Malaria. They are also pursuing research on Dengue, namely, on breeding potential of Dengue vector in Steel Township, Rourkela. There are four scientists working on tropical diseases.

Infrastructure and Services
For public health: Consultancy on mosquito/malaria control; field evaluation of new intervention tools; GCP trials on new drugs/combinations; training of clinicians, laboratory staff, public health staff and engineers etc.
For patient care: Malaria diagnosis and treatment
Others: Community mobilization through IEC, BCC.

It has Parasitology lab, entomology lab, instrumentation room, biological control lab, insectary, animal house for rabbits, malaria clinic. Equipments available: Refrigerated micro-centrifuge; PCR, Kinetic microplate readers, Gel Doc. System, Compressor Sprayer; UV cabinet, Blood cell counter; cell counter, UV-VIS Spectrophotometer, Microscan Elisa Reader, Gradient PCR Electrophoresis.

New Principle/theory developed
Their theory on building small dams capable of decreasing malaria in village, altered, the water flow in the up and down streams to make it unfavourable for the breeding of *An. fluviatilis*; Epidemiological data collected showed significant reduction in malaria incidence and prevalence among all age groups in dam site village in comparison to control area.
Clinical trials completed/ongoing are as follows:

A) A phase II, double-blind, parallel-group, randomized, dose-ranging study assessing the antimalarial activity and safety of RBx 11160 administered for 7 days in patients with acute uncomplicated *Plasmodium falciparum* malaria.

B) Multicentre, open-label randomized clinical trial of efficacy and tolerability of the fixed-dose artesunate/amodiaquine (AS/AQ) combination therapy *versus* amodiaquine (AQ) monotherapy for treatment of uncomplicated falciparum malaria in India.

C) A phase II, randomized, open label, multicentre study to assess the antimalarial efficacy and safety of arterolane (RBx 11160) maleate and piperaquine phosphate coadministration and Coartem® in patients with acute uncomplicated *P.falciparum* malaria.

D) A phase II, randomized, open label, multicentre study to assess the antimalarial efficacy and safety of arterolane (RBx 11160) maleate and piperaquine phosphate coadministration and Coartem® in paediatric patients with acute uncomplicated *Plasmodium falciparum* malaria.

Highlights of the translational research are:

1. **Role of larvivorous fish in malaria control** - Period of trial: 1988 to 2005 - the results were encouraging; the NVBDCP adopted this; fish hatcheries were developed at each block level in the entire state of Orissa and It is a nodal agency for supply of larvivorous fish to other districts.

2. **Insecticide treated mosquito nets for malaria control** - Period of trial: 1991 to 1993; introduced in the operational programme during Enhanced Malaria Control Project.

3. **Community financing of ITMNs under operational malaria control programme** - Period of trial: 1995 to 1998. The strategy was adopted by national programme for distribution of ITMNs during 1997 onwards.

4. **Long-lasting insecticidal nets for malaria control** - Period of trials: 2006-2010
   The NVBDCP has now started procuring LLINs for distribution in the high risk areas as a strategy under operational programme w.e.f 2008-09.

5. **Change of IRS pattern, schedule and type of insecticide based on vector bionomics in Sundargarh district** produces better epidemiological results as compared to that of uniform use of a single insecticide.

5. University of Hyderabad

**School of Life Sciences**

**Scientific Expertise:**

**Dr. S E Hasnain works on** *M. tb* Dehydrogenases and their role in the display of strong B-Cell response. His findings show regions of high antigenicity within the India. His work on hypothetical PPE_MPTR Rv2608 ORF shows a differential humoral response and a Low T-cell response in various categories of TB patients. He has also developed a method of diagnosing tuberculosis.

**Dr. Sharmistha Banerjee** teaches Enzyme Kinetics, Molecular Biology, Endocrine Biochemistry and Infectious diseases. Her research area is Molecular Pathogenesis of *M.tb*, HIV and *M.tb-HIV* co-infection such as, Rev and its interactions with host factors.
in HIV replication and turn-over, Comparative proteomics in M.tb co-infections: identification of new therapeutic targets and immune activation markers through system-wide differences in the entire complement of proteins expressed in the lymphocytes from TB and HIV patients, TB-HIV co-infected patients and from the patients with TB related immune reconstitution inflammatory syndrome. Identification and characterization of novel M.tb antigens as potential diagnostic markers.

**Dr. M. K. Bhattacharyya** works on nuclear and chromosomal influence and the seeming inaccuracy in DNA repair that helps a pathogen to manipulate the “host-pathogen interaction through the mechanisms of DNA repair in Plasmodium and contribution to genetic diversities that result in antigenic variation, the most potent means of immune evasion.

**Prof. P. Prakash Babu** studies the mechanism of cell death and cell survival signals in cerebral malaria.

**Dr. Vaibhav Vindal and Dr. Niyaz Ahmed** are investigating the area of TB.

**Prof. A. K. Kondapi** has isolated a glycoprotein from human placenta which shows anti-HIV activity.

**Prof. M. Sritharan** has study on host-pathogen interactions with reference to iron acquisition in pathogenic mycobacteria.

**Dr. Radheshyam Maurya** works on infection, immunity and diagnostic aspects of visceral leishmaniasis.

### 6. Institute of Life Sciences, University of Hyderabad

It has the Biology department understanding of biological signaling mechanisms through innovative experimental approaches and novel hypotheses for infectious diseases; Chemical Biology Program through High Throughput Chemistry: Natural Product-Inspired, Diversity-Oriented Synthesis; Medicinal Chemistry; Computational Chemistry and Biology is focused on development of small molecules related to: Intracellular signaling in infectious/neglected diseases. ILS Chemical Biology Small Molecule Collection facilitates to explore the value of other novel compounds generated by other institute through network in a not-for-profit setting through highly unique enzymatic and cell-based assaysand IP pathway.

**Computer-Assisted Drug Discovery** conducts research on computational methodologies and aspects of drug discovery in a collaborative spirit to introduce rational drug discovery approaches to succeed in individual and institutional efforts.

**ILS incubates Nutracryst Therapeutics Private Limited** will integrate a platform technology by involving re-purposing and re-engineering of existing drugs to build a robust pipeline with a vision to partner with other companies to take it to the market. **ILS has become a partner of CSIR on open source drug discovery** to work on TB. **DBT established centre of Excellence for TB research.**

**Scientific Expertise:**
**Dr. Ritta Mathew** has studied bacterial persistence in latent stage by targeting the electron / energy metabolic pathways as well as targeting quorum sensing by inhibiting biofilm formation in mycobacteria.  
**Dr. N. Z. Ehtesham** established a direct relationship between micronutrient deficiency and TB disease status in humans; the underlying mechanism of macrophage immune modulation during micronutrient deficiency; identification of sterilization markers for TB.

### 7. Centre for Cellular and Molecular Biology

13 **Project(s)** handled in the Institute on Tropical Disease in last 10 years on HIV/AIDS, Japanese Encephalitis, Tuberculosis, Malaria and Leishmaniasis. 9 Faculty members are working on Tropical Diseases.  
**Infrastructure and services:** Well Equipped BSL-2 and BSL-3 Facilities; Jonaki, (a unit of Board of Radiation and Isotope Technology (BRIT) under Department of Atomic Energy, set up in the campus of CCMB, produces and supplies more than a dozen of 32P and 33P radioisotope labeled nucleotides and almost an equal number of molecular biology kits to various universities and research institutions from all over the country.); Haldane's Collection J.B.S Haldane’s collection of books and reprints; Electron Microscope with cryo-accessories capable of magnifying up to 6.5 lakh times; FACS; DNA Microarray.  
**Future Aim:** They need to develop tissue banking facilities to store the well defined, graded human cells and tissues for research purpose. Also, is interested in building disease-specific epidemiological models along with prevalence data analysis. This is different from statistical studies, which are commonly done. There are no other groups in India who do mathematical modeling of diseases.  
**New Principle/Theory developed:**  
i) Multi-step Polynomial Regression Method to Model and Forecast Malaria Incidence  
ii) Chaos Game Representation analysis of HIV-1 subgroup genomes  
iii) Development of software to represent disease prevalence data  
iv) Developed paper based microfluidics which has the advantages of easy handling, temperature stability and cost effectiveness  

**Scientific Expertise:**  
**Prof. Amitabha Chattopadhyay** is interested in Role of Membrane Cholesterol in Leishmaniasis and patented Method of Treating Leishmaniasis using Methyl-beta-cyclodextrin  
**Dr. R. R Tirumalai** is studying the Molecular basis of MTb Pathogenesis during Latency, the identification of mycobacterial virulence factors and the discovery of novel targets for the development of anti-TB therapeutics. The ongoing project is elucidating the physiological role of whib2 a member of the whib like family of proteins in MTb: implications in redox regulation and the induction of latency.  
**Dr. Sunit Kumar Singh** has the Research Interests in Neurovirology & Inflammation Biology e.g., **HIV Pathogenesis:** to combine the clinical and basic science approaches to understand the mechanism of HIV neuropathogenesis and systemic immune activation. **Neuroinfections by Flaviviruses** (JEV & Dengue Virus): to understand the mechanism
of neuro-infection; major viral determinants of JEV and DENV responsible for the neuroinvasion and neuroinflammation.

**Dr. P. S Sijwali is interested in** proteases required for haemoglobin degradation, processing of host and parasite proteins, anti-oxidative defense and virulence proteins PfEMP1 of malaria parasites to identify novel antimalarial drug targets and to understand the pathogenesis of lethal P.falciparum malaria. They are trying to generate transgenic parasite lines with defined cytoadherence properties, to identify pathogenic cytoadherence phenotypes and provide insights into how cytoadherence translates into lethal malaria.

**Dr. T. Baidya** has Research Interests in understanding Host Pathogen interactions that dictate the outcome of infection in L. donovani; Mechanisms of Virulence and Cell survival in Leishmania; Mechanisms of Host Susceptibility/Resistance; Analysis of immunological memory in B-lymphocytes; the molecular mechanisms underlying the generation of memory B cells.

**Dr. S. K Saxena** works on to understand the epidemiology and molecular mechanisms of host-defense during human viral infections and to develop new predictive, preventive and therapeutic strategies for them; using JEV; as a model.

**Dr. Somdatta Sinha** has expertise in: Deterministic and stochastic modelling of infectious diseases; Modelling Spatiotemporal Distribution of Host-Parasite Population and Disease Spread; Malaria prevalence in India – data analysis; Genome analysis of HIV-1 – Bioinformatic studies. Using genomic signatures for HIV-1 sub-typing. Multi-step Polynomial Regression Method to Model and Forecast Malaria Incidence.

2 Faculty members are working on Tropical Diseases

**Infrastructure and services:** 2 Workstation Computers, 2 Laptop computers and 2 Laser Printers.

**8. Center for DNA Fingerprinting and Diagnostics**

**The National Genomics and Transcriptomics Facility** is a Biotechnology services core group, provides on demand services in the areas of automated DNA sequencing, Genotyping and Real time PCR, and has initiated services in the area of cDNA microarrays, mainly for Tuberculosis and cancer. 35 Projects handled in the Institute on Tropical Disease in last 10 years on: Malaria, Tuberculosis, HIV/AIDS and Leprosy.

**Number of Faculty members working on Tropical Diseases:**
Total Number: 08, (03 faculty left CDFD during 2000-2010)

**Bioinformatics Services** is the national node for European Molecular Biology network; and Asia Pacific Bioinformatics Network for India; a Sun Centre of Excellence in Medical Bioinformatics. It provides biomolecular sequence databanks, macromolecular structure databanks, genome and other useful databases; comparison and analysis of sequence/structure/genome data, Protein 3-D Modelling and molecular graphics. It also conducts National and International level training for the use of commercial software.
Infrastructure at CDFD:
ABI 377XL DNA Sequencer; ABI Prism 3100 16 capillary Automated DNA Sequencer; DNA Sequencer; Real time PCR Machine; Accent Micro Array Spotter & Scanner; SE Flowcytometer with sorting facility; Phosphor Imaging System; DNA Synthesizer, High Speed Centrifuge, Spectropolarimeter; FPLC, LPLC, Scanning Spectrophotometer; Stereo Microscope, Inverted Fluorescence Microscope; Micromanipulator; GeneAmp PCR System; Luminometer; Turner design Fluorimeter; Refrigerated Table Top Centrifuge; Hybridization Oven; UV Crosslinker; Speedvac Concentrator; Steam Sterilizers; UV Transilluminators.

New Principle/Theory developed:
1. Discovered a novel fold discriminatory features for protein fold recognition by H A Nagarajaram et al.
2. Developed new substitution scoring matrices suitable for homology detection in AT rich genomes such as P. falciparum by Akash R et al.
3. New Algorithm developed for prediction of protein–protein interactions by S C Mande et al.
4. Developed a new algorithm for structure based prediction of functional sites in proteins by S C Mande et al.

New Process(es) developed:
1. High copy number plasmid yielding *E.coli* strain by J Gowrishankar et al.
2. A microbial process for Arginine production by J Gowrishankar et al.
3. Identification of new drug targets for tuberculosis by Sangita M et al.
4. Identification of methods to diagnose tuberculosis by S E Hasnain et al.
5. Immunodominant Antigen Rv2430c and method of treating tuberculosis by S E Hasnain et al.

Research Works:
**Dr. S. Mukhopadhay** is working on Identification of targets for Development of new TB Diagnostics for early and accurate detection of the bacilli at POC level. Evaluation is done in a small sample size, needs to be validated in a large sample size and clinically defined specimens. She has several patents like: Detection of MTb, a method of diagnosing TB; Peptide antigens which elicit high humoral Immune response and T-cell response; Antigenic Peptides; Immunodominant Antigen RV2430C and method of treating TB. Her current research interest is Mtb immunology.

**Dr. Shekhar C. Mande** works on structural and functional studies on *M. tuberculosis* heat shock proteins

**Dr. Abhijit A Sardesai** is exploiting the sophisticated genetic tools that the bacterium *E. coli* offers to delineate the functions of ORFs from the bacterium *M. tuberculosis*, involved in cytoplasmic protein folding with Collaboration with Dr S.C Mande.

**Dr. A. Ranjan** has opted for genomics approach for identification of possible drug targets of MTb.
9. National Institute of Pharmaceutical Education and Research, Hyderabad

NIPER Hyderabad has started recently, and research activity is yet to be initiated. Recently a proposal has been submitted to the Department of Pharmaceuticals on the “Development of New Anti-TB Therapeutics”. This will be a network programme involving NIPER Hyderabad, IICT Hyderabad, AIIMS New Delhi and IIIM Jammu.

Scientific Expertise:
Dr. N. Shankaraiah and Dr. A. Kamal has work on Solid-phase synthesis of a library of pyrrolo [2,1-c][1,4]benzodiazepine-5,11-diones with potential antitubercular activity; Dr. Ramakrishna Sistla works in the area of anti-infectives.

10. Indian Institute of Chemical Technology

Ten Project(s) handled in the Institute on Tropical Disease in last 10 years. Name of the Tropical Disease(s) handled are: Malaria, Lymphatic Filariasis, JE and Dengue. Two Faculty members are working on Tropical Diseases.

Services:
A centre on ENVIS (Environmental Information System) on Bioinformatics – Vector control exclusively to disseminate information on Vectors and Vector borne diseases (www.iictenvis.nic.in). The concerned PI and Coordinator is Dr USN Murty, Head Biology.
An ISO certified bioevaluation studies
Anti bacterial and anti fungal studies.
Public Health Pests e.g. mosquitoes, cockroaches, houseflies etc.

Infrastructure and services
Autoclave , Laminar flow unit, Environmental chamber, plarimeters, hydrogen, apparatus, pressure reactors, ozoniser, lyophilizer, vaccine centrifuge, Roto vapour, Scanning electron microscope, Mass spectrometry, HPLC, GC,GC-MS, X-ray Crystallography, NMR unit, Insectary, Spectrophotometer, NIKON Microscope, Gel Documentation unit, PCR, Amino acid Analyzer, Microbiology lab facilities, Bioinformatics lab facilities etc., with super computing facility like PARAM 10000 and Param Padma.

New Product(s) developed
Biological database on Malaria (implemented in Arunachal Pradesh), Filariasis (implemented in Andhra Pradesh) and JE (implemented in Andhra Pradesh).
Software for probit analysis for estimating the lethal doses in bioassay studies of mosquitoes.
Software for estimating the aerodynamic parameters of fliers.
Software for identification of Indian Anopheles mosquitoes Malaria by using Expert system.
Software for identification of female Culex mosquitoes of South-East Asian countries.
Software for Prioritization of endemic areas of vector borne diseases by Cluster Analysis.
novel forecasting software (JEBNET) for prediction of JE vectors density.
Developed epidemiological data classification tool (VBCLASSIF) for classification and identification of disease positive cases.
Developed a Dengue Decision Support System for diagnosis of dengue cases.
Developed a GIS application for mapping of the endemic zones of LF in Karimangar, Chittoor, East & West Godavari districts of Andhra Pradesh.

The scientists of the Institute involved in Infectious diseases area are:

**Dr. J.S Yadav** - carry out extensive basic and applied research investigations in the synthesis of complex Natural products of biological relevance like Hydroxy fatty acid, Discodermalice, Rifamycin, Scytophycin, Calcimycin, Artemisin, Taxol etc. has successfully developed cost effective Technologies for Diltiazem, Ondaseyron, Pyrazinamide, Ketotifen, Mefloquain, Tamoxifen etc., They have been very well received by the Indian and Overseas drug industries.

**Dr. U.S.N. Murty, Dr. J. Venkateswara Rao, Dr. P. Usha Rani, Dr. Paramjit Grover, Dr. Ghausia Begum and Dr. S. Indu Kumari.**

Projects are carried out on:
- DRL, Tezpur, Sponsored project on “Forecasting system and Identification for the control of Malaria in certain parts of Assam.
- **CSIR** Sponsored project on An Integrated Malaria control program through Heuristic Engine software technology in North-East region with particular reference to Mizoram and Sikkim: An innovative tool for predicting the outbreak of disease.
  - “Control of Malaria through Integrated Information Technology Tools in Manipur” in collaboration with State Medical and Health Department.
- **ICMR** Sponsored project on Advanced forecasting system for the control of Japanese encephalitis in Andhra Pradesh, India.
- **DST** Sponsored project on Control of Malaria through Integrated Information Technology tools in Arunachal Pradesh.
- **DBT** Sponsored project on integrated control of Filariasis and Malaria through Decision Support System (DSS) in Andhra Pradesh, India.
- **Ministry of Communication & Information Technology** Sponsored project on An Integrated Information System for the control of Bancroftian Filariasis in Andhra Pradesh.
- **DST** Sponsored project on Rapid Epidemiological mapping of endemic zones of Malaria in Arunachal Pradesh through Geographical Information System.
- **Ministry Of Environment & Forest**, Sponsored project on “Bioinformatics-Vector Control”.
- **CSIR Network project** on “Integrated Analysis for Impact, Mitigation and Sustainability: Regional Climate Modeling at Decadal Scale”.

An ongoing programme of IICT on the Design and Synthesis of New Anti-TB compounds involving IIIM, Jammu funded by Department of Science and Technology.
11. Tuberculosis Research Centre

Facility: TRC has developed the Institutional Repository. It is engaged in all three activities of Diagnostics, drugs and vaccines in some stages of development, clinical trial etc.
In diagnostics, it is actively engaged in: Malaria- platform development; HIV target development; for TB and filarial, both target and platform developmental stages.
In drugs area, for TB, HIV and Filaria, all three activities like target, platform and product development as Kit & Chip Development are ongoing.

Clinical Trials:
TRC is one of the centres of excellence for AIDS vaccine clinical evaluation in India with proper clinical trial site and facilities. Also, Clinical trial staff has obtained training in basic and advanced Good Clinical Practice and Good Clinical Laboratory Practices.

D001: The second Phase I trial of another vaccine candidate, TBC-M4 (Modified Vaccinia Ankara or MVA), began in early 2006 and has been completed. The results indicate that the vaccine was found to be safe and elicited modest immune responses among volunteers. Further Phase I trials are being considered on the basis of the safety and immunogenicity data generated by clinical research.
P001: Third phase I clinical trial to evaluate the safety and Immunogenicity of vaccine candidate, TBC-M4, a multigenic MVA HIV Vaccine vs. ADVAX, a multigenic DNA HIV Vaccine followed by TBC-M4, a multigenic MVA HIV Vaccine was initiated in January 2009 at NARI and TRC after obtaining all ethical and regulatory approvals. It is envisaged that both the vaccines may induce different portions of the immune system, resulting in a stronger and broader response than with either vaccine alone. This trial would also determine whether this combination can increase the breadth and duration of the immune response. By December 2009 all the volunteers at the NARI and TRC were enrolled and their vaccinations completed. Post-vaccination follow up visits are ongoing as scheduled. No Grade3/4 adverse events or serious adverse events have been reported till date (Source: IAVI, New Delhi).

Scientific Expertise:
Dr. V. D Ramanathan Engineering gp41 of HIV-1 on nano particles as vaccine candidates Target discovery, development and clinical trials
Dr. V. Kumarasami Target discovery to clinical trials of Filaria.
Dr. Vanaja Kumar works on Composition useful for identification of microorganism of interest.
Dr. N. Selvakumar worked on Pot staining procedure like: A novel method of staining acid-fast bacilli in sputum containers; Phenol ammonium sulphate basic fuchsin staining of sputum in pot for the detection of acid-fast bacilli.
Dr. Sujatha Narayanan works on “A process for designing primers useful for detection of Mycobacterium tuberculosis"
12. Centre for Research in Medical Entomology

**Area of Research** is medical entomology, microbiology, molecular biology and epidemiology. **Facilities** are supporting molecular entomology, mosquito taxonomy, vector control and serology. Services offered are Training, DNA/Protein Synthesis, RFLP/RAPD, 2D Gel electrophoresis. **Achievements:** It has developed immunodiagnostics for Dengue and field tests are ongoing; initiated target discovery project on malaria, Dengue which may yield diagnostic products. For Filaria, it has targeted vector control mechanism as an adjunct to the MDA program. **Technology Transferred:** Use of neem coated urea for preventing breeding of JE vectors; Use of insecticides impregnated curtains to TN Health Department.

**Scientific expertise:**

**Dr. Paramasivan** developed antigen capture ELISA to detect dengue virus antigen from the field caught mosquitoes; used in Public health Department of the state. For dengue surveillance in India, doing DEN ciru specific mAb which can be used if diagnostic assay developed by CRME. The successive development of cell culture based diagnostic antigen will be used in routine diagnostic test. An indirect immunofluorescent assay developed for mosquito inoculation developed for the first time which is s sensitive and rapid method for isolation and assay of dengue viruses.

**Dr. N. Arunachalam** studied on JE in Kurnool District in AP.

**Dr. B. K. Tyagi** worked on JEV activity in Cuddalore District, TN and dengue emergence in Kerala State.

**Dr. R. Rajendran** has studied filariasis elimination as implemented by Government Agencies in 2 revenue blocks of TN.

**M. Muniaraj** has Field of specialization: Isolation and growth of leishmanial parasite.

**Dr. P P. Samuel** has Research Experience on Diagnosis and Epidemiology of Japanese Encephalities.

**Dr. S. C Tewari** has work on- Medical entomology, particuylarly on vectors and vector-borne diseases viz. malaria, filariasis, dengue, Japanese encephalitis.

13. Madurai Kamaraj University

**School of Biotechnology,**

**Scientific expertise:**

Prof. Dharmsalingam works on Immunology of leprosy; Genome analysis of *M. leprae* and immunology of leprosy; examining the expression of various virulence related genes of *M. leprae* from biopsy samples to understand the mechanism of infection by semi quantitative RT-PCR and Real Time PCR; also studying the immune status of various forms of leprosy by analyzing the cytokines in the affected peripheral skin lesions. Plasma proteome profiling of leprosy patients.
Dr. S. Krishnaswamy works on: structural analysis of Outer membrane protein OmpC from Salmonella typhi and E. coli; Understanding structural interaction of S.typhi OmpC with the antibodies specific to OmpC.

Dr. H. Shakila, has Research Interests on: Immunopathological studies of granuloma in cutaneous tuberculosis and in lymphadenitis. Three week reaction in cutaneous TB and immuno histological characterization of this reaction. Fibrosis in TB. Delayed hypersensitivity reaction observed in experimental TB. Immunomodulatory effect of immune complexes in experimental TB. The efficacy of recombinant BCG vaccine in experimental TB. Histological and immunohistological characterization of various forms of leprosy.

Dr. Pitchappan RM works on: Immunology of Infectious diseases, Genome predisposing leprosy, Genetic susceptibility of TB; Spectrum of immune reactivity to mycobacterial (BCG) antigens in healthy hospital contacts in South.

New Principle/Theory developed: Leprosy has a host genetic predisposition – Genome scan studies; First migration of man to India; Tuberculosis – Immunogenetic predisposition 7 Functional Genomics / Expression profiling in disease status dissected by BCG vaccination and host genetic (HLA DR2) status.

14. Bharathidasan University

Facilities: well-equipped laboratory, with almost all equipments, all types of chemicals and diagnostic kits, the facilities of the Biomedical Diagnostic lab, at which students are exposed to various disciplines, such as Clinical Biochemistry and Clinical Microbiology.

Scientific Expertise:
Dr. K. Balakrishnan, Immunology of infectious and genetic diseases like A region of Chromosome 20 is linked to Leprosy Susceptibility in a South Indian population; A major susceptibility locus for leprosy in India maps to chromosome 10p13; Association of HLA-DRB1, DQB1 alleles with pulmonary tuberculosis in South India.

Dr. S. D. Saraswathy works on Biochemical Toxicology; Effect of Liv.100 against antitubercular drugs (Isoniazid, Rifampicin and Pyrazinamide induced hepatotoxicity in rats. Hepatoprotective effect of Liv.100, a polyherbal formulation, on mitochondrial enzymes in anti-tubercular drug-induced liver damage in rats.

Dr. K. Sathiyamurthy; Area of work involves: Antibiotic-Resistant V. cholerae in Parangipettai Coastal Environs, Southeast India; Studies on pathogenic vibrios with special reference to V. cholerae and V. parahaemolyticus from marine food resources.

15. Anna University Chennai
Facilities Available at Center for BioTechnology: modern infrastructure to conduct work in Bioprocess technology, Molecular Biology, Cell Biology, Immunology, etc. Major Equipments are Plate scintillation counter, Liquid handling system, Gel Documentation system, Deep freezer-80C, FPLC system, HPLC, Ultracentrifuge, Refrigerated centrifuges, Spectrophotometer, Fluorescence spectrophotometer, 300 lit. Fermenter, Fluorescence & Absorbance Elisa Reader, Computer systems, AKTA Prime, Microprocessor, Animal Cell Culture Reactor, Sonicator – Multi element and continuous; Library, Biotech Information System, The Techno Business Incubator Park and Foundation of Advancement of Pharmaceutics

Scientific Expertise:
Dr. R. B. Narayanan has work on Effect of recombinant proteins on PBMCs derived from the filarial patients in vitro; Multi Institutional Programme on Innate immune responses in filarial patients using recombinant proteins; Diminished monocytes function in microfilaremic patients with LF and its relationship to altered lymphocyte responses;
Dr. P. Kaliraj has work on Immune response studies with W. bancrofti vespid allergen homologue (WbVAH) in human LF; Diminished Monocyte function in microfilaremic patients with LF and its relationship to altered lymphoproliferative responses; Recombinant antigen-based antibody assays for the diagnosis and surveillance of LF; a multicenter trial; Programme for Immunodiagnosis of infectious Diseases development & Productization of Diagnostics & Prophylactics for Neglected Infectious Diseases With Filariasis as Model etc.
Prof. K. Sankaran has products and prototypes like:
A rapid enzymatic colorimetric kit for detection of Shigella and enteroinvasive E.coli from food and stool samples
Fluoropath – An immuno biosensor based portable fluorescence meter for bacterial pathogen detection under DST sponsored National initiative for instrumentation for infectious diseases Antibiogram.
Worked on: Extrusion of actinpositive strands from HEp-2 and Int-407 cells caused by outermembrane preparations of Enteropathogenic E. coli and specific attachment of wildtype bacteria to the strands.; Shigella apyrase – a novel variant of bacterial acid phosphatases; DOLOP – Database Of Bacterial Lipoproteins; Evidence that the wzxE gene of Escherichia coli K-12 encodes a protein involved in the transbilayer movement of a trisaccharide-lipid intermediate in the assembly of enterobacterial common antigen; Apyrase-based colorimetric test for detection of Shigella and enteroinvasive E.coli in stool etc
Dr. Anuradha Dhanasekaran has expertise in Signal transduction in infection diseases, Transcriptional control and gene regulation in Filariasis, drug discovery systems, Gene expression, nanobiotechnology.

16. Indian Institute of Technology Madras
It has **basic amenities** like the library, computer centre, photographic section, electronics centre, workshop, glass blowing section, etc.  
**D/o Biotechnology**: Carries out work in TD.  
**Facilities**: National Imaging Facility, with Laser Real Time Confocal Microscope and Atomic Force Microscope. Fourier Transform Infrared Analysers; Fluorescent Microscope, HPLC, FPLC GC, Spectrophotometers, Gas Analyser, Centrifuges, Cell Counters, Real-time PCR, Electric Cell Impedance System; Tissue Culture Labs; Patch Clamp facility; Auto radiographic facility, National Centre for Cellular Dynamics, BSL 2 Facilities.  
**Carries work** on: Bioprocess Engineering; Chemical Biology; Computational Biology and Medical Biotechnology.  

**Scientific Expertise:**  
**Prof. Mukesh Doble** works in the area of Drug Design and QSAR for TB drug development; synthesise molecules and test biological activity and develop structure activity relationships; and also, screening marine actinomycetes for TB;  
**Dr. S. Mahalingam** works on the molecular pathogenesis of HIV like: HIV-1 Vpr: a closer look at the multifunctional protein from the structural perspective, A comprehensive analysis of the naturally occurring polymorphisms in HIV-1 Vpr: potential impact on CTL epitopes etc.  

**17. National Institute of Epidemiology**  
It provides the Epidemiology facility at the national and regional level in the Global context. It is a WHO Collaborating Centre for Leprosy Epidemiology, does Evaluation of National Leprosy Eradication Program Simulation model for leprosy transmission and control; LQAS for leprosy elimination monitoring. Simulation model for leprosy transmission and control ha sbeen made.  

**Equipments**: The centralized laboratory system is access controlled and composed of dedicated areas for biochemical and hematological analysis, bacteriology, serology, tissue culture, molecular biology, HIV, lyophilisation and strain maintenance etc. The epidemiology training lab is most has autoanalysers, bio-safety cabinets, fume safety cabinets, centrifuges, electrophoretic systems, gel documentation systems, U-V spectrophotometers, MT plate readers, sophisticated research microscopes, freeze drying apparatus, biophotometer, robotic liquid handling system, regular gradient and real time PCR systems.  

**Training activities**: It imparts: Field Epidemiology Training Programme leading to Master of Applied Epidemiology. Epi Weeks: The Institute has established linkage with Training Program in Epidemiology and Public Health Intervention Network (TEPHINET) and Epi workshops. Basic Course in Statistics for Medical Doctors is taken.  
**Clinical trial**: for traditional remedies, Leprosy vaccine trial C; Uniform Multi-Drug Therapy (MDT) regimen for all leprosy patients; Prevalence of neurological lesions in MB patients, 5 years or more after completion of WHO MB MDT regimen; Cochrane
review on BCG vaccination for preventing leprosy; Nutritional status and HIV infection among IDUs in Chennai - A cross – sectional study. Also, HIV / AIDS studies were undertaken.

**Methodological Studies taken as:** Implications of misdiagnosis in field trials of vaccines; Impact of BCG vaccination on the efficacy of antileprosy vaccines ; Sample size estimation for comparing two proportions; Confidence intervals in medical research; Index of nutritional status in children aged 5-10 years

**Meetings:** Organized five 10-day WHO South East Asia Regional Workshops on 'Surveillance, Epidemic Preparedness and Response". Conducted a 5-day Basic Course in Statistics for Medical Doctors and a 2-week Training Programme on Controlled Clinical Trials with special reference to Good Clinical Practice guidelines. National Institute of Epidemiology organized "Epidemiology week" twice in Chennai to strengthen the network and develop partnership with these international and National Institutions in 2002 and 2003. Training programme on controlled clinical trial. It does Outbreak investigations as: An awareness programme on dengue was carried out in Thodupuzha Taluk, Idukki Dist., Kerala; A dengue fever outbreak in Chennai city and a food poisoning episode in a school hostel in Tiruchi were investigated.

**Meta-analysis** was carried out to estimate cure, relapse and success rates of short-course chemotherapy in the treatment of pulmonary tuberculosis.

**18. Christian Medical College Vellore**

**Achievements are:** Rapid Tests and LED-Microscopy evaluation in diagnosis of infection for malaria, Evaluation of newer diagnostic tests for TB, Rapid Test Evaluation, CD4 Screening for HIV/AIDS and Rapid and Immunological and Molecular test evaluation for Dengue is going on. One of the need identified as several secondary level community hospitals in malaria endemic states do not have laboratory diagnostic tests for the rapid diagnosis of malaria except the conventional blood smear microscopy. Hence, evaluating rapid diagnostic tests including the cost effective LED Fluorescence microscopy in these areas are required.

Further details may be seen in the chapter on Profiles of Institutes.

**Dr. Dilip Mathai** works on HIV/AIDS.

**19. National Institute of Malaria Research, Chennai Field Station**

The research activities at the field station are described as : Bio-environmental control of malaria; seven point action plan for malaria control; malarionic stratification of dindigul district; GIS based malaria surveillance system for dindigul; field evaluation of *bacillus sphaericus* and *b. thuringiensis var. Israelensis* in water ways in Chennai; rainwater harvesting and its implication on vector breeding in Chennai; drug resistance
status in *P. falciparum*; therapeutic efficacy of chloroquine for the treatment of vivax malaria; evaluation of parasight - f in the detection of *P. falciparum*; evaluation of ICT malaria pf/pv immunochromatographic test in India; evaluation of hilmilin (an igr compound) against *Culex quinquefasciatus* in unused domestic wells; evaluation of mosquito repellent action of neem oil on topical application etc.

The centre also provides health education to health and medical officers and students of DMLT in colleges etc.

**Three workshops** on the 'Intersectoral coordination for malaria control' have been organized for Senior Engineers and other administrators of PWD, Telephones, Highway department, Slum clearance Board, Chennai Metro Water Supply and Drainage Board etc. in Chennai; one was held at Dindigul, Tamil Nadu. The role of different departments in the creation of mosquitogenic conditions and necessary actions/precautions to be taken to prevent them has been highlighted.

**Dr. A. Eapen** has experience in Vector Biology and Control, Indigenous larvivorous fishes for mosquito control, Epidemiology of Malaria.

### 20. Vector Control Research Centre

VCRC is a centre of excellence for research and training in vector-borne diseases and control and a WHO collaborating Centre for Research and Trainining in Lymphatic Filariasis and Integrated Methods of Vector Control. It has several units for specific functions as: Insecticide Resistance Monitoring and Management Cell; Gis Cell for Vector Borne Pathogens; Culicid Biodiversity Cell; Filariasis Elimination cell Micobiology & immunology, Chemistry, Vector Biology and Control, Clinical Epidemiology and Chemotherapy; Health Economics & Disease Burden Estimation Environmental Sciences; Operations research & Surveillance.

**Products Developed:** DEPA - a synthetic insect repellent Cyclosporin A - an immunosuppressive agent licensed to M/S Nixcil Pharmaceuticals & Specialities Ltd. Lucknow; Sperifix - a controlled release formulation of *Bacillus sphaericus* for mosquito larval control, assigned to NRDC; Deltafix - a controlled release formulation of *Bacillus thuringiensis* var. *israelensis* for mosquito larval control, assigned to NRDC; F24 - a mosquito oviposition attractant assigned to NRDC; B426 - a mosquito pupicide assigned to NRDC; Controlled release formulation of DPE-28 an igr for mosquito larval control assigned to NRDC; IIFT - an insecticide impregnated fabric trap for sampling filariasis vector.

**Diagnostics/kits under development:** Monoclonal antibody based ELISA for the diagnosis of lymphatic filariasis; RT-PCR assay for the detection of infectivity with filarial parasites in vectors; rDNA-ITS2 region based probes developed for two sibling species of *Anopheles fluviatilis*, a major vector of malaria in hilly and forest areas.

**Control strategies developed for:**
- Malaria in coastal areas of Pondicherry
- Bancroftian filariasis in Pondicherry
- Urban malaria in Salem, Tamil Nadu
- Coastal malaria in Rameswaram Island, Tamil Nadu
- Malaria in riverine areas in Sathanur, Tamil Nadu
- Brugian filariasis in Shertallai, Kerala
- Tribal malaria in Koraput, Orissa

**Strategy Development**
- Drug delivery strategies for control of lymphatic filariasis
- Development of sampling strategies for monitoring and evaluation of filariasis control/elimination programmes

**Decision Support tools**
- Development of mathematical models (LYMPHASIM and EPIFIL) to optimize appropriate control strategies
  - Rapid assessment procedures for infection / disease
  - Rapid epidemiological mapping of bancroftian filariasis endemic areas
  - Filariasis risk mapping using geostatistical and GIS tools

**Epidemiological studies**; Socio-economic burden of filarias and malaria Dynamics of transmission, infection and disease, filariasis and malaria; Epidemiological investigations of vector-borne disease outbreaks.

**Clinical studies**
Hospital and community based clinical trails for transmission and morbidity control of LF.

**Master plans for mosquito control**

**Trainings:**
- PG Diploma in Medical Entomology - One year
- Comprehensive Vector Control - 6 weeks
- WHO Regional Course on Comprehensive Vector Control
- PhDs, Short term training a in important Life Sciences areas.

### 21. Regional Medical Research Centre, Port Blair

**Scope of Activities** – It conducts research on non-communicable diseases prevalent in Andaman and Nicobar Islands focussing the health problems of the indigenous tribes. Local technical manpower development is another important facet of the Centre’s mandate.

**Thrust Areas:** Diarrhoeal diseases, TB, lymphatic filariasis, malaria and Dengue. Seven Faculty members are working on Tropical Diseases.

**Infrastructure and services**
- BSL 3 facilities; Well established laboratories in the disciplines of microbiology, molecular biology, immunology and entomology; Grade I virology diagnostic laboratory for carrying out serology, culture and sequencing of viral isolates; Well equipped tissue culture facilities; Cold room; Liquid nitrogen storage facility; Computer and internet facilities and Library.

**Equipments:**
- Genetic Analyzer Ultra Centrifuge Mylab – chromatograph;
- Gel Documentation system;
- Laminar flow (Hepa guard) Dark field microscope SDC-310 with monitors and camera attachments;
- Lyophilizer- freeze dryer with pump & stabiliozer,
Thermal cycler PTC 200, DNA Engine RT-PCR Transblot biorad SD cell for western blotting.

**Services provided:**

**Diarrheal Diseases:** For Public Health
Isolation and identification of bacterial enteric pathogens causing outbreaks of diarrheal diseases including cholera; Bacterial quality testing of drinking water sources; Assessing contamination levels and chlorination levels in water sources; Monitoring of emergence of drug resistance among bacterial enteric pathogens;

**For Patient care**
Isolation and identification of bacterial enteric pathogens
Serotyping/genotyping of isolates
Testing of virulence of pathogens by PCR based identification of virulence genes
Testing of isolates for drug susceptibility

**Others**
Study on the presence and distribution of virulence genes among various environmental *Vibrio* isolates.

**Tuberculosis**
For Public health: Sputum microscopy for AFB; Isolation and identification of M. tuberculosis; (DST) of M. tuberculosis to monitor prevalence of MDR and XDR strains circulating in these islands.
For patient care: Direct microscopy, culture and DST results are being reported to the referral hospital.

**Vector Borne Diseases**
For Public Health: PCR and slide microscopy for detection of malarial parasites; Undertake outbreak investigations of suspected vector-borne diseases; Assessment of environmental risk and consequent risk of malaria; Assessing *Aedes* spp infestation for viral diseases (Chikungunya fever, Dengue fever) levels in terms of entomological indices, identify major breeding sources for targeting source reduction measures; Monitoring entomological parameters (infection, infectivity and transmission parameters) which reflect transmission dynamics and transmission intensity with respect to LF; Drawn up a collaborative research proposal for putting in place administration of DEC fortified salt programme for the elimination of diurnally sub periodic filariasis with emphasis on applied field research.

**Others:** Understand the role of vectors in transmission of vector borne diseases.
Demonstrating feasibility of community involvement for successful control of *Aedes* spp in view of controlling chikungunya and dengue outbreaks. Conducting awareness meet among the public.

**Virology Laboratory**
For Public Health: Investigation of outbreaks of viral diseases; Serological confirmation of viral etiology of outbreaks; Estimation of incidence/prevalence of respiratory syncytial virus infections, Rota viral diarrhea and Dengue. PCR based detection of viral infections and genotyping of viruses; Entomological investigation of viral outbreaks including vector dynamic studies.

**For Patient care:** Rapid detection and confirmation by IgM ELISA for dengue followed by furnishing reports to the concerned clinicians attached to referral hospitals.
**Others:** Attempts to isolate the virus for further investigations; Further studies on molecular characterization of the virus to track the origin of the virus and to check the changes genomic structure, which facilitates the rapid spread and different severe clinical manifestations. Developing animal models to understand clinico-pathological changes and conducting awareness among the public.

**Outbreak Investigations**
Detected the first reported outbreak of cholera in Andaman and Nicobar Islands, caused by the seventh pandemic strain of *V cholerae* Ogawa biotype El Tor. Subsequently outbreaks due to *V. cholerae* Inaba were also identified led to better understanding of the etiology and the transmission, adopting control measures.

Investigated the first ever upsurge of an outbreak of Dengue Fever in South Andaman.

**Human Resource Development:** PhD in Microbiology and Entomology; several workshops/seminars/symposia are also organized on various aspects of both communicable diseases including CME programmes.

**Major Achievements:**
Study of the transmission dynamics of diurnally sub periodic Wuchereira bancrofti transmitted by Ochleorotatus niveus in the Nancowry group of islands.

Active participation in the medical relief operations after the Asian Tsunami, initiation of Field Units at Car Nicobar and Nancowry Islands.

**Patented the Latex Agglutination Test**

**Diarrhoeal Diseases:** **Completed Projects:** Hospital based surveillance of childhood diarrhoeas in Port Blair. Screening of environmental samples for *Vibrio parahaemolyticus*. A unique haemolysin produced by environmental isolates of *V. parahaemolyticus*.

Survival ability of Shigellae in natural water samples

Cholera outbreak in Nancowry group of islands.

**Ongoing Projects:** Molecular epidemiology of shigellosis and of E. coli.

Transmission dynamics of subperiodic filariasis in Nancowry group of islands

Elimination of subperiodic filariasis in Nancowry by mass chemotherapy

**Completed Projects on TB:** Estimation of Annual Risk of Infection in Car Nicobar and Estimation of Annual Risk of Infection in Andaman Islands.

**On Lymphatic Filariasis/Entomological Studies**:
- Filariasis survey in Little Andaman;
- Filariasis survey in Teressa Island;
- Filariasis survey in Nancowry group of Islands;
- Aedes survey in Port Blair and South Andaman

**Expertise of Scientists:**

**Vijayachari, P.V.**, a clinician is specialized in Microbiology Parasitology and has contribution in the R&D of Fialria, Cholera.

**Dr. A.P.Sugunan**, a clinician is specialized in Internal Medicine and Epidemiology; has contribution in the R&D of Fialria, Cholera

**R. K. Sharma**, a Zoologist, is engaged in Determination of mycobacterial phylogeny on the basis of immunological relatedness of superoxide dismutases
M. S. Prakash, an epidemiologist and Sunita Singh, another scientist are working on Emergence of Vibrio cholerae O1 Inaba in Andaman Islands.

Zone 5

1. National Chemical Laboratory

NCL activities can be categorized into the following: Exploratory research and science, Applied research and technology; Consultancy and scientific services; Building and maintaining national resource centers; Education, training, dissemination and popularization; Contributions to scientific professions.

They have the Resource Centers as: world-class infrastructure to support the science & technology activities; sophisticated instruments, information infrastructure, workshop & glass blowing; Stimulated moving bed chromatography, Accelerated Solvent extractor, Parallel Synthesizer; Chemspeed; Catalyst Pilot Plant Center, Central Digital, National Collection of Industrial Microorganisms, Research Support Services, Center for Materials Characterization.

Available assay is: anti TB

Available expertise: Assay development, screening and data analysis. It has High throughput screening facility for drug development, radioactive counter, ORCA robot, Liquid handling system, Plate Reader, etc.

Scientific Expertise:

Dr. Dhiman Sarkar has expertise in Identifying novel targets, development of assays for High Throughput Screening to get lead molecules against tuberculosis and malaria; Enzymology, molecular parasitology and assay development for target based as well as whole cell based screening.


Dr. Shubhada Ratnakar Thengane- Biodiversity, chemodiversity, molecular characterization in medicinal plants, Molecular markers in diversity, Biodiversity, In vitro Secondary metabolite production, transfer of technology, Lab. Designing.

Dr. P. Poddar works on Scanning probe microscopy techniques, magnetization measurements, electrical & thermal transport measurements, synthesis of nanomaterials.

2. National Centre for Cell Sciences
The facilities available are: Experimental animal, FACS, Confocal Laser Scanning Microscope, Automatic DNA Sequence Analyzer, Computer centre, National repository for animal Cells.

**Scientific Expertise:**

In Leishmaniasis, **Dr. Bhaskar Saha** has one New Principle/Theory developed; has 30 international publications. Interested in Immuno-parasitology; Cell signaling etc. and the Current Projects are: Leishmania-macrophage interaction; Development and regulation of regulatory T cells in leishmaniasis and DC subsets in leishmaniasis and regulation of T cell response.

**Dr. Samit Chattopadhyay** works on Epigenetic regulation during HIV transcription Molecular mechanisms of DNA damage-repair

**Dr. M. S. Patole** has expertise in Cloning of house keeping enzymes gene from insects and Leishmania; identification of bacteria and studying microbial physiology. He is the Person in charge of animal cell culture repository at NCCS; in last 12 years they have supplied approximately 10,000 cultures to Scientists located in 115 Institutions in India.

**Dr. Y. Shouche** understanding the microbial community structure of some unique environmental sites using the 16S rRNA based culture independent approach. He has studied the mid gut flora of mosquito *Culex quinquefasciatus* and described a new species *Aeromonas culicicola* from it. Presently studying the role played by this species in the gut environment. He is analyzing Expressed Sequence Tags in the mid gut of malaria vector *Anopheles stephensi* as well as Gene regulation in mosquitoes in relation to development and host-parasite interaction.

**Dr. G. C. Mishra** works on the following areas: Widespread Occurrence of the P. falciparum Resistance Transporter (PFCRT) Gene Haplotype SVMNT in P. falciparum Malaria in India; TH-1 specific bystander co stimulation imparts resistance against MTb infection; Apoptosis of Th1-like cells in experimental tuberculosis; L. donovani infection of a susceptible host results in CD4 + T-cell apoptosis and decreased Th1 cytokine production; L. donovani infection of susceptible host results in apoptosis of Th1-like cells; rescue of anti-leishmanial CMI by providing Th1-specific bystander costimulation.

**Dr. D. Mitra** working on three different aspects related to the virus. The primary objective is to gain more understanding of the virus and its interaction with the host cell, which may lead to new antiviral strategies. also understanding the immune response to HIV in order to design novel vaccination strategies, towards generation of DNA vaccine . Finally, identification of anti- HIV activity in plant and marine bivalve extracts. Role of viral regulatory proteins Tat and Nef in HIV pathogenesis and differential gene expression studies in HIV-1 infected cells.

---

**3. National AIDS Research Institute**

Apart from Intra-mural research activity, the Institute has conducted 51 different research projects on Acquired Immunodeficiency Syndrome in last 10 years. Sixteen Scientists are working on Tropical Diseases.

**Product/Process:** An instrument for mental health needs survey among HIV infected individuals named **NARI-Mental Health Needs Scale [NMHNS]** can be used in clinic,
ICTC, ART centre and community settings. Using Principal Component Analysis (PCA) and Varimax Rotation methods the 99 items were reduced to 46 items. Needs of PLHAS in India must be addressed to ensure that they do not impact their mental health. The scale shows a high reliability score (Cronbach alpha- 0.95). Four point Likert scale is used to record the responses. It takes 10 - 15 minutes to administer the tool at any health care setting or ART centre in India to estimate mean scores indicative of mental health needs of HIV infected individuals in India for the patient management team to plan and implement appropriate intervention strategies to improve mental health of people living with HIV infection in India.

Adolescent Sexual and Reproductive Health Education module- A curriculum for 9th to 12th standard school going adolescents in India. NARI developed presentations in consultations with doctors, social scientists and psychologists, shared with parents, guardians and teachers in Pune through several workshops. Based on the concerns raised by parents, the module for urban and rural site Pune was finalized. The module was used both in setting. It is a comprehensive module dealing with life skills, growth, body image, nutrition, interpersonal relationship, and reproductive health, RTI, STI and HIV for schools/junior colleges, can be used to educate school going adolescents. In addition to teachers, a non-teaching [Parents/ Mothers/ VLW] personnel be trained to impart education on ARSH by using this module.

Scientific Achievements

Cohort of HIV Seronegative Persons: established a cohort of patients attending STD clinics and through their long term follow up collected very important information on the factors that are associated with the spread of HIV, the rate at which HIV infection is increasing in this group (Incidence) and role of associated disease.

NARI conducted India’s first HIV vaccine trial. Phase one trial of HIV-1 subtype C based Adeno Associated Virus vector based vaccine will be completed very soon. State of the art facilities have been established to carry out vaccine trials in the future also.

Clinical Trial Unit: established a capacity to carry out clinical trials for anti-HIV drugs under international regulatory requirements. The center also provides treatment to HIV infected persons through National ARV roll out programme.

Studies on Women Controlled Methods for Preventions of HIV: A facility to conduct studies in vaginal microbicides and female condom has been established. A number of Phase I and II studies, like indigenous preparation, Praneem, have been carried out.

Training Activities: Training programs and workshops on various aspects of HIV infection for doctors, laboratory & health care workers & counselors from different states of India. Training of Trainers’ for counseling as a part of NACO programme. Workshops for maintaining quality control in laboratory testing of HIV diagnosis. Short-term training for post-graduate students in medicine and life sciences on request & Summer training for M.Sc students from various Universities in the country.

Outreach Activities: to create awareness on HIV and AIDS it has done: Radio talks; Exhibitions; Group meetings; Networking with NGO’s and resource building; Talks/ Awareness programmes for students, women, industrial workers and slum dwellers; publication of books, information pamphlets, posters.

Chair for Technical Resource Group on Research and Development constituted by NACO: The TRG has brought out a joint consultative document on priorities for R & D
on HIV and AIDS and document on recommendations for prophylaxis against Opportunistic Infections and post-exposure prophylaxis.

**National reference Center for HIV testing:** NARI is one of the 12 National Reference Centers identified by NACO for HIV testing in the country and implementing the National External Quality Assurance program for Maharashtra, Goa and Gujarat.

### Table 2: Clinical Trials conducted in NARI in last 10 years

<table>
<thead>
<tr>
<th>Title of the trial</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety study of Praneem polyherbal vaginal tablet use among HIV-uninfected women in Pune, India (NACO)</td>
<td>Phase I 2003-2004</td>
</tr>
<tr>
<td>Safety study of 0.5% PRO 2000 vaginal Gel among HIV un-infected women in Pune, India (HPTN-047)</td>
<td>Phase I 2003-2004</td>
</tr>
<tr>
<td>Safety study of Praneem polyherbal vaginal tablet use among HIV-uninfected FSWs in Pune, India (NACO)</td>
<td>Phase I 2004-2005</td>
</tr>
<tr>
<td>Randomized, Placebo-Controlled, Double-Blind Dose-Escalation Trial to Evaluate the Safety and Immunogenicity of tgAAC09, a gag-PR-DRT AAV HIV Vaccine (IAVI)</td>
<td>Phase I 2004-2006</td>
</tr>
<tr>
<td>Safety study of Praneem polyherbal vaginal tablet use among hundred HIV-uninfected women in Pune, India (NACO)</td>
<td>Phase II 2005-2006</td>
</tr>
<tr>
<td>Expanded Safety and Acceptability Study of the Vaginal Microbicide 1% Tenofovir Gel (HPTN 059)</td>
<td>Phase II 2006-2007</td>
</tr>
<tr>
<td>Prospective, Randomized, Open Label Evaluation of The Efficacy of Once Daily Protease Inhibitor and Once-Daily Non-Nucleoside Reverse Transcriptase Inhibitor-Containing Therapy Combinations for Initial Treatment of HIV-1 Infected Individuals. (ACTG-5175)</td>
<td>Phase IV 2005-2010</td>
</tr>
<tr>
<td>A Strategy Study of Immediate Versus Deferred Initiation of Antiretroviral Therapy for AIDS Disease-Free Survival in HIV-Infected Persons Treated for Tuberculosis with CD4 &lt; 250 Cells/mm3 (ACTG-5221)</td>
<td>2009-2010</td>
</tr>
<tr>
<td>Randomized Trial to Evaluate the Effectiveness of Antiretroviral Therapy plus HIV Primary Care versus HIV Primary Care Alone to Prevent the Sexual Transmission of HIV-1 in Sero-discordant Couples (HPTN-052)</td>
<td>Phase III 2005-Ongoing</td>
</tr>
<tr>
<td>Nevirapine versus Efavirenz-based highly active antiretroviral therapy regimens in antiretroviral-naive patients with HIV and Tuberculosis infection in India.(NACO)</td>
<td>2007-Ongoing</td>
</tr>
<tr>
<td>ADVAX [DNA] and TBC-M4 [MVA] Prime Boost HIV-1 subtype C vaccine trial 2008-2010 (IAVI)</td>
<td>Phase I 2008-Ongoing</td>
</tr>
</tbody>
</table>

**Scientific Expertise:**

**Dr. R.S. Paranjape** had the field of research on the field of Filariasis Immunology and Tuberculosis Immunology earlier in other Institute. In NARI, he had established Serology and Immunology laboratories in the new premises of the Institute; also initiated a programme of Immunological studies.

**Dr. Sanjay Mehendale** works on Epidemiology of viral diseases like: Japanese encephalitis; Dengue fever; Hepatitis viruses; Measles and Outbreak investigation

**Dr. Arun Risbud** works on Epidemic investigation of viral disease outbreaks, serological surveys, JE vaccine trial; Sexually Transmitted Infection diagnostics,
Opportunistic infections, HIV testing, implementation of External Quality Assessment Scheme for HIV testing etc.

**Dr. Nita Mawar studies** Social and behavioral aspects of HIV AIDS in groups with risky behaviors eg Jail inmates, drug users Sexworkers, STD patients, general population like the tribal rural and urban population women youth and the HIV infected patients attending the clinic.

Organizing training workshops at NARI: Methods and Issues, research methods in social and behavioral research; Issues in social and bio-medical research for Participants of 34th Immunological Conference at Pune; ICMR-NIH-NARI: Ethical issues in Bio-medical research Western Region; NACO: Training counselors at VCTC, PMTCT, ART centers and ICTC.

**Dr. Srikanth Tripathy** HIV ART Clinical Trials, HIV-TB studies, Molecular virology studies.

**Dr. Raman Gangakhedkar is** Working on HIV/AIDS.

**Dr. Seema Sahay** studies on Willingness to participate in HIV vaccine trial. This was a clinic based study and sub-study of Indo-US collaborative study HVTN, funded by NIH; also done Community preparedness for phase-I HIV vaccine trial in India; Psychosocial needs and stressors among HIV infected people with reference to partner support issues.

**Dr. Manisha Ghatè** Investigator for Indo-US projects namely PAVE/ HIVNET & RO1 studies; clinical progression of HIV infected individuals in Pune ; HIV incidence and Participant Retention study; first HIV Vaccine trial study in India; Indo-US collaborative HIV Dementia and Peripheral Neuropathy study; NeuroAIDS study; Nodal Officer for NACO free ART roll out programme at NARI ; Immunological and virological characterization of early HIV infection; Training Coordinator for Medical Officer Training Programme by NACO; Indo US collaborative Clinical Trials Unit grant .

**Dr. Sampada Dhayarkar** has expertise in Epidemiology.

**Dr. Smita Kulkarni works on** HIV Virology and Molecular Virology: Establishment of repository of over 200 HIV-1 and HIV-2 well characterized Indian strains; Isolates made available to researchers worldwide; Characterization of Indian HIV 1 and HIV-2 strains; First report of HIV-2 isolation from India; Isolation and characterization of HIV-1 B/C recombinants; HIV-1 strains from recently infected individuals used for vaccine development and characterization; Development of in vitro anti-HIV testing system for indigenously developed drugs; Testing of over 200 herbal and synthetic preparations for anti-HIV activity;. HIV Immunology;

**Dr. Arti Mane** works in Microbiology.

**Dr. Ashwini Shete is** in immunology department is involved in mice experiments for testing Immunogenecity of Vaccinia based HIV-1 C gag vaccine ; Also, experienced in performing ELISPOT assays, Lympho- proliferative assays, flow cytometric assays, ELISA, Protein array system etc. Has worked on the project involving Phase I HIV Vaccine Clinical Trial. Associated with setting up of a vaccine trial laboratory, planning and performing experiments according to GCLP and GCP guidelines, involved in performing quality assurance and quality control and responsible for overall supervision of laboratory work.

**Dr. Vijay Nema** is interested in new drug discovery and vaccine development against M. tuberculosis; Rational anti-infective drug discovery and screening (MIC and IC50 determination); Lead a team consisting of two research trainees in infectious disease
department. Characterized a large number of environmental and clinical isolates of V. cholerae

**Dr. J. Bhattacharya** working on: Research on HIV-1 entry, neutralization; for vaccine target discovery as neutralizing antibodies to HIV-1 envelope protein; research on dissecting mechanism of viral envelope trafficking and assembly; design and develop rapid and cost effective HIV diagnostics from dried blood sopt (dbs) and improved viral load detection using real time PCR platform.

**4. National Institute of Virology**

Name of the Tropical Diseases handled are: J E, Dengue, Viral Gastroenteritis, etc. Thirty Five Scientists are working on Tropical Diseases. It has the **Infrastructure** of:

- Virus and cell repositories, Bank of clinical specimens, Biosafety Level-2 and 3 Facility Labs, BSL-4 under construction, Laboratory animal house, Non-human Primate Facility, Electron Microscope, Confocal Microscope, DNA Sequencers, Fluorescein Activated Cell Sorters, Thermal Cyclers, Real Time PCR Machines, Bioinformatics Facility, Liquid Nitrogen Plant, Walk-In- Cold rooms and Freezer rooms, Walk-In- Incubator, Microarray facility, Museum of Indian sand flies, Library oriented to virological sciences. It also has **Microbial Containment Complex (Pashan):**

**Services offered are:**
- Investigations of outbreaks and sporadic infections, Serological and molecular diagnosis of viral infections, Supply of viruses, cell lines and laboratory animals, Training to personnel from different scientific organizations, Two year MSc. Virology Course affiliated to University of Pune, India.

**25 each of new Products and Processes developed, few are related to TD**

**Diagnostics**
- i. ELISA based detection of IgM antibodies against JE, Dengue,
- ii. ELISA based detection of antigen from Rotaviruses,
- iii. Real Time PCR based diagnosis of Hepatitis B and Dengue virus infections

**Vaccine candidates**
- 1. Indigenous strains of J E viruses transferred to Bharat Biotech International Ltd. for vaccine development.
- 2. Hyperimmune goat colostrum and Egg yolk antibodies were prepared against rotaviruses for oral immunization against rotavirus diarrhea.

**Clinical Trials:** Post marketing study to evaluate the Safety and immunogenicity of a single dose of Japanese Encephalitis vaccine at Burdwan, West Bengal (completed)
- A prospective open label, uncontrolled, single-centre evaluation of viremia in healthy flavivirus serenegative adults after primary vaccination with JE SA14-14-2 live attenuated vaccine (completed).

**Scientific Expertise:**

**Dr. Cecilia Dayaraj: Field of specialization:** Monoclonal antibodies and its applications to virology. Molecular characterization of viruses-sequence analysis, phylogeny etc. Immunological profiles of HIV infection. Vaccine development using recombinant DNA technology.
Area of interests: Dengue and HIV; Dengue epidemiology in Pune.; Molecular evolution of dengue viruses in India; Role of Host/viral factors in dengue pathogenesis; Development of Dengue NS1 antigen and antibody detection kits based on recombinant NS1 protein and anti-NS1 monoclonal antibody which is being developed in the group; siRNA as an antiviral tool against dengue; the real time RT-PCR detects Dengue (all four serotypes) viral RNA in clinical samples during the early phase of infection, till 10 days post onset of symptoms.

Presently in collaboration with BigTech it is being developed as a Point-of-care diagnostic test.

She has evaluated several kits for dengue diagnosis. E.g NIV MAC-ELISA kit and indogenous real time RT-PCR assay.

Dr. A. C. Mishra does Extensive field tours for investigations of epidemics suspected of virus origin all over the country; epidemiology and Natural cycle of JE, Taxonomy, ecology and vector bionomics of haematophagous arthropods. Described Millardia kondana a new species. Also worked on cytology and serology of small mammals as tool for identification. Currently, involved full time for the development of Containment facilities at MCC, Pashan, Pune. This lab will be a unique laboratory and only lab of this kind in the country having biosafety level-3 facilities to work on pathogens of risk category-3.

Dr. M. M. Gore has expertise in Chimeric T helper B cell peptide vaccine against Japanese encephalitis virus. Polytope DNA vaccine against JE virus. Immunopathology of dengue and other flavivirus infections

Dr. G. N Sapkal studied in protein purification and Immunology techniques; Immunopathogenesis of viral diseases; Diagnostic Virology; Standardization of antigen capture ELISA for detection of JE virus from field caught mosquitoes.

Dr. S. D. Chitambar works on Hep A; diagnostic Virology; Molecular Virology; Immunology, Viral Vaccines.

Dr. V. Gopal Krishna has contributed in Emerging viral diseases; Tissue culture, quality control & viral diagnostics.

Dr. R.P. Deolankar has studied Nutraceuticals, Immunodietetics, Simple solutions to viral diseases, Functional foods.

Dr. Atanu Basu has work on Dengue 2 virus inhibits in vitro megakaryocytic colony formation and induces apoptosis in thrombopoietin-inducible megakaryocytic differentiation from cord blood CD34+ cells; Imaging the interaction between dengue 2 virus and human blood platelets using atomic force and electron microscopy.

Dr. P. George Jacob works on Bio-ecological studies on vectors of JE/WN and DEN viruses Studies on the bionomics of KFD ticks in Shimoga District of Karnataka; Field investigations of JE epidemic in Bankura district, West Bengal; Entomological and vertebrate host studies on JE/WN viruses in Kolar & Mandya districts of Karnataka; Studies on Aedes aegypti in relation to dengue virus infection in rural areas of Karnataka State.

Dr. C. G. Raut has worked on Disease surveillance programme and investigated several outbreaks of Buffalo-pox zoonosis, Dengue fever, and JE.

Mr. P.N. Yergolkar is interested in JE, DEN epidemics, isolation of JE, WN and DEN viruses from humans, vertebrate hosts and mosquitos’ vectors.
Dr. S.N. Ranadive works on Construction of cDNA libraries of viruses and Gene cloning and expression.

Dr. Pragya D. Yadav has done Molecular Virology, Containment Facilities; Work on the identification and expression of pathogen immunoresponsive genes in vector mosquito is highly appreciated by scientific community, and immunological technique.

Dr. Rashmi Singh works on Microarray techniques

Dr. P. S. Shah Studies RNAi; Development of rapid diagnostics test for arboviruses; JE virus pathogenesis; Dengue virus phylogeny; Establishment of persistently infected cell line with JE virulence.

5. Microbial Containment Complex

It has mandate of: To create centers of excellence for study of high-risk and novel viruses. Establishing National Virus Repository and Serum Bank; providing teaching and training programs on bio-safety and bio-containment. To establish rapid response team to investigate epidemics of viral origin.

Services are BSL II and III, monkey run, and BSL2 for proper upkeep of lab animals, High containment abs consists of Molecular Biology, Serology, Tissue culture, entomology, material. All the laboratory personnel are to be specially trained in handling pathogens and potentially lethal agents and are to be supervised by competent scientists who are experienced in working with these agents. It will make National standards setting & formation and specialized development.

The High Containment Bio-Safety laboratory is state-of-the-art biosafety Level – 3+ laboratories. It has been planned and designed as per Centre for Disease Control and Prevention, USA, guidelines. Database (including repositories) developed.

The virus strains available are being characterized at molecular level and basic atabase is being generated. Such data is an asset to any country.

Newer Initiatives Taken

National virus repositories, molecular diagnostic facilities like Microarray, are being established. Reagents and vaccine development for neglected but important disease are being taken-up on priority.

Scientific Expertise:

Dr. D. T. Maurya has worked on Medical Entomology, Molecular Virology, Epidemiology, Public Health & Containment Laboratory Facility ; Worked on the vector potential of mosquitoes to Dengue, Chikungunya and Japanese encephalitis viruses, particularly on the genetic and molecular aspects of vector competence ; Establishing biochemical techniques for detection of insecticide resistance in mosquito vectors in this country.

Dr. Vijay P Bondre works on Transmission Electron Microscopy, Molecular diagnosis of infectious viruses, genetics, epidemiology and pathogenesis of arboviruses.

Dr. A. Tripathi has work on Clinical findings and pro-inflammatory cytokines in dengue patients in Western India: A facility based study.
6. Indian Institute of Science Education and Research

The common instrumentation facility of Biology Department houses temperature controlled table top refrigerated centrifuges, a number of Biosafety II cabinets, fluorescent gel documentation and analysis systems, UV trans-illuminators and cross-linkers, DNA and protein speed-vac systems; inverted fluorescent microscope A stereomicroscope; will include temperature and CO2 regulated growth chambers for live cell imaging. A laser Total Internal Reflection Fluorescence unit with automated wavelength and critical angle switching for time lapse imaging is also being integrated with this system, chemi-bioluminiscence imager, multi-mode plate reader and double beam UV-VIS spectrophotometer. Few Centres of Excellence are going to come here.

Scientific Expertise:
K Saikrishnan works towards understanding the molecular basis of restriction and modification in bacteria.

The Chemistry Department equipped with: Cyclic Voltameter, HPLC-2, GS –MS, MALDI-TOF Mass Spectrometer, Peptide Synthesizer, Picosecond Life Time Measurements; FT-IR Spectrophotometer, ITC Microcalorimeter, Nd-YAG Laser.
Dr. S. Galande has identified involvement of a T-lineage-enriched host factor SATB1 during the early events in HIV-1 life cycle; functional interaction between SATB1 and PML oncoprotein regulates the chromatin loop architecture and transcription of the MHC class I locus.

7. University of Pune

Dept. of Zoology.
It has facilities such as Educational Multimedia Research Center, Science and Technology Park, ISRO cell.

Dept. of Biotechnology
Facilities and Major Equipments for teaching and research in Modern Biology and Biotechnology are namely, Animal and Plant Tissue culture facility, Molecular Biology and Genetic Engineering facility, state of the art common Instrumentation facility, excellent computer and network facility for the students and Library.
equipments: Atomic Absorption Spectrophotometer, CO2 Incubators, Deep Freezer, ELISA Reader, Fermenter, Gel Documentation System, HPLC-cum-Liquid chromatography system, Laminar Air flow hoods, Luminometer, Lyophilizer, Microinjection system With Inverted Microscope, Microscopes: Dissecting, Compound
& Fluorescence with Camera & Imaging system, PCR Thermal Cycle, Pulse Field Gel Electrophoresis Apparatus, Real time PCR, thermal cycler, Refrigerated High Speed Centrifuges, Speed Vac Concentrator, 2-D gel electrophoresis system, Ultracentrifuges, UV-Visible Double beam Spectrophotometers, UV Transilluminator,

**Molecular Immunology and Bioinformatics:** Prof. A.S. Kolaskar and his group in association with the scientists at NIV are developing peptide vaccines against JE virus. In the area of Bioinformatics, his group has developed world’s largest computerized information system on virus and its classification. Protein and peptide modeling are being carried out to develop drugs and vaccines. Molecular dynamics studies on large DNA using parallel computer in collaboration with C-DAC and PARAM computer are some of the highlights.

**Cell and Molecular Biology:** Prof. J. K. Pal and his group have been working on L. donovani which has provided insights in the manipulation of protein synthesis and thereby possible methods of controlling these parasites in vitro.

**D/O Zoology**

**Infrastructure and services:** All equipments and facilities pertaining to Biochemistry, Cell Biology, Tissue Culture and Molecular biology teaching and research are available. 3 scientists are engaged in Tropical Diseases R&D

**Dr. Kalpana Pai,** works on VL; She has personal Cell and Leishmania culture facilities.

**Drs. Dileep and Deepti Deobagkar** of Center of Advanced Studies works on Malria and dengue, handled one project in last 10 years. The areas are: Dengue-2-virus-interacting polypeptides involved in mosquito cell infection; Morphometric and allozyme variation in the mosquito Culex tritaeniorhynchus populations from India; Prediction of B cell and T cell epitopes of DBLa domain in *P. falciparum* Malaria Vaccine Candidate Var Gene. Prohibitin confers Dengue-2 virus refractivity in *Aedes aegypti.*

They developed one **new process** as: Prediction and Mapping antigenic epitopes of pfEMP1 Process for development of epidemiological studies Understanding Molecular basis of prohibitin action and vectoral competence.

And Sequences deposited in GenBank – Acc. numbers: DQ 364441- 364452, DQ 408208- 408223, EF143927- EF143965

8. **King Edward Memorial Hospital and Seth Gordhandas Sunderdas Medical College**

Training Courses offered are:
- Course on HIV/AIDS: Certificate course in Medical Education Technology Part I & Part II
- Leadership development for HIV/AIDS prevention
- Training workshop for HIV/AIDS for physicians
- Training course in Epidemiology and research methodology
- Certificate course in Good Clinical Laboratory Practices.
Skin, STD and Leprosy Department offers services as: STI Clinic - daily; Patients with sexually transmitted infections are treated accordingly and tested for HIV and syphilis and treated accordingly. 
Clinical meeting held of Indian association of Dermatologists, Venereologists and Leprologists, Maharashtra State Branch at K.E.M. Hospital in every June. In this meeting fully worked up interesting Cases and spot cases are presented by post graduate students. 
D/o Microbiology had the following highlights in 2009:

Patient care:
- The renovated molecular diagnostic laboratory was sanctioned and inaugurated with conventional and Real Time PCR setup. Currently, routine HIV viral load testing on a charge of Rs 2000 is done. Shortly, TB diagnosis and MRSA detection will be added to the portfolio.
- RDT for Malaria antigen has been made available.
- Biological indicators have been supplied for validation of sterilizers.
- Bacteriology requisition forms have been revised to aid antimicrobial policy.
- Under the sentinel surveillance programme, more than 7000 samples were tested for HIV antibodies using the new technique of dried blood spot.

Research:
- HIV subtypes in serodiscordant couples were successfully completed in collaboration with NARI, Pune.
- Real time PCR for the detection and drug susceptibility testing of MDRTB, has been standardized under the collaborative project with the Department of Immunology and Laboratory Medicine, BARC.

Education and Training programmes conducted are:
- The department successfully conducted an awareness programme on “Hand Hygiene” on 5th May, International Hand Hygiene Day as part of the activity envisaged by the Infection Control Committee.
- The practical class has been renovated to accommodate 60 students at a time, with two separate demonstration rooms as per the stipulations of MCIHIV
- Training of laboratory technicians on collection of dried blood spot for implementation of HIV PCR for early infant diagnosis (EID).
- “EQAS in HIV” – Training workshop for Laboratory technicians in collaboration with MDACS.
- STI/RTI training workshop for laboratory technicians in collaboration with MDACS.
- Postgraduate; M.D (Microbiology); Ph. D program.

Ongoing projects / dissertations:
- Real time PCR for the detection and DST of MDRTB in collaboration with Laboratory Medicine, BARC.
- Study of HIV viral load in asymptomatic treatment naïve individuals with low CD4 counts.
- Multi-drug resistant organisms causing VAP- risk factors, and outcome.
- Comparative study of PBS, Optimal and PCR for the diagnosis of malaria.
- CRBSI- incidence, risk factors, aetiology and outcome.

Completed projects/ dissertations:
- Time to sputum conversion and sterility in smear positive pulmonary TB patients following commencement of treatment under DOTS.
- MODS assay for *Mtb*- Its utility in resource poor settings.
- Study of cutaneous mycoses in HIV positive and HIV negative individuals
- Spectrum of parasitic diarrhea in seropositive patients with special reference to staining techniques for microsporidia.
- ‘To determine if repeated exposure to an antimicrobial agent leads to the development of drug resistance in bacteria
- ‘Utility of a rapid Immunochromatography test (Paramax-3) for the diagnosis of malarial fever.’

**KEM Hospital, Pune**

Superspeciality Services in Pulmonary Unit OPD offers: Tuberculin tests; counsels patients suffering from TB.

**Research/ Academics:** Each year, two students are inducted for the post-graduate Diploma in Tubercular Diseases under the College of Physicians and Surgeons with the syllabus covering tubercular and non-tubercular chest diseases. Chest related procedures viz., bronchoscopy, intercostal drainage, pleural tapping and biopsy, Tru-Cut biopsy of lung, medical thoracoscopy and PFT are taught.

**Medical Social Work department** provides HIV Counseling as this important, distressing dimension has been done by the MSWs since the last few years. HIV infected patients and, where permitted by the patient, the spouse and other family members need to be counseled. Many problems inherent in the situation need to be worked out, like: the acceptance of the diagnosis, ventilation, helping the patient handle his/her despair and face the future with courage. The MSW is non-judgmental, supportive and maintains confidentiality.

**Workshops:** The Department has conducted a series of workshops on HIV awareness, attitudes and Bio-safety precautions for the KEM Hospital staff to: Sensitize them to the HIV infected patient; To raise levels of awareness about HIV among them; also to motivate them to practice universal bio-safety precautions.

KEM Hospital has The **Vadu Rural Health Program (VRHP)**, which is an unique experiment in public-private partnership between a NGO (KEM Hospital, Pune), the District Government (Zillah Parishad, Pune) and the State (Health Services), Government of Maharashtra. The headquarter of the program is Shirdi Sai Baba Rural Hospital.

VRHP has the **Research** portfolio which spans community based epidemiological, biomedical, intervention studies as well as operations and health systems research. Vadu has recently taken up vaccine trials and other clinical trials; the research agenda prioritizes existing needs of public health importance but also addresses research needs for newly emerging public health issues. It has ongoing projects as:

a) **Indepth-Datasharing (iSHARE):** Vadu-India, Wosera-Papua New Guinea, Kanchanaburi-Thailand, Magu-Tanzania, Dikgale-South Africa and Agincourt-South Africa. All these sites are the members of Indepth-Network. Data Sharing group in Asia, Oceania and Africa will share a common interest of sharing the demographic surveillance
data for the use by researchers all over the globe. At the same time all sites are committed to share the data for use by anyone from anywhere in the world.

Old Website: www.indepth-datasharing.org and the New Website (Under Construction): www.indepth-ishare.org

b) **Influenza Study**: Population based surveillance of seasonal Influenza in rural population of Western India [Pune district]. Over 500 nasal and oropharyngial samples of secretions from people suffering from mild to severe influenza will be collected per year for three years. Study aims at looking at the incidence, severity of cases and the strains of virus involved. To increase the sensitivity of surveillance system co-operation from private practitioners as well as pharmacists will be sought. Sponsors: CDC Atlanta. www.idbi-india.org

c) **IMVAC** - the Imperial College, London, VRHP, a Div of KEM Hospital, Pune and Chest Research Foundation, Pune joined hands to conduct a two year study on COPD in the Vadu area coverings a population of about 78000 in the 22 villages of the VRHP area.

d) **HIV-Ca Cervix Prevention Research Program**: A Consortium of Vanderbilt University, ICMR, NARI, JN Medical College- Belgaum and VRHP is conducting this multi-centric study regarding association of HIV-Ca Cervix and the alternatives to diagnosing Ca Cervix early in resource constrained settings. This study would involve 100 subjects from VRHP, 300 from Sassoon Hospital and 300 more from the JN Medical College. The multicentre approach would enable the study to have more external validity which is a first of its kind study.

**Vadu Outreach program** has the routine activities like: National AIDS Control Program; National Anti Malaria Program; National Revised Tuberculosis Control Program (http://www.tbcindia.org); National Leprosy Elimination Program.

Additionally, the Vadu Program also implements other special health programs like Filariasis Control Program, National Epidemic Control Program which includes Surveillance of 7 communicable diseases, etc. Vadu research program has the study on risk factors of Acute Respiratory Infections in children, funded by WHO, focuses primarily on hand washing behavior and indoor air pollution.

**KEM Hospital Research Centre, Pune**
**The Microbiology Department** does diagnostics work & research also; and the laboratory is equipped with:- Centrifuges, Laminar air flow, Incubators/CO2 incubator, Axsym, Elisa-reader, Bact Alert- 240, MB-Bact-240, Vitek-2 Compact, mini-API. Major Project under **Pediatrics Department** is Meningococcal GSK Project. **D/o Gynecology** works with "Prayas" on a project which deals with prevention of transmission of HIV from mother to child during pregnancy. **D/o Biochemistry** does Detection of M. tuberculosis by PCR technique. **D/o Hematology** has done research project on: Study of the hematological parameters in persons infected with HIV, including Bone marrow studies wherever possible.
It had completed the project on: To assess immediate needs of HIV patients, women and men, in rural Maharashtra, India- A rapid study (2 months)

9. National Institute of Immunohaematology

Institute conducting basic and applied research, providing reference services (for routine and specialized tests) to needy patients and offering training especially in blood banking methodology and several blood bank technicians and medical officers and molecular hematology thus ultimately helping the society in different ways.

Facilities are: Computer Section, Animal House, Microscopes, RTPCR, DNA Sequencer, NEphelometer, ELISPOT Reader etc.

Scientific Expertise:
Dr. K. Ghosh has work on Deep venous thrombosis associated with antiphospholipid antibodies following tuberculosis lymphadenitis in a predisposed patient

Dr. R. B. Colah works on Hemoglobinopathies, Red Cell Enzymopathies Molecular Genetics, and Prenatal Diagnosis

Dr. K. VAsantha works on Blood Group Serology, Molecular Immunohaematology, Population Genetics

Dr. Manisha R. Madkaikar engaged in service activity of Diagnosis of selected primary immunodeficiency disorders

Dr. U. Shankarkumar studied Immunology, Molecular Immunogenetics, Studies in Immunological Mechanisms of antigen presentation, Population Diversity of HLA, Functional Genomics in selected diseases, Immuno-modulation and Vaccines design; Specific Human Leukocyte antigen alleles associated with HIV-1 infection in Indian population. Serum Beta 2 microglobulin as a prognostic marker for HIV disease.

Dr. A. Pawar has work on Specific Human Leukocyte antigen alleles associated with HIV-1 infection in Indian population. Serum Beta 2 microglobulin as a prognostic marker for HIV disease. Herbal preparation for HIV treatment, Evaluation of Receptol for HIV treatment, She has contribution in the service activities on HIV, HBV, HCV testing by Rapid ELISA and Western Blot assay; CD4 and CD8 counts; viral load testing; EQAS program for ICTC and SRLs as per NACO directions; Conducting periodical training of HIV testing for Blood bank and ICTC technicians

Dr. S. D. Shetty is working on Studies on the effect of dengue viruses on haematopoietic stem cell differentiation and haemostatic properties of vascular endothelial cells in vitro.

10. Enterovirus Research Centre

Aims: Apart from other enterovirus work, acute gastroenteritis caused by enteric viruses such as Rotavirus, Norovirus and enteroviruses are worth mentioning.
Two Project(s) handled in the Institute on Rotaviruses in last 10 years.
Two Scientists working on Tropical Diseases. Both projects were epidemiological studies on acute gastroenteritis in children and successfully completed. Those are: Hospital based surveillance for rotavirus disease and strains. Rotavirus strain characterization and genotyping was carried out to understand rotavirus strains dynamics. The studies would help in evaluating rotavirus vaccine performance. The more recent project was with the support of ICMR/CDC as a network project.

Infrastructure and services:
Bio-safety level 2 Virology Laboratory, Animal cell culture facility, Molecular diagnostics by PCR, real time PCR, Sequencing. ELISA, Fluorescence microscopy and Flow cytometry, Biotechnology and Biochemistry facility.

Major achievements: Reported New Enterovirus 71 genotype (genotype D) from India.
Dr. J.M. Deshpande worked on Delayed hypersensitivity eliciting lipoprotein antigen of mycobacterium tuberculosis H37Rv.

11. Advanced Centre for Treatment, Research and Education in Cancer

The Institute is engaged solely in Basic and clinical cancer research. It has all the required facilities for doing so. Like: a room fitted with a biosafety hood, shaker-incubators for bacterial work; collection and processing of tissue specimens for research work at ACTREC, has liquid nitrogen storage container, centrifuges. In vivo animal imaging system, Hand-held vibration monitor, Conductivity meter, Calibration weights for balance calibration, and Refrigerated tabletop centrifuge, Variable bandwidth spectrophotometer and Nanodrop spectrophotometer. Flow Cytometry, MS, Laser confocal microscope and experimental animal facility are also available.

Only one scientist has worked in the area of tropical disease as:

Dr. Robin Mukhopadhyaya has done: The HIV seropositivity by Western Blot kit, licensed to and manufactured by J. Mitra & Co., New Delhi, since 2002: first indigenous sero-diagnostic system marketed. He has expertise in: isolation, propagation and culture of HIV from Indian patients for the first time. Following the initial foray in HIV sub type incidence enumeration, profiling of mother-child transmission of HIV and HHV-6 in untreated HIV+ve mothers (before the advent of anti-retroviral therapy in India) and a whole virus purified lysate derived immuno-blot kit development,. They are developing an Indian (HIV-2) isolate-based lentiviral vector for gene transfer. Complete nucleotide sequence of the said CD4 independent isolate was deduced and the annotated (GenBank #DQ307022). This is the first complete sequence information of an HIV-2 isolate reported from India/Asia. A first-generation prototype 5 plasmid basic vector and a second-generation format of the same now has been obtained by imparting self-inactivating configurations and the third generation vector construction is on way. The lenti-vector developed is also to be used for siRNA delivery.
12. Tata Institute of Fundamental Research

It has the following common facilities like: Computer center, Central workshop, Technical services, Scientific facilities, Information System development, Scientific information resource centre TIFR has the FTNMR, Low temperature facility, Spectroscopy etc.

*It organizes Teacher Researcher Interaction Program every year.*

Only two scientists are involved in the desired area from **D/O Biological Sciences**. The department conducts MSc, PhD and integrated PhDs.

**Meetings/conferences** organized are: Proteomics and Genomics Workshop (8-10 November 2010)

XXXVI Mahabaleshwar Seminar (January 2011)

Indo-US Conference on Infectious Diseases (5-8 January 2010),

Young Explorers in Indian Biology.

**Scientific expertise** is as follows:

**Prof. Gotam K. Jarori** investigating some of the proteins from *P. falciparum* to understand basic parasite biology and to identify novel drug and vaccine targets against malaria. One of the proteins is 'enolase', a glycolytic enzyme which shows that this protein is present on cell surface, nucleus, cytosol and associated with food vacuole and cytoskeletal structures. They are focused on understanding the novel biological functions that enolase may have in parasite nucleus, food vacuole and cell membrane.

**Prof. Shobhona Sharma** investigating several aspects of the biology of the malarial parasite. Immunity to malaria develops slowly after repeated attacks, and manifests itself mainly in the adults. She aims to molecularly dissect out the protective responses present in the immune adults residing in endemic areas of Orissa. Recent analysis of data from a less endemic area (Mumbai city) has suggested the presence of age-dependent sexual dimorphism in clinical susceptibility to the disease. She also is investigating on the glucose utilization by the parasite and on the membrane properties of parasite-infected red blood cells. The latter is examined in single red cells using a combination of laser optical tweezer, flow cell and fluorescence microscopy.

13. Indian Institute of Technology Bombay

**Educational Program is:** Ph.D, MSc - Ph.D (BT), M.Tech (BME), M.Sc (BT), Institute Electives and Departmental Courses.

**Work on tropical diseases is carried out only in Department of Biosciences and Bioengineering** where strong infrastructure and a unique interdisciplinary, environment contribute towards the goal of creating a department of excellence in Biotechnology and Biomedical Engineering. The **M.Tech** program is unique in that it provides an entry point for medical doctors (MBBS) to work together with engineering students and obtain an **engineering degree**.

**Facilities** at the department are: Microscopy, Computational facility, Fermentation, Tissue culture (The Biosafety Level 1 consist of clean rooms with laminar flow hoods,
CO2 incubators, centrifuges and microscopes. The BSL2 facility; a biosafety cabinet, incubator and centrifuge. National biosafety procedures are followed in all tissue culture facilities and laboratories at the Biodepartment), radioactivity facility etc.

**Equipment**: HPLC, FPLC, High speed and ultra-centrifuges, Centrifugal lyophilizers, Spectrophotometers, Spectrofluorimeter, CD Spectrometer, Spectropolarimeter, Langmuir Blodgett trough, Capillary surfactometer, Captive bubble surfactometer & Contact angle meter, Concentric cylinder viscometer, Automated hematology & coagulation analyzer etc.

Only two faculties are involved in the desired field:

**Prof. Rinti Banerjee** is involved in Evaluation of antitubercular drug insertion into preformed dipalmitoylphosphatidylcholine monolayers. Colloids & Surfaces B: Biointerfaces; Development of antitubercular drug loaded surfactants for aerosol therapy, Antitubercular drug loaded surfactants as inhalable drug delivery system for pulmonary tuberculosis, Lung surfactant dysfunction in tuberculosis: effect of mycobacterial tubercular lipids on dipalmitoylphosphatidylcholine surface activity. Colloids Surfaces B; Biointerfaces 45.

**Dr. Swati Patankar** works on Transcription regulation in the malaria parasite *P. falciparum*, Bioinformatics analysis of *P. falciparum* genome sequence to uncover candidate noncoding RNAs, Screening natural product libraries for novel anti-malarial agents, Choice of translation initiation sites in *P. falciparum*.

14. **Mahatma Gandhi Institute of Medical Sciences**

**Courses offered are**: It has 2 years rural placement after PG, PG internship I rural posting, ROME as reorientation of Medical Education; Social Services camp introduction to villages.

Bioinformatics Centre by DBT has made: Databases on Filariasis and TB cases (Adults and Children) across the clinical spectrum: Centre has Developed MycoProtease-DB a database of M.tb and NTM proteases. MGIMS-JBTDCR Health Update – Web for current awareness on Emerging Infectious Diseases and Life Style Health Problems (Web: http://www.jbtcrc.org/Health-Update/). It also provides information on Medical Tourism which covers provision of cost effective medical services along with information on medical centres combining with tourism and Traveler's Health is related to travel health tips, immunization etc before traveling abroad.


The Centre has Jamnalal Bajaj Tropical Disease Research Centre which does:
the immunodiagnostics for Filariasis and TB using in house developed diagnostic tests ‘SEVA FILA CHEK and SEVA TB ELISA for suspected cases of patients from Kasturba Hospital and other patients referred from endemic areas. Biochemistry and Microbiology are involved in ELISA assays and culture testing techniques. Community Medicine, Medicine, Surgery, Orthopaedics, Pediatrics, Skin & V D, Obstetrics & Gynaecology departments are involved in using Filaria and Tuberculosis test systems in diagnosis and clinical management of patients.


Inhibition of M. tuberculosis secretory serine protease, blocks bacterial multiplication both in axenic culture and in human macrophages. Upadhye V, Majumdar A, Gomashe A, Joshi D, Gangane N, Thamke D, Mendiratta DK and Harinath BC.


Detection of circulating free and immune complexed antigen in pulmonary tuberculosis using cocktail of antibodies to Mtb excretory secretory antigens by Peroxidase enzyme immunoassay. Majumdar A, Kamble PD, Harinath BC.

Assay for circulating Tubercular Antigen level by Sandwich ELISA using cocktail of Affinity Purified Antibodies to ES-31, ES-43, EST-6 Antigens of Diagnostic Interest, in Pulmonary & Lymphnode TB and HIV-TB Coinfection.” Inhibition of MTb secretory serine protease, blocks bacterial multiplication both in axenic culture and in human macrophages.

15. International Institute for Population Sciences

The teaching programme of the institute offers Diploma in Population Studies, Master of Population Studies, M. Phil. and Ph.D. in Population Studies. The MPS teaching is conducted both as regular course and through correspondence. The Institute is also engaged in short-term training of in-service professionals from India and neighboring countries, which are of one- to three-week duration. Diploma in Health Promotion Education (DHPE), Short Term Courses; IIPS-JHU Course on FPRH; and M.A./M.Sc Programme in Population Studies.
Research: Apart from the teaching activities, it also conducts a large number of research projects on various aspects of population, undertakes evaluative studies and large-scale surveys. Emphasis is given on studies related to inter-relationship of various social and economic variables of the components of population change such as Fertility, Mortality and Migration.

Consultative Services is provided and undertakes special studies on problems related to population at the request of the Government, the United Nations and other specialized agencies. It has well organized Documentation facilities.

Department of Public Health & Mortality Studies has two faculties working on: Prof. Subrata Lahiri’s work area is Demographic & Socio-economic Correlates of Knowledge and Awareness about HIV/AIDS. Worked at Mumbai as a Consultant to the East West Center during May to August 1995 to write a research monograph on ‘Awareness and Knowledge on AIDS among Indian Women based on the NFHS I, 1992-93 Survey data’ in collaboration with the EWC, Honolulu, Hawaii, U.S.A. Dr. Usha Ram has interest in Public Health, Health and Gender Issues among adolescents and youth, Woman Empowerment Issues, Population Aging, Population Projections.

16. Indian Institute of Science

The Department of Biochemistry is well equipped with Spectrophotometers, Ultracentrifuges, Fluorimeter, High Speed Centrifuges, FPLC, Scintillation Counter, Lyophiliser, DNA and Protein Sequencing Facilities, DNA Microarray, Gamma Counter, Circular Dichroism Spectrophotometer, Animal House, Green House, Computing, cryogenic, nano electronic centre, science information and NMR facilities are available.

Scientific Expertise:
Prof. K. Muniyappa works on mechanistic aspects of recombination and to elucidate the basis for inefficient allele exchange in the TB bacillus, molecular and structural approaches are being used to isolate the genes, overexpress proteins and study their biochemical functions; Comparative genomics to understand the phylogenetic relationship between pathogenic and non-pathogenic species of mycobacteria.

Prof. H.S. Savithri works on Structure and function of viral proteins; Cloning, expression, purification, crystallization and preliminary X-ray diffraction analysis of universal stress protein F (YnaF) from Salmonella typhi murium.

Prof. Ram Rajasekharan works on Functional characterization of a phospholipase C activity of Rv3487c and its localization to cell wall in Mycobacterium tuberculosis.

Prof. P.N. Rangarajan identified a number of genes whose expression is altered in mouse brain during infection by neurotropic viruses such as Japanese encephalitis virus (JEV) and rabies virus. Recently, one of the JEV-inducible genes was shown to encode a novel nuclear noncoding RNA named VINC/NEAT1/epsilon RNA which is essential for the formation of nuclear paraspeckles. Identification and characterization of all the enzymes of the heme biosynthetic pathway of the malarial parasite. In addition, we
demonstrated that curcumin, a component of turmeric, in combination with artemisinin can be a potent antimalarial.

Prof. Dipankar Nandi has characterized the 20S proteasome from *M. smegmatis*, using the fluorogenic chymotryptic substrate, Suc-LLVY-AMC; discovered a ~ 90 kDa protein that cleaves Suc-LLVY-AMC in both *M. smegmatis* and *E. coli*. Identified Peptidase N to be responsible for aminopeptidase activities, biochemically characterized PepN from *S. typhimurium* and are studying its role during infection in mice. They aim to identify and characterize additional enzymes involved in cytosolic protein degradation and understand their role in microbial physiology.

Prof. Utpal S. Tatu works on Chaperones in malarial parasite: The rationale; Role of ER chaperones in protein folding: Proteomic and Bioinformatic activities etc.

Dr. R. Manjunath works on immune responses against JE virus. ; The mechanisms with which an ultimate balance between cell mediated and humoral immune responses against JEV is established are being pursued.

Dr. Ganesh Nagaraju has work on *M. tuberculosis* cells are exposed to DNA damaging agents such as reactive oxygen intermediates and reactive nitrogen intermediates generated by host macrophages. They are interested to study various helicases and other DNA repair/recombination proteins from *MTb* through genetic, biochemical and biophysical approach. Understanding the role of these proteins could provide new insights into pathogenesis of *MTb* in humans.

Dr. P. Ajitkumar has studied Mechanism of Cell Division in MTb. The promoters that regulate expression of *ftsZ*, *ftsQ*, *ftsW*, and *ftsE* genes have been identified and characterized.

Dr. K.N. Balaji is interested in Activation of novel signaling cascades by MTb; Role of surface proteases expressed on professional antigen presenting cells in escape mechanisms against lysis by cytotoxic T lymphocytes and NK cells; Survival strategies and functional characterization of CD4, CD8 and T cells during tuberculosis infection etc

Dr. Dipshikha Chakravortty Understanding the immune evasion and survival mechanisms of Salmonella and Staphylococcus Prof. C. Durga Rao is understanding the structure and function of the rotavirus enterotoxin NSP4 and molecular mechanism of NSP4-mediated pathogenesis, mechanism of selective translation of rotaviral mRNAs in the infected cells, molecular interactions between other nonstructural proteins NSP2, NSP5 and NSP6.

Dr. S.S. Indi Studies on cell division protein FtsZ; Structure-function aspects of bacterial homologue of tubulin, Polymerization properties of FtsZ between various species of bacteria and between various deletion and point mutations of Mycobacterial FtsZ are being investigated. Electron microscope is used to visualize FtsZ polymers.

Prof. V. Nagaraja revealed that mycobacterial topoisomerase I is distinct from other prokaryotic and eukaryotic topoisomerases in many characteristics. Understanding the need for this specificity and the importance of unusual domains are the current projects.

Prof. Umesh Varshney works on DNA repair in mycobacteria: with the aim to develop newer drug targets and also the attenuated strain as possible vaccine candidates.

Prof. S. Vijaya is working on host-pathogen interactions and the molecular basis for pathogenesis of two human infectious agents MTb and JEV. A new promoter in the M. tuberculosis genome that functioned efficiently in E. coli was identified, characterized and used to construct a vector that allowed its use to drive expression of heterologous
genes in M. tuberculosis and in BCG, the latter holding promise for the development of BCG-based multivalent vaccines.

Prof. P. Balaram Studies on Triosphosphate Isomerase from P falciparum; explored two distinct approaches to inhibit PfTIM: Design of synthetic interface peptides, which can potentially impede subunit association and Modification of cysteine, which is proximal to the active site residue lysine.

Prof. Saraswathi Vishveshwara has focused on Protein-Structure, Folding, Function and Dynamics through computational biology approaches.

Prof. M. Vijayan works on Ribosome recycling factor from M.tuberculosis; Peptidyl-tRNA hydrolase and Pantothenate kinase from M. tuberculosis.

Prof. K. Suguna works in 3 different areas as: rotaviral non-structural protein, MTb adenyllyl cyclases, P. falciparum fatty acid biosynthesis pathway enzymes.

Prof. M.R.N. Murthy works on Propionate kinase from S. typhimurium; Structural studies on 2-methylisocitrate lyase involved in propionate metabolism in S.yphimurium; Structural studies on Pf Adenylsuccinate Synthetase; Structural studies on P falciparum triosephosphate isomerase; Thermodynamics of calcium binding to the 4 sites present in a calmodulin homologue, a calcium binding protein from E. histolytica has been investigated in detail

Prof. Dipankar Chatterji works on Inhibition of Mycobacterial Growth by Plumbagin derivatives; Mycobacterial stress regulation: the Dps 'Twin sister' defense mechanism and structure-function relationship; The Mycobacterial MsDps2 protein is a nucleoid forming DNA binding protein regulated by sigma factors {sigma} A and {sigma}B. Stationary phase induced alterations in mycobacterial RNA polymerase assembly: A cue to its phenotypic resistance towards rifampicin. Synthesis and hydrolysis of ppGpp in mycobacteria: A ligand mediated conformational Switch in Rel.

17. National Centre for Biological Sciences

Facilities available are: a multi-photon microscopy and spectroscopy station with fluorescence lifetime spectroscopy and correlation; Central Imaging and Flow Cytometry Facility; training the individual researchers ; a state-of-the-art imagining facility that will not only cater our institutional needs but also provide training to researchers coming from all over India and. Abroad; animal house and animal care facility in line with CPCSEA guidelines, which provides training of animal usage; Mouse Genetics Facility and Programme: Mass spectrometry facility, and informatics.

Courses offered are:
MSc, PhD. Integrated PhD, Post doctoral projects, MD-PhD programme, iBIO or the interdisciplinary biology- exploring the physics and chemistry of living matter;
Work on tropical disease is carried out by Dr. Satyajit Mayor who is specifically studying the role of the HIV nef gene and its clinically occurring variants on their ability to dramatically down modulate long lived macrophage cell surface proteins, important for the development of an immune response against the virus.
18. Jawaharlal Nehru Centre for Advanced Scientific Research

Facility of the Laboratory - A Biosafety level II plus laboratory, very good Library facility, Computer Lab; the animal facility experimentation is under the control of the Institutional Animal Ethics Committee and animal use is regulated as per the guidelines of Government of India. The facility is registered with the CPCSEA.

Laboratory equipments: A Brillouin Spectrometer to carry out Brillouin experiments, custom built both macro and micro Raman spectrometers; the micro Raman setup uses an epi-fluorescence. A compressed Helium cryostat is used for low temperature experiments in the temperature range of 25 to 300 K. Currently the laboratory is doing routine experiments up to 30 GPa.

Courses are PhD and Integrated PhD.

Scientific expertise:
Prof. Chandrabhas Narayana, recently used Surface enhances Raman studies on biomolecules to study recombinant HIV virus RNA in collaboration with Prof. Udaykumar Ranga. Also, are in the process of developing a diagnostic kit for determining the CD3, CD4 and CD8 in human cells of HIV patients in order to develop an early detection strategy.

Prof. H. Balaram studies hypoxanthine guaninephosphoribosyltransferase and adenylosuccinate synthetase, enzymes involved in purine salvage in P.falciparum, also studying enzymes involved in hemoglobin degradation and glycolysis. Protein engineering/ mutagenesis, spectroscopy and X-Raycrystallographic techniques are used to probe the structure, function and dynamics of these enzymes. Other aspects studied include substrate specificity, catalytic and kinetic mechanisms, and protein stability. Insights from these studies would aid the development of new antimalarials.

Prof. Namita Surolia has worked on: Do Plasmodium protein kinases contribute to virulence of the disease? Association of severe/nonsevere malaria pathogenesis with variant surface antigen sequences. Apicoplast interactome analysis by ‘Systems-Biology’ approach; Molecular epidemiology of malaria and Knock out approach to know essentiality of various apicoplast genes for parasite survival,malaria mortality.

Dr. Tapas K. Kundu is working on Small molecule modulators of histone modifying enzymes, which may serve as lead compounds for the treatment AIDS. Specific Inhibition of p300-HAT Alters Global Gene Expression and Represses HIV replication, and Chromatin Modifications (Acetylation/ Deacetylation/ Methylation) as new targets for HIV therapy.

Dr. Udaykumar Ranga, works on the following: Study of the molecular epidemiology of HIV-1 in India; 2) Analysis of the pathogenic properties of subtype-C strains of India3) Optimization of DNA vaccines by engineering molecular adjuvants (Tat as a modular antigen); Evaluation of an Indian traditional therapy as an AIDS intervention strategy.

19. National Institute of Mental Health and Neuro Sciences

Infrastructural Facilities for study of Tropical Diseases:
It has 23 Departments with faculty strength of 145
Outpatient services and In patient services; Emergency; A dedicated Neuroinfection Ward; State of the art Virology laboratory that has the following facilities: A Modular P3 containment laboratory, Biohazard Class II cabinets for virus handling molecular biology- PCR, Real Time PCR, FACS machine for immuno-phenotyping of blood cells, Cytometric bead assay, Fluorescent microscopy, Deep freezers, CO2 Incubators and all other facilities for tissue culture. The department of Neurovirology is National AIDS Reference laboratory, national CD4 Reference laboratory, WHO Collaborating center for Rabies, WHO SEARO Regional reference laboratory for Japanese encephalitis, National Influenza Surveillance Laboratory and an Apex Laboratory for Arboviral disease diagnosis (JE, DEN and CHIK viruses).
Microbiology – facilities available for bacterial and fungal cultures, antibiotic sensitivity testing, Hospital infection control laboratory, PCR, BACTEC, BACTI-ALERT rapid bacterial culture system, Neuroimmunology diagnostic facilities such as gel electrophoresis, Western Blotting etc.
Department of Neuropathology has an established facility for histological preparations, routine staining, immuno-histochemistry and electron microscopic facility for characterization of infectious diseases of nervous system.
Regular teaching classes for students of MD (Pathology), DM (Neurology) and MCh (Neurosurgery) on pathological aspects of tropical diseases is conducted periodically. A Museum with mounted specimens of various CNS infections and the Human Brain Tissue Repository .Well equipped Animal house facility for animal experimentation on small animals such as mice, rats, rabbits and gerbils.

Scientists are working on the tropical diseases which are HIV/AIDS, TB, Leprosy JE and Dengue.
Dr. V. Ravi- works on Inflammation in JE: Role of IL-6, Development of an IgM capture ELISA for the diagnosis of Dengue Infections, A genomic approach to the development of peptide based diagnostic tests for Japanese encephalitis. Dr. V. Ravi specialized in HIV diagnosis, development of kits, antiretroviral therapy. Japanese encephalitis
Prof. S. Chandra and V. Ravi have studied on HIV1&2 co-infections: neurological progression
Drs P. Chandra and V. Ravi – worked on Prevalence and Correlates of HIV infection among psychiatric inpatients at NIMHANS, Bangalore, India
Drs. S, K Shankar and A. Mahadevan has focused on Cellular Tropism and Viral Reservoir in Brain with HIV-Clade C Virus; Phenotypic alterations of astroglia and microglial in the brain – in response to tuberculous pathology in association with HIV/AIDS. – Study on Archival Material of autopsy tissue.
Dr. S. K Shankar is investigating Molecular& functional characterization of HIV-1 Long Terminal repeat cloned from India Patients.
Drs. V. Ravi, Anita Desai and S. K Shankar worked on a study of on virological and immunological aspects associated with opportunistic viral infections in HIV-1 infected individuals in India (South India).
Dr.SK Shankar, Dr.Anita Mahadevan, Dr. P.Satishchandra worked on Role of CNS opportunistic infections in subsequent development of HIV.
Prof. Jayashree Ramakrishna works on HIV/AIDS.
Prof. P. Satishchandra and Dr. A. Anlini works on Neuro-AIDS.
Dr. R. ravikumar- works on Opportunistic bacterial, Parasitic, Fungal and Protozoal infections like Tuberculosis, Toxoplasmosis, Amoebic encephalitis and other neuroinfections in immunocompromised individuals.
Dr. Shripad A. Patil interested in Immunology of autoimmune diseases of the central and peripheral nervous system including leprosy. Development of immunodiagnostics for chronic infectious disease of CNS with special reference to CNS TB meningitis and Neurocysticercosis.
Dr. S. Nagarathna has work on Delineating cryptococcal meningitis in AIDS patients with clinical correlation; a study of mortality and morbidity. Rapid modes of isolation of M.tuberculosis – PCR, Bactec
Prof. S.K. Shankar – ha studied Neuropathology of Viral Infections with special reference to HIV/AIDS.
Dr. Anita Mahadevan- worked on Pathology of Neuroinfections, AIDS.
Prof. P. S. Chandra – has studied HIV and Mental Health,
Dr. A. Thirumoorthy- has investigated psychosocial problems of Patients of HIV / AIDS
Dr. Ramachandra- works on HIV & Mental Health.

20. National Tuberculosis Institute

The NTI is designated as WHO Collaborating centre for TB research & training since June 1985 and formulate TB Control Programme; several Operational Research Studies and evolved a nationally applicable TB Control Programme. It trains the key personnel to run the programme through District TB Centers. This nationally evolved TB Control Programme has been adopted by several other countries. The main training activity is job oriented, in-service training of Medical and Para Medical personnel of district level. They can in turn train Medical and Para Medical staff at primary health centres and grass root levels as well as implement and manage district TB programmes. Seminars, workshops, etc., are organized in which senior officers of Directorates of Health Services of states and union territories, Chief Medical officers of the districts, teachers of tuberculosis and preventive and social medicine in medical colleges etc., are briefed about the programme. The STDC training of the personnel namely Epidemiologist, Bacteriologist, Statistician, TB specialist and trainers of STS & STLS are eligible for undergoing this training. After one week common training these personnel would be given intensive training in their respective specialties for the remaining period.

Research Activities are: Estimation of protective effect of BCG among children aged 0-14 years – a retrospective case control study ; National Sample Survey to estimate the Annual Risk of Tuberculous Infection in different parts of India; Estimation Of Annual Risk Of Tuberculous Infection In Khammam District Of Andhra Pradesh – Collaborative Study With DFID; A Sample Survey To Estimate The Annual Risk Of Tuberculosis Infection In Orissa State – Collaborative Study With DANTB; Study on the status of pulmonary tuberculosis patients put on treatment under Revised National Tuberculosis
Programme in Bangalore Mahanagara Palike Study on treatment outcome of smear positive pulmonary tuberculosis patients treated under RNTCP – A prospective study

Study on drug resistance surveillance in Mysore district; Study on Surveillance of Drug resistance in the district of Mayurbhanj-Orissa,Hoogli-West Bengal, and Nagaon-Assam Study on behavior of INH drug resistant tubercle bacilli in guinea pigs Study on "Screening fresh isolates of M.tuberculosis for biovars".

21. St. Johns Research Institute

The institute has set up the scientific goal as developing and establishing strong rural linkage to set up community action areas and also actively interact with the industry to undertake excellent application research that serves the needs of the community.

Six Project(s) handled in the Institute on Tropical Disease in last 10 years on TB and HIV/AIDS. Four Scientists are working on Tropical Diseases in The Division of Infectious Diseases and Epidemiology working on Infectious disease related projects.

Infrastructure and services

Laboratories, Biorepository, BSL3 facility, Animal House, Library, Field laboratory and data collection centre at Palamaner, AP.

Training courses are:

Two-week Advanced Health Research Methodology Course- 2010; One-day workshop on ‘How to get published in Medical Journals’; Bangalore Boston Nutrition Collaborative; NIH sponsored training in Health Research; Three-day Course in Health Research Methodology & Advanced GCP.

Research interests in Infectious diseases area are:

Examining ART adherence issues; Epidemiology of childhood TB; A state of the art diagnostic laboratory has been set up in the rural site for this purpose, including automated culture and sensitivity determinations and speciation of mycobacterium; Studies on social factors in HIV prevalence; Case control studies on adult TB; IBBA (Integrated Biological and Behavioral assessment)To know the prevalence of risk behaviors & curable STI & HIV among ANC attendants, FSW, Clients and MSM; Special Behavioral Surveys (SBS ; General Population Surveys to study the prevalence of STI & HIV and risk behaviors among urban and rural populations, HIV transmission; PPTCT Study through Perceptions of HIV ; Factors influencing decision ; Issues surrounding disclosure of HIV status and stigma ; Importance of cultural pressure ; Barriers and Acceptability of the current PPTCT program.

SJRI has become the IAEA Collaborating Centre in Nutrition and Health-Related Environmental Studies Section since 1988, and is well networked in India as well as internationally; focuses on nutrition, cancer, as well as infectious and lifestyle-related diseases. There the stable isotope technique is being used for nutrition-related research in a developing country and training is provided for the same to the researchers.

Scientific expertise is:
Dr. J. K. Philip J has Research Interests in: Molecular methods for: Rapid Diagnostics and Point of care testing; Bacterial resistance; Viral Exanthems Mycobacterial diseases and prevention; Re-emergence of Salmonella paratyphi A: a shift in immunity?; Neonatal septicemia caused by Vibrio cholerae O:139; Identification of an IV-dextrose solution as the source of an outbreak of Klebsiella pneumoniae sepsis in a newborn nursery.

Prof. R. G. Washington has Research Interests on Community and population based behavioral and biological research related to HIV & STI; Community and population based behavioral and biological research related to HIV & STI; Monitoring and Evaluation of reproductive health care services, with special emphasis on STI and HIV; Evidence based HIV prevention and care intervention programming; Monitoring and Evaluation of training and capacity building initiatives in reproductive health, including STI and HIV.

Dr. Anita Shet works on : Infectious diseases in children, particularly HIV, TB, vector-borne emerging infectious diseases i.e dengue infections; Disease pathogenesis in HIV, HIV drug resistance, interaction between nutrition and infection, anemia of chronic infection.


Dr. Divya Rajaraman has expertise in HIV/AIDS especially changing roles and responses of health care workers in the era of HIV treatment scale up; Extended family caring for children orphaned by AIDS: balancing essential work and caregiving in a high prevalence nation; few socio-economic studies on HIV in Botswana.

22. Dorabji Tata Centre for Research in Tropical Diseases

One of the objectives of SDTC is to encourage medical institutions to understand the application of advanced basic research in molecular biology in the field of rapid diagnosis of Tropical Diseases, and to train the clinicians/scientists in that area. Towards achieving the goal, the Scientific Advisory Committee decided to hold workshops on "Application of Polymerase Chain Reaction" in clinical diagnosis.

Some of the research papers are: Epidemiology Of Tuberculosis; HIV and Tuberculosis; The Control of Tuberculosis a Continuous GameVaccine; DBT to formulate guideline on HIV vaccine trials; HIV vaccine trial in India; Malaria Surveillance.

Infrastructure:
Service room with Millipore Water Purification System and Microwave oven; Molecular biology laboratory; some of the facilities like Analytical balances, Microscopes, ELISA-Reader etc.; Deep freezer; Carbon Dioxide incubator and autoclave etc.

It has provided a list of 25 Indian Laboratories/Institutions dealing with Tropical Diseases.

Workshop and symposia: to disseminate knowledge in the field of Tropical Diseases and to provide an effective interaction among the experts in medical and basic research institutions. SDTC has so far organised ten symposia viz. "Status of Tuberculosis in India.

Some of the publications done by the centre are: Status of TB in India, Trends in Malaria, Vaccine Research, Diarroheal diseases, Trends in respiratory Diseases, Trends and research in Leishmaniasis etc.

### 23. National Institute of Malaria Research, Bangalore Field Station

Major accomplishments, achievements: is to transfer of technology on bioenvironmental control of malaria to the state health department, Government of Karnataka. Local Malaria problems have been identified and updated time to time.

a. Identification of problems / location in high strata PHC where bio-environmental methods are required to be introduced. And Transfer of Technology; Setting up of larvivorous fish hatcheries along with handling, transportation and its usage.

Also, to organize workshops / Training courses in various aspects of control of malaria from time to time to update knowledge and proper implementation of control strategy. It carried out outbreak incidents of malaria in different parts of abngalore and the whhole state; Mosquito control in Bangalore, Malaria control in Mangalore; (GIS) to identify mosquito breeding habitats in district Tumkur; Operational feasibility of use of larvivorous fish for control of malaria in a high risk areas of Karnataka State’;

Evaluation of the impact of DDT indoor residual spraying being used in malaria control programme on the disease prevalence. Stratification of Karnataka based on An. culicifacies and An. fluviatilis sibling species prevalence by polytene chromosome and by PCR.

**Workshops:** Several are taken for health and non health professionals from time to time.

**Dr. S. K. Ghosh** has expertise in Biological Control of Malaria using Fish and diagnostics of Malaria. To develop strategies for integrated control of vectors of Malaria, JE and Dengue in Karnataka, Mosquito control in Bangalore, Malaria control in Mangalore

### 24. Rajiv Gandhi Centre for Biotechnology

13 Project(s) handled in the Institute on Tropical Disease in last 10 years and 4 scientists are working on Tuberculois, Dengue and Cholera.

**Infrastructure and facilities:** BSL2+ Facilities, robust infrastructure for carrying out cell biological and molecular biological investigations, modern animal facility ; core instrumentation facility, Library, DISC facility, Regional facility for DNA Fibngerprinting and Regional Centre for Molecular Diagonsritics. 40 international and 14 National publications are done on the area of work.
Training Courses are: PhD, Post doctoral Training, Short term training, Specialized training program, training for researchers for the safety manual as prepared by the IBSC.

Scientific expertise is:
Dr. S. Mundayoor works on Molecular epidemiology and fingerprinting of field strains of MTB; Identification and characterization of novel sequences from Kerala through AFLP and Subtractive Hybridisation; Host-pathogen interaction by designed a Host-Pathogen Interaction Analysis vector to identify the mycobacterial genes that are induced when the bacterium interacts with the macrophage. The characterization of some of the genes that have been identified are in progress.

Dr. R. Ajay Kumar has interest in Search for new anti-TB molecules from herbal and soil bacteria and Regulation of Macrophage gene expression by mycobacterial proteins; clone DNA from uncluturable bacteria into BAC vector (metagenomics) and screen the library for antimycobacterial principles. The Anti-TB screening studies are carried out on actively growing M. tuberculosis but recently initiated screening against dormant bacteria.

Dr. E. Sreekumar has expertise in characterization of the Dengue viral genotypes circulating in South India, Kerala in particular; and documentation of specific mutations that may affect viral virulence. Also, development of targeted antiviral development against these viruses, taking the envelop protein and NS3 protease as primary targets for dengue virus.

Dr. H. Krishnan K works on culture-independent analysis of a mixture of microbial genomes (metagenomics) based on expression or sequencing; they try to analyze the complex genomes of microbial niches through culture-independent molecular techniques by generating 16S rRNA clone library along with RFLP, sequencing and phylogenetic analysis.

Dr. Sabu Thomas has work on Molecular Biology and Epidemiology of V. cholerae; interested in the role of plasmids, SXT constrin and Class 1 integrons in conferring multiple drug resistance in environmental isolates of V. cholerae. She is interested in V. cholerae biofilm inhibition, and potential biofilm inhibitors will be isolated from suitable bioresources and its mechanism of action will be explored.

Dr. K. Santhosh Kumar works on structure-function studies of HIV proteins. The chemokine receptors CXCR4 and CCR5, a seven-transmembrane domain G-protein coupled receptor superfamily, have been identified as the two principal co-receptors for the cellular entry of the T-tropic and M-tropic HIV-1 isolates respectively.

25. Sree Chitra Tirunal Institute for Medical Sciences & Technology

11 Project(s) handled in the Institute on Tropical Disease in last 10 years by Faculty members and 6 student projects by Masters in Public Health Students. 5 investigators are working in the specified areas of TB, Malaria, HIV/AIDS, Vector borne diseases, Leprosy; has 2 national publications.

Infrastructure and services
Good documentation centre and a field area to implement interventional researches; Patient care, Biomedical Technology, Public Health, Computer facility and Library are worth mentioning as good facilities provided by the Institute.
SCTIMST has the **The Achutha Menon Centre for Health Science Studies** which offers an international Master of Public Health programme, short courses and Ph.D. programme catering to all South Asian Countries. SCTIMST and AMCHSS have acquired the unique combination of tertiary care, biomedical technology research and health science training and research.

**Division of Microbiology:** The projects are on:
1. Anti viral studies on some indigenous medicinal plants of Western Ghats
2. Identification and characterization of protective antigens of MTb with the potential benefits of identifying antigens as vaccine candidate and as reagents for immunodiagnostic tests

**Scientific Expertise is:**

**Dr. TK Sundari Ravindran** works on Gender & Poverty issues in TB in the WHO South- East Asia Region; Gender and Poverty Related Barriers in TB Care and Treatment: A Protocol for Rapid Assessment; The interrelationship between gender and malaria among the rural poor in Jharkhand Sama—Resource Group for Women and Health

**Dr. K .R. Thankappan and Dr. P. S. Sharma** work on: Independent Review of National Vector Borne Disease Control Programme; Review of Enhanced Malaria Control Project; Smoking by Tuberculosis Patients in Kerala, India Proactive Cessation Efforts are Urgently Needed; Knowledge and attitude of college students in Kerala towards HIV/AIDS, sexually transmitted diseases and sexuality.

**Dr. Thankappan** has studied Predictors of Treatment Delays for Tuberculosis in Sikkim; Patterns of Tobacco Use and Cessation Practices among Tuberculosis Patients in Trivandrum District of Kerala, Patterns of tobacco use and cessation practices among male tuberculosis patients in Trivandrum, Kerala. -

**Dr. Ramankutty** has work on Vulnerability to HIV/AIDS in tsunami affected population in southern Indian states, Prevalence of helminthic infestation among primary school children;

**Dr. P. S. Sharma worked on** Assessment of the risk of HIV Spread via Non-steady Heterosexual Partners in the US Population; Knowledge and attitude of college students in Kerala towards HIV/AIDS, sexually transmitted diseases and sexuality”.

**MPH Dissertations are done on:** A study of gender related and Rural – Urban Differences in knowledge and attitude towards AIDS, Sexuality and related gender issues among college students in Kerala; A study on the effectiveness of the School AIDS education programme in Trivandrum Education District; Role, Response and Responsibilities of Pvt. Hospitals for HIV/AIDS related activities in Mumbai; Role of Non-Government Health Care providers in Leprosy elimination activities in Sitapur; Factors affecting prompt treatment of Malaria in a Tribal District of Orissa.
7. Funding

There are a number of agencies and organizations involved in funding of tropical diseases. Some fund their own R&D work and some fund extramural R&D projects. There are a total of 21 Departments/Agencies/Councils/Commissions in India who provide financial assistance to various R&D programmes under different schemes.

The Science and Technology (S&T) departments functioning under the auspices of Govt. of India are:

- Department of Science and Technology (DST)
- Department of Scientific & Industrial Research (DSIR)
- Department of Atomic Energy (DAE)
- Department of Space (DoS)
- Department of Biotechnology (DBT)
- Department of Ocean Development (DOD)

Among the S&T organizations associated with other Central Government Ministries, Defence Research & Development Organization (DRDO) under the Ministry of Defence, Indian Council of Agricultural Research (ICAR) under the Ministry of Agriculture and Indian Council of Medical Research (ICMR) under the Ministry of Health & Family Welfare fund and also conduct scientific research.

In addition to R&D establishments, the other major body pursuing S&T activities in India is the country's vast university system. This system comprises of 162 universities, 32 institutions deemed to be universities and 10 institutes of national importance; it is a major source of S&T manpower development.

Despite a huge number of funding organizations, only a few contribute towards the research and finding on Tropical Diseases. Some of those are listed below:

- Indian Council of Medical Research (ICMR)
- Department of Science and Technology (DST)
- Department of Biotechnology (DBT)
- Council of Scientific and Industrial research (CSIR)
- University Grants Commission (UGC)

**Indian Council of Medical Research (ICMR):** ICMR, the apex body in India for the formulation, coordination and promotion of biomedical research, is one of the oldest medical research bodies in the world. The ICMR is funded by the Government of India through the Department of Health Research, Ministry of Health & Family Welfare.
The Council's research priorities coincide with the National Health Priorities such as control and management of communicable diseases, fertility control, maternal and child health, control of nutritional disorders, developing alternative strategies for health care delivery, research on major non-communicable diseases like cancer, cardiovascular diseases, blindness, diabetes and other metabolic and haematological disorders; mental health research and drug research. All these efforts are undertaken with a view to reduce the total burden of disease and to promote health and well-being of the population in India.

The Council promotes biomedical research in the country through intramural as well as extramural research.

**Intramural research** is carried out currently through the Council's 29 Research Institutes/Centres/Units. These include

(i) **Eighteen Mission-Oriented National Institutes** located in different parts of India that address themselves to research on specific areas such as tuberculosis, leprosy, cholera and diarrhoeal diseases, viral diseases including AIDS, malaria, kala-azar, vector control, nutrition, reproduction, immunohaematology, oncology, medical statistics.

(ii) **Six Regional Medical Research Centres** that address regional health problems, and also aim to strengthen or generate research capabilities in different geographic areas of the country; and

(iii) **Five Units / Centres** dealing with food and drug toxicology, viral diseases, handling microorganisms of highly infectious nature, prenatal diagnosis for neonatal retardation etc and supply of various animal models and feeds for experimental purposes.

**Extramural research** is promoted by ICMR through:

(i) **Setting up Centres for Advanced Research** in different research areas around existing expertise and infrastructure in selected departments of Medical Colleges, Universities and other non-ICMR Research Institutes.

(ii) **Task force** studies which emphasize a time-bound, goal-oriented approach with clearly defined targets, specific time frames, standardized and uniform methodologies, and often a multicentric structure.

(iii) **Open-ended research** on the basis of applications for grants-in-aid received from scientists in non-ICMR Research Institutes, Medical colleges, Universities etc. located in different parts of the country.

The Council is alert to emerging diseases and new dimensions of existing diseases, as exemplified by the rapid organization of a network of Surveillance Centres for AIDS in different states of India in 1986.

ICMR contributes 25% weight age of funding towards communicable diseases with respect to all other disciplines. The Funds have also increased up to 63% in Epidemiological area in 2008-09 in comparison to 2007-08 as evident from Figure 1.
Figure 1

<table>
<thead>
<tr>
<th>Discipline wise distribution in ICMR</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Bar chart" /></td>
</tr>
</tbody>
</table>

(1 lakh = 100,000)

- **ECD-Epidemiology and Communicable Diseases**
- All Disciplines include Reproductive Health and Nutrition, Non Communicable diseases, Basic Medical Sciences, Publication and Information, Medicinal Plant Unit and International Health division.

### Table 3: Summary of Expenditure of Extramural Projects of ICMR

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cholera &amp; Enteric Diseases (CHO)</td>
<td>31.05</td>
<td>42.68</td>
<td>43.04</td>
<td>31.49</td>
<td>14.8</td>
<td>27.04</td>
<td>33.1</td>
<td>33.55</td>
<td>66.32</td>
<td>46.58</td>
<td>369.65</td>
</tr>
<tr>
<td>Filarisis (Fil)</td>
<td>49.2</td>
<td>29.06</td>
<td>17.55</td>
<td>4.08</td>
<td>2.84</td>
<td>12.67</td>
<td>20.7</td>
<td>3.91</td>
<td>31.74</td>
<td>11.17</td>
<td>182.92</td>
</tr>
<tr>
<td>Kala-azar (KA)</td>
<td>13.23</td>
<td>18.6</td>
<td>66.12</td>
<td>12.52</td>
<td>3.73</td>
<td>10.94</td>
<td>16.34</td>
<td>25.72</td>
<td>29</td>
<td>56.28</td>
<td>252.48</td>
</tr>
<tr>
<td>Leprosy (Lep)</td>
<td>7.29</td>
<td>5</td>
<td>32.44</td>
<td>41.95</td>
<td>78.71</td>
<td>61.68</td>
<td>72.09</td>
<td>84.03</td>
<td>54.06</td>
<td>183.58</td>
<td>620.83</td>
</tr>
<tr>
<td>Malaria (Mal)</td>
<td>109.68</td>
<td>170.45</td>
<td>20.88</td>
<td>178.1</td>
<td>2.47</td>
<td>131.71</td>
<td>103.73</td>
<td>128.32</td>
<td>153.98</td>
<td>180.87</td>
<td>1180.19</td>
</tr>
<tr>
<td>TB &amp; Chest Diseases (TB)</td>
<td>25.81</td>
<td>46.08</td>
<td>64.57</td>
<td>91.68</td>
<td>61.15</td>
<td>37.08</td>
<td>57.65</td>
<td>65.28</td>
<td>80.26</td>
<td>229.41</td>
<td>758.97</td>
</tr>
<tr>
<td>HIV</td>
<td>44.41</td>
<td>33.73</td>
<td>76.54</td>
<td>48.54</td>
<td>76.88</td>
<td>49.74</td>
<td>141.6</td>
<td>159.61</td>
<td>248.44</td>
<td>408.88</td>
<td>1288.37</td>
</tr>
<tr>
<td>Dengue (Den)</td>
<td>1.5</td>
<td>4.81</td>
<td>4.05</td>
<td>2.14</td>
<td>1.21</td>
<td>2.75</td>
<td>2.39</td>
<td>5.34</td>
<td>7.87</td>
<td>18.11</td>
<td>50.17</td>
</tr>
<tr>
<td>Meningitis (Men)</td>
<td>1.79</td>
<td>1.91</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>1.64</td>
<td>1.64</td>
<td>7.88</td>
<td>14.86</td>
<td></td>
</tr>
<tr>
<td>JE</td>
<td>23.28</td>
<td>24.1</td>
<td>36.86</td>
<td>39.93</td>
<td>23.22</td>
<td>53.2</td>
<td>34.62</td>
<td>38.61</td>
<td>42.95</td>
<td>32.1</td>
<td>348.87</td>
</tr>
<tr>
<td>Total*</td>
<td>314.91</td>
<td>388.01</td>
<td>371.63</td>
<td>482.7</td>
<td>287</td>
<td>418.4</td>
<td>498.73</td>
<td>553.63</td>
<td>720.5</td>
<td>1205.5</td>
<td></td>
</tr>
</tbody>
</table>
As evident from Figure 2, out of all the 11 Tropical Diseases, HIV, Malaria, Tuberculosis and Leprosy are the highly funded Tropical Diseases in India by ICMR. HIV gets the maximum 24%, Malaria ~ 23 %, Tuberculosis ~15 % and Leprosy ~ 12 % weight age of total funds sanctioned by ICMR. Others like Cholera, Japanese Encephalitis, Leishmaniasis, Filariasis and Pneumonia receive moderate funds while Dengue and Meningitis get less than 1% of the total ICMR funds.

(1 lakh = 100,000)
Figure 3 shows that ICMR has played a very significant role in funding on Tropical Diseases since the funds have risen to almost four times since 2000 in the past ten years.

Department of Science and Technology (DST): is the nodal Department of the Ministry of Science and Technology. It supports 21 autonomous research institutions/ S&T professional bodies that are working in diverse areas for the promotion of Science and Technology.

The Integrated Finance Division (IFD) of DST has been entrusted with the responsibility of providing advice and support on all financial matters and monitoring the progress of expenditure on various activities. There are some research schemes in each agency under which the financial approval of the projects is being done. Some of these schemes of DST contributing in Tropical Disease related projects are mentioned below-

- **Drugs and pharmaceutical research programme (DPRP)** - During the Tenth financial plan, many Tropical disease based projects were supported under this scheme which led to novel drug development. Besides this, other projects related to indigenous novel-diagnostics for detection of HIV/AIDS and new drug delivery systems for Tuberculosis using nanotechnology were also supported through this scheme.

- **Science and Engineering Research Council (SERC)** - SERC is an apex body through which DST promotes R&D programmes in newly emerging and challenging areas of science and engineering. It has the broad mission of promoting excellence in S&T with focus on basic research in all disciplines of physical science, chemical science, life science etc.

- **Young scientists Scheme (YSS)**
  This program promotes and nurtures young professionals to pursue a career in Science by giving them small grants to start their projects.

- **International Division (ID)**
  This division promotes bilateral associations between India and other countries by funding the training of Indian researchers in the best laboratories outside India.

- **Intensification of Research In High Priorities Areas (IRHPA)**

India currently has bilateral S&T cooperation agreements with many countries and International agencies. The multilateral programmes of DST are with partnership with the following agencies

- UNESCO
- UNDP
- BIMST-EC (Bangladesh, India, Myanmar, Srilanka, Thailand)
- IOR - EC (Indian Ocean Rim)
- TWAS
- Indo European

Besides this, DST also offers the Scholarship Scheme for Women Scientists and Technologists. Under this scheme, women scientists are encouraged to pursue research in frontier areas of science and engineering and on problems of societal relevance.
**Department of Biotechnology (DBT):** DBT has been providing grants-in-aid to various scientific/ professional/ educational institutions as well as autonomous bodies, etc. for research and development in the frontier areas of Biotechnology. The project proposals in these areas are submitted to the **Integrated Finance Division (IFD).** IFD also acts as the nodal division for organizing the meetings of the **Standing Finance Committee (SFC)** and the **Expenditure Finance Committee (EFC)** as well as for liaison with the Ministry of Finance.

**Fifteen Task forces** and various expert/steering committees of the department meet two or four times during the year to review and monitor the ongoing projects and also consider new proposals in the priority areas. One of these Task Force deal with the **Infectious Disease Biology.**

The Department of Biotechnology, Ministry of Science & Technology also invites project proposals from Indian scientists for Research and Development under the recently approved **Vaccine Grand Challenge Programme (VGCP).** The broad purpose of the program is to support research of scientific or technological nature that could provide a scientific basis of future vaccine design and development.

The **rapid review process** and **flexible funding system** is designed to swiftly award funding to scientists in the area of **Infectious Diseases** who are testing novel ideas that could lead to breakthroughs in National and Global health, as well as accelerate development of existing leads.

**Council of Scientific and Industrial Research (CSIR):** CSIR is an autonomous body and India’s largest publicly funded R&D organization, with 39 laboratories and 50 field stations or extension centers spread across the nation.

CSIR provides financial assistance to promote research work in the fields of Science & Technology, including Agriculture, Engineering and Medicine. The assistance is provided by way of grants to Professors/Experts in Universities, Institutes and R&D laboratories **both in public and private sectors.** Research proposals of applied nature as well as those falling under basic sciences which attempt to solve specific problems being pursued by CSIR laboratories or in newer and complementary fields are provided with CSIR support.

CSIR approves extramural R&D projects under the following schemes:

- Emeritus Scientists
- General Scheme
- Sponsored Scheme

**NMITLI: New Millennium Indian Technology Leadership Initiative** is the largest public-private-partnership effort within the R&D domain in the country. It looks beyond today’s technology and thus seeks to build, capture and retain for India a leadership
position by synergizing the best competencies of publicly funded R&D institutions, academia and private industry. It has so far involved 57 largely networked projects in diverse areas viz. Agriculture & Plant Biotechnology, General Biotechnology, Bioinformatics, Drugs and Pharmaceuticals, Chemicals, Materials, Information and Communication Technology and Energy. These projects involve 80 industry partners & 270 R&D groups from different institutions. These 57 projects cumulatively have had an outlay of approximately Rs 500 Crores.

**Figure 4a**

As evident from the **Figure 4a**, CSIR provides financial support in both the fields of Biological Sciences and Health Sciences which involves various types of diseases including the Tropical diseases. The focus of CSIR towards Health Sciences has slightly decreased from Tenth financial Plan to Eleventh Plan.

NIMTLI on the other hand is continuously engaged in providing its financial support in the field of Health Sciences.

**CSIR’s commitment for Tropical disease research is growing stronger as evident from their funding depicted in Figure 4b**
Table 4: Science Budget (Excluding Defence, Space and Atomic Energy)

<table>
<thead>
<tr>
<th>Agency</th>
<th>Five Year Plan (in Crore Rs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>9th</td>
</tr>
<tr>
<td>DBT</td>
<td>621</td>
</tr>
<tr>
<td>ICMR</td>
<td>NA</td>
</tr>
<tr>
<td>CSIR Basic Research</td>
<td>3939</td>
</tr>
<tr>
<td>DST</td>
<td>1497</td>
</tr>
<tr>
<td>UGC</td>
<td>2000</td>
</tr>
</tbody>
</table>

*Source-DBT  **1 Crore = 10 million

The above table depicts the plan-wise commitment of different major funding agencies in Science and Technology.

A computerized database is maintained by National Science & Technology Management Information System (NSTMIS; www.nstmis-dst.org) under the aegis of DST. For the present analysis, individual projects in Tropical diseases were searched under three major funding agencies DST, DBT and CSIR from 2002-03 onwards upto 2007-08.
NSTMIS has also been compiling information annually on extramural (Sponsored) R&D projects approved by different funding agencies in order to exchange information with different interest groups.

The listing of the projects in this database is based on the inputs received from the responding agencies, so it is presumed that the information furnished by them is complete. Total number of projects and Tropical Disease related projects were cumulated year wise as seen in Table 5.

Individual project cost for the tropical diseases has been cumulated and as summarized in the table below:

Table 5: Comparative Analysis of different Agencies from NSTMIS

<table>
<thead>
<tr>
<th>Funding Agency</th>
<th>Total Number of approved Projects during 2002-03 to 2007-08</th>
<th>Number of Projects on Tropical Diseases</th>
<th>Amount for Tropical Diseases (Rupees in Crore**)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DST</td>
<td>6309</td>
<td>128</td>
<td>64.92</td>
</tr>
<tr>
<td>DBT</td>
<td>2016</td>
<td>188</td>
<td>107.22</td>
</tr>
<tr>
<td>CSIR</td>
<td>1593</td>
<td>48</td>
<td>5.87</td>
</tr>
</tbody>
</table>

*Source-NSTMIS  ** 1 Crore = 10 million

DST is the largest funding organization approving maximum number of projects during the period 2002-2008 but Tropical Disease related projects are only 2% of the total while the ratio of Tropical Disease related projects vs Total projects is very less (~0.3) for CSIR.

DBT has relatively larger contribution for Tropical Diseases as nearly 9% of the total projects are Tropical disease related.

University Grants Commission (UGC): The UGC has a unique distinction of being the only grant-giving agency from all the states in the country. It is not only responsible for disbursing grants to the universities and colleges but also in determining and maintaining standards of teaching, examination and research in universities.

Inter University Accelerator Centre (formerly, Nuclear Science Centre): IUAC division of UGC aims to formulate the common research programmes of research and development in collaboration with universities, IITs and other research institutions. It promotes group activities and human research development in experimental science.

UGC has formulated 42 schemes for providing development assistance to universities, university level institutions, colleges and individual faculty members and researchers.
The extramural projects are approved under the following two schemes:
- Major Projects (MJRP) Amount Ceilings- Rs. 12 / 10 lakh
- Minor Projects (MNRP) Amount Ceilings- Rs.1 lakh

Table 6: Funding of Tropical Diseases by UGC

<table>
<thead>
<tr>
<th>Year</th>
<th>Total No of Projects</th>
<th>No. of Projects on Tropical Diseases</th>
<th>Amount Sanctioned for Tropical Diseases (in Rupees lakhs **)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002-03</td>
<td>374</td>
<td>3</td>
<td>14.9</td>
</tr>
<tr>
<td>2003-04</td>
<td>646</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>2004-05</td>
<td>568</td>
<td>8</td>
<td>50.48</td>
</tr>
<tr>
<td>2005-06</td>
<td>758</td>
<td>6</td>
<td>19</td>
</tr>
<tr>
<td>2007-08</td>
<td>393</td>
<td>9</td>
<td>56.8</td>
</tr>
</tbody>
</table>

*Source - NSTMIS ** 1 lakh = 100,000

On the basis of information that is being extracted out from NSTMIS database as in Table 6, UGC has negligible role in funding any Tropical Disease. UGC approves more than 500 projects every year but number of projects on Tropical Diseases is just 1-2%.

It is seen that most of the funding agencies have diverse area of focus for Research and development. **ICMR is the only primary agency giving maximum contribution for Communicable/Tropical Diseases.**

Methodology used in our study to obtain information about funding in Tropical Diseases from individual Institutes/Universities/ Investigators

Two sets of Questionnaires were designed. One set was sent to the Head/Director of the corresponding Institute/University whose area of focus of research was primarily the Tropical diseases. Another set was directed to the Principal Investigators working on one or more Tropical Diseases. Nearly 100 Questionnaires were sent to Directors/Heads/Principal Investigators in this regard.

Depending upon the responses received, information has been compiled in **Table 7 and Table 8** as seen below:

**Table 7: Funding to Institute/University working in Tropical Diseases**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of the Institute/University</th>
<th>Total Funding for the past 10 years (Rupees in Lakhs*)</th>
<th>Funding allotted for Tropical Diseases for the past 10 years (Rupees in Lakhs*)</th>
<th>Percent contribution in Tropical Diseases compared to Total Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>IICB</td>
<td>15260</td>
<td>3788</td>
<td>25%</td>
</tr>
<tr>
<td>2.</td>
<td>NICED</td>
<td>24519.18</td>
<td>24519.18</td>
<td>100%</td>
</tr>
<tr>
<td>No.</td>
<td>Institution</td>
<td>Budget (Rs.)</td>
<td>Expenditure (Rs.)</td>
<td>Percentage</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------------------------</td>
<td>--------------</td>
<td>------------------</td>
<td>------------</td>
</tr>
<tr>
<td>3.</td>
<td>Bose Institute</td>
<td>2500-3000</td>
<td>300-500</td>
<td>12.15 %</td>
</tr>
<tr>
<td>4.</td>
<td>RMRC, Dibrugarh (Approx)</td>
<td>14400</td>
<td>About 50%</td>
<td>~ 50%</td>
</tr>
<tr>
<td>5.</td>
<td>(IIT, Guwahati)</td>
<td>91.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>CDRI</td>
<td>63655.369</td>
<td>17248.68</td>
<td>27%</td>
</tr>
<tr>
<td>7.</td>
<td>JALMA</td>
<td>11020.196</td>
<td>11020.196</td>
<td>100%</td>
</tr>
<tr>
<td>8.</td>
<td>IIIM</td>
<td>16771</td>
<td>446</td>
<td>~ 3%</td>
</tr>
<tr>
<td>9.</td>
<td>IMTECH</td>
<td>17394.08</td>
<td>3417.381</td>
<td>~ 20%</td>
</tr>
<tr>
<td>10.</td>
<td>NIMR</td>
<td>23306.59</td>
<td>23306.59</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>National: 22614.62</td>
<td>International: 691.97</td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>NIPER, Mohali</td>
<td></td>
<td>103.49</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Punjab University (Dept. of Zoology)</td>
<td>50</td>
<td>50</td>
<td>100%</td>
</tr>
<tr>
<td>13.</td>
<td>PGIMER, Chandigarh (Dept. of Parasitology)</td>
<td>186</td>
<td>88</td>
<td>~50%</td>
</tr>
<tr>
<td>14.</td>
<td>IGIB</td>
<td>NA</td>
<td>8400</td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>NII</td>
<td>16337</td>
<td>1139</td>
<td>~7%</td>
</tr>
<tr>
<td>16.</td>
<td>VPCI</td>
<td>17896</td>
<td>1700.91</td>
<td>~10%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>National: 1576.73</td>
<td>International: 96.58</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NGO: Rs. 27.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>NBRC</td>
<td>NA</td>
<td>214.08</td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>ICGB</td>
<td>2000</td>
<td>1380</td>
<td>~70%</td>
</tr>
<tr>
<td>19.</td>
<td>BHU, Institute of Medical Sciences</td>
<td></td>
<td>&gt;100</td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td>LRS Institute of Tuberculosis and Respiratory Diseases</td>
<td>20000</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>21.</td>
<td>RMRC, Port Blair</td>
<td>412.5</td>
<td>412.5</td>
<td>100%</td>
</tr>
<tr>
<td>22.</td>
<td>DMRC</td>
<td>5522</td>
<td>1274</td>
<td>~23%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Extramural-156</td>
<td>Intramural-1118</td>
<td></td>
</tr>
<tr>
<td>23.</td>
<td>ILS, Bhubaneswar</td>
<td>NA</td>
<td>49.44</td>
<td></td>
</tr>
<tr>
<td>24.</td>
<td>NIMR, Rourkela Field Station</td>
<td>445.85</td>
<td>445.85</td>
<td>100%</td>
</tr>
<tr>
<td>25.</td>
<td>CCMB</td>
<td>65000</td>
<td>10000</td>
<td>~15%</td>
</tr>
<tr>
<td>26.</td>
<td>CDIFD</td>
<td>7500.33</td>
<td>1614.49</td>
<td>~22%</td>
</tr>
<tr>
<td>27.</td>
<td>IICT</td>
<td>NA</td>
<td>301.87</td>
<td></td>
</tr>
<tr>
<td>28.</td>
<td>CRME</td>
<td>600</td>
<td>600</td>
<td>100%</td>
</tr>
<tr>
<td>29.</td>
<td>NARI</td>
<td>13379</td>
<td>13379</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ICMR Extramural-4821</td>
<td>Extramural</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(National)</td>
<td>1754</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(International)</td>
<td>8804</td>
<td></td>
</tr>
<tr>
<td>31.</td>
<td>NIV</td>
<td>23961.07</td>
<td>23961.07</td>
<td>100%</td>
</tr>
<tr>
<td>32.</td>
<td>EVRC</td>
<td>2242</td>
<td>22</td>
<td>~1%</td>
</tr>
<tr>
<td>33.</td>
<td>TIIFR</td>
<td>700</td>
<td>~13%</td>
<td>~13%</td>
</tr>
<tr>
<td>34.</td>
<td>JNCSR</td>
<td>15000</td>
<td>1120</td>
<td>~7.5%</td>
</tr>
</tbody>
</table>
There are some Institutes in India which are focusing mostly on Tropical disease like NICED, JALMA, NIMR, CRME, RMRC (Port Blair), NARI, NIV and NTI. The entire funding in these institutes is being utilized in carrying out the basic research on Tropical Diseases only.

**ICGEB and RMRCT (Jabalpur)** utilize more than half of their funds to Tropical Diseases, while some other Institutes give only a part of their funding for Tropical diseases.

**IICT, IMTECH, CDRI, DMRC (Jodhpur), CCMB, CDFD, TIFR and SJRI** are some which utilize less than 50% of their total funds towards Tropical diseases.

**IIIM, NII, Patel Chest, EVRC, JNCASR and SCTIMST** receive nearly 10% or even less of their total funds in conducting the research on Tropical Diseases.

### Table 8: Funding of Principal Investigators working on Tropical Diseases

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of the Institute/University</th>
<th>Name of the Principal Investigator</th>
<th>Total Funding (Rupees in Lakhs*)</th>
<th>Funding allotted for Tropical Diseases (Rupees in Lakhs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>BHU</td>
<td>Dr. Shyam Sunder</td>
<td>1500</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prof. (Mrs.) Sushma Rathaur</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prof. Gopal Nath</td>
<td>About 55</td>
<td>10</td>
</tr>
<tr>
<td>2.</td>
<td>PGIMER, Chandigarh</td>
<td>Dept. of Virology</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Deepak Kaul</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Anuradha Chakraborti</td>
<td>74</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Dibyajyoti Banerjee</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>IICT</td>
<td>Dr. Poonam Salotra</td>
<td>655</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>AIIMS</td>
<td>Prof. Sarman Singh</td>
<td>&gt;300</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Arti Kapil</td>
<td>~270</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Rama Chaudhary</td>
<td>140</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Purva Mathur</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>University of Delhi</td>
<td>Prof. Anil Tyagi</td>
<td>690</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>JNU</td>
<td>Prof. Anil Tyagi</td>
<td>690</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>UCMS</td>
<td>Dr. Shukla Das</td>
<td>0.75</td>
<td></td>
</tr>
</tbody>
</table>
Several International Agencies also provide financial assistance to various Institutes in India for Tropical diseases through their different programmes and schemes. Some of the major International Funding Agencies are described below.

- **United Nations Development Programme (UNDP)** is committed to help India achieve the global Millennium Development Goals (MDGs). The goal of the organization is to help improve the lives of the poorest women and men, the marginalized and the disadvantaged in India. UNDP in India, works in the following areas: **Democratic Governance, Poverty Reduction, Crisis Prevention and Recovery, Environment and Energy, and HIV and Development.** UNDP works with the National AIDS Control Organisation (NACO) to respond to HIV and AIDS in India and reduce its impact. For the next five years, UNDP will be working to ensure that HIV becomes part of India’s development response across districts vulnerable to HIV in nine states across India.

- **Drugs for Neglected Diseases initiative (DNDi)**, which recently opened its new offices to support DNDi’s increasing research activities in India, is based at the Indian Council for Medical Research (ICMR) in New Delhi. The office functions as a relay for DNDi’s operational activities in India, which are primarily focused on two diseases, malaria and visceral leishmaniasis. R&D activities involve not only ongoing clinical trials but a number of earlier stage projects. DNDi’s key Indian partners are Indian Council of Medical Research (ICMR), Central Drug Research Institute (CDRI), Advinus Therapeutics, Kala Azar Medical Research Centre, Rajendra Memorial Research Institute of Medical Sciences, GVK BIO, and Cipla.

- **United Nations Children Funds (UNICEF)** has been working in India since 1949, the largest UN organization in the country. It has a diverse network of 13 state offices in India. The objective is to make prevention education available, provide care and support, stop the spread of HIV from mother to child, and make antiretroviral treatment accessible. The National AIDS Control Programme (NACP) III 2007-2012 has the overall goal of halting and reversing the epidemic in India.

- **United States Agency for International Development (USAID)**: USAID/India implements HIV/AIDS prevention, care, and treatment as part of the President’s Emergency Plan for AIDS Relief (PEPFAR), spearheaded by the U.S. Government, the largest health care initiative of its kind dedicated to a single disease. The financial support for HIV/AIDS in India by USAID has been continuously rising from **$9m in 2001 to $22.6m in 2009.** High-level technical assistance (TA) from USAID is provided to various Institutes in India.
bolstering the GOI’s National Tuberculosis Control Program. TA focuses on priorities such as: Sustaining and improving the quality of Directly Observed Therapy-Short Course for Tuberculosis (DOTS), a globally recognized strategy for TB control; Expanding services for diagnosis and treatment of multi-drug resistant TB (MDR-TB); and, strengthening linkages between TB and HIV/AIDS services and control activities. **In 2008, USAID has invested $8,431 thousands in TB.**

- **Department for International Development (DFID):** India is DFID’s largest bilateral programme. It has provided financial assistance to India in bilateral aid over the past five years. **In 2006/07 the financial support given to India in the health sector was £70m.** DFID works at the national level as well as supporting programmes in several focus states of India. The Revised National Control Programme II (£41.7m, 2005-2010) is expected to reduce more than half the number of annual deaths from TB by 2015. DFID funds National AIDS Control Programme (NACP). It is working in partnership with NACO to implement the third phase NACP3 for which DFID will provide £102m over five years.

- **Medicines for Malaria Venture (MMV):** MMV has joined hands with one of the world’s top drug maker AstraZeneca (Bangalore) to develop medicines to eliminate malaria in India and world over. According to this joint venture, AstraZeneca has opened up around 500,000 of its chemical compounds to MMV to help speed up development of mosquito-born disease treatments.

- **Bill and Melinda Gates Foundation (BMGF):** In 2003, the Bill & Melinda Gates Foundation launched Avahan, an initiative to reduce the spread of HIV in India. Avahan provides funding and support to targeted HIV prevention programs in the six Indian states with the highest HIV prevalence, and along the nation’s major trucking routes. **In July 2009, the foundation announced that it had increased its total commitment to Avahan from $258 million to $338 million.**

- **Program for Appropriate Technology in Health (PATH):** PATH began its work in India the late 1990s, bringing governments, communities, private-sector companies, and experienced public health practitioners together to address some of the country’s most crucial health problems. PATH’s India projects focus on immunization, HIV/AIDS, injection safety, and microbicides. PATH has launched **Tarang** project, which will work to reduce HIV incidence by helping individuals and communities in India. PATH has successfully transferred five new rapid diagnostic tests including tests for HIV/AIDS and Malaria to Indian industrial partners. It is also working with Indian partners to develop and produce a meningitis vaccine.

- Howard Hughes Medical Institute (HHMI)
- Institute for Oneworld Health (IOWH), San Fransisco, USA
- Mac Arthur Foundation,
- Rockefeller Foundation,
- Indo UK Medical Research Council
- Johns Hopkins University (JHU), USA
• European Commission
• University of Maryland (UMB), Baltimore, USA
• Yakult Honsha Co. Ltd, Japan
• IPCA Labs, Mumbai
• Centers for Disease Control and Prevention (CDC)
• National Institute of Health (NIH)
• Wellcome Trust
8. Outputs

The SCOPUS abstract and indexing database was searched for publications made in each tropical disease for a particular Institute/University from our list of establishments (1). The search term was

“abs(Disease name) and affil(name of Institute/University) and pubyear aft 2000”

Wherein, abs stands for abstract, affil for affiliation and pubyear aft for publication year after.

SCOPUS database includes abstracts from 1966 onwards and cited reference from 1996 onwards. Till 2009 there were 18000 titles and 41 million records of references that could be searched. Links to research papers available online can also be found here.

However this database does not include publications in health bulletins and non peer reviewed journals that lead to advocacy and surveillance details directly relating to diseased population and are easily accessible to ordinary citizens.

A total number of 5,142 publications on tropical diseases were made from the chosen Institutes in a time period of 2000-2010 (Table 9 and Figure 5). Out of these 1573 were from the Tuberculosis disease area alone and the second highest disease focus was HIV with 976 publications. The lowest publications made in terms of cumulative number were in Typhoid, Helminths, Dengue and Japanese Encephalitis with 59, 66, 154 and 174 publications in each disease category respectively.

The top publications were made from All India Institute of Medical Sciences (AIIMS), New Delhi with a total of 669 publications. Major publications were made in HIV (255 papers) and Tuberculosis (TB; 202 papers).

If each disease is considered, National Institute of Malaria Research (NIMR), New Delhi shows the highest publications on Malaria with 94 publications in the last ten years. The top cited papers from this Institute encompass survey of disease affected areas, study of basic biology of the parasite, putative drug targets and drug interactions.

National Institute of Cholera and Enteric Diseases (NICED), Kolkata, West Bengal has published the highest number of papers on Diarrhea, totaling 147. The most cited papers focus on bacterial toxins, clinical trial studies, and basic biology of the infective agent and biological agents that can inhibit pathogen growth.

Similarly, Indian Institute of Chemical Biology (IICB), Kolkata, West Bengal has made 268 publications on Leishmaniasis. The most cited research papers are on putative drugs and drug targets towards a cure for the disease.
Vector Control Research Centre (VCRC), Puducherry has published 43 papers on Helminthiasis. The most cited papers include study of biology of the Helminth in addition to possible drug treatments for their extinction.

AIIMS has contributed 87 publications in Pneumonia and Meningitis and the top cited papers include patient case studies, study of causative agents and their action and secondary infections. The same Institute has published a highest number of 255 papers on HIV. These papers focus on secondary infections on patients infected with HIV, patient case studies, disease surveillance and viral genomic studies.

National JALMA Institute for Leprosy and other Mycobacterial Diseases (JALMA), Agra has made 57 publications in Leprosy. The top cited papers include work on drug reviews, comparisons and relation between Leprosy and other Mycobacterial diseases and disease surveillance.

Similarly, Tuberculosis Research Centre (TRC), Chennai published 210 papers on Tuberculosis. The research focus on prevalent health systems to curb the disease, disease surveillance, comparisons of treatment methods, basic biology of the causative bacteria and causes for occurrence of drug resistance strains.

National Institute of Virology (NIV), Pune has published a highest number of 25 papers on Dengue. The same Institute has made 32 publications in Japanese Encephalitis. The most cited papers include studies on causes for viral outbreaks, disease surveillance and secondary infections.

NICED also has made 16 publications in Typhoid in the same ten year time period and the cited papers include surveillance of disease, studies on vaccine development, basic biology studies of the pathogen and causes for drug resistance strains.

Bibliometric measure for scientific achievement was calculated in terms of h index for each disease area for each Institute/University (Table 10 and Figure 6). h index is a measure of individual citation where a scientist has index h if h of his or her Np papers have at least h citations each and the other (Np-h) papers have ≤ h citations each (2).

For Malaria, the highest h index of 13 was obtained from Central Drug Research Institute (CDRI), Lucknow from its 64 publications made in the last ten years. The top cited papers involve work on chemotherapies for malaria and putative drug targets. Also, International Centre for Genetic Engineering and Biotechnology (ICGEB), New Delhi has a high h index of 12 for its 27 publications in Malaria alone. The top cited papers from ICGEB focus on novel drug targets and drug interactions with the parasite. NIMR which has the highest number of publications in Malaria has an h index of 9.

In the area of Diarrhea, NICED has an h index of 37 and Christian Medical College (CMC), Vellore, Tamil Nadu has an h index of 17 for its 44 publications. Bose Institute, Kolkata, West Bengal and Jawaharlal Nehru University, New Delhi have h index of 14.
and 12 respectively for their total of 27 and 49 number of publication. The papers deal with study of possible drug targets and basic biology of pathogens.

The h index of 23, for the publications on Leishmaniasis is highest from IICB, closely followed by Benaras Hindu University, Varanasi, Uttar Pradesh, with an h index of 18 for its 46 publications and CDRI with an h index of 14 for its 92 publications.

VCRC shows the highest h index of 7 in the study of Helminths.

In the sector of Pneumonia and Meningitis, the highest h index of 17 is obtained by AIIMS followed by CMC with 12.

National Aids Research Institute (NARI), Pune has an h index of 16 from a total of 96 publications wherein the research papers focus on clinical trials of putative drugs, secondary infections of HIV and study of drug targets in the virus. AIIMS has an h index in the same disease of 15.

JALMA shows an h index of 7 for publications made in the area of Leprosy.

In Tuberculosis, the highest h index of 22 was found from TRC. In the same disease, several important establishments are AIIMS with an h index of 19 for its 202 publications, CDRI with h index of 16 for its 101 publications, Indian Institute of Science, Bangalore has an h index of 16 for its 139 publications and the research focus is mainly on elucidation of Mycobacterial biology and identification of putative drug targets. Postgraduate Institute of Medical Education and Research (PGIMER), Chandigarh, Punjab shows an h index of 14 for its 90 publications on TB. The top cited papers from PGIMER focus on chemotherapy against TB.

NIV shows the highest h index of 8 for Dengue.

National Brain Research Centre, Manesar, Haryana; National Institute of Immunology, New Delhi and IISc, all show an h index of 9 for Japanese Encephalitis. The number of publications made from these Institutes was 22, 19 and 23 respectively. NIV has an h index of 8 for the same disease.

The highest h index of 6 was obtained on Typhoid from publications at NICED.
### Table 9: Number of publications for Institutes / Universities in each disease since 2000

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Institute / University</th>
<th>Total Number of publications in each disease (Scopus search engine)</th>
<th>Search terms: abs (disease name) and affil (establishment name) and pubyear aft 2000</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mal</td>
<td>Diarr</td>
</tr>
<tr>
<td>1</td>
<td>IICB</td>
<td>11</td>
<td>29</td>
</tr>
<tr>
<td>2</td>
<td>NICED</td>
<td>1</td>
<td>147</td>
</tr>
<tr>
<td>3</td>
<td>Bose Institute</td>
<td>2</td>
<td>27</td>
</tr>
<tr>
<td>4</td>
<td>CSTM</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>RMRIMS</td>
<td>20</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>RMRC, Dibrugarh</td>
<td>20</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>IITK</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>IITG</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td>CDRI</td>
<td>64</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>CIMAP</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>11</td>
<td>JALMA</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>12</td>
<td>SGPGMIS</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>BHU</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>14</td>
<td>KGMC</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>15</td>
<td>NBRC</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>16</td>
<td>IIIM</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>17</td>
<td>IMTECH</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>18</td>
<td>PGIMER</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>19</td>
<td>NIPER, Mohali</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>20</td>
<td>Panjab University</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>21</td>
<td>IGIB</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>22</td>
<td>NII</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>23</td>
<td>ICMR HQ</td>
<td>22</td>
<td>16</td>
</tr>
<tr>
<td>24</td>
<td>NIMR</td>
<td>94</td>
<td>1</td>
</tr>
<tr>
<td>25</td>
<td>IOP</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>26</td>
<td>AIIMS</td>
<td>45</td>
<td>18</td>
</tr>
<tr>
<td>27</td>
<td>University of Delhi</td>
<td>20</td>
<td>4</td>
</tr>
<tr>
<td>28</td>
<td>UCMS</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>29</td>
<td>VPCI</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>30</td>
<td>ACBR</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>31</td>
<td>JNU</td>
<td>13</td>
<td>49</td>
</tr>
<tr>
<td>32</td>
<td>ICGEB</td>
<td>27</td>
<td>0</td>
</tr>
<tr>
<td>33</td>
<td>LRS Institute of Tuberculosis and Respiratory Diseases</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>34</td>
<td>NCDC</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>35</td>
<td>RMRCT</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>36</td>
<td>DMRC</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>37</td>
<td>DRDE</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>38</td>
<td>SMS Medical College &amp; Allied</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Hospitals</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>---------------------------</td>
<td>----</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>IISER, Bhopal</td>
<td>39</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ILS, Bhubaneshwar</td>
<td>40</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>RMRC, Bhubaneshwar</td>
<td>41</td>
<td>27</td>
<td>8</td>
</tr>
<tr>
<td>NISER, Bhubaneshwar</td>
<td>42</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>NIMR, Rourkela</td>
<td>43</td>
<td>18</td>
<td>0</td>
</tr>
<tr>
<td>University of Hyderabad</td>
<td>44</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>IISER, Port Blair</td>
<td>45</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>CCMB</td>
<td>46</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CDFD</td>
<td>47</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>NIPER, Hyderabad</td>
<td>48</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>IICT</td>
<td>49</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>TRC</td>
<td>50</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>CRME</td>
<td>51</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>MKU</td>
<td>52</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Bharatidasan University</td>
<td>53</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Anna University Chennai</td>
<td>54</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>IITM</td>
<td>55</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>NIE</td>
<td>56</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>CMC, Vellore</td>
<td>57</td>
<td>4</td>
<td>44</td>
</tr>
<tr>
<td>NIMR, Chennai</td>
<td>58</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>VCRC</td>
<td>59</td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td>RMRC, Port Blair</td>
<td>60</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>NCL, Pune</td>
<td>61</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>NCCS</td>
<td>62</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>NARI</td>
<td>63</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>NIV</td>
<td>64</td>
<td>2</td>
<td>25</td>
</tr>
<tr>
<td>MCC</td>
<td>65</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>University of Pune</td>
<td>66</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>NIHH</td>
<td>67</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ERC</td>
<td>68</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ACTREC</td>
<td>69</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>TIFR</td>
<td>70</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>IIT Bombay</td>
<td>71</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>MGMIS</td>
<td>72</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>IIPS</td>
<td>73</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>IISc</td>
<td>74</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>NCBS</td>
<td>75</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>JNCASR</td>
<td>76</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>NIMHANS</td>
<td>77</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>NTI</td>
<td>78</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>SJRI</td>
<td>79</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

**Figure 5: Graphical representation of cumulative number of publications on each disease**

**Table 10: h index for Institutes/Universities for each disease**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Institute/University</th>
<th>Mal</th>
<th>Diarr</th>
<th>Leish</th>
<th>Helm</th>
<th>P/M</th>
<th>HIV</th>
<th>Lep</th>
<th>TB</th>
<th>Den</th>
<th>JE</th>
<th>Typ</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>IICB</td>
<td>6</td>
<td>10</td>
<td>23</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2.</td>
<td>NICED</td>
<td>1</td>
<td>37</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>3.</td>
<td>Bose Institute</td>
<td>1</td>
<td>14</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>11</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4.</td>
<td>CSTM</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>5.</td>
<td>RMRIMS</td>
<td>5</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6.</td>
<td>RMRC, Dibrugarh</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>7.</td>
<td>IITK</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>8.</td>
<td>IITG</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>9.</td>
<td>CDRI</td>
<td>13</td>
<td>2</td>
<td>14</td>
<td>1</td>
<td>1</td>
<td>10</td>
<td>3</td>
<td>16</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>No.</td>
<td>Institute</td>
<td>04-2021</td>
<td>05-2021</td>
<td>06-2021</td>
<td>07-2021</td>
<td>08-2021</td>
<td>09-2021</td>
<td>10-2021</td>
<td>11-2021</td>
<td>12-2021</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>------------------------------------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>CIMAP</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>JALMA</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>7</td>
<td>12</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>SGPGIMS</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>BHU &amp; BHU IMS</td>
<td>6</td>
<td>7</td>
<td>18</td>
<td>2</td>
<td>3</td>
<td>8</td>
<td>0</td>
<td>11</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>KGMC</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>NBRC</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>IIIM</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>IMTECH</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>10</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>PGIMER</td>
<td>5</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td>11</td>
<td>6</td>
<td>2</td>
<td>14</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td>NIPER, Mohali</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td>Panjab University</td>
<td>1</td>
<td>5</td>
<td>2</td>
<td>0</td>
<td>4</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21.</td>
<td>IGIB</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>6</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22.</td>
<td>NII</td>
<td>8</td>
<td>3</td>
<td>9</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>1</td>
<td>12</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23.</td>
<td>ICMR HQ</td>
<td>7</td>
<td>10</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24.</td>
<td>NIMR</td>
<td>9</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25.</td>
<td>IOP</td>
<td>0</td>
<td>0</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26.</td>
<td>AIIMS</td>
<td>10</td>
<td>10</td>
<td>5</td>
<td>1</td>
<td>17</td>
<td>15</td>
<td>5</td>
<td>19</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27.</td>
<td>University of Delhi</td>
<td>6</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>7</td>
<td>4</td>
<td>10</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28.</td>
<td>UCMS</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>5</td>
<td>2</td>
<td>6</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>29.</td>
<td>VPCI</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30.</td>
<td>ACBR</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31.</td>
<td>JNU</td>
<td>6</td>
<td>12</td>
<td>9</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32.</td>
<td>ICGEB</td>
<td>12</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>7</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>33.</td>
<td>LRS Institute of Tuberculosis and Respiratory Diseases</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>34.</td>
<td>NCDC</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>5</td>
<td>0</td>
<td>4</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35.</td>
<td>RMRCT</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>36.</td>
<td>DMRC</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>37.</td>
<td>DRDE</td>
<td>3</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>38.</td>
<td>SMS Medical College &amp; Allied Hospitals</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>39.</td>
<td>IISER, Bhopal</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40.</td>
<td>ILS, Bhubaneshwar</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>41.</td>
<td>RMRC, Bhubaneshwar</td>
<td>5</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>42.</td>
<td>NISER, Bhubaneshwar</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Institution</td>
<td>Type</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>---</td>
<td>----------------------------------</td>
<td>------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>43.</td>
<td>NIMR, Rourkela</td>
<td></td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>44.</td>
<td>University of Hyderabad</td>
<td></td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>0</td>
<td>7</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>45.</td>
<td>ILS, Hyderabad</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>46.</td>
<td>CCMB</td>
<td></td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>7</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>47.</td>
<td>CDFD</td>
<td></td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>10</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>48.</td>
<td>NIPER, Hyderabad</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>49.</td>
<td>IICT</td>
<td></td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>50.</td>
<td>TRC</td>
<td></td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>12</td>
<td>0</td>
<td>22</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>51.</td>
<td>CRME</td>
<td></td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>52.</td>
<td>MKU</td>
<td></td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>5</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>53.</td>
<td>Bharatidasan University</td>
<td></td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>54.</td>
<td>Anna University College, Chennai</td>
<td></td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>55.</td>
<td>IITM</td>
<td></td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>56.</td>
<td>NIE</td>
<td></td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>57.</td>
<td>CMC, Vellore</td>
<td></td>
<td>2</td>
<td>17</td>
<td>0</td>
<td>1</td>
<td>12</td>
<td>11</td>
<td>3</td>
<td>13</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>58.</td>
<td>NIMR, Chennai</td>
<td></td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>59.</td>
<td>VCRC</td>
<td></td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>60.</td>
<td>RMRC, Port Blair</td>
<td></td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>61.</td>
<td>NCL, Pune</td>
<td></td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>0</td>
<td>4</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>62.</td>
<td>NCCS</td>
<td></td>
<td>4</td>
<td>0</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>63.</td>
<td>NARI</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>16</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>64.</td>
<td>NIV</td>
<td></td>
<td>0</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>65.</td>
<td>MCC</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>66.</td>
<td>IISc</td>
<td></td>
<td>7</td>
<td>7</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>15</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>67.</td>
<td>University of Pune</td>
<td></td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>68.</td>
<td>NIIN</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>69.</td>
<td>ERC</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>70.</td>
<td>ACTREC</td>
<td></td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>71.</td>
<td>TIFR</td>
<td></td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>72.</td>
<td>IITB</td>
<td></td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>73.</td>
<td>MGMIS</td>
<td></td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>13</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>74.</td>
<td>IIPS</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>75.</td>
<td>NCBS</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>76.</td>
<td>IJNCSR</td>
<td></td>
<td>7</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>1</td>
<td>10</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>77.</td>
<td>NIMHANS</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>5</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>78.</td>
<td>SIJII</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>11</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>79.</td>
<td>SIRI</td>
<td></td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>80.</td>
<td>Dorabji Tata</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

249
The number of times a particular article has been cited gives an indication to the relevance of the published research. SCOPUS data base was also searched for cumulative citation from 2000-2010. It was found that many Institutes like CDRI, Lucknow and AIIMS, New Delhi are focused on multiple tropical diseases like Malaria, Leishmaniasis, Pneumonia and Meningitis and HIV. There are also some Institutes and Universities focusing on specific research on Leishmaniasis (IICB, Kolkata), Diarrhea (NICED, Kolkata) and Leprosy (National JALMA Institute for Leprosy and other Mycobacterial Diseases, Agra) as is evident from Table 11.

**Figure 6: Cumulative h index for each disease**
Table 11: Citations from 1996 to 2010 from the Institutes with high h index

<table>
<thead>
<tr>
<th>SL.No.</th>
<th>Institute/University</th>
<th>Disease</th>
<th>Cumulative Citation (till 2010)</th>
<th>Number of Papers Published</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CDRI</td>
<td>Malaria</td>
<td>347</td>
<td>64</td>
</tr>
<tr>
<td>2</td>
<td>ICGEB</td>
<td>Malaria</td>
<td>250</td>
<td>27</td>
</tr>
<tr>
<td>3</td>
<td>NICED</td>
<td>Diarrhea</td>
<td>692</td>
<td>147</td>
</tr>
<tr>
<td>4</td>
<td>CMC, Vellore</td>
<td>Diarrhea</td>
<td>245</td>
<td>44</td>
</tr>
<tr>
<td>5</td>
<td>Bose Institute</td>
<td>Diarrhea</td>
<td>238</td>
<td>27</td>
</tr>
<tr>
<td>6</td>
<td>JNU</td>
<td>Diarrhea</td>
<td>282</td>
<td>49</td>
</tr>
<tr>
<td>7</td>
<td>IICB</td>
<td>Leishmaniasis</td>
<td>1335</td>
<td>268</td>
</tr>
<tr>
<td>8</td>
<td>BHU</td>
<td>Leishmaniasis</td>
<td>169</td>
<td>16</td>
</tr>
<tr>
<td>9</td>
<td>CDRI</td>
<td>Leishmaniasis</td>
<td>417</td>
<td>92</td>
</tr>
<tr>
<td>10</td>
<td>VCRC</td>
<td>Helminthiasis</td>
<td>114</td>
<td>43</td>
</tr>
<tr>
<td>11</td>
<td>AIIMS</td>
<td>Pneumonia and Meningitis</td>
<td>281</td>
<td>87</td>
</tr>
<tr>
<td>12</td>
<td>CMC, Vellore</td>
<td>Pneumonia and Meningitis</td>
<td>193</td>
<td>46</td>
</tr>
<tr>
<td>13</td>
<td>NARI</td>
<td>HIV</td>
<td>682</td>
<td>96</td>
</tr>
<tr>
<td>14</td>
<td>AIIMS</td>
<td>HIV</td>
<td>982</td>
<td>255</td>
</tr>
<tr>
<td>15</td>
<td>JALMA</td>
<td>Leprosy</td>
<td>155</td>
<td>57</td>
</tr>
<tr>
<td>16</td>
<td>TRC</td>
<td>Tuberculosis</td>
<td>1035</td>
<td>210</td>
</tr>
<tr>
<td>17</td>
<td>AIIMS</td>
<td>Tuberculosis</td>
<td>919</td>
<td>202</td>
</tr>
<tr>
<td>18</td>
<td>IISc</td>
<td>Tuberculosis</td>
<td>486</td>
<td>139</td>
</tr>
<tr>
<td>19</td>
<td>PGIMER</td>
<td>Tuberculosis</td>
<td>398</td>
<td>90</td>
</tr>
<tr>
<td>20</td>
<td>NBRC</td>
<td>JE</td>
<td>184</td>
<td>22</td>
</tr>
<tr>
<td>21</td>
<td>IISc</td>
<td>JE</td>
<td>117</td>
<td>23</td>
</tr>
<tr>
<td>22</td>
<td>NIV</td>
<td>JE</td>
<td>77</td>
<td>32</td>
</tr>
<tr>
<td>23</td>
<td>NIV</td>
<td>Dengue</td>
<td>89</td>
<td>25</td>
</tr>
<tr>
<td>24</td>
<td>NICED</td>
<td>Typhoid</td>
<td>155</td>
<td>16</td>
</tr>
</tbody>
</table>

**Journal impact factors** are figures based on average citations for their articles in a year. It varies year to year and unlike individual citation of each article as in h index, it is an average of all articles published in a particular journal. Impact factor is more of an indication of the journal and less of an individual article. The impact factor of the journals in which articles on Tropical diseases were published vary from high ranking journals like *Nature* (3 and 4), *Science* (5), *Proceedings of National Academy of Sciences* (6) and *Journal of Biological Chemistry* (7).

Many Institutes and hospitals publish their studies in bulletins and journals that are easily accessible by all. For instance the King Edward Hospital at Vadu (http://www.kemhospitalvadu.org/publication.asp), International Institute of Population Sciences (http://www.iipsindia.org/publications05_a_04.htm) and Vector Control Research Centre, Puducherry (http://icmr.nic.in/icmrsql/lstpub.asp) publish
important aspects of disease surveillance, demographics and information to combat
diseases successfully.

A list of patents was compiled from information received from questionnaires (for the
format of Questionnaire, please see Annexure 1). Only twenty seven Institutes sent in
information regarding patents (Table 12). Amongst these CDRI, Lucknow, has the
highest number of patents granted and filed in the area of Tropical diseases. Some of the
granted patents are listed in Table 13.

Table 12: Patents granted and filed on Tropical Diseases

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Name of Institute/University</th>
<th>International Patents Granted</th>
<th>National Patents Granted</th>
<th>International patents Filed</th>
<th>National Patents Filed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IICB</td>
<td>3</td>
<td>0</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>NICED</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Bose Institute</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>RMRC, Dibrugarh</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>CDRI</td>
<td>18</td>
<td>26</td>
<td>17</td>
<td>60</td>
</tr>
<tr>
<td>6</td>
<td>JALMA</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>NBRC</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>IIIM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>IMTECH</td>
<td>15</td>
<td>1</td>
<td>17</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>NIPER, Mohali</td>
<td>5</td>
<td>2</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>IGIB</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>12</td>
<td>NII</td>
<td></td>
<td></td>
<td>13</td>
<td>5</td>
</tr>
<tr>
<td>13</td>
<td>AIIMS [Prof. Sarman Singh]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>University of Delhi</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>VPCI</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>JNU</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>ICGEB</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>40</td>
</tr>
<tr>
<td>18</td>
<td>ILS, Bhubaneshwar</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>ILS, Hyderabad</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>CCMB</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>21</td>
<td>CDFD</td>
<td>8</td>
<td>3</td>
<td>29</td>
<td>11</td>
</tr>
<tr>
<td>22</td>
<td>NIV</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>MGIMS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>JNCASR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>IOP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>IITG</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>27</td>
<td>NIMR</td>
<td>3</td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Sl. No.</td>
<td>Institute/University</td>
<td>Country where patent was granted</td>
<td>Title of the patent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>---------------------</td>
<td>----------------------------------</td>
<td>---------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>IICB</td>
<td>Canada, USA, India</td>
<td>Anti Leishmanicidal activity of Betel leaf extract</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>IICB</td>
<td>India, USA</td>
<td>Antileishmanial activity of drug entrapped cationic liposomal formulations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>IICB</td>
<td>India, Brazil, Nepal, Bangladesh</td>
<td>Leishmanicidal activity of night Jasmine leaf extract containing Calceolarioside A against chronic visceral Leishmaniasis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>IICB</td>
<td>India</td>
<td>Antileishmanial activity of Amphotericin B entrapped in cationic liposomal formulation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>IICB</td>
<td>USA</td>
<td>DNA vaccine as an immunoprophylactic agent against Leishmaniasis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>IICB</td>
<td>India, Nepal, Bangladesh, Europe</td>
<td>Hybrid cell vaccine against Kala-Azar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>IICB</td>
<td>India</td>
<td>Karela extract and Momorducatin purified from Momodica charantia are chemotherapeutic agents against Kala-Azar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>IICB</td>
<td>India</td>
<td>Soluble protein antigen vaccine as immunoprophylaxis and immunotherapy against Kala-Azar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>IICB</td>
<td>India</td>
<td>Anti-Leishmanial activity of Paramomycin entrapped in cationic liposomal formulation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>IICB</td>
<td>India</td>
<td>ELISA and Dipstick based immunoassay for field diagnosis of visceral Leishmaniasis (Kala-Azar) and PKDL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>IICB</td>
<td>India</td>
<td>Amino Quinoline based compounds are potent antileishmanial, antibacterial, antifungal, antiviral (JEV) and anticancer (Prostate) agents.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>CDRI</td>
<td>Malaysia, Sri Lanka, USA and South Africa</td>
<td>Synergistic anti-malarial formulation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>CDRI</td>
<td>USA</td>
<td>Novel spiro 1,2,4 trioxanes as antimalarial agents and a process for the preparation thereof</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>CDRI</td>
<td>Canada, South Africa, Bangladesh, USA, Peru, Philippines, Singapore</td>
<td>Substituted 1,2,4-trioxanes useful as antimalarial agents and a process for the preparation thereof</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>CDRI</td>
<td>USA</td>
<td>Combination kit used in the treatment of malaria</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>CDRI</td>
<td>South Africa</td>
<td>Synergistic combination kits of α, β- arteether, sulfadoxin and pyrimethamine for the treatment of severe/multi-drug resistant cerebral malaria</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>CDRI</td>
<td>Malaysia, Australia, Japan, USA, Canada, Sri Lanka, Bangladesh, South Africa, Europe</td>
<td>Formulation of dihydroartemisinin for the control of wide spectrum of malaria</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Organization</td>
<td>Country</td>
<td>Description</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>--------------</td>
<td>---------</td>
<td>-------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>CDRI</td>
<td>USA</td>
<td>Amino-functionalized 1,2,4-trioxanes useful as antimalarial agents and process for preparation thereof</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>CDRI</td>
<td>African Regional Industrial Property Organization</td>
<td>Novel 6-[(cycloalkylphenyl) vinyl] -1,2,4-trioxanes useful as antimalarial agents</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>CDRI</td>
<td>USA</td>
<td>Method of treating a cognitive memory dysfunction using gugulipid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>CDRI</td>
<td>Slovenia, USA, South Africa, Pakistan, Sri Lanka</td>
<td>Substituted 1,2,4-trioxanes as antimalarial agents and a process of producing the substituted 1,2,4-trioxanes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>CDRI</td>
<td>Sri Lanka</td>
<td>Intramuscular formulation of an antimalarial dihydro artemisinin for the control of multidrug resistant and severe completed malaria</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>CDRI</td>
<td>Germany, Europe, Israel, Bangladesh</td>
<td>Composition useful for the early diagnosis of visceral leishmaniasis and a process for preparing the same</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>CDRI</td>
<td>Mexico</td>
<td>A composition for treating neurocerebrovascular disorders</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>CDRI</td>
<td>USA, Europe, Australia</td>
<td>Herbal extracts of Salicornia species, process of preparation thereof, use thereof against tuberculosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>CDRI</td>
<td>Uzbekistan, Ukraine,</td>
<td>Biodegradable, inhalable microparticles containing anti-tubercular drugs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>CDRI</td>
<td>USA</td>
<td>Mycobacterium tuberculosis specific DNA fragment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>CDRI</td>
<td>USA</td>
<td>Mycobacterium tuberculosis specific DNA fragment (probe)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>CDRI</td>
<td>India</td>
<td>Novel amino functionalized 1,2,4-trioxanes useful as antimalarial agents and a process for the preparation thereof</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>CDRI</td>
<td>India</td>
<td>Novel substituted 1,2,4, -trioxanes as anti malarial agents</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>CDRI</td>
<td>India</td>
<td>Novel substituted 1,2,4-trioxanes useful as anti malarial agents</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>CDRI</td>
<td>India</td>
<td>Novel 6-[(cycloalkylphenyl) vinyl] -1,2,4-trioxanes useful as antimalarial agents</td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>CDRI</td>
<td>India</td>
<td>Novel substituted 1,2,4-trioxanes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>CDRI</td>
<td>India</td>
<td>A formulation of a-ß artemether useful for the treatment of wide spectrum multi drug resistant malaria through rectal route</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>CDRI</td>
<td>India</td>
<td>Novel ether derivatives of dihydro artemisinin as anti malarials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>CDRI</td>
<td>India</td>
<td>Novel 6-[(substituted biphenyl) vinyl] -1,2,4-trioxanes, useful as antimalarial agents</td>
<td></td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>CDRI</td>
<td>India</td>
<td>A process for the preparation of novel 6-[(cycloalkylphenyl) vinyl] -1,2,4-trioxanes useful as antimalarial agents</td>
<td></td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>CDRI</td>
<td>India</td>
<td>An improved process for the preparation of 2-pyridyl -2,8-bis- (trifluromethyl) -4-quinolyl ketone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Institution</td>
<td>Country</td>
<td>Description</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>-------------</td>
<td>---------</td>
<td>-------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>CDRI</td>
<td>India</td>
<td>A process for the preparation of novel ether derivatives of dihydroartemisinin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>CDRI</td>
<td>India</td>
<td>An improved process for the preparation of α-(2-pyridyl-N-oxide)-4-quinolyl methane</td>
<td></td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>CDRI</td>
<td>India</td>
<td>A process for the preparation of novel substituted 1,2,4-trioxanes and their esters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>CDRI</td>
<td>India</td>
<td>A process for the preparation of a dihydroartemisinin formulation useful for the control of wide spectrum of malaria</td>
<td></td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>CDRI</td>
<td>India</td>
<td>A process for the preparation of novel substituted 1,2,4-trioxanes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>CDRI</td>
<td>India</td>
<td>An improved one-pot process for the preparation of ether derivative of dihydroartemisinin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>CDRI</td>
<td>India</td>
<td>A one-pot process for the preparation of artemether from artemisinin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>CDRI</td>
<td>India</td>
<td>An improved process for the preparation of dihydroartemisinin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>CDRI</td>
<td>India</td>
<td>A process of preparation of formulation useful for treatment of malaria</td>
<td></td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>CDRI</td>
<td>India</td>
<td>An improved process for the preparation of ether derivatives of dihydroartemisinin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>49</td>
<td>CDRI</td>
<td>India</td>
<td>A process for the preparation of stable antigen useful for early diagnosis of visceral leishmaniasis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>CDRI</td>
<td>India</td>
<td>Herbal extracts of Salicornia species, process of preparation thereof, use thereof against tuberculosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>51</td>
<td>CDRI</td>
<td>India</td>
<td>A process for the preparation of novel N1, N,N-diglycosylated diaminoalcohol useful in chemotherapy of tubercular infections</td>
<td></td>
<td></td>
</tr>
<tr>
<td>52</td>
<td>CDRI</td>
<td>India</td>
<td>A process for the preparation of novel combinational library of N1-glycosylated and N3-substituted ureas and thioureas useful as antitubercular agents</td>
<td></td>
<td></td>
</tr>
<tr>
<td>53</td>
<td>CDRI</td>
<td>India</td>
<td>A novel combinational library of 3-substituted amino-3-glycosylated propanamides useful as antifungal and antibacterial agents</td>
<td></td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>CDRI</td>
<td>India</td>
<td>A process for the preparation of novel combinational library of 3-substituted amino-3-glycosylated propanoate useful as antifungal and antibacterial agents</td>
<td></td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>IMTECH</td>
<td>India</td>
<td>A process for the preparation of a vaccine against Tuberculosis and other intracellular pathogens</td>
<td></td>
<td></td>
</tr>
<tr>
<td>56</td>
<td>IMTECH</td>
<td>Europe, Japan, USA</td>
<td>Process for the isolation of a nontoxinogenic Vibrio cholerae strain and a process for preparing Cholera vaccine from said Vibrio cholerae strain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>57</td>
<td>IMTECH</td>
<td>USA</td>
<td>Process for the preparation of a vaccine for the treatment of Tuberculosis and other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Institution</td>
<td>Location</td>
<td>Description</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>-------------</td>
<td>----------</td>
<td>-------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>IMTECH</td>
<td>USA, Europe</td>
<td>Reporter gene based method for the screening of anti-Tuberculosis drugs by using essential and regulatory genes of Mycobacteria as drug target</td>
<td></td>
<td></td>
</tr>
<tr>
<td>59</td>
<td>IMTECH</td>
<td>Philippines, Malaysia, Bangladesh, Russian Federation, Pakistan, South Africa, Canada, Indonesia, Viet Nam</td>
<td>The vaccine for the treatment of Tuberculosis and other intracellular Infectious diseases</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>NIPER, Mohali</td>
<td>Europe, USA, Japan, Australia, Brazil, India</td>
<td>Ring-substituted 8-aminoquinoline analogs as antimalarial agents and process for their preparation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>61</td>
<td>NIPER</td>
<td>India</td>
<td>process for preparation of ring-substituted 8-aminoquinoline analogues as antimalarial agents</td>
<td></td>
<td></td>
</tr>
<tr>
<td>62</td>
<td>University of Delhi</td>
<td>Singapore</td>
<td>Mutants of mycobacteria and process thereof,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>63</td>
<td>ICGEB</td>
<td>India</td>
<td>A method for preparing scar primers for use in MAS of rice varieties susceptible to attack by gall midge biotypes and a method for screening rice varieties</td>
<td></td>
<td></td>
</tr>
<tr>
<td>64</td>
<td>ICGEB</td>
<td>Sri Lanka</td>
<td>Recombinant Dengue Multiepitope (r-DME) Protein as Diagnostic Intermediates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>CDFD</td>
<td>Singapore, Europe, USA, India</td>
<td>A method of diagnosing tuberculosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>66</td>
<td>CDFD</td>
<td>Singapore</td>
<td>Antigenic peptides</td>
<td></td>
<td></td>
</tr>
<tr>
<td>67</td>
<td>CDFD</td>
<td>USA</td>
<td>Immunodominant antigen RV2430C and method of treating tuberculosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>68</td>
<td>CDFD</td>
<td>USA, Europe, Germany, Japan</td>
<td>A method of altering levels of plasmids</td>
<td></td>
<td></td>
</tr>
<tr>
<td>69</td>
<td>CDFD</td>
<td>India</td>
<td>Peptide antigens which elicit high humoral immune response and T-cell response</td>
<td></td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>CDFD</td>
<td>India</td>
<td>A microbial process for arginine production</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**References**


9. Comparative Analysis

Introduction:

This exercise of mapping of institutes with capacity and capability in Tropical Diseases was carried out in order to assess if these institutions as a whole had all the elements required for control and elimination of the tropical diseases or whether there was a better way of “virtual” networking and coordination between them in the form of an Institute dedicated to Tropical Diseases. In this chapter, key institutes contributing to tropical disease control and elimination, infrastructure like SAIF, repositories and containment facilities, the existing networks for surveillance and clinical trials, the need for integration of various surveillance initiatives and existing capacity building initiatives have been discussed. A suggestion for way forward has been attempted.

Key institutes in the area of tropical diseases:

For this exercise 85 National Research Institutes, Universities and few private establishments were mapped for the a) profile of the institute, b) the infrastructure that exists there, c) the profile of the scientists contributing to tropical diseases d) the research carried out by them, e) the services rendered and f) contribution to capacity building in different domains for control and elimination of these diseases. The funds available to an institute for research in tropical diseases could be obtained from only some of the institutes and hence the details from each funding agency were obtained separately. The output from each institute was measured in terms of the total number of publications in tropical diseases and also the number of national and international patents filed and granted. Since the whole gamut from basic science to implementation and operation research was covered, we also tried our best to map the Sophisticated Analytical Instruments and bio-containment facilities which were accessible to neighboring institutions and universities as well, albeit for a fee. This was done because these instruments are expensive and get outdated fast without being optimally utilized.

Out of the 85 Institutes mapped, the 28 key institutes were listed based on the number of publications and patents, the number of scientists working in the area of tropical diseases, their strengths of infrastructure, training; specimen banking, conducting high quality basic science and/or clinical research.

There are a few institutes that are being planned or are in their infancy. There are a few scientists working on tropical diseases of interest to this study in these institutes. All these institutes have been created with a purpose of contributing to reduction in disease burden by strengthening one domain or the other in the whole enterprise. These institutes have been dealt with under the heading “New Research Institutes and Health Biotech Clusters”
Table 14: Strengths of key institutes at a glance

<table>
<thead>
<tr>
<th>Institute</th>
<th>Diseases covered</th>
<th>No. of scientists involved</th>
<th>Strengths</th>
</tr>
</thead>
<tbody>
<tr>
<td>IICB</td>
<td>Cholera, Leishmaniasis</td>
<td>20</td>
<td>SAIF (Access or not/; IP management Cell; Technology Development for diagnostics, immunoprophylaxis, and chemotherapy of Leishmania.</td>
</tr>
<tr>
<td>NICED</td>
<td>Cholera Typhoid/paratyphoid Shigellosis HIV/AIDS Rotavirus</td>
<td>34</td>
<td>Multidisciplinary research*, Linkages with ID Hospital Kolkata &amp; Dr. B.C Roy Memorial Hospital for children; urban &amp; semi urban community based clinical trial centers; SAIF, BSL3 facility, Data management center, Modern Biology including Transgenic animal facility, Eastern Hub of ICMR School of public health</td>
</tr>
<tr>
<td>Bose Institute</td>
<td>Cholera Leishmaniasis TB</td>
<td>2</td>
<td>Regional SAIF, Drug discovery research</td>
</tr>
<tr>
<td>CSTM</td>
<td>HIV/AIDS JE, Dengue Malaria, Leishmaniasis (VL and PKDL)</td>
<td>51 (only 70% filled)</td>
<td>Linkages with Carmichael Hospital; COE in HIV; Dept. of Tropical Medicine; Daily ART center; Studies on nutrition in ART patients; Training programs, Public Health and Field work</td>
</tr>
<tr>
<td>RMRIMS</td>
<td>Leishmaniasis, PKDL, HIV&amp;TB Malaria</td>
<td>16</td>
<td>Clinical &amp; epidemiological studies; cost effective vector management; VL-HIV co-infection, clinical trials for new drugs &amp; vaccines for Leishmania</td>
</tr>
<tr>
<td>RMRC, Dibrugarh</td>
<td>HIV(&amp; drug abuse) JE, TB, malaria</td>
<td>10</td>
<td>Exploring traditional medicine with multidisciplinary approach; Xeno-diagnosis of arboviral infection: early warning system for JE, Eastern Hub of ICMR School of public health</td>
</tr>
<tr>
<td>CDRI</td>
<td>Malaria, LeishmaniasisFilarialsis, Tuberculosis</td>
<td>44</td>
<td>14 R&amp;D &amp; 13 Technical services divisions for Drug development: capacity,</td>
</tr>
</tbody>
</table>

Remarks: Highest h index of 23 for 268 publications on Leishmania
147 papers in diarrhoea alone, WHO Phage reference Center; WHO Collaborative Centre for Research and Training on Diarrheal Diseases; Supply of reagents (page 90 for more details)
S.N. De, the discoverer of cholera toxin worked here
NRL for QA and QC of HIV testing for ICTCs, PPTCT, blood banks of West Bengal
Accredited by WHO for conducting bioequivalence studies; WHO reference centre for Leishmania Parasite and Sera Bank.
WHO recognized centre for training in malariology
Highest h index of 13 for 64 publications in Malaria; h index of 14
<table>
<thead>
<tr>
<th>Institution</th>
<th>Activities</th>
<th>Publications</th>
<th>H-index</th>
<th>Additional Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>BHU</td>
<td>Leishmaniasis, Filariasis, HIV, TB, typhoid</td>
<td>9</td>
<td>52</td>
<td>Capability &amp; infrastructure for design, development, formulation, Preclinical &amp; delivery systems, SAIF (p155 for details) for 92 publications in Leishmaniasis; Highest No. of Patents filed and granted</td>
</tr>
<tr>
<td>KGMC (CCSMU)</td>
<td>JE, Dengue, TB, HIV, Shigella, pneumonia, meningitis</td>
<td>9*</td>
<td>26</td>
<td>National Center for Shigella</td>
</tr>
<tr>
<td>JALMA</td>
<td>Leprosy, Tuberculosis, HIV/AIDS and Filariasis</td>
<td>20</td>
<td>122</td>
<td>Out &amp; in patient services, physiotherapy &amp; reconstructive surgery for leprosy patients; National Facility for drug resistance in leprosy; BSL-3 for humans and animal experiments; Model rural health research unit for operational research</td>
</tr>
<tr>
<td>IMTECH</td>
<td>Malaria, Cholera, Leishmaniasis, TB and HIV/AIDS</td>
<td>22</td>
<td>45</td>
<td>Computational Resources for Drug Discovery, Microbial type culture and Gene bank facility, facilities for design of process equipment and bioreactors, EM Facility</td>
</tr>
<tr>
<td>PGIMER</td>
<td>Malaria, Leishmaniasis, TB, JE, HIV/AIDS, Dengue, Pneumonia and meningitis, diarrhoea, leprosy</td>
<td>13</td>
<td>238</td>
<td>Premier Post graduate Medical teaching and training institute; Nodal center for sentinel surveillance of diseases; member of the Partners for Parasite Control under the Programme for Control of Neglected Tropical Diseases</td>
</tr>
<tr>
<td>AIIMS</td>
<td>HIV/AIDS, Malaria, TB, Leishmaniasis, Dengue, Pneumonia meningitis, Diarrhoea, Leprosy, typhoid</td>
<td>16</td>
<td>669</td>
<td>Premier Model institute for graduate and post graduate Medical teaching and training, Research institute; Tertiary care conglomerate of facilities under different super-specialities Nodal center for sentinel surveillance of pneumonia, HIV, TB</td>
</tr>
<tr>
<td>NII</td>
<td>HIV, TB, JE, Typhoid, Leishmaniasis, Malaria</td>
<td>17</td>
<td>142</td>
<td>Infrastructure and capacity to conduct studies on immunobiology of host &amp; pathogen; Small animal &amp; primate facility, SEM, TEM confocal microscope facility</td>
</tr>
<tr>
<td>Institution</td>
<td>Focus Areas</td>
<td>Infrastructure and capacity</td>
<td>Research Highlights</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>-------------</td>
<td>-----------------------------</td>
<td>--------------------</td>
<td></td>
</tr>
<tr>
<td>ICGEB</td>
<td>HIV, TB, Malaria, dengue</td>
<td>Infrastructure and capacity for basic research as well as product development, SAIF, National TB aerosol facility, round the year training programmes, ongoing, TB and dengue drug discovery programmes</td>
<td>rDengue Multi-epitope Protein marketed as Diagnostic Intermediates, malaria &amp; Dengue vaccine being developed Part of NAC consortium of IAVI. h index of 12 for 27 publications in malaria</td>
<td></td>
</tr>
<tr>
<td>JNU</td>
<td>Leishmaniansis, Filarias, malaria, TB</td>
<td>Autonomous university Teaching and Research in TDs in 3 departments, Design / development/ fabrication &amp; maintenance of SAIF; Animal facility, BSL-3 facility</td>
<td>Biomarkers for drug resistance in L. donovani.</td>
<td></td>
</tr>
<tr>
<td>IGIB</td>
<td>TB, HIV, Pneumonia, Malaria diarrhoea</td>
<td>Key partner in OSDD, SAIF, stocks fine chemicals for supply to other research laboratories.</td>
<td>Areas as evident from publications</td>
<td></td>
</tr>
<tr>
<td>NARI</td>
<td>HIV, HIV-TB, JE</td>
<td>Expertise in all aspects of HIV disease biology, epidemiology, diagnosis, drug and vaccine trials, education and advocacy, Social aspects and ethics, drug development and discovery for TB Repository HIV-1 &amp; HIV-2 well characterized Indian strains</td>
<td>National Center for HIV testing, h index of 16 for 96 publications in HIV, Key center for clinical trials for drugs and vaccine for HIV</td>
<td></td>
</tr>
<tr>
<td>NIV MCC</td>
<td>JE, DEN, Rotavirus Hepatitis</td>
<td>Arboviral Epidemic &amp; outbreak investigation, supply of MAC-ELISA kits for Den to the NVBDCP, Microarray facility, BSL3 + facility, good entomology expertise available. EM and animal facility, Regents and cell culture supply to other institutions</td>
<td>WHO Advanced center for Virus reasearch, H5 reference lab. for South-East Asia National Virus Repository and Serum bank</td>
<td></td>
</tr>
<tr>
<td>NCCS</td>
<td>HIV, Leishmania, Malaria</td>
<td>Mainly work on Immunity and infections, and cell pathogen interactions.</td>
<td>Animal cell culture repository, Supply to other institutes,</td>
<td></td>
</tr>
<tr>
<td>NIMHANS</td>
<td>HIV/AIDS, TB, Leprosy JE and Dengue.</td>
<td>Teaching and training in all aspects of mental health, 25 departments and faculty strength of 125, Good neuro virology &amp; neuropath. facilities</td>
<td>Houses the Human Brain Tissue Repository, National AIDS Reference laboratory; national CD4 Reference lab, WHO Collaborating center for Rabies, WHO SEARO Regional ref. lab for JE; National Flu Surveillance Lab &amp;</td>
<td></td>
</tr>
<tr>
<td>Institute</td>
<td>Diseases</td>
<td>Facilities</td>
<td>Contributions</td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td>----------</td>
<td>------------</td>
<td>--------------</td>
<td></td>
</tr>
<tr>
<td>IISc</td>
<td>TB, JE, Malaria, Typhoid, Rotavirus</td>
<td>Widely known for its contribution to basic science, in-depth study of disease biology, Well equipped, SAIF, animal house</td>
<td>216 Has one of the Indian TB vaccine candidates, partner in Indian Rota vaccine development</td>
<td></td>
</tr>
<tr>
<td>TRC</td>
<td>TB, HIV/AIDS</td>
<td>Known world over for quality research and patient care in TB and HIV-TB, centres of excellence for AIDS vaccine clinical evaluation in India</td>
<td>287 210 Publications in TB, h index 22, an Internationally Certified Institute for Excellence in Research (ICER)</td>
<td></td>
</tr>
<tr>
<td>CMC</td>
<td>TB, HIV, Pneumonia, Meningitis, Rotavirus</td>
<td>High Quality patient care, teaching and research centre, well known for its short term training in various important areas of disease control, reference laboratory for the SAPNA and INCLEN.</td>
<td>250 Conducts fellowship in HIV medicine with CSTM, has the only MSc Biostatistics course in the country</td>
<td></td>
</tr>
<tr>
<td>VCRC</td>
<td>JE, Dengue, Filariasis</td>
<td>Known for developing new intervention strategies for surveillance &amp; control of vector borne diseases &amp; transfer them to the operational settings, develop methods &amp; manpower for rapid response to outbreaks, Generate evidence-base for policy formation.</td>
<td>72 Centre of excellence for research &amp; training in vector-borne diseases; a WHO collaborating Centre for Research and Training in Lymphatic Filariasis and Integrated Methods of Vector Control</td>
<td></td>
</tr>
<tr>
<td>NIE</td>
<td>HIV/AIDS, TB, Leprosy</td>
<td>Centre of excellence in the field of epidemiology, works in all areas related to public health practice, operational research, health systems research, training.</td>
<td>32 ICMR nodal school of Public Health</td>
<td></td>
</tr>
<tr>
<td>CDFD</td>
<td>Malaria, TB</td>
<td>SAIF, National node for European Molecular Biology network; Asia Pacific Bioinformatics Network for India; Sun Centre of Excellence in Medical Bioinformatics</td>
<td>46</td>
<td></td>
</tr>
<tr>
<td>CCMB</td>
<td>HIV/AIDS, JE, TB, Malaria Leishmaniasis.</td>
<td>Well Equipped BSL-2 and BSL-3 Facilities; Jonaki (A unit of BRIT); Plan to take up tissue banking and initiated mathematical modeling of disease.</td>
<td>32 Supplies 32P and 33P labeled nucleotides &amp; biology kits to various universities &amp; research institutes in the country</td>
<td></td>
</tr>
</tbody>
</table>

*(Epidemiology, bacteriology, virology, parasitology, clinical medicine, immunology and molecular biology)

**search limited to Microbiology and Pediatrics

# refer to page 240 of this document for details

SAIF= Sophisticated Analytical Instrument Facility present
New research institutes and Health Biotech Clusters

With the aim to educate and empower the country’s increasing population, the Government of India has engaged in a strong policy to set up several new educational and research institutes all over the country. The new institutes are being modeled on previously successful chain of institutes like Indian Institute of Technology s (IITs) and Indian Institute of Science (IISc) at Bangalore, which will not only produce a strong manpower force versed in Biotechnology encompassing Tropical Diseases but also discover novel research products to combat these diseases.

New IITs have been created in Hyderabad and Jodhpur, which engage in undergraduate and postgraduate courses with the B.Tech and M.Tech degrees in Department of Biotechnology/Biomedical studies and also enable students to pursue their Doctorate degrees in research.

Five new Indian Institute of Science Education and Research (IISER) have been established in the past three years to enable education and research in science. The IISERs are at Kolkata, Pune, Mohali, Bhopal and Trivandrum. Faculties with experience in latest areas of science have been recruited to foster a multidisciplinary environment encompassing Chemistry, Mathematics, Physics and Biology. With similar ambition, a National Institute of Science Education and Research has been established in Bhubaneswar.

National Institute of Technology (NIT) such as those set up at Calicut and Durgapur promote undergraduate, postgraduate and doctoral courses in engineering and technology fields including courses in Biotechnological sciences.

New National Institutes of Pharmaceutical Education and Research (NIPER) set up in Ahmedabad, Guwahati, Hajipur and Hyderabad will pursue courses in Biotechnology and Pharmaceutical science education and research. The main objective of NIPER is to provide leadership in pharmaceutical science with industry, National and International collaborations and promoting community and institutional pharmacy apart from establishing national centres in advanced research and emerging areas.

Major Biotech Science Cluster of Institutes one in North India in the Delhi National Capital Region (NCR) and the other in South of India at Bangalore are being established with the aim to integrate Translation science with Basic research. In Delhi NCR, the Translational Health Science and Technology Institute (THSTI) forms a part of an emerging health biotech science cluster creating a unique institutional environment for the conduct of truly multidisciplinary research that translates scientific and technological advancements into medical innovations that will improve public health.

It also seeks to establish collaborations with research institutions and hospitals around India, making this a national undertaking. The goal is to work towards affordable technologies and solutions that address global healthcare challenges.
Three new programs have been launched by THSTI, namely,

- **Pediatric Biology Center (PBC)**, a collaboration of THSTI, All India Institute of Medical Science (AIIMS), and National Institute of Immunology (NII)
- **Vaccine and Infectious Disease Research Center (VIDRC)**, a collaboration of THSTI and NII
- **Biodesign Centre**, a collaboration of IIT-Delhi, AIIMS, THSTI, and International Centre for Genetic Engineering and Biotechnology (ICGEB).
- **Clinical Development and Services Agency (CDSA)**, a not for profit company, engaged in clinical trials and provides assistance and training in regulatory submissions

The same cluster will include the **Regional Centre for Biotechnology (RCB)**, a newly established institution of **education, training and research** in the Delhi NCR by the Department of Biotechnology, Government of India under an agreement with UNESCO. RCB is designed to be a centre of excellence in biotechnology with intimate contributions from the countries of the region and academic institutions from the rest of the world. It provides a meeting place where innovation, enterprise, and industrial development will germinate.

This Centre would be beneficial to all countries in the region including India in carrying out biotechnology research of highest caliber and developing knowledge-rich highly skilled human resource. Biotechnology being essentially global, the partnerships are as much within as across countries.

A major Bio Cluster of interdisciplinary research and education has also come up in **Bangalore**, which includes National Centre of Biological Science and two new, institutes namely **Institute for Stem Cell Biology and Regenerative Medicine** (inSTEM) and **Centre for Cellular and Molecular Platforms** (C-CAMP). The aim of this cluster is to act as an enabler of success in bioscience research and entrepreneurship by providing research, development, training and service in state of the art technology platforms, Stem cell therapy and basic and applied research in Biological sciences.

Many new institutes are being established with the help of private and public partnerships between the National Institutes and private foundations for example **Institute of Molecular Medicine** at New Delhi is newly set up with the help of **The Chatterjee Group** and **Institute of Genomics and Integrative Biology**.

Similarly **Institute of Life Sciences at Hyderabad** has been set up with the **Reddy’s Group and University of Hyderabad**. In both the new institutes, Principal investigators are actively pursuing research in tropical diseases like Dengue, TB and Leishmaniasis.
**Surveillance and the National Vector Borne Disease Control Programme (NVBDCP)**

Vector borne diseases constitute majority of the burden of diseases in the tropical regions. These include disease like Malaria, Filariasis, JE and Dengue etc. The pattern of distribution of these diseases is changing rapidly due to industrialization, rapid unplanned urbanization, deforestation and changing ambient temperatures, resulting in steady increase in epidemics and outbreaks in new areas. Increase in frequency of these diseases and that too in their severe forms has become a cause of concern for public health professionals and public alike. The other complexities in effectively controlling transmission of these diseases include involvement of vectors, presence of animal reservoirs as in JE, development of drug resistance and resistance to insecticides in vectors of malaria and to some extent Kala-azar.

Directorate of **National Vector Borne Disease Control Programme** (NVBDCP) at the **National Center for Disease Control (NCDC) at New Delhi** is the central nodal agency for the prevention and control of vector borne diseases i.e. Malaria, Dengue, Lymphatic Filariasis, Japanese Encephalitis and Chikungunya in India. The programme also includes several short term training programmes for capacity building in surveillance and epidemiology. The common strategies adopted include:

1. Early case Detection and Prompt Treatment (EDPT)
2. Vector Control
   (i) Chemical Control
   (ii) Biological Control
   (iii) Personal Prophylactic Measures that individuals/communities can take
3. Community Participation
4. Environmental Management & Source Reduction Methods
5. Monitoring and Evaluation of the Programme

The NVBDCP responds to inputs form the Integrated Disease Control Project (IDSP) also coordinated by the **National Center for Disease Control** and the **Communicable Disease Cluster of the country office of WHO**, which in turn get inputs from various State and regional health societies.

**Integration of GIS and Remote Sensing (RS) in disease surveillance**

Due to fast changing environment there is a need for regular surveillance of both disease as well as the vectors. Factors responsible for the disease transmission are governed by the local environmental conditions at the micro level, which vary vastly in the country. **Geographical Information System (GIS)** and **Remote Sensing (RS)** are tools that can provide solutions in vector borne disease control programs apart from playing an important role in planning, research and formulation of public health policy. It is a technology that establishes link between many complex health factors like population, environment, economic and social factors. It also improves decision makers
understanding of community health situation and empowers them to design effective interventions.

GIS has been successfully employed in malaria research, AIDS and asthma, surveillance of disease spread in cholera, avian influenza and dengue. It has also been used successfully to trace TB clusters in the city of Dehradun, aiding intensified case finding, promotion of general health and hygiene and better coordination between government and private agencies in the hotspot detected by the study.

Many private agencies like the **Bhaskaracharya Institute of Space Applications and Geoinformatics (BISAG) Gujrat** and NIIT-GIS have become nodal agencies at the state level. **Indian institute of Remote sensing (IIRS)** and the **NIC** has various GIS initiatives that can provide a base for National GIS concept.

ICMR has a task force on GIS and Health and has overseen many projects of importance to tropical diseases. The participating institutes are **National Institute of Malaria Research, New Delhi; Vector Control Research Center, Puducherry and Rajendra Memorial Research Institute of Medical Sciences, Patna** while the institutes collaborating with these key institutes are **Regional Remote Sensing and Service Center, Bangalore; Regional Remote Sensing and Service Center, Kharagpur and Haryana Space Research Center, Hisar**

The other institutes which have used GIS and Remote sensing for tropical diseases control include:

- **Bangalore and Chennai field stations of National Institute of Malaria Research; Regional Medical Research Center, Bhuwaneshwar** (used the technology to develop a strategy for malaria control, for mapping kala-azar prone areas of Bihar and for studying the epidemiology of filariasis in Orissa); **National Institute of Epidemiology, Chennai** (used GIS to study the leprosy vaccine trial area); **Indian Institute of Chemical Technology, Hyderabad**, uses GIS for prediction of JE vectors density, mapping of the endemic zones of Lymphatic Filariasis in Karimangar, Chittoor, East & West Godavari districts of Andhra Pradesh and for mapping of endemic zones of Malaria in Arunachal Pradesh, Manipur, Assam and Andhra Pradesh).

Variability in such factors like disease endemicity & transmission pattern, variation of vector and pathogen responses to control tools and to human host socio-cultural aspects demand situation specific strategies. The data needs to be collected in a manner that can be extrapolated to larger areas. **Therefore, for planning an effective control/elimination and eradication strategy of vector borne diseases, it is essential that it is integrated with a regular surveillance program perhaps under the umbrella of the National Vector Borne Disease Control Program (NVDCP).**

The important surveillance networks in the country are listed below in Table 15.
Table 15: Important surveillance networks and coordinating centers

<table>
<thead>
<tr>
<th>Institute</th>
<th>Disease(s) covered</th>
<th>Type of surveillance*</th>
<th>Partners</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>NICED</td>
<td>Cholera, Typhoid, HIV, Pneumonia and meningitis</td>
<td>S, IDSP</td>
<td>NACO</td>
<td>Cholera under IDSP and with IVI for GIS in cholera</td>
</tr>
<tr>
<td>CSTM</td>
<td>HIV/AIDS, JE, Dengue</td>
<td>S</td>
<td>NACO</td>
<td>Surveillance for JE and Den</td>
</tr>
<tr>
<td>RMRIMS</td>
<td>VL-PKDL</td>
<td>A, S, IDSP</td>
<td>BHU</td>
<td></td>
</tr>
<tr>
<td>JALMA</td>
<td>HIV</td>
<td>CC</td>
<td>NACO</td>
<td>HIV testing and ART monitoring</td>
</tr>
<tr>
<td>PGIMER</td>
<td>All vector borne diseases, Rotaviral diarrhoea and Pneumonia</td>
<td>RL, S, IDSP</td>
<td>** PneumoADIP and INCLEN</td>
<td>RL for arboviral diseases, rotavirus and pneumonia</td>
</tr>
<tr>
<td>SGPGIMS</td>
<td>Polio</td>
<td>S, IDSP</td>
<td>WHO, MOH</td>
<td>SAPNA Nodal Lab</td>
</tr>
<tr>
<td>KGMC</td>
<td>Pneumonia</td>
<td>S, IDSP</td>
<td>PneumoADIP, INCLEN</td>
<td></td>
</tr>
<tr>
<td>CMC</td>
<td>Pneumonia, Rotaviral diarrhoea,</td>
<td>S, IDSP</td>
<td>PneumoADIP, INCLEN</td>
<td>Reference laboratory for SAPNA</td>
</tr>
<tr>
<td>NARI</td>
<td>HIV</td>
<td>S, IDSP</td>
<td>National reference Lab.</td>
<td></td>
</tr>
<tr>
<td>NIV</td>
<td>Viral diseases</td>
<td>S, IDSP</td>
<td>WHO, NCDC</td>
<td>Reference lab for arboviral infections</td>
</tr>
<tr>
<td>NIMHANS</td>
<td>Arboviruses, HIV Influenza</td>
<td>R</td>
<td>WHO, NCDC</td>
<td>Apex lab for Arboviruses,</td>
</tr>
<tr>
<td>NIE</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCDC</td>
<td>All diseases included in the study</td>
<td>CC, IDSP</td>
<td>NVBDCP, IDSP</td>
<td></td>
</tr>
</tbody>
</table>

* A: Active, S: Sentinel, CC: Co-ordinating Center, R: Referral Center, IDSP: contributes to Integrated Disease Surveillance Project
** Partners in rotavirus surveillance network are St. Stephen’s Hospital, Delhi in the North; RIMS, Imphal, Assam Medical College, Dibrugarh in the North-East; NICED Kolkata, SCB Medical College, Cuttack in the East; CMC Hospital, Vellore, Child Jesus Hospital, Trichy in the South; LTMG Hospital, Kasturba Hospital, Mumbai, UHC-Dharavi, Navi Mumbai Municipal Medical Centre, Vashi, KEM Hospital, Bharathi Hospital, Shaishav Clinic, Pune in the West.

Nutrition studies in tropical diseases

Several mapping studies have confirmed that there exists a positive correlation between endemicity of tropical diseases and malnourishment. Nutrition research under Indian Council of Medical Research was mainly carried out by National Institute of Nutrition, Hyderabad till 1980. In late seventies and early eighties ICMR initiated the Task Force strategy for centrally coordinated studies in various areas including “nutrition” as extramural research. The task force approach emphasized a time bound, goal oriented...
approach with clearly defined goals, specific time frames, standardized methodologies and often a multicentre structure. Besides, ICMR has also been playing supportive role by providing financial assistance to individuals from various institutes/ Organizations of the country for carrying out nutrition research.

**National Institute of Nutrition, Hyderabad:** Nutrition research in India started in 1918 when Sir Robert Mc Carrison set up Beri–Beri Enquiry Unit in a single room laboratory at the Pasteur Institute, Coonoor, Tamil Nadu. The laboratory was shifted to Hyderabad in 1958 and was renamed as –National Institute of Nutrition (NIN) in 1969.

The research work carried out in the hospital, laboratory and community is closely integrated by the Institute. Emphasis is laid on problem oriented research with a view to find out effective, practical, economically viable and sustainable solutions to nutrition related problems affecting people. Low-cost nutritional supplements, development of a Nutrition Surveillance System, salt fortified with iron and iodine, effective dietary guidelines for Indians, innovative methods for nutrition education and other IEC strategies, determination of dietary requirements and nutritive values of Indian foods and creation of trained man power in nutrition are some vital contributions of the Institute. The current national nutrition programmes aimed at controlling vitamin A deficiency and iron deficiency anaemia are the results of NIN research.

**Food and Drug Toxicology Research Centre (FDTRC),** set up in 1971 was established as separate centre in NIN Campus in 1978. The mandate was to investigate food borne disease outbreaks and undertake toxicological evaluation of foods and drugs.

**National Nutrition Monitoring Bureau (NNMB)** was established in the year 1972, with a Central Reference Laboratory at NIN and units in the states of Andhra Pradesh, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Tamil Nadu, Uttar Pradesh and West Bengal. Since then the bureau has been collecting data on dietary intakes and nutritional status of the population on a continuous basis.

**The National Centre for Laboratory Animal Sciences** was set up with the aim of producing quality laboratory animals for experimental purposes. The center is currently meeting the breeding and experimentation needs of over 180 institutions in the country. Currently the centre is focusing on, to breed and supply genetically and microbiologically defined laboratory animals; to import and supply selected strains of laboratory animals for biomedical research; development of natural mutants for study of human diseases; conducting research in laboratory animal sciences; human resource development by organizing regular training courses; to disseminate information through Information-Education- Communication; to serve as a national reference centre and nodal agency on matters related to laboratory animal science and technology.

There are a few other groups outside of NIN trying to study the link between nutrition deficiency and tropical diseases. These are as follows:
Calcutta school of Tropical Medicine, Kolkata, one of the oldest centers dedicated to tropical medicine has a department dedicated to study the link between nutrition and tropical diseases. The school has carried out cross-sectional study of the nutritional status of patients on ART; A prospective study on the effect of nutritional counseling on nutritional status of patients starting first line ART; Prospective, randomized control trial of the impact of nutritional counseling and macronutrient and micronutrient supplementation on the health status of patients starting first line of

All India Institute of Medical Sciences:

Advanced Center for Diarrheal Disease Research and Nutrition: This ICMR Advanced Center at All India Institute of Medical Sciences has carved a niche in nutrition research by identifying zinc deficiency in children as a major public health problem affecting 30-40% children and defining its biological and health impact. They also showed that correction of zinc deficiency is a major strategy for prevention of diarrhea and pneumonia. These studies formed an important evidence for global recommendation by WHO for of zinc as a treatment for diarrhea. Studies on higher doses effects of zinc as a preventive strategy in children aged 6 and up and fortification of food with zinc are underway. The group along with the department of human nutrition has also shown the benefits of Vit A supplementation with measles immunization.

At the Regional Medical Research Centre for Tribals (RMRCT), Jabalpur efforts are on to improve tribal health through its basic, applied and operational research on nutrition and educational awareness among tribals in the Central India,

Regional Medical Research Centre, Dibrugarh is aiming to improve nutrition status in the North East and also trying to study the link between Haemoglobinopathies and nutrition. Regional Medical Research Centre, Bhubaneswar is studying the effect of nutrition on tribal health in Orissa and neighboring states.

At Institute of Life Sciences, Hyderabad, an associate Institute of the University of Hyderabad, research is on to unravel the underlying mechanism of macrophage immune modulation during micronutrient deficiency and identification of markers of sterilization for tuberculosis. A group from this institute has shown a direct relationship between micronutrient deficiency and TB disease status in humans. Demographical evidences also suggest a positive correlation of micronutrient deficiency and occurrence of infectious diseases like tuberculosis.

At St. Johns Research Institute (SJRI), Bangalore Dr. Anita Shet, a pediatrician, is interested in infectious diseases affecting children, particularly HIV and tuberculosis, and dengue. She is also interested in disease pathogenesis in HIV, HIV drug resistance, and interaction between nutrition and infection.

Dr. Shally Awasthi of the King George Medical College, Lucknow also a pediatrician, is keen on unraveling the link between the tropical infections and nutrition.
There is a need to extend the monitoring work being carried out by National Nutrition Monitoring Bureau (NNMB) to tropical infectious disease conditions and the initiate network projects in different regions of India. The expertise and facilities of the central laboratory of NIN could prove to be useful. This could then be linked to various other ongoing efforts in the country mentioned earlier.

**Capacity building in key areas**

**Public Health and Epidemiology:**

ICMR in Partnership with Boston University and University of Michigan started Schools of Public Health (IPSPH) in response to the need for qualitative and quantitative change in the practice of public health in India. This initiative primarily aims to develop middle level managers for public health. **Master of Public Health (MPH)** course launched in July 2008 at the ICMR School of Public Health, National Institute of Epidemiology (NIE), Chennai The programme is an off-campus course of Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST), Thiruvananthapuram, and is recognized by Medical Council of India (MCI). The core course at NIE is supported by Regional Hubs located at NARI and NIV in Pune, NIRRH in Mumbai, NIOH at Ahmedabad for the West zone and NICED, Kolkata; All-India Institute of Public Health and Hygiene, Kolkata and RMRC, Dibrugarh in the East, NIMR, Delhi in the North and TRC Chennai, NIN Hyderabad and VCRC Puducherry in the South. The Asian Institute of Public Health, Bhuwaneshwar and School of Public Health at the PGIMER, Chandigarh are few other initiatives contributing towards to capacity building in Public Health. The courses offered range from Field Epidemiology Training Programmes (FETP) leading to Masters in Applied Epidemiology (MAE), which serves as source of manpower to the ISDP and The Masters in Public Health for capacity building for the State Public Health authorities. Several training programs at different levels for surveillance are also offered under the **National Vector Borne Disease Control Programme**.

**Clinical Trials and Regulatory Submissions:**

Knowledge of basic disease biology of the pathogen and its interaction with the host is as important for control and elimination of Tropical Diseases as is the need to develop and implement interventions. An important aspect of development of interventions like drug and vaccines is the demonstration of its safety and efficacy in the target population. Both hospital-based and community-based studies form an important part. Regulatory submissions also demand that the study be conducted in more than one areas where there is high disease burden in order to see visible impact of the intervention. These trials not only require proper and ethical execution of the study but also many different skill sets like communication with local leaders and the study population, data-record and management and finally ability to analyze and interpret the results. It is seen that there are a very few groups in the country that undertake such studies (see table 16 on Clinical Trial Networks below) and therefore the number of studies that each group handle is quite large. This often reflects in the quality of the study. There is a need for creation of more teams around Principal Investigators or PIs who can undertake these studies and
who in turn can undertake training at different levels of conduct of these studies. There is also a need for agencies that can offer assistance for regulatory submissions that are a key for these interventions to see the light of the day. Clinical Development and Services Authority arm of the Translational health Science and Technology Institute is one such non-profit organization which has plans to fill in this gap.

**Table 16: Major clinical trial networks in India**

<table>
<thead>
<tr>
<th>Institute</th>
<th>Condition</th>
<th>Sponsors</th>
<th>Phases</th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>NICED</td>
<td>Cholera, Diarrhea, Vibrio infections</td>
<td>IVI; Shantha Biotechnics Ltd</td>
<td>Phase II, III</td>
<td>Killed bivalent whole cell oral cholera vaccine;</td>
</tr>
<tr>
<td></td>
<td>Typhoid, Paratyphoid fever</td>
<td>IVI; Wellcome Trust; University of Western Ontario, Canada; GlaxoSmithKline</td>
<td>Phase IV</td>
<td>Typhoid Vi vaccine</td>
</tr>
<tr>
<td>CMC</td>
<td>Cholera; Diarrhea; Vibrio infections</td>
<td>IVI; ICDDR, B, Bangladesh; Avant Immunotherapeutics; Vaccine Technologies, Inc</td>
<td>Phase II</td>
<td>Peru-15 Vaccine</td>
</tr>
<tr>
<td></td>
<td>Cholera, Diarrhea</td>
<td>IVI; Shantha Biotechnics Ltd</td>
<td>Phase II</td>
<td>Bivalent killed oral cholera vaccine</td>
</tr>
<tr>
<td>Rotavirus</td>
<td>Gastroenteritis</td>
<td>Shantha Biotechnics Ltd</td>
<td>Phase I</td>
<td>Live-Attenuated Tetravalent (G1-G4) Rotavirus Vaccine (BRV-TV)</td>
</tr>
<tr>
<td></td>
<td>Pulmonary TB</td>
<td>Dalhousie University</td>
<td>Phase III</td>
<td>Drug: A. 100,000 IU Cholecalciferol per dose of 3.3ml</td>
</tr>
<tr>
<td>NARI</td>
<td>HIV infections</td>
<td>IAVI, Targeted Genetics Corporation; Children’s Hospital of Philadelphia; Nationwide Children’s Hospital</td>
<td>Phase I</td>
<td>TgAAC09</td>
</tr>
<tr>
<td></td>
<td>HIV infections</td>
<td>NICHD; National Institute on Drug Abuse (India)</td>
<td>Phase II</td>
<td>drug: 1% Tenofovir gel (microbicide)</td>
</tr>
<tr>
<td>AIIMS</td>
<td>TB (Drug Induced Hepatoxicity)</td>
<td>DBT sponsored Multicentric trial</td>
<td>Phase III</td>
<td>Intra-dermal administration of <em>Mycobacterium w</em></td>
</tr>
<tr>
<td></td>
<td>Sepsis; Bacterial infections; Pneumonia</td>
<td>Centre for International Health</td>
<td>Phase II / Phase III</td>
<td>Rifampicin (max dose 10 mg/kg/day), Isoniazid (max dose 5 mg/kg/day) and Pyrazinamide (max dose 25 mg/kg/day)</td>
</tr>
<tr>
<td></td>
<td>Pulmonary TB</td>
<td>NIH</td>
<td>Phase III</td>
<td>Drug: ATT</td>
</tr>
<tr>
<td></td>
<td>HIV associated Pulmonary TB; HIV infections</td>
<td></td>
<td></td>
<td>Drug: Moxifloxacin, Isoniazid,</td>
</tr>
</tbody>
</table>
Source: ClinicalTrials.gov (Searched with Condition* and India where* is one of the tropical diseases chosen for the study). Some of the interesting clinical trials conducted in India which highlights the existing centers where these trials are conducted. Only those studies were chosen listed where the PI was from India.

**Training in basic and clinical sciences:**

**ICMR, DBT, CSIR and UGC** have Human Resource Development programmes in biomedical research through various schemes such as Research fellowships, Short-term research studentship and various training programmes and workshops conducted by

---

<table>
<thead>
<tr>
<th>Condition</th>
<th>PI/Institute</th>
<th>Phase</th>
<th>Drug/Device</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuberculosis; HIV infections (effectiveness of Short course)</td>
<td>ICMR, NACO, NARI</td>
<td>Phase III</td>
<td>Drug: Anti-TB drugs</td>
</tr>
<tr>
<td>TB, HIV-TB</td>
<td>IDRI, BMGF</td>
<td>Phase I</td>
<td>Leish-111f + MPL-SE Adjuvant</td>
</tr>
<tr>
<td>BHU VL, PKDL</td>
<td>LSHTM, UK Institute of Tropical Medicine, Belgium, RMRIMS, ICDDR.B B.P. Koirala Institute of Health Sciences</td>
<td>Phase I</td>
<td>Device Long Lasting Impregnated Nets (LLIN)</td>
</tr>
<tr>
<td>SAS</td>
<td>EU, WHO, Norwegian Council of Universities' Committee for Development Research and Education</td>
<td>Phase I</td>
<td>Drug: Zinc and vitamin A single dose at enrollment</td>
</tr>
<tr>
<td>KGMC</td>
<td>USAID</td>
<td>Phase II</td>
<td>Amoxicillin</td>
</tr>
<tr>
<td>Non-Severe Pneumonia; Under-fives; Children</td>
<td>USAID ICMR</td>
<td>Phase III</td>
<td>Oral Co-trimoxazole (8mg/kg/day trimethoprim) twice a day for five days vs. oral amoxicillin (20 mg/kg/day) thrice a day for three days.</td>
</tr>
</tbody>
</table>
ICMR Institutes and Headquarters. Some of the institutes that offer training and human resource development required for tropical diseases are as follows:

**National Institute of Nutrition (NIN):** This is a WHO/FAO recognized Centre for advanced training in nutrition. The training programmes at NIN include Master of Science Applied Nutrition Course, Postgraduate Certificate Course in Nutrition, and Training Course on Techniques for Assessment of Nutritional Anaemias.

**Food and Drug Toxicology Research Centre (FDTRC):** Food safety, GM foods and pre-clinical toxicity testing of drugs are the important activities of FDTRC. The Centre also investigates the food borne disease outbreaks and identifies the causative factors.

**National Centre for Laboratory Animal Science (NCLAS):** The Centre has the facility to breed and supply genetically and microbiologically defined laboratory animals to different institutions for biomedical research. NCLAS also conducts research in laboratory animal science and develop new animal models from the existing gene pools available in the country.

**Tuberculosis Research Centre:** The World Health Organization (WHO) has designated TRC as a collaborating centre for tuberculosis control programme in India. The Centre imparts training in laboratory diagnosis and controlled clinical trials of tuberculosis. It is also actively engaged in evolving comprehensive methodologies for strengthening the case-finding and case-holding components of National Tuberculosis Control Programme.

**National Institute of Cholera and Enteric Diseases:** This is the WHO Collaborating Centre for Research and Training in Diarrhoeal Diseases. The Institute is actively engaged in imparting training in research on diarrhoeal diseases as well as to develop teaching modules and methodologies for training of the health care personnel at different levels. It provides referral services and extends support to the National Diarrhoeal Disease Control Programme. It also provides research information and expertise for tackling national emergencies caused by epidemics of cholera and other diarrhoeal diseases. It also runs a School of Public health for capacity building in public health and epidemiology.

**Vector Control Research Centre:** The World Health Organization (WHO) has designated VCRC as a Collaborating Centre for Research and Training in Integrated Methods of Vector Control. The Centre imparts important training in vector biology, manpower development, ecology, epidemiology and control of vector borne diseases.

**National JALMA Institute for Leprosy:** National JALMA Institute for Leprosy imparts training on different aspects of leprosy. Recently the Centre has started giving attention to other mycobacterial diseases.

**National Institute of Epidemiology:** The institute has been actively involved in the assessment of the National Leprosy Control Programme and in operational research on certain aspects of the National Tuberculosis Control Programme. The center houses one
of the ICMR schools of Public Health and offers a Masters Degree course in the field of epidemiology.

**Institute for Research in Medical Statistics:** The Institute for Research in Medical Statistics was established as a statistical unit at ICMR Headquarters and upgraded into an independent Institute in 1978.

Major emphasis of the Institute is goal-oriented statistical research in the development of a health information system, suitable procedures for evaluation of national health programmes and epidemiology of various diseases of national importance. The Institute also organizes training programmes in biomedical research for medical scientists and statisticians.

**Rajendra Memorial Research Institute of Medical Sciences:** The thrust areas of research at the Institute are the studies on kala-azar including its diagnosis, epidemiology, vector biology and control. WHO, NVBDCP & ICMR sponsored “Intra-Country Training for State/ District Programme Managers Workshop for Elimination” was organized in 2007. WHO Inter-Country Training of Trainers Workshop for Elimination” was held in Nov. 2007.

**National AIDS Research Institute:** The National AIDS Research Institute was established in 1992 with the mission to provide leadership in biomedical research on HIV/AIDS in India and with an aim to compliment and strengthen the National AIDS Control Programme. It is also a west region hub for ICMR schools of public health.

**Regional Medical Research Centre for Tribals, Jabalpur:** The mandate of the Regional Medical Research Centre for Tribals is to undertake studies on health problems of tribal population. The Centre is involved in planning and executing the various tribal health programmes and also training the health functionaries in undertaking such studies.

**Desert Medicine Research Centre:** The major research activities of Desert Medicine Research Centre include studies on the health problems of the desert with special thrust in the field of malaria, dengue and silicosis. The Centre is involved in building up technical health manpower locally and also interacts with local health authorities to help find solution to health problems of the region.

**Postgraduate Institute of Medical Education & Research:** Postgraduate Institute of Medical Education & Research, one of the two most premier Centre's of excellence in medical education and research having autonomous status. It imparts training and awards postgraduate degrees (MD/MS) in almost all branches of medicine and superspeciality degrees (MCH/DM) in nephrology, gastroenterology, cardiology, neurology, neurosurgery, neonatology etc. It also gives Bachelor/Master degrees in different fields of biomedical technology. In addition Ph.D. degrees are awarded to both Medical/Non-medical graduates. The Institute has a College of Nursing which awards B.Sc./M.Sc. degrees in different specialties of nursing. The center also runs a school of Public health.
All India Institute of Medical Sciences is one of the two most premier Centre's of excellence in medical education and research having autonomous status. The Institute has comprehensive facilities for teaching, research and patient-care. It conducts teaching programmes in medical and para-medical courses both at undergraduate and postgraduate level and awards its own degrees. Teaching and research are conducted in 42 disciplines. The Institute runs a college of nursing and trains students for B.Sc.(Hons) degree.

Centre for Cellular and Molecular Biology is one of the premier national institution of the Council of Scientific and Industrial Research. The Centre conducts research in multidisciplinary areas of modern biology. Main emphasis is on the research relevant to societal needs and application oriented research towards commercialization. The Centre conducts the short-term training programmes in modern biology and provides centralized facilities in the country for new and modern techniques of biology.

Central Drug Research Institute: The mandate of CDRI is to strengthen and advance the drug research in India. The major activities of the Institute include the development of new drugs and diagnostics, cellular and molecular studies to understand disease processes and reproductive physiology, systematic evaluation of medicinal properties of natural products, development of technology for drugs, intermediates and biologicals, dissemination of information in the field of drug research, development and production, consultancy and development of technical manpower. The Institute also offers training courses on advance techniques in drug research.

Microbial and Tissue Repositories

Repositories are National Resource Centres which helps scientists in research institutes and medical colleges access biological material that aid research on various aspects of basic pathophysiological pathways involved in various disease processes which may lead to new inventions of diagnostics, drugs, and vaccines aiming at the major diseases prevalent in the country. There are excellent source of biomaterials for investing in research for identifying, validating several new innovations and understanding host-parasite interaction better (Table 17).

Table 17: Existing repositories in India

<table>
<thead>
<tr>
<th>Name of the Repository</th>
<th>Diseases covered</th>
<th>Host Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>NICED culture collection</td>
<td>Cholera and enteric diseases</td>
<td>NICED</td>
</tr>
<tr>
<td>Indian HIV repository</td>
<td>Indian HIV strains.</td>
<td>NARI</td>
</tr>
<tr>
<td>Malaria Parasite Bank</td>
<td>Indian strains of Malarial parasite</td>
<td>NIMR</td>
</tr>
<tr>
<td>WHO Reference Centre for Leishmania Parasite and Sera Bank</td>
<td>Leishmania Parasite and Sera</td>
<td>RMRIMS</td>
</tr>
<tr>
<td>Mycobacterial Repository Center</td>
<td>Mycobacterial Strains</td>
<td>JALMA</td>
</tr>
<tr>
<td>Virus Repository</td>
<td>Emerging and reemerging Viruses</td>
<td>NIV</td>
</tr>
<tr>
<td>Microbial Type Culture (and Gene Bank) Collection</td>
<td>Microbial repository under “Budapest Treaty”</td>
<td>IMTECH</td>
</tr>
<tr>
<td>Human Brain tissue repository</td>
<td>Infected and normal cadaveric brains</td>
<td>NIMHANS</td>
</tr>
</tbody>
</table>
The gaps as perceived by the respondents

Based on the questionnaires circulated to the scientists working in the area of Tropical diseases following is a list of the common issues and gaps that need to be addressed in order to encourage research in Tropical Diseases in India as perceived by the respondents:

- The time from submission of the research project to approval/sanction of the projects for funding usually is very long and thus the proposed aims and objectives get outdated. There is a need to shorten the incubation period for project approvals by the funding agencies.

- Lack of a process of selection and funding of projects that is transparent and quick came up as a major bottle-neck. Delay in release of funds by the funding agency was mentioned as important causes of improper utilization of funds in the stipulated period.

- Creation BSL-3 and BSL-4 facilities are resource intensive yet there is requirement for more such facilities in the country, especially for smaller institutions. Ways and means of sharing the existing facilities albeit for a fee should be given a thought.

- Institutional grants to peripheral medical colleges need to be improved. Institutional objectives for faculty in medical colleges are undergraduate and postgraduate teaching and faculty cannot devote full time in quality and time bound research. Therefore the outcomes are delayed and remain insignificant. In some medical colleges undertaking research (clinical) projects, administrative support is negligible, Institutional grant (Intramural) is meager, laboratory infrastructure including space is constrained and manpower is lacking.

- There was a suggestion from Dept. of Virology, PGIMER that the diseases like enteric hepatitis (HAV, HEV), Rabies, Measles and Rubella may be considered under the tropical diseases as they are still a public health problem in India.

- Ban on creation of new permanent posts is affecting work in institutions like the RMRCT, Jabalpur which is engaged primarily in field based action oriented research programs among the tribes located in far-flung and inaccessible hills and forests, despite the resource crunch, internal infrastructural constraints.

- Lack a culture of ethical data sharing causes duplication and fragmentation of efforts by several institutions and organizations. Guidelines by the funding agencies towards access to data generated will enable proper utilization of available funds. Lack of funding for good longitudinal studies was also mentioned as a shortfall.

- A common platform (e.g. a web resource) where all information pertaining to a tropical disease in India is available was suggested as one of the ways to avoid duplication. There should be separate funding for the infectious diseases research.
• Mathematical modeling and epidemiological data analysis should be encouraged at all levels as “case prevalence over time” is not enough for predictive purpose. There is a need for capacity building in this area as well.

• Active networking between different organisations working on the same disease is required. A good case is HIV. NARI, NIV, TRC, NACO, WHO (India), City municipalities, many NGOs, etc are all working on HIV and also collecting some epidemiological data. But there is no good resolution (at least, monthly) of long term HIV prevalence data from any of their website. Consolidation under one virtual network would be useful.

• A set guidelines need to be framed in order to address the bureaucratic hassles at the level of the University Administration, in order to encourage faculty form peripheral universities to participate in tropical disease research.

Conclusion and Way Forward

Control and Elimination of Tropical Diseases requires strong political will and appropriate policies to implement the intervention programmes. From this exercise it is clear that there are very few centers like NICED, Kolkata, NIV, Pune, TRC, Chennai, KGMC Lucknow, PGIMER, Chandigarh and CMC, Vellore are carrying out studies which could contribute to data to be used as evidence-base for policies required for control and elimination of these diseases from India. Data on disease and economic burden of many of the diseases (under consideration) are not available from the Indian subcontinent. These data are important for programme planners for estimating resource requirements and effective monitoring of the elimination/control programme.

Integration of different modes of surveillance for the tropical diseases under one programme will enable compilation of the “denominator” in various disease burden and economic estimations and will enable better estimation of effectiveness of programmes. Having disease specific Surveillance Networks with good laboratory facilities and harmonized protocols could be useful.

Sharing of Instrumentation Facilities: Sophisticated analytical instruments as well as biological containment facilities required for basic research in tropical diseases are extremely expensive and are rendered obsolete in a short span of time. Most of these instruments are not utilized to the full capacity. Hence making such expensive analytical instruments available to the other institutes and universities in the vicinity should be encouraged, albeit for a fee. The staff requirements for running such a service facility should be kept in mind while planning.

Strengthening the National Regulatory Authority with identification of a National Control Laboratory and Building capacity for Regulatory Submissions will improve
the gap between demand and supply of interventions and will impact the cycle of innovation too.
APPENDIX – I: Questionnaires used in the survey

Two sets of Questionnaires were prepared, one for Heads of Institutions and the other for Principal Investigators. These two types of Questionnaires are represented below.

1. Questionnaire for Institutional Head

Mapping of National Centers/Institutions on Tropical Diseases in India 2010

QUESTIONNAIRE

Please fill up and send to nkganguly@nii.res.in

SECTION – A

INSTITUTE’S PROFILE

1. Name of the University:

2. Name of the Director

3. Present Address

4. Tel. No. :

5. E. mail:

SECTION – B

PROJECT PROFILE

1. Number of Project(s) handled in the Institute on Tropical Disease in last 10 years

2. Name of the Tropical Disease(s):
   i) __________________________________________________________
   ii) ________________________________________________________
iii)

3. Total number of Scientists in the institute


4. Number of Scientists working on Tropical Diseases


5. Infrastructure and services


SECTION – C

FUNDING PROFILE

2. Sources of Funding:

i. National:

ii. International:

iii. NGO:

2. Total Funding for the institute in the past 10 years (Rs in Lakhs):

3. Funding allotted for Tropical Diseases in the past 10 years (Rs in Lakhs):

SECTION – D

OUTPUT OF THE PROJECT

No. of Research Paper(s) published in the last 10 years:

<table>
<thead>
<tr>
<th></th>
<th>National</th>
<th>International</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Published in Journals</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>b) Presented in conference(s)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td><strong>Item</strong></td>
<td><strong>Number</strong></td>
<td><strong>Details</strong></td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------</td>
<td>-----------------------------------------------------</td>
</tr>
<tr>
<td>New Product(s) developed:</td>
<td></td>
<td>Please attach separate sheets with complete details</td>
</tr>
<tr>
<td>New Process(es) developed:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Instrument(s) developed:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prototype(s) developed:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IPR’s registered:</td>
<td></td>
<td>Please attach separate sheet with complete details</td>
</tr>
<tr>
<td>Patents filed:</td>
<td>National</td>
<td>Please attach separate sheet with complete details</td>
</tr>
<tr>
<td>International</td>
<td></td>
<td>Please attach separate sheet with complete details</td>
</tr>
<tr>
<td>Patents</td>
<td>National</td>
<td>Please attach separate sheet with complete details</td>
</tr>
<tr>
<td>Sealed/granted:</td>
<td>National</td>
<td>Please attach separate sheet with complete details</td>
</tr>
<tr>
<td>International</td>
<td></td>
<td>Please attach separate sheet with complete details</td>
</tr>
<tr>
<td>Copyright(s)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Principle/Theory developed:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical Trials completed and ongoing</td>
<td></td>
<td>Please attach separate sheet with complete details</td>
</tr>
</tbody>
</table>

Brief Description of the problem(s)/constraints faced in implementing the project:

________________________________________________________________________________________

________________________________________________________________________________________

Any other specific comment(s)/suggestion(s) (*please specify)*:

________________________________________________________________________________________

________________________________________________________________________________________
2. Questionnaire for Principal Investigator

Mapping of National Centers/Institutions on Tropical Diseases in India 2010

QUESTIONNAIRE

Please fill up and send to nkganguly@nii.res.in

SECTION – A

PRINCIPAL INVESTIGATOR’S (P.I.) PROFILE

1. Name of the Principal Investigator:

______________________________________________________________________________

2. Present Address of P.I.

______________________________________________________________________________

______________________________________________________________________________

3. Tel. No. : __________________________

4. E. mail:

______________________________________________________________________________

SECTION – B

PROJECT PROFILE

1. Number of Project(s) handled on Tropical Disease in last 10 years

______________________________________________________________________________

2. Name of the Tropical Disease(s):

i) ____________________________________________________________________________

ii) ____________________________________________________________________________

iii) ____________________________________________________________________________

3. Title of the project and its duration:

i. ____________________________________________________________________________

______________________________________________________________________________

ii. ____________________________________________________________________________

______________________________________________________________________________
SECTION – C
FUNDING PROFILE

3. Sources of Funding: ________________________________________________________________

i. National: ________________________________________________________________

ii. International: ____________________________________________________________

iii. NGO: ________________________________________________________________

2. Total Funding allotted for Tropical Diseases in the past 10 years (Rs in Lakhs):
___________________________________________________________________________

SECTION – D
OUTPUT OF THE PROJECT

No. of Research Paper(s) published in the last 10 years:

<table>
<thead>
<tr>
<th></th>
<th>National</th>
<th>International</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Published in Journals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) Presented in conference(s)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) Top 5 most cited papers</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

i. ________________________________________________________________

ii. ________________________________________________________________

iii. ________________________________________________________________
iv.  ___________________________________________________  
v.  ___________________________________________________

Any Monograph /Book/Technical report produced out of the project *(Please give numbers):*

<table>
<thead>
<tr>
<th>Item</th>
<th>Monograph</th>
<th>Number</th>
<th>Book</th>
<th>Technical report</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Product(s) developed:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Process (es) developed:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Instrument(s) developed:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prototype(s) developed:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IPR’s registered:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patents filed:</td>
<td>National</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>International</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patents Sealed/granted:</td>
<td>National</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>International</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copyright(s)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Principle/Theory developed:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Brief Description of the problem(s)/constraints faced in implementing the project:

__________________________________________________________________________________________

__________________________________________________________________________________________

Any other specific comment(s)/suggestion(s) *(please specify):*

__________________________________________________________________________________________

__________________________________________________________________________________________
APPENDIX – II: Private sector organizations that contribute to Tropical Diseases in the area of Drugs, Diagnostics and Vaccines

**Drugs**

<table>
<thead>
<tr>
<th>Serial No.</th>
<th>Company</th>
<th>Web-link</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Aurobindo Pharma Limited, Hyderabad</td>
<td><a href="http://www.aurobindo.com">www.aurobindo.com</a></td>
</tr>
<tr>
<td>2</td>
<td>AstraZeneca India Pvt. Ltd., Bangalore</td>
<td><a href="http://www.astrazenecaindia.com">www.astrazenecaindia.com</a></td>
</tr>
<tr>
<td>3</td>
<td>Avesthagen Limited, Bangalore</td>
<td><a href="http://www.avesthagen.com">www.avesthagen.com</a></td>
</tr>
<tr>
<td>4</td>
<td>Bharat Serums and Vaccines Limited, Mumbai</td>
<td><a href="http://www.bharatserums.com">www.bharatserums.com</a></td>
</tr>
<tr>
<td>5</td>
<td>Cipla Limited, Mumbai</td>
<td><a href="http://www.cipla.com">www.cipla.com</a></td>
</tr>
<tr>
<td>6</td>
<td>Ipca Laboratories Ltd., Mumbai</td>
<td><a href="http://www.ipcalabs.com">www.ipcalabs.com</a></td>
</tr>
<tr>
<td>7</td>
<td>Cadila Pharmaceuticals Ltd., Ahmedabad</td>
<td><a href="http://www.cadilapharma.com">www.cadilapharma.com</a></td>
</tr>
<tr>
<td>8</td>
<td>Dr. Reddy’s Laboratories Limited, Hyderabad</td>
<td><a href="http://www.drreddys.com">www.drreddys.com</a></td>
</tr>
<tr>
<td>9</td>
<td>GlaxoSmithKline Pharmaceuticals Ltd., Mumbai</td>
<td><a href="http://www.gsk-india.com">www.gsk-india.com</a></td>
</tr>
<tr>
<td>10</td>
<td>Intas Pharmaceuticals Ltd., Ahmedabad</td>
<td><a href="http://www.intaspharma.com">www.intaspharma.com</a></td>
</tr>
<tr>
<td>11</td>
<td>Lupin Limited, Mumbai</td>
<td><a href="http://www.lupinworld.com">www.lupinworld.com</a></td>
</tr>
<tr>
<td>12</td>
<td>Macleods Pharmaceuticals Limited, Mumbai</td>
<td><a href="http://www.macleodspharma.com">www.macleodspharma.com</a></td>
</tr>
<tr>
<td>13</td>
<td>Matrix Laboratories Limited, Secunderabad</td>
<td><a href="http://www.matrixlabsindia.com">www.matrixlabsindia.com</a></td>
</tr>
<tr>
<td>14</td>
<td>Novartis India Limited, Mumbai</td>
<td><a href="http://www.novartis.com">www.novartis.com</a></td>
</tr>
<tr>
<td>15</td>
<td>Panacea Biotec Ltd, New Delhi</td>
<td><a href="http://www.panacea-biotec.com">www.panacea-biotec.com</a></td>
</tr>
<tr>
<td>16</td>
<td>Piramal Life Sciences Limited, Mumbai</td>
<td><a href="http://www.piramallifesciences.com">www.piramallifesciences.com</a></td>
</tr>
<tr>
<td>17</td>
<td>Ranbaxy Laboratories Limited, Gurgaon</td>
<td><a href="http://www.ranbaxy.com">www.ranbaxy.com</a></td>
</tr>
<tr>
<td>18</td>
<td>Strides Arcolab Limited, Bangalore</td>
<td><a href="http://www.stridesarco.com">www.stridesarco.com</a></td>
</tr>
<tr>
<td>19</td>
<td>Sun Pharmaceutical Industries Ltd., Mumbai</td>
<td><a href="http://www.sunpharma.com">www.sunpharma.com</a></td>
</tr>
<tr>
<td>20</td>
<td>Wockhardt Limited, Mumbai</td>
<td><a href="http://www.wockhardt.com">www.wockhardt.com</a></td>
</tr>
</tbody>
</table>
### Diagnostics

<table>
<thead>
<tr>
<th>Serial No.</th>
<th>Company</th>
<th>Web-link</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>XCyton Diagnostics Ltd., Bangalore</td>
<td><a href="http://www.xcyton.com">www.xcyton.com</a></td>
</tr>
<tr>
<td>2</td>
<td>Genomix Molecular Diagnostics Pvt. Ltd., Hyderabad</td>
<td><a href="http://www.genomixbiotech.com">www.genomixbiotech.com</a></td>
</tr>
<tr>
<td>3</td>
<td>Super Religare Laboratories Ltd., Mumbai</td>
<td><a href="http://www.srl.in">www.srl.in</a></td>
</tr>
<tr>
<td>4</td>
<td>Biogenex Life Sciences Pvt. Ltd., Hyderabad</td>
<td><a href="http://www.biogenex.com">www.biogenex.com</a></td>
</tr>
<tr>
<td>5</td>
<td>Cadila Pharmaceuticals Ltd., Ahmedabad</td>
<td><a href="http://www.cadilapharma.com">www.cadilapharma.com</a></td>
</tr>
<tr>
<td>6</td>
<td>PREMAS Biotech Pvt. Ltd., Gurgaon</td>
<td><a href="http://www.premasbiotech.com">www.premasbiotech.com</a></td>
</tr>
<tr>
<td>7</td>
<td>RFCL Limited, New Delhi</td>
<td><a href="http://www.RFCL.in">www.RFCL.in</a></td>
</tr>
<tr>
<td>8</td>
<td>Span Diagnostics Limited, Surat</td>
<td><a href="http://www.span.co.in">www.span.co.in</a></td>
</tr>
<tr>
<td>9</td>
<td>Transasia Bio-Medicals Ltd, Mumbai</td>
<td><a href="http://transasia.co.in">http://transasia.co.in</a></td>
</tr>
<tr>
<td>10</td>
<td>Novartis India Limited, Mumbai</td>
<td><a href="http://www.novartis.com">www.novartis.com</a></td>
</tr>
<tr>
<td>11</td>
<td>Tulip Group, Goa</td>
<td><a href="http://www.tulipgroup.com">www.tulipgroup.com</a></td>
</tr>
<tr>
<td>12</td>
<td>Ocimum Biosolutions Ltd., Hyderabad</td>
<td><a href="http://www.ocimumbio.com">www.ocimumbio.com</a></td>
</tr>
<tr>
<td>13</td>
<td>Bhat Bio-Tech India (P) Ltd., Bangalore</td>
<td><a href="http://www.bhatbiotech.com">www.bhatbiotech.com</a></td>
</tr>
<tr>
<td>14</td>
<td>Bigtec Labs, Bangalore</td>
<td><a href="http://www.bigteclabs.com">www.bigteclabs.com</a></td>
</tr>
</tbody>
</table>

### Vaccines

<table>
<thead>
<tr>
<th>Serial No.</th>
<th>Company</th>
<th>Web-link</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Serum Institute of India Ltd., Pune</td>
<td><a href="http://www.seruminstitute.com">www.seruminstitute.com</a></td>
</tr>
<tr>
<td>2</td>
<td>Gennova Biopharmaceuticals Ltd., Pune</td>
<td><a href="http://www.emcure.co.in/gennoval.html">www.emcure.co.in/gennoval.html</a></td>
</tr>
<tr>
<td>3</td>
<td>Shantha Biotechnics Ltd., Hyderabad</td>
<td><a href="http://www.shanthabiotech.com">www.shanthabiotech.com</a></td>
</tr>
<tr>
<td>5</td>
<td>Biological E Ltd., Hyderabad</td>
<td><a href="http://www.biologicale.com">www.biologicale.com</a></td>
</tr>
<tr>
<td>6</td>
<td>Cadila Pharmaceuticals Ltd., Ahmedabad</td>
<td><a href="http://www.cadilapharma.com">www.cadilapharma.com</a></td>
</tr>
<tr>
<td>7</td>
<td>Panacea Biotec Ltd., New Delhi</td>
<td><a href="http://www.panacea-biotec.com">www.panacea-biotec.com</a></td>
</tr>
<tr>
<td>8</td>
<td>Indian Immunologicals Ltd., Hyderabad</td>
<td><a href="http://www.indimmune.com">www.indimmune.com</a></td>
</tr>
</tbody>
</table>
## APPENDIX – III: List of institutes and allied information for different zones

**Zone-1**

<table>
<thead>
<tr>
<th>Serial No.</th>
<th>Name of Institution/University/School/Division/Department</th>
<th>Web-link</th>
<th>Name of Scientist/Clinical Investigator/Doctor</th>
<th>Web-link</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Indian Institute of Chemical Biology, Kolkata</td>
<td><a href="http://www.iicb.res.in">www.iicb.res.in</a></td>
<td>Dr. Hemanta K. Majumder (Head)</td>
<td><a href="http://www.iicb.res.in/divisionwiselistofscientists/id/hemanta.html">www.iicb.res.in/divisionwiselistofscientists/id/hemanta.html</a></td>
</tr>
<tr>
<td></td>
<td>Infectious Diseases &amp; Immunology Division</td>
<td><a href="http://www.iicb.res.in/id.html">www.iicb.res.in/id.html</a></td>
<td>Dr. Pijush K. Das</td>
<td><a href="http://www.iicb.res.in/divisionwiselistofscientists/id/pijushdas.html">www.iicb.res.in/divisionwiselistofscientists/id/pijushdas.html</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Chitra Mandal</td>
<td><a href="http://www.iicb.res.in/divisionwiselistofscientists/id/chitramandal.html">www.iicb.res.in/divisionwiselistofscientists/id/chitramandal.html</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Syamal Roy</td>
<td><a href="http://www.iicb.res.in/divisionwiselistofscientists/id/sroy.html">www.iicb.res.in/divisionwiselistofscientists/id/sroy.html</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Santu Bandyopadhyay</td>
<td><a href="http://www.iicb.res.in/divisionwiselistofscientists/id/sbandopadhyay.html">www.iicb.res.in/divisionwiselistofscientists/id/sbandopadhyay.html</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Dr. Nahid Ali</td>
<td><a href="http://www.iicb.res.in/divisionwiselistofscientists/id/nali.html">www.iicb.res.in/divisionwiselistofscientists/id/nali.html</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Rukhsana Chowdhury</td>
<td><a href="http://www.iicb.res.in/divisionwiselistofscientists/id/rukhsana.html">www.iicb.res.in/divisionwiselistofscientists/id/rukhsana.html</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Rupak K. Bhadra</td>
<td><a href="http://www.iicb.res.in/divisionwiselistofscientists/id/rupak.html">www.iicb.res.in/divisionwiselistofscientists/id/rupak.html</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Tripti Dey</td>
<td><a href="http://www.iicb.res.in/divisionwiselistofscientists/id/tdey.html">www.iicb.res.in/divisionwiselistofscientists/id/tdey.html</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Debjani Mandal</td>
<td><a href="http://www.iicb.res.in/divisionwiselistofscientists/id/debjani.html">www.iicb.res.in/divisionwiselistofscientists/id/debjani.html</a></td>
</tr>
<tr>
<td></td>
<td>Structural Biology &amp; Bio-informatics Division</td>
<td><a href="http://www.iicb.res.in/sdb.html">www.iicb.res.in/sdb.html</a></td>
<td>Dr. Uday Bandyopadhyay</td>
<td><a href="http://www.iicb.res.in/divisionwiselistofscientists/id/ub.html">www.iicb.res.in/divisionwiselistofscientists/id/ub.html</a></td>
</tr>
<tr>
<td></td>
<td>Molecular &amp; Human Genetics Division</td>
<td><a href="http://www.iicb.res.in/mhg.html">www.iicb.res.in/mhg.html</a></td>
<td>Dr. Subrata Adak</td>
<td><a href="http://www.iicb.res.in/divisionwiselistofscientists/sbbi/sadak.html">www.iicb.res.in/divisionwiselistofscientists/sbbi/sadak.html</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Samit Adhya (Head)</td>
<td><a href="http://www.iicb.res.in/divisionwiselistofscientists/mhg/sadhya.html">www.iicb.res.in/divisionwiselistofscientists/mhg/sadhya.html</a></td>
</tr>
<tr>
<td>2</td>
<td>National Institute of Cholera and Enteric Diseases, Kolkata</td>
<td><a href="http://www.niced.org.in">www.niced.org.in</a></td>
<td>Dr. Sulagna Basu</td>
<td><a href="http://www.niced.org.in/scientists/SB_profile.asp">www.niced.org.in/scientists/SB_profile.asp</a></td>
</tr>
<tr>
<td></td>
<td>Division of Bacteriology</td>
<td><a href="http://www.niced.org.in/bacteriology/default.asp">www.niced.org.in/bacteriology/default.asp</a></td>
<td>Dr. Shanta Dutta</td>
<td><a href="http://www.niced.org.in/scientists/SD_profile.asp">www.niced.org.in/scientists/SD_profile.asp</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Hemanta Koley</td>
<td><a href="http://www.niced.org.in/scientists/HK_profile.asp">www.niced.org.in/scientists/HK_profile.asp</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. A.K. Mukhopadhyay</td>
<td><a href="http://www.niced.org.in/scientists/AKM_profile.asp">www.niced.org.in/scientists/AKM_profile.asp</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. G. Balkrish Nair (Director)</td>
<td><a href="http://www.niced.org.in/scientists/GBN_profile.asp">www.niced.org.in/scientists/GBN_profile.asp</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Ranjan Kumar Nandy</td>
<td><a href="http://www.niced.org.in/scientists/RKN_profile.asp">www.niced.org.in/scientists/RKN_profile.asp</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. S.K. Niyogi</td>
<td><a href="http://www.niced.org.in/scientists/SKN_profile.asp">http://www.niced.org.in/scientists/SKN_profile.asp</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Anup Palit</td>
<td><a href="http://www.niced.org.in/scientists/AP2_profile.asp">www.niced.org.in/scientists/AP2_profile.asp</a></td>
</tr>
<tr>
<td>Division</td>
<td>Website</td>
<td>Name</td>
<td>profile.asp</td>
<td></td>
</tr>
<tr>
<td>-------------------------------</td>
<td>----------------------------------------------</td>
<td>-------------------------------</td>
<td>------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Division of Biochemistry</td>
<td><a href="http://www.niced.org.in/biochem/default.asp">www.niced.org.in/biochem/default.asp</a></td>
<td>Dr. T. Ramamurthy</td>
<td><a href="http://www.niced.org.in/scientists/TRM">www.niced.org.in/scientists/TRM</a>_</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. B.L. Sarkar</td>
<td>profile.asp</td>
<td></td>
</tr>
<tr>
<td></td>
<td>dr. kalyan k. banerjee</td>
<td><a href="http://www.niced.org.in/scientists">www.niced.org.in/scientists</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Division of Clinical Medicine</td>
<td><a href="http://www.niced.org.in/clinical_med/default.asp">www.niced.org.in/clinical_med/default.asp</a></td>
<td>Dr. M.K. Bhattacharya</td>
<td>KB_profile.asp</td>
<td></td>
</tr>
<tr>
<td></td>
<td>dr. nabendu sekhar chatterjee</td>
<td><a href="http://www.niced.org.in/scientists">www.niced.org.in/scientists</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>dr. santa sabuj das</td>
<td>SSD_profile.asp</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>dr. utpala mitra</td>
<td><a href="http://www.niced.org.in/scientists">www.niced.org.in/scientists</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Management</td>
<td><a href="http://www.niced.org.in/data_mngt/default.asp">www.niced.org.in/data_mngt/default.asp</a></td>
<td>Dr. Byomkesh Manna</td>
<td>UM_profile.asp</td>
<td></td>
</tr>
<tr>
<td></td>
<td>dr. k. rajendran</td>
<td><a href="http://www.niced.org.in/scientists">www.niced.org.in/scientists</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Division of Epidemiology</td>
<td><a href="http://www.niced.org.in/epidemiology/default.asp">www.niced.org.in/epidemiology/default.asp</a></td>
<td>Dr. Alok Deb</td>
<td>AD_profile.asp</td>
<td></td>
</tr>
<tr>
<td></td>
<td>dr. Subrata Ghosh</td>
<td><a href="http://www.niced.org.in/scientists">www.niced.org.in/scientists</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>dr. suman kanungo</td>
<td>SG2_profile.asp</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>dr. samiran panda</td>
<td><a href="http://www.niced.org.in/scientists">www.niced.org.in/scientists</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>dr. kamalesh sarkar</td>
<td>KS_profile.asp</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>dr. dipika sur</td>
<td><a href="http://www.niced.org.in/scientists">www.niced.org.in/scientists</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Division of Electron Microscopy</td>
<td><a href="http://www.niced.org.in/electronmicro/default.asp">www.niced.org.in/electronmicro/default.asp</a></td>
<td>Dr. Amar N. Ghosh</td>
<td>ANG_profile.asp</td>
<td></td>
</tr>
<tr>
<td></td>
<td>dr. Dhira Rani Saha</td>
<td><a href="http://www.niced.org.in/scientists">www.niced.org.in/scientists</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Division of Immunology</td>
<td><a href="http://www.niced.org.in/immunology/default.asp">www.niced.org.in/immunology/default.asp</a></td>
<td>Dr. Tapas Biswas</td>
<td>TB_profile.asp</td>
<td></td>
</tr>
<tr>
<td></td>
<td>dr. Manoj kr. Chakraborty</td>
<td><a href="http://www.niced.org.in/scientists">www.niced.org.in/scientists</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Division of Pathophysiology</td>
<td><a href="http://www.niced.org.in/pathophysiology/default.asp">www.niced.org.in/pathophysiology/default.asp</a></td>
<td>Dr. Amit Pal</td>
<td>MKC_profile.asp</td>
<td></td>
</tr>
<tr>
<td></td>
<td>dr. sandipan ganguly</td>
<td><a href="http://www.niced.org.in/scientists">www.niced.org.in/scientists</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Division of Parasitology</td>
<td><a href="http://www.niced.org.in/parasitology/default.asp">www.niced.org.in/parasitology/default.asp</a></td>
<td>Dr. Sekhar Chakrabarti</td>
<td>AP1_profile.asp</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><a href="http://www.niced.org.in/scientists">www.niced.org.in/scientists</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Division of Virology</td>
<td><a href="http://www.niced.org.in/virology/default.asp">www.niced.org.in/virology/default.asp</a></td>
<td>Mr. B. Ganesh</td>
<td>BG_profile.asp</td>
<td></td>
</tr>
<tr>
<td></td>
<td>dr. mamta chawla sarkar</td>
<td><a href="http://www.niced.org.in/scientists">www.niced.org.in/scientists</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>MCS_profile.asp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bose Institute, Kolkata</td>
<td><a href="http://www.boseinst.ernet.in">www.boseinst.ernet.in</a></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Division of Molecular Medicine</td>
<td><a href="http://bic.boseinst.ernet.in/mol_med/">http://bic.boseinst.ernet.in/mol_med/</a></td>
<td>Prof. Subrata Majumder</td>
<td><a href="http://bic.boseinst.ernet.in/subrata">http://bic.boseinst.ernet.in/subrata</a></td>
<td></td>
</tr>
<tr>
<td>Department of Microbiology</td>
<td><a href="http://bic.boseinst.ernet.in/micro/">http://bic.boseinst.ernet.in/micro/</a></td>
<td>Prof. Sujoy K. Das Gupta</td>
<td><a href="http://bic.boseinst.ernet.in/sujoy">http://bic.boseinst.ernet.in/sujoy</a></td>
<td></td>
</tr>
<tr>
<td>Calcutta School of</td>
<td><a href="http://www.caltropmed.org">www.caltropmed.org</a></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Tropical Medicine, Kolkata</td>
<td>Prof. Bibhuti Saha (HOD)</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>--------------------------</td>
<td>----</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. S.K. Guha</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. R.P. Goswami</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. Netai Pramanik</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. S. Mallick</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. M. Rahman</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. D. Modak</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. Debananda Gonjhu</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anti-Retroviral Therapy (ART) Centre</td>
<td>Prof. Bibhuti Saha (Nodal Officer)</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. Ayesha Chaudhuri</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. Ramprasad Debnath</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. Prapa De</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. Rupali Ganguly</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Centre of Excellence in HIV</td>
<td>Dr. Subhasish Kamal Guha</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Microbiology</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bacteriology and Serology Unit</td>
<td>Prof. K.K. Haldar (HOD)</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. Sougata Ghosh</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. Monalisa Majumdar</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anti Plague Cell</td>
<td>Dr. Swapan Sarkar</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. Vivek Mazumder</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protozoology Unit</td>
<td>Prof. P.K. Kundu (In-Charge)</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. A.K. Maji</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. Swagata Ganguly</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Virology</td>
<td>Prof. Nemai Bhattacharya</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. (Mrs.) Bhaswati Bandypadhyay</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Helminthology Unit</td>
<td>Prof. D.K. Bera</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. P.K. Sikdar</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Medical Entomology</td>
<td>Dr. Hiranmoy Mukherjee (Acting HOD)</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mycology Unit</td>
<td>Dr. Sukumar Basak</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. Sougata Ganguly</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Dermatology, STD &amp; Leprosy, and Leprosy Training Centre</td>
<td>Prof. Dwijendra Nath Gangopadhyay</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. Gautam Mazumdar</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. Jayasri Das</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of</td>
<td>Prof. Bilquis Begum</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department</td>
<td>Name</td>
<td>Position</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>-----------------------------</td>
<td>-------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hematology</td>
<td>Dr. Debasis Bhattacharya</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. Debasis Roy Barman</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Endocrine, Nutrition &amp; Metabolic Diseases</td>
<td>Dr. Prabir Kumar Kundu (HOD)</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. Madhuchhanda Mandal</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Laboratory Medicine</td>
<td>Prof. Swapna Chaudhuri (HOD)</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. Anindita Debnath</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. Indranil Dhar</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Biochemistry and Medical Biotechnology</td>
<td>Prof. Indranil Chakraborty (In-Charge)</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. Mandira Mukherjee</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. Sujata Law</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. Anusri Tripathi</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Clinical and Experimental Pharmacology</td>
<td>Prof. Biplab Kumar Mitra</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. Santanu Munshi</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. Chandan Kumar Saha</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. Swati Bhattacharya</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Pathology</td>
<td>Prof. Nandita Bhattacharya</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. Nipa Biswas</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Radiology</td>
<td>Dr. Abhiram Chakraborty (Acting HOD)</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5 Rajendra Memorial Research Institute of Medical Sciences, Patna [www.rmrims.org.in](http://www.rmrims.org.in)

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Pradeep Das</td>
<td>(Director) <a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00015600">http://icmr.nic.in/icmrsql/biodata.asp?expno=00015600</a></td>
</tr>
<tr>
<td>Dr. Narendra Kumar</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00011054">http://icmr.nic.in/icmrsql/biodata.asp?expno=00011054</a></td>
</tr>
<tr>
<td>Dr. Prabhat Kumar Sinha</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00011644">http://icmr.nic.in/icmrsql/biodata.asp?expno=00011644</a></td>
</tr>
<tr>
<td>Dr. Neena Verma</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00011056">http://icmr.nic.in/icmrsql/biodata.asp?expno=00011056</a></td>
</tr>
<tr>
<td>Dr. V.N.R. Das</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00011605">http://icmr.nic.in/icmrsql/biodata.asp?expno=00011605</a></td>
</tr>
<tr>
<td>Dr. Anil Kumar Gupta</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00011058">http://icmr.nic.in/icmrsql/biodata.asp?expno=00011058</a></td>
</tr>
<tr>
<td>Dr. Krishna Pandey</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00011593">http://icmr.nic.in/icmrsql/biodata.asp?expno=00011593</a></td>
</tr>
<tr>
<td>Dr. Vahab Ali</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00011823">http://icmr.nic.in/icmrsql/biodata.asp?expno=00011823</a></td>
</tr>
<tr>
<td>Dr. Alok Ranjan</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00011677">http://icmr.nic.in/icmrsql/biodata.asp?expno=00011677</a></td>
</tr>
<tr>
<td>Dr. Sanjeeva Bimal</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00011692">http://icmr.nic.in/icmrsql/biodata.asp?expno=00011692</a></td>
</tr>
<tr>
<td>Dr. Chandra Sekhar Lal</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00011658">http://icmr.nic.in/icmrsql/biodata.asp?expno=00011658</a></td>
</tr>
<tr>
<td>Dr. Naween Kumar</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00011727">http://icmr.nic.in/icmrsql/biodata.asp?expno=00011727</a></td>
</tr>
<tr>
<td>6</td>
<td>Regional Medical Research Centre, Dibrugarh</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>6</td>
<td>Regional Medical Research Centre, Dibrugarh</td>
</tr>
<tr>
<td>6</td>
<td>Regional Medical Research Centre, Dibrugarh</td>
</tr>
<tr>
<td>6</td>
<td>Regional Medical Research Centre, Dibrugarh</td>
</tr>
<tr>
<td>6</td>
<td>Regional Medical Research Centre, Dibrugarh</td>
</tr>
<tr>
<td>6</td>
<td>Regional Medical Research Centre, Dibrugarh</td>
</tr>
<tr>
<td>6</td>
<td>Regional Medical Research Centre, Dibrugarh</td>
</tr>
<tr>
<td>6</td>
<td>Regional Medical Research Centre, Dibrugarh</td>
</tr>
<tr>
<td>6</td>
<td>Regional Medical Research Centre, Dibrugarh</td>
</tr>
<tr>
<td>6</td>
<td>Regional Medical Research Centre, Dibrugarh</td>
</tr>
<tr>
<td>6</td>
<td>Regional Medical Research Centre, Dibrugarh</td>
</tr>
<tr>
<td>6</td>
<td>Regional Medical Research Centre, Dibrugarh</td>
</tr>
<tr>
<td>6</td>
<td>Regional Medical Research Centre, Dibrugarh</td>
</tr>
<tr>
<td>6</td>
<td>Regional Medical Research Centre, Dibrugarh</td>
</tr>
<tr>
<td>6</td>
<td>Regional Medical Research Centre, Dibrugarh</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7</th>
<th>Indian Institute of Technology (IIT), Kharagpur</th>
<th><a href="http://www.iitkgp.ac.in">www.iitkgp.ac.in</a></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Indian Institute of Technology (IIT), Kharagpur</td>
<td><a href="http://www.iitkgp.ac.in/department/home.php?deptcode=BT">www.iitkgp.ac.in/department/home.php?deptcode=BT</a></td>
<td>Prof. A.K. Das, HOD</td>
<td><a href="http://www.iitkgp.ac.in/department/showprofile.php?empcode=aJmXU&amp;deptcode=BT">www.iitkgp.ac.in/department/showprofile.php?empcode=aJmXU&amp;deptcode=BT</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>8</th>
<th>Indian Institute of Technology (IIT), Guwahati</th>
<th><a href="http://www.iitg.ac.in">www.iitg.ac.in</a></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Indian Institute of Technology (IIT), Guwahati</td>
<td><a href="http://www.iitg.ac.in/biotech/index.htm">www.iitg.ac.in/biotech/index.htm</a></td>
<td>Dr. Vikash Kumar Dubey</td>
<td><a href="http://www.iitg.ernet.in/vdubey/">http://www.iitg.ernet.in/vdubey/</a></td>
</tr>
<tr>
<td>8</td>
<td>Indian Institute of Technology (IIT), Guwahati</td>
<td><a href="http://www.iitg.ac.in/biotech/index.htm">www.iitg.ac.in/biotech/index.htm</a></td>
<td>Dr. Vishal Trivedi</td>
<td><a href="http://www.iitg.ac.in/biotech/faculty.htm">http://www.iitg.ac.in/biotech/faculty.htm</a></td>
</tr>
<tr>
<td>Serial No.</td>
<td>Name of Institution/ University/ School/ Division/ Department</td>
<td>Web-link</td>
<td>Name of Scientist / Clinical Investigator / Doctor</td>
<td>Web-link</td>
</tr>
<tr>
<td>-----------</td>
<td>---------------------------------------------------------------</td>
<td>----------</td>
<td>--------------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>1</td>
<td>Central Drug Research Institute, Lucknow</td>
<td><a href="http://www.cdrindiaindia.org">www.cdrindiaindia.org</a></td>
<td>Dr. Saman Habib</td>
<td><a href="http://www.cdrindiaindia.org/saman.htm">www.cdrindiaindia.org/saman.htm</a></td>
</tr>
<tr>
<td></td>
<td>Molecular &amp; Structural Biology Division</td>
<td>NA</td>
<td>Dr. Amogh A. Sahasrabuddhe</td>
<td><a href="http://www.cdrindiaindia.org/amogh.htm">www.cdrindiaindia.org/amogh.htm</a></td>
</tr>
<tr>
<td></td>
<td>Medicinal &amp; Process Chemistry Division</td>
<td>NA</td>
<td>Dr. Bijoy Kundu</td>
<td><a href="http://www.cdrindiaindia.org/bjoykundu.htm">www.cdrindiaindia.org/bjoykundu.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. P.M.S. Chauhan</td>
<td><a href="http://www.cdrindiaindia.org/pmschauhan.htm">www.cdrindiaindia.org/pmschauhan.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Yenamandra S. Prabhakar</td>
<td><a href="http://www.cdrindiaindia.org/ysp.htm">www.cdrindiaindia.org/ysp.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Anil Kumar Saxena</td>
<td><a href="http://www.cdrindiaindia.org/anikumarsaxena.htm">www.cdrindiaindia.org/anikumarsaxena.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. R.P. Tripathi</td>
<td><a href="http://www.cdrindiaindia.org/prtripathi.htm">www.cdrindiaindia.org/prtripathi.htm</a></td>
</tr>
<tr>
<td></td>
<td>Parasitology Division</td>
<td>NA</td>
<td>Dr. Shailja Bhattacharya</td>
<td><a href="http://www.cdrindiaindia.org/shailja.htm">www.cdrindiaindia.org/shailja.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Suman Gupta</td>
<td><a href="http://www.cdrindiaindia.org/suman.htm">www.cdrindiaindia.org/suman.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. P. Kalpana Murthy</td>
<td><a href="http://www.cdrindiaindia.org/pkalpana.htm">www.cdrindiaindia.org/pkalpana.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. S.K. Puri</td>
<td><a href="http://www.cdrindiaindia.org/skpuri.htm">www.cdrindiaindia.org/skpuri.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Rajakumar Sethu</td>
<td><a href="http://www.cdrindiaindia.org/rajkumar.htm">www.cdrindiaindia.org/rajkumar.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Kumkum Srivastava</td>
<td><a href="http://www.cdrindiaindia.org/kumkum.htm">www.cdrindiaindia.org/kumkum.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Renu Tripathi</td>
<td><a href="http://www.cdrindiaindia.org/rene.htm">www.cdrindiaindia.org/rene.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Anuradha Dube</td>
<td><a href="http://www.cdrindiaindia.org/aneuradha.htm">www.cdrindiaindia.org/aneuradha.htm</a></td>
</tr>
<tr>
<td></td>
<td>Biochemistry Division</td>
<td>NA</td>
<td>Dr. Uma Roy</td>
<td><a href="http://www.cdrindiaindia.org/uma.htm">www.cdrindiaindia.org/uma.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Neena Goyal</td>
<td><a href="http://www.cdrindiaindia.org/neena.htm">www.cdrindiaindia.org/neena.htm</a></td>
</tr>
<tr>
<td></td>
<td>Drug Target Discovery &amp; Development Division</td>
<td>NA</td>
<td>Dr. Vineeta Chaturvedi</td>
<td><a href="http://www.cdrindiaindia.org/vineetachaturvedi.htm">www.cdrindiaindia.org/vineetachaturvedi.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Neeloo Singh</td>
<td><a href="http://www.cdrindiaindia.org/neeloo.htm">www.cdrindiaindia.org/neeloo.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Sudhir Kumar Sinha</td>
<td><a href="http://www.cdrindiaindia.org/ssinha.htm">www.cdrindiaindia.org/ssinha.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Manju YK</td>
<td><a href="http://www.cdrindiaindia.org/ykmanju.htm">http://www.cdrindiaindia.org/ykmanju.htm</a></td>
</tr>
<tr>
<td></td>
<td>Pharmaceuticals</td>
<td>NA</td>
<td>Dr. Anil Kumar Dwivedi</td>
<td><a href="http://www.cdrindiaindia.org/anil.htm">www.cdrindiaindia.org/anil.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Girish Kumar Jain</td>
<td><a href="http://www.cdrindiaindia.org/girish.htm">www.cdrindiaindia.org/girish.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Amit Misra</td>
<td><a href="http://www.cdrindiaindia.org/amitmisra.htm">www.cdrindiaindia.org/amitmisra.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Prabhat Ranjan Mishra</td>
<td><a href="http://www.cdrindiaindia.org/prabhat.htm">www.cdrindiaindia.org/prabhat.htm</a></td>
</tr>
<tr>
<td></td>
<td>Microbiology</td>
<td>NA</td>
<td>Dr. Bhupendra Narain Singh</td>
<td><a href="http://www.cdrindiaindia.org/bnsingh.htm">www.cdrindiaindia.org/bnsingh.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Sudheer K. Singh</td>
<td><a href="http://www.cdrindiaindia.org/sudhirksingh.htm">www.cdrindiaindia.org/sudhirksingh.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Ranjana Srivastava</td>
<td><a href="http://www.cdrindiaindia.org/ranjana.htm">www.cdrindiaindia.org/ranjana.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Kishore K. Srivastava</td>
<td><a href="http://www.cdrindiaindia.org/kishor.htm">www.cdrindiaindia.org/kishor.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Rajkamal Tripathi</td>
<td><a href="http://www.cdrindiaindia.org/rajkamal.htm">www.cdrindiaindia.org/rajkamal.htm</a></td>
</tr>
<tr>
<td>Page</td>
<td>Organization/Department</td>
<td>Website</td>
<td>Contact Person</td>
<td>Additional Information</td>
</tr>
<tr>
<td>------</td>
<td>-------------------------</td>
<td>---------</td>
<td>----------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>3</td>
<td>National JALMA Institute for Leprosy &amp; Other Mycobacterial Diseases, Agra</td>
<td><a href="http://www.jalma.icmr.org.in/">www.jalma.icmr.org.in/</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Clinical Division, Medical Unit - I</td>
<td><a href="http://www.jalma.icmr.org.in/interface/DEPT/Mu1.htm">www.jalma.icmr.org.in/interface/DEPT/Mu1.htm</a></td>
<td>Dr. Kiran Katoch (Director-in-Charge)</td>
<td><a href="http://www.jalma.icmr.org.in/dynamic/profile/kiranka">www.jalma.icmr.org.in/dynamic/profile/kiranka</a> toch.htm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Raj Kamal</td>
<td><a href="http://www.jalma.icmr.org.in/dynamic/profile/rajkam">www.jalma.icmr.org.in/dynamic/profile/rajkam</a> al.html</td>
</tr>
<tr>
<td></td>
<td>Clinical Division, Medical Unit - II</td>
<td><a href="http://www.jalma.icmr.org.in/interface/DEPT/Mu2.htm">www.jalma.icmr.org.in/interface/DEPT/Mu2.htm</a></td>
<td>Dr. Mohan Natarajan</td>
<td><a href="http://www.jalma.icmr.org.in/dynamic/profile/natrajan.htm">www.jalma.icmr.org.in/dynamic/profile/natrajan.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Joy Kumar Chakma</td>
<td><a href="http://www.jalma.icmr.org.in/dynamic/profile/chakma.html">www.jalma.icmr.org.in/dynamic/profile/chakma.html</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Sajid Hussain</td>
<td><a href="http://www.jalma.icmr.org.in/dynamic/profile/hussain.html">www.jalma.icmr.org.in/dynamic/profile/hussain.html</a></td>
</tr>
<tr>
<td></td>
<td>Laboratory Division, Department of Biochemistry</td>
<td><a href="http://www.jalma.icmr.org.in/interface/DEPT/biochemistry.htm">www.jalma.icmr.org.in/interface/DEPT/biochemistry.htm</a></td>
<td>Dr. K. Venkatesan</td>
<td><a href="http://www.jalma.icmr.org.in/dynamic/profile/venkatesan.htm">www.jalma.icmr.org.in/dynamic/profile/venkatesan.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Deepa Bisht</td>
<td><a href="http://www.jalma.icmr.org.in/dynamic/profile/deepab">www.jalma.icmr.org.in/dynamic/profile/deepab</a> isht.html</td>
</tr>
<tr>
<td></td>
<td>Laboratory Division, Department of Pathology</td>
<td><a href="http://www.jalma.icmr.org.in/interface/DEPT/pathology.htm">www.jalma.icmr.org.in/interface/DEPT/pathology.htm</a></td>
<td>Dr. Anita Girdhar</td>
<td><a href="http://www.jalma.icmr.org.in/dynamic/profile/girdhar.html">www.jalma.icmr.org.in/dynamic/profile/girdhar.html</a></td>
</tr>
<tr>
<td></td>
<td>Laboratory Division, Department of Immunology</td>
<td><a href="http://www.jalma.icmr.org.in/interface/DEPT/immunology.htm">www.jalma.icmr.org.in/interface/DEPT/immunology.htm</a></td>
<td>Dr. U.D. Gupta</td>
<td><a href="http://www.jalma.icmr.org.in/dynamic/profile/udgupta.html">www.jalma.icmr.org.in/dynamic/profile/udgupta.html</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Beenu Joshi</td>
<td><a href="http://www.jalma.icmr.org.in/dynamic/profile/beenujoshi.html">www.jalma.icmr.org.in/dynamic/profile/beenujoshi.html</a></td>
</tr>
<tr>
<td></td>
<td>Laboratory Division, Department of Microbiology &amp; Molecular Biology</td>
<td><a href="http://www.jalma.icmr.org.in/interface/DEPT/microbiology.htm">www.jalma.icmr.org.in/interface/DEPT/microbiology.htm</a></td>
<td>Dr. Om Prakash</td>
<td><a href="http://www.jalma.icmr.org.in/dynamic/profile/omprakash.html">www.jalma.icmr.org.in/dynamic/profile/omprakash.html</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. D.S. Chauhan</td>
<td><a href="http://www.jalma.icmr.org.in/dynamic/profile/dschau">www.jalma.icmr.org.in/dynamic/profile/dschau</a> han.html</td>
</tr>
<tr>
<td></td>
<td>Laboratory Division, Laboratory for Animal Experiments</td>
<td><a href="http://www.jalma.icmr.org.in/interface/DEPT/experimental_leprosy.htm">www.jalma.icmr.org.in/interface/DEPT/experimental_leprosy.htm</a></td>
<td>Dr. Mamta Arora</td>
<td><a href="http://www.jalma.icmr.org.in/dynamic/profile/mamtaarora.html">www.jalma.icmr.org.in/dynamic/profile/mamtaarora.html</a></td>
</tr>
<tr>
<td></td>
<td>Laboratory Division, Electron Microscopy</td>
<td><a href="http://www.jalma.icmr.org.in/interface/DEPT/electron_microscopy.htm">www.jalma.icmr.org.in/interface/DEPT/electron_microscopy.htm</a></td>
<td>Dr. V.D. Sharma</td>
<td><a href="http://www.jalma.icmr.org.in/dynamic/profile/vdsharma.html">www.jalma.icmr.org.in/dynamic/profile/vdsharma.html</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. V.K. Sharma</td>
<td><a href="http://www.jalma.icmr.org.in/dynamic/profile/vksharma.html">www.jalma.icmr.org.in/dynamic/profile/vksharma.html</a></td>
</tr>
<tr>
<td>Supportive Units, Biostatistics &amp; Epidemiology</td>
<td><a href="http://www.jalma-icmr.org.in/interface/DEPT/statistical_unit.htm">www.jalma-icmr.org.in/interface/DEPT/statistical_unit.htm</a></td>
<td>Dr. Anil Kumar</td>
<td><a href="http://www.jalma-icmr.org.in/dynamic/profile/anilkumar.htm">www.jalma-icmr.org.in/dynamic/profile/anilkumar.htm</a></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>4 Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow</td>
<td><a href="http://www.sgpgi.ac.in/index.html">www.sgpgi.ac.in/index.html</a></td>
<td>Prof. T.N. Dhole</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Department of Microbiology</td>
<td><a href="http://www.sgpgi.ac.in/micro.html">www.sgpgi.ac.in/micro.html</a></td>
<td>Prof. K.N. Prasad</td>
<td><a href="http://www.sgpgi.ac.in/cvkn.pdf">www.sgpgi.ac.in/cvkn.pdf</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prof. J. Kishore</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Ujjala Ghoshal</td>
<td><a href="http://www.sgpgi.ac.in/cvug.pdf">www.sgpgi.ac.in/cvug.pdf</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Vijaya Lakshmi Nag</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Rungmei S.K. Marak</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>5 Banaras Hindu University, Varanasi</td>
<td><a href="http://www.bhu.ac.in">www.bhu.ac.in</a></td>
<td>Faculty of Science</td>
<td><a href="http://www.bhu.ac.in/science/index.html">www.bhu.ac.in/science/index.html</a></td>
<td></td>
</tr>
<tr>
<td>Department of Biochemistry</td>
<td><a href="http://www.bhu.ac.in/DepartmentOfBiochemistry/index.html">www.bhu.ac.in/DepartmentOfBiochemistry/index.html</a></td>
<td>Dr. (Mrs.) S. Rathaur</td>
<td><a href="http://www.bhu.ac.in/DepartmentOfBiochemistry/index.html">www.bhu.ac.in/DepartmentOfBiochemistry/index.html</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Rakesh K. Singh</td>
<td><a href="http://www.bhu.ac.in/DepartmentOfBiochemistry/index.html">www.bhu.ac.in/DepartmentOfBiochemistry/index.html</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. H.P. Pandey</td>
<td><a href="http://www.bhu.ac.in/DepartmentOfBiochemistry/index.html">www.bhu.ac.in/DepartmentOfBiochemistry/index.html</a></td>
<td></td>
</tr>
<tr>
<td>Department of Zoology</td>
<td><a href="http://www.bhu.ac.in/zoology/index.html">www.bhu.ac.in/zoology/index.html</a></td>
<td>Dr. Ashok Kumar Maurya</td>
<td><a href="http://www.bhu.ac.in/zoology/employeeisplay.php">www.bhu.ac.in/zoology/employeeisplay.php</a></td>
<td></td>
</tr>
<tr>
<td>Institute of Medical Sciences</td>
<td><a href="http://www.imsbhuni.c.in">www.imsbhuni.c.in</a></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Medicine</td>
<td><a href="http://www.imsbhuni.c.in/medicine/dep_index.html">www.imsbhuni.c.in/medicine/dep_index.html</a></td>
<td>Dr. Shyam Sundar</td>
<td><a href="http://www.imsbhuni.c.in/medicine/flist.htm">www.imsbhuni.c.in/medicine/flist.htm</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. M. Rai</td>
<td><a href="http://www.imsbhuni.c.in/medicine/flist.htm">www.imsbhuni.c.in/medicine/flist.htm</a></td>
<td></td>
</tr>
<tr>
<td>Department of Microbiology</td>
<td><a href="http://www.imsbhuni.c.in/microbiology/dep_index.html">www.imsbhuni.c.in/microbiology/dep_index.html</a></td>
<td>Dr. A.K. Gulati</td>
<td><a href="http://www.imsbhuni.c.in/microbiology/flist.htm">www.imsbhuni.c.in/microbiology/flist.htm</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Gopal Nath</td>
<td><a href="http://www.imsbhuni.c.in/microbiology/flist.htm">www.imsbhuni.c.in/microbiology/flist.htm</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Shampa Anupura (HOD)</td>
<td><a href="http://www.imsbhuni.c.in/microbiology/flist.htm">www.imsbhuni.c.in/microbiology/flist.htm</a></td>
<td></td>
</tr>
<tr>
<td>6 Chhatrapati Shahaji Maharaj Medical University/ King George Medical College, Lucknow</td>
<td><a href="http://www.kgmcindia.edu">www.kgmcindia.edu</a></td>
<td>Department of Microbiology</td>
<td><a href="http://www.kgmcindia.edu/departments/microbiology_index.htm">www.kgmcindia.edu/departments/microbiology_index.htm</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Mastan Singh (HOD)</td>
<td><a href="http://www.kgmcindia.edu/departments/microbiology_faculty.htm">www.kgmcindia.edu/departments/microbiology_faculty.htm</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Amita Jain</td>
<td><a href="http://www.kgmcindia.edu/departments/microbiology_faculty.htm">www.kgmcindia.edu/departments/microbiology_faculty.htm</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Vimala Venkatesh</td>
<td><a href="http://www.kgmcindia.edu/departments/microbiology_faculty.htm">www.kgmcindia.edu/departments/microbiology_faculty.htm</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Jyotsna Agarwal</td>
<td><a href="http://www.kgmcindia.edu/departments/microbiology_faculty.htm">www.kgmcindia.edu/departments/microbiology_faculty.htm</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Gopa Banerjee</td>
<td><a href="http://www.kgmcindia.edu/departments/microbiology_faculty.htm">www.kgmcindia.edu/departments/microbiology_faculty.htm</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. K.P. Singh</td>
<td><a href="http://www.kgmcindia.edu/departments/microbiology_faculty.htm">www.kgmcindia.edu/departments/microbiology_faculty.htm</a></td>
<td></td>
</tr>
</tbody>
</table>
Dr. Raj Kumar Kalyan
www.kgmcindia.edu/departments/microbiology_faculty.htm

Dr. Prashant Gupta
www.kgmcindia.edu/departments/microbiology_faculty.htm

Dr Shally Awasthi
www.kgmcindia.edu/departments/pediatrics_faculty.htm

Department of Pediatrics
www.kgmcindia.edu/departments/pediatrics_index.htm

Dr. Pankaj Seth
www.nbrc.ac.in/faculty/pankaj

Dr. Anirban Basu
www.nbrc.ac.in/faculty/abasu

National Brain Research Centre, Gurgaon
www.nbrc.ac.in

Dr. Ram A. Vishwakarma
http://www.iiim.res.in/rd_medicine1.html#people

Institute of Microbial Technology, Chandigarh
www.imtech.res.in

Dr. Kanak L. Dikshit

Dr. K. Rajagopal

Dr. S. Karthikeyan

Dr. Pradip Kumar Chakraborti

Dr. Saumya Ray Chaudhuri

Dr. Dibyendu Sarkar

Dr. Charu Sharma

Dr. Ashish

Dr. Grish C. Varshney

Dr. Manoj Raje

Dr. Sekhar Majumdar

Dr. Javed N. Agrewala
<table>
<thead>
<tr>
<th></th>
<th>Department of Medical Education and Research, Chandigarh</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Postgraduate Institute of Medical Education and Research, Chandigarh</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Department of Parasitology</td>
<td>Prof. Nancy Malla (HOD)</td>
<td></td>
</tr>
<tr>
<td></td>
<td><a href="http://pgimer.nic.in/code/new%20department/Department%20of%20Parasitology/introduction.html">http://pgimer.nic.in/code/new%20department/Department%20of%20Parasitology/introduction.html</a></td>
<td><a href="http://pgimer.nic.in/code/profiles/nancymalla.htm">http://pgimer.nic.in/code/profiles/nancymalla.htm</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prof. R.C. Mahajan</td>
<td>Prof. Mohan Lal Dubey</td>
<td>Prof. Rakesh Sehgal</td>
</tr>
<tr>
<td></td>
<td>Prof. Mohan Lal Dubey</td>
<td>Prof. Rakesh Sehgal</td>
<td>Prof. Sumeeta Khurana</td>
</tr>
<tr>
<td></td>
<td>Dr. Deepak Kaul (HOD)</td>
<td>Dr. Madhu Khullar</td>
<td>Dr. Deepak Kaul (HOD)</td>
</tr>
<tr>
<td></td>
<td>Dr. Madhu Khullar</td>
<td>Dr. Anuradha Chakraborti</td>
<td>Dr. Veena Dhawan</td>
</tr>
<tr>
<td></td>
<td>Dr. Anuradha Chakraborti</td>
<td>Dr. Sujata Ghosh</td>
<td>Dr. Alka Bhatia</td>
</tr>
<tr>
<td></td>
<td>Dr. Veena Dhawan</td>
<td>Dr. Alka Bhatia</td>
<td>Dr. Dibyajyoti Banerjee</td>
</tr>
<tr>
<td></td>
<td>Dr. Dibyajyoti Banerjee</td>
<td>Dr. Mini P. Singh</td>
<td></td>
</tr>
<tr>
<td></td>
<td><a href="http://pgimer.nic.in/code/new%20department/Department%20of%20Virology/introduction.html">http://pgimer.nic.in/code/new%20department/Department%20of%20Virology/introduction.html</a></td>
<td><a href="http://pgimer.nic.in/code/new%20department/Department%20of%20Virology/faculty.html">http://pgimer.nic.in/code/new%20department/Department%20of%20Virology/faculty.html</a></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>National Institute of Pharmaceutical Education and Research, S.A.S. Nagar</td>
<td>Prof. K.K. Bhutani (Director)</td>
<td>Prof. A.K. Chakraborti</td>
</tr>
<tr>
<td></td>
<td><a href="http://www.niper.ac.in">www.niper.ac.in</a></td>
<td><a href="http://www.niper.ac.in/index.htm">www.niper.ac.in/index.htm</a></td>
<td><a href="http://www.niper.ac.in/index.htm">www.niper.ac.in/index.htm</a></td>
</tr>
<tr>
<td></td>
<td>Institution Name</td>
<td>Department/Research Group</td>
<td>Faculty Members</td>
</tr>
<tr>
<td>----</td>
<td>-----------------------------------------</td>
<td>-----------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>12</td>
<td>Panjab University, Chandigarh</td>
<td>Department of Zoology</td>
<td>Prof. K.P. Ravindranathan Kartha</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Prof. Rahul Jain</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Sankar K. Guchhait</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Sanjay Jachak</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Prof. Prati Pal Singh</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Sushma Singh</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Chaaya Iyengar Raje</td>
</tr>
<tr>
<td>13</td>
<td>Institute of Genomics and Integrative Biology, New Delhi</td>
<td>Department of Biotechnology</td>
<td>Prof. A. Surolia (Director)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Bhupesh Taneja</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. L.S Meena</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Rakesh Sharma</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. S. Ramachandran</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Vinod Scaria</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Yogendra Singh</td>
</tr>
<tr>
<td>14</td>
<td>National Institute of Immunology, New Delhi</td>
<td></td>
<td>Prof. A. Surolia (Director)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Prof. Sandip K. Basu</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Lalit C. Garg</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Akhil C. Banerjea</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Amitabha Mukhopadhyay</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Rajni Rani</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Sudhanshu Vrati</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Sangeeta Bhaskar</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Kanwaljit Kaur</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Mohd. Ayub Qadri</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Devinder Sehgal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Pushkar Sharma</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Vinay Kumar Nandicoori</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Sandeep Saxena</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Agam P. Singh</td>
</tr>
</tbody>
</table>

**Note:** All links are to the respective institution's website or faculty member's page.
<table>
<thead>
<tr>
<th>15</th>
<th>Indian Council of Medical Research Headquarters, New Delhi</th>
<th>Dr. Vishwa Mohan Katoch (Director-General)</th>
<th>Dr. Lalit Kant</th>
<th>Dr. Bontha Veerraju Babu</th>
<th>Dr. Reeta Rasaily</th>
<th>Dr. Anju Sharma</th>
<th>Dr. Divya Srivastava</th>
<th>Dr. Rajni Kant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><a href="http://www.icmr.nic.in">www.icmr.nic.in</a></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| 16 | National Institute of Malaria Research, Delhi        | Dr. V.K. Dua (Officer-in-Charge)        | Dr. T. Adak | Dr. Neena Valecha        | Dr. R.C. Dhiman | Dr. M.S. Malhotra | Dr. A. Sharma | Dr. S.K. Ghosh |
|    | www.mrcindia.org                                    |                                          |              |                          |                 |                |                   |               |

| 17 | Institute of Pathology, New Delhi                  | Dr. Poonam Salotra                      | Dr. Ranvir Singh |
|    | http://instpath.gov.in/                            |                                          |               |

298
<table>
<thead>
<tr>
<th>18</th>
<th>All India Institute of Medical Sciences, New Delhi</th>
<th><a href="http://www.aiims.edu">www.aiims.edu</a></th>
<th>Dr. Aruna Singh (Mittal)</th>
<th><a href="http://www.icmr.nic.in/icmrsql/biodata.asp?expno=00006280">www.icmr.nic.in/icmrsql/biodata.asp?expno=00006280</a></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Department of Biochemistry</td>
<td><a href="http://www.aiims.edu/aiims/departments/biochem/biochem.htm">www.aiims.edu/aiims/departments/biochem/biochem.htm</a></td>
<td>Prof. D.N. Rao</td>
<td><a href="http://www.aiims.edu/aiims/departments/biochem/biochem.htm#dnr">www.aiims.edu/aiims/departments/biochem/biochem.htm#dnr</a></td>
</tr>
<tr>
<td></td>
<td>Department of Biotechnology</td>
<td><a href="http://www.aiims.edu/aiims/departments/Biotechnology/biotechintro.htm">www.aiims.edu/aiims/departments/Biotechnology/biotechintro.htm</a></td>
<td>Prof. Y.D. Sharma (HOD)</td>
<td><a href="http://www.aiims.edu/aiims/departments/Biotechnology/biotechydsharma.htm">www.aiims.edu/aiims/departments/Biotechnology/biotechydsharma.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Prof. Jaya S. Tyagi</td>
<td><a href="http://www.aiims.edu/aiims/departments/Biotechnology/biotechjayatyagi.htm">www.aiims.edu/aiims/departments/Biotechnology/biotechjayatyagi.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Prof. H. Krishna Prasad</td>
<td><a href="http://www.aiims.edu/aiims/departments/Biotechnology/biotechkjprasad.htm">www.aiims.edu/aiims/departments/Biotechnology/biotechkjprasad.htm</a></td>
</tr>
<tr>
<td></td>
<td>Department of Microbiology</td>
<td><a href="http://www.aiims.edu/aiims/departments/micro/mainpage2.htm">www.aiims.edu/aiims/departments/micro/mainpage2.htm</a></td>
<td>Prof. J.C. Samantary</td>
<td><a href="http://www.aiims.edu/aiims/departments/micro/jcs.htm">www.aiims.edu/aiims/departments/micro/jcs.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Bimal Kumar Das</td>
<td><a href="http://www.aiims.edu/aiims/departments/micro/bimal.htm">www.aiims.edu/aiims/departments/micro/bimal.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Arti Kapil</td>
<td><a href="http://www.aiims.edu/aiims/departments/micro/arti.htm">www.aiims.edu/aiims/departments/micro/arti.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Prof. Shobha Broor</td>
<td><a href="http://www.aiims.edu/aiims/departments/micro/Broor2.htm">www.aiims.edu/aiims/departments/micro/Broor2.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Urvashi B. Singh</td>
<td><a href="http://www.aiims.edu/aiims/departments/micro/ubsingh.htm">www.aiims.edu/aiims/departments/micro/ubsingh.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Madhu Vajpayee</td>
<td><a href="http://www.aiims.edu/aiims/departments/micro/madhu2.htm">www.aiims.edu/aiims/departments/micro/madhu2.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr Rama Chaudhry</td>
<td><a href="http://www.aiims.edu/aiims/departments/micro/rama1.htm">www.aiims.edu/aiims/departments/micro/rama1.htm</a></td>
</tr>
<tr>
<td></td>
<td>Department of Medicine</td>
<td><a href="http://www.aiims.edu/aiims/departments/medicine/medicine.htm">www.aiims.edu/aiims/departments/medicine/medicine.htm</a></td>
<td>Prof. S.K. Sharma</td>
<td><a href="http://www.aiims.edu/aiims/departments/medicine/drsksharma.htm">www.aiims.edu/aiims/departments/medicine/drsksharma.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Sanjeev Sinha</td>
<td><a href="http://www.aiims.edu/aiims/departments/medicine/drsinha.htm">www.aiims.edu/aiims/departments/medicine/drsinha.htm</a></td>
</tr>
<tr>
<td></td>
<td>Department of Pediatrics</td>
<td><a href="http://www.aiims.edu/aiims/departments/pediatrics/introduction.htm">www.aiims.edu/aiims/departments/pediatrics/introduction.htm</a></td>
<td>Prof. S.K. Kabra</td>
<td><a href="http://www.aiims.edu/aiims/departments/pediatrics/faculty.htm">www.aiims.edu/aiims/departments/pediatrics/faculty.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Rakesh Lodha</td>
<td><a href="http://www.aiims.edu/aiims/departments/pediatrics/faculty.htm">www.aiims.edu/aiims/departments/pediatrics/faculty.htm</a></td>
</tr>
<tr>
<td></td>
<td>Department of Laboratory Medicine</td>
<td><a href="http://www.aiims.edu/aiims/departments/Labmedicine/LabIntro1.htm">www.aiims.edu/aiims/departments/Labmedicine/LabIntro1.htm</a></td>
<td>Prof. Sarman Singh</td>
<td><a href="http://www.aiims.edu/aiims/departments/Labmedicine/drsarmanSingh.htm">www.aiims.edu/aiims/departments/Labmedicine/drsarmanSingh.htm</a></td>
</tr>
<tr>
<td></td>
<td>Jai Prakash Narayan Apex Trauma Center</td>
<td><a href="http://www.jpnatc.com/">www.jpnatc.com/</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Department of Laboratory Medicine</td>
<td><a href="http://www.jpnatc.com/departement.lab.asp">www.jpnatc.com/departement.lab.asp</a></td>
<td>Dr. Purva Mathur</td>
<td><a href="http://www.jpnatc.com/docs/purva.mathur.pdf">www.jpnatc.com/docs/purva.mathur.pdf</a></td>
</tr>
<tr>
<td>19</td>
<td>University of Delhi, Delhi</td>
<td><a href="http://www.du.ac.in">www.du.ac.in</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Department of Zoology</td>
<td><a href="http://www.du.ac.in/index.php?id=422">www.du.ac.in/index.php?id=422</a></td>
<td>Dr. Virendra K. Bhasin</td>
<td><a href="http://www.du.ac.in/faculty_member_details.htm?id=497">www.du.ac.in/faculty_member_details.htm?id=497</a></td>
</tr>
<tr>
<td></td>
<td>University of Delhi South Campus, New Delhi</td>
<td><a href="http://www.south.du.ac.in/cms/index.php?page=templ">www.south.du.ac.in/cms/index.php?page=templ</a></td>
<td>Prof. Anil K. Tyagi</td>
<td><a href="http://www.du.ac.in/faculty_member_details.htm?id=781">www.du.ac.in/faculty_member_details.htm?id=781</a></td>
</tr>
<tr>
<td>Biochemistry</td>
<td><a href="http://www.south.du.ac.in/cms/index.php?page=microbiology">www.south.du.ac.in/cms/index.php?page=microbiology</a></td>
<td>Dr. Amita Gupta</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Department of Microbiology</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>University College of Medical Sciences, University of Delhi, Delhi</td>
<td><a href="http://www.ucms.ac.in">www.ucms.ac.in</a></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Microbiology</td>
<td><a href="http://www.ucms.ac.in/d_microbiology.htm">www.ucms.ac.in/d_microbiology.htm</a></td>
<td>Prof. V.G. Ramachandran</td>
<td><a href="http://www.ucms.ac.in/PROFILE/Microbiology/Dr_VG_Ramachandran.htm1">www.ucms.ac.in/PROFILE/Microbiology/Dr_VG_Ramachandran.htm1</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td><a href="http://www.ucms.ac.in/d_microbiology.html">www.ucms.ac.in/d_microbiology.html</a></td>
<td>Prof. (Mrs.) Shukla Das Rudra</td>
<td><a href="http://www.ucms.ac.in/PROFILE/Microbiology/Dr(Mrs)_SD_Rudra.html">www.ucms.ac.in/PROFILE/Microbiology/Dr(Mrs)_SD_Rudra.html</a></td>
<td></td>
</tr>
<tr>
<td>Department of Biostatistics &amp; Medical Informatics</td>
<td><a href="http://www.ucms.ac.in/d_biosstatitics.htm">www.ucms.ac.in/d_biosstatitics.htm</a></td>
<td>Prof. A. Indrayan</td>
<td><a href="http://indrayan.weebly.com/">http://indrayan.weebly.com/</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vallabhbhai Patel Chest Institute, University of Delhi, Delhi</td>
<td><a href="http://www.vpci.org.in/institute.asp">www.vpci.org.in/institute.asp</a></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Biochemistry</td>
<td><a href="http://www.vpci.org.in/department.asp">www.vpci.org.in/department.asp</a></td>
<td>Prof. H.G. Raj</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Department of Microbiology</td>
<td><a href="http://www.vpci.org.in/dep_microbiology.asp">www.vpci.org.in/dep_microbiology.asp</a></td>
<td>Prof. S.S. Thukral</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prof. Mridula Bose</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Malini Shariff</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Mandira Varma</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.R. Ambedkar Centre for Biomedical Research, University of Delhi, Delhi</td>
<td><a href="http://www.acbbru.ac.edu">www.acbbru.ac.edu</a></td>
<td>Prof. Vani Brahmacari</td>
<td><a href="http://www.acbbru.ac.edu/rf.html">http://www.acbbru.ac.edu/rf.html</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prof. Daman Saluja</td>
<td><a href="http://www.acbbru.ac.edu/rf.html">http://www.acbbru.ac.edu/rf.html</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prof. K. Natarajan</td>
<td><a href="http://www.acbbru.ac.edu/rf.html">http://www.acbbru.ac.edu/rf.html</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Anju Katyal</td>
<td><a href="http://www.acbbru.ac.edu/rf.html">http://www.acbbru.ac.edu/rf.html</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jawaharlal Nehru University, New Delhi</td>
<td><a href="http://www.jnu.ac.in">www.jnu.ac.in</a></td>
<td>Prof. Santosh K. Kar</td>
<td><a href="http://www.jnu.ac.in/FacultyStaff/ShowProfile.asp?SendUserName=skkar">www.jnu.ac.in/FacultyStaff/ShowProfile.asp?SendUserName=skkar</a></td>
<td></td>
</tr>
<tr>
<td>School of Biotechnology</td>
<td><a href="http://www.jnu.ac.in/SBT">www.jnu.ac.in/SBT</a></td>
<td>Dr. Swati Tiwari</td>
<td><a href="http://www.jnu.ac.in/FacultyStaff/ShowProfile.asp?SendUserName=stiwari">www.jnu.ac.in/FacultyStaff/ShowProfile.asp?SendUserName=stiwari</a></td>
<td></td>
</tr>
<tr>
<td>School of Life Sciences</td>
<td><a href="http://www.jnu.ac.in/main.asp?sendval=SchoolOfLifeSciences">http://www.jnu.ac.in/main.asp?sendval=SchoolOfLifeSciences</a></td>
<td>Prof. Rajiv K. Saxena</td>
<td><a href="http://www.jnu.ac.in/Faculty/rksaxena">www.jnu.ac.in/Faculty/rksaxena</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prof. Alok Bhattacharya</td>
<td><a href="http://www.jnu.ac.in/Faculty/alok">www.jnu.ac.in/Faculty/alok</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prof. Rentala Madhubala</td>
<td><a href="http://www.jnu.ac.in/Faculty/madhubala">www.jnu.ac.in/Faculty/madhubala</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prof. R.N.K. Bamezai</td>
<td><a href="http://www.jnu.ac.in/Faculty/bamezai">www.jnu.ac.in/Faculty/bamezai</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Neelima Mondal</td>
<td><a href="http://www.jnu.ac.in/Faculty/nmondal">www.jnu.ac.in/Faculty/nmondal</a></td>
<td></td>
</tr>
<tr>
<td>School of Environmental Sciences</td>
<td><a href="http://www.jnu.ac.in/main.asp?sendval=SchoolOfEnvironmentalSciences">www.jnu.ac.in/main.asp?sendval=SchoolOfEnvironmentalSciences</a></td>
<td>Prof. Sudha Bhattacharya</td>
<td><a href="http://www.jnu.ac.in/FacultyStaff/ShowProfile.asp?SendUserName=sbhattac'harya">www.jnu.ac.in/FacultyStaff/ShowProfile.asp?SendUserName=sbhattac'harya</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mammalian Biology: Immunology</td>
<td><a href="http://www.icgeb.org/mammi-an-biology-">www.icgeb.org/mammi-an-biology-</a></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mammalian Biology: Malaria</td>
<td>Immunology.html</td>
<td>(Group Leader)</td>
<td>Dr. Gobardhan Das</td>
<td><a href="http://www.icgeb.org/g-das-lab.html">www.icgeb.org/g-das-lab.html</a></td>
</tr>
<tr>
<td>---------------------------</td>
<td>----------------</td>
<td>---------------</td>
<td>-----------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td></td>
<td><a href="http://www.icgeb.org/mammalian-biology-malaria.html">www.icgeb.org/mammalian-biology-malaria.html</a></td>
<td>Prof. Virander S. Chauhan (Group Leader &amp; Director)</td>
<td><a href="http://www.icgeb.org/virander-chauhan.html">www.icgeb.org/virander-chauhan.html</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Paushali Mukherjee</td>
<td><a href="http://www.icgeb.org/paushali-mukherjee-lab.html">www.icgeb.org/paushali-mukherjee-lab.html</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Asif Mohmmed</td>
<td><a href="http://www.icgeb.org/mohammed-asif-lab.html">www.icgeb.org/mohammed-asif-lab.html</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Chetan Chitnis</td>
<td><a href="http://www.icgeb.org/chetan-chitnis-lab.html">www.icgeb.org/chetan-chitnis-lab.html</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Pawan Malhotra</td>
<td><a href="http://www.icgeb.org/pawan-malhotra-lab.html">www.icgeb.org/pawan-malhotra-lab.html</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Dinkar Sahal</td>
<td><a href="http://www.icgeb.org/dinkar-sahal-lab.html">www.icgeb.org/dinkar-sahal-lab.html</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Syed Shams Yazdani</td>
<td><a href="http://www.icgeb.org/pi-shams.html">www.icgeb.org/pi-shams.html</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Renu Tuteja</td>
<td><a href="http://www.icgeb.org/renu-tuteja-lab.html">www.icgeb.org/renu-tuteja-lab.html</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. S. Swaminathan</td>
<td><a href="http://www.icgeb.org/pi-swaminathan.html">www.icgeb.org/pi-swaminathan.html</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Anand Ranganathan</td>
<td><a href="http://www.icgeb.org/pi-ranganathan.html">www.icgeb.org/pi-ranganathan.html</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Arulandu Arockiasamy</td>
<td><a href="http://www.icgeb.org/pi-arockiasamy.html">www.icgeb.org/pi-arockiasamy.html</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Neel Sarovar Bhavesh</td>
<td><a href="http://www.icgeb.org/pi-bhavesh.html">www.icgeb.org/pi-bhavesh.html</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Dinesh Gupta</td>
<td><a href="http://www.icgeb.org/pi-gupta.html">www.icgeb.org/pi-gupta.html</a></td>
<td></td>
</tr>
<tr>
<td>LRS Institute of Tuberculosis and Respiratory Diseases, New Delhi</td>
<td><a href="http://lrsitbrd.nic.in/Inde">http://lrsitbrd.nic.in/Inde</a> x.htm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Epidemiology and Public Health</td>
<td><a href="http://lrsitbrd.nic.in/Inde">http://lrsitbrd.nic.in/Inde</a> x.htm</td>
<td>Dr. Khalid Umer Khayyam (HOD)</td>
<td><a href="http://lrsitbrd.nic.in/Index.htm">http://lrsitbrd.nic.in/Index.htm</a></td>
<td></td>
</tr>
<tr>
<td>Department of Internal Medicine</td>
<td><a href="http://lrsitbrd.nic.in/Inde">http://lrsitbrd.nic.in/Inde</a> x.htm</td>
<td>Dr. Upasana Agarwal (HOD)</td>
<td><a href="http://lrsitbrd.nic.in/Index.htm">http://lrsitbrd.nic.in/Index.htm</a></td>
<td></td>
</tr>
<tr>
<td>Department of Microbiology</td>
<td><a href="http://lrsitbrd.nic.in/Inde">http://lrsitbrd.nic.in/Inde</a> x.htm</td>
<td>Dr. V. P. Myneedu (HOD)</td>
<td><a href="http://lrsitbrd.nic.in/Index.htm">http://lrsitbrd.nic.in/Index.htm</a></td>
<td></td>
</tr>
<tr>
<td>Department of Paediatrics</td>
<td><a href="http://lrsitbrd.nic.in/Inde">http://lrsitbrd.nic.in/Inde</a> x.htm</td>
<td>Dr. Sangeeta Sharma (HOD)</td>
<td><a href="http://lrsitbrd.nic.in/Index.htm">http://lrsitbrd.nic.in/Index.htm</a></td>
<td></td>
</tr>
<tr>
<td>Department of Pathology</td>
<td><a href="http://lrsitbrd.nic.in/Inde">http://lrsitbrd.nic.in/Inde</a> x.htm</td>
<td>Dr. Kumud Gupta (HOD)</td>
<td><a href="http://lrsitbrd.nic.in/Index.htm">http://lrsitbrd.nic.in/Index.htm</a></td>
<td></td>
</tr>
<tr>
<td>Department of Physiology</td>
<td><a href="http://lrsitbrd.nic.in/Inde">http://lrsitbrd.nic.in/Inde</a> x.htm</td>
<td>Dr. Rupak Singla (In-Charge)</td>
<td><a href="http://lrsitbrd.nic.in/Index.htm">http://lrsitbrd.nic.in/Index.htm</a></td>
<td></td>
</tr>
<tr>
<td>Serial No.</td>
<td>Name of Institution/ University/ School/ Division/ Department</td>
<td>Web-link</td>
<td>Name of Scientist / Clinical Investigator / Doctor</td>
<td>Web-link</td>
</tr>
<tr>
<td>-----------</td>
<td>---------------------------------------------------------------</td>
<td>----------</td>
<td>-----------------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>1</td>
<td>Regional Medical Research Centre for Tribals, Jabalpur</td>
<td><a href="http://www.rmrct.org">www.rmrct.org</a></td>
<td>Dr. Neeru Singh (Director)</td>
<td><a href="http://www.rmrct.org/files_rmrct_web/cv/director.htm">www.rmrct.org/files_rmrct_web/cv/director.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Surendra Kumar</td>
<td><a href="http://www.rmrct.org/files_rmrct_web/cv/DrSurendra.htm">www.rmrct.org/files_rmrct_web/cv/DrSurendra.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Chandra Kumar Dolla</td>
<td><a href="http://www.rmrct.org/files_rmrct_web/cv/drdolla.htm">www.rmrct.org/files_rmrct_web/cv/drdolla.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. M. L. Mathur</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00011391">http://icmr.nic.in/icmrsql/biodata.asp?expno=00011391</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Karam Vir Singh</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00011397">http://icmr.nic.in/icmrsql/biodata.asp?expno=00011397</a></td>
</tr>
<tr>
<td>Serial No.</td>
<td>Name of Institution/ University/ School/ Division/ Department</td>
<td>Web-link</td>
<td>Name of Scientist / Clinical Investigator / Doctor</td>
<td>Web-link</td>
</tr>
<tr>
<td>------------</td>
<td>-------------------------------------------------------------</td>
<td>----------</td>
<td>--------------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>4</td>
<td>SMS Medical College and Allied Hospitals, Jaipur</td>
<td><a href="http://smsmedicalcollege.webs.com/">http://smsmedicalcollege.webs.com/</a></td>
<td>Dr. N.K. Jain (Hospital Superintendent)</td>
<td><a href="http://smsmedicalcollege.webs.com/departments/CHEST%20&amp;%20B.%20DEPARTMENT.htm">http://smsmedicalcollege.webs.com/departments/CHEST%20&amp;%20B.%20DEPARTMENT.htm</a></td>
</tr>
<tr>
<td>5</td>
<td>Indian Institute of Science Education and Research, Bhopal</td>
<td><a href="http://www.iiserbhopal.ac.in">www.iiserbhopal.ac.in</a></td>
<td>Dr. Vikas Jain</td>
<td><a href="http://home.iiserbhopal.ac.in/~vikas">http://home.iiserbhopal.ac.in/~vikas</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Himanshu Kumar</td>
<td><a href="http://home.iiserbhopal.ac.in/~hhumar/">http://home.iiserbhopal.ac.in/~hhumar/</a></td>
</tr>
<tr>
<td>Zone-4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Institute of Life Sciences, Bhubaneswar</td>
<td><a href="http://www.ilsc.org">www.ilsc.org</a></td>
<td>Dr. B. Ravindran (Director)</td>
<td><a href="http://www.ilsc.org/ravindran.htm">www.ilsc.org/ravindran.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Durg V. Singh</td>
<td><a href="http://www.ilsc.org/dvs.htm">www.ilsc.org/dvs.htm</a></td>
</tr>
<tr>
<td>2</td>
<td>Regional Medical Research Centre, Bhubaneswar</td>
<td><a href="http://icmr.nic.in/pinstitute/Bhubaneswar.htm">http://icmr.nic.in/pinstitute/Bhubaneswar.htm</a></td>
<td>Dr. S.K. Kar (Director)</td>
<td><a href="http://icmr.nic.in/icmrsrl/biodata.asp?expno=00002530">http://icmr.nic.in/icmrsrl/biodata.asp?expno=00002530</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Namita Mahapatra</td>
<td><a href="http://icmr.nic.in/icmrsrl/biodata.asp?expno=00011383">http://icmr.nic.in/icmrsrl/biodata.asp?expno=00011383</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Dasarathi Das</td>
<td><a href="http://icmr.nic.in/icmrsrl/biodata.asp?expno=00011601">http://icmr.nic.in/icmrsrl/biodata.asp?expno=00011601</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Anna Salomi Kerketta</td>
<td><a href="http://icmr.nic.in/icmrsrl/biodata.asp?expno=00011633">http://icmr.nic.in/icmrsrl/biodata.asp?expno=00011633</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Amarendra Mohapatra</td>
<td><a href="http://icmr.nic.in/icmrsrl/biodata.asp?expno=00011386">http://icmr.nic.in/icmrsrl/biodata.asp?expno=00011386</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Bibhuti Bhusan Pal</td>
<td><a href="http://icmr.nic.in/icmrsrl/biodata.asp?expno=00011387">http://icmr.nic.in/icmrsrl/biodata.asp?expno=00011387</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. M.R. Ranjit</td>
<td><a href="http://icmr.nic.in/icmrsrl/biodata.asp?expno=00011696">http://icmr.nic.in/icmrsrl/biodata.asp?expno=00011696</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Ashok Kumar Satapathy</td>
<td><a href="http://icmr.nic.in/icmrsrl/biodata.asp?expno=00011389">http://icmr.nic.in/icmrsrl/biodata.asp?expno=00011389</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. R.K. Hazra</td>
<td><a href="http://icmr.nic.in/icmrsrl/biodata.asp?expno=00019852">http://icmr.nic.in/icmrsrl/biodata.asp?expno=00019852</a></td>
</tr>
<tr>
<td>3</td>
<td>National Institute of Science Education and Research, Bhopal</td>
<td><a href="http://niser.ac.in">http://niser.ac.in</a></td>
<td>Dr. Trailokya Nath Naik (Ex-Faculty; till 20/07/2010)</td>
<td><a href="http://niser.ac.in/people.php?p=faculty">http://niser.ac.in/people.php?p=faculty</a></td>
</tr>
<tr>
<td>4</td>
<td>National Institute of Malaria Research,</td>
<td><a href="http://www.mrcindia.org/rourke.htm">www.mrcindia.org/rourke.htm</a></td>
<td>Dr. S.K. Sharma (Officer-in-Charge)</td>
<td><a href="http://www.mrcindia.org/scientist.htm#Sharma,%20SK">www.mrcindia.org/scientist.htm#Sharma,%20SK</a></td>
</tr>
<tr>
<td>Page</td>
<td>School/Department</td>
<td>Website</td>
<td>Coordinator/Professor</td>
<td>Website Link</td>
</tr>
<tr>
<td>------</td>
<td>-------------------</td>
<td>---------</td>
<td>-----------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>5</td>
<td>University of Hyderabad</td>
<td><a href="http://www.uohyd.ernet.in">www.uohyd.ernet.in</a></td>
<td>Prof. Seyed E. Hasnain (Vice-Chancellor)</td>
<td><a href="http://isogem.org/hasnain.html">http://isogem.org/hasnain.html</a></td>
</tr>
<tr>
<td></td>
<td>School of Life Sciences</td>
<td><a href="http://www.uohyd.ernet.in/academic/school_study/Sciences/index.html">www.uohyd.ernet.in/academic/school_study/Sciences/index.html</a></td>
<td>Prof. P. Prakash Babu</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Department of Biotechnology</td>
<td><a href="http://www.uohyd.ernet.in/academic/school_study/Sciences/mission_biotecnology.html">www.uohyd.ernet.in/academic/school_study/Sciences/mission_biotecnology.html</a></td>
<td>Dr. Vaibhav Vindal</td>
<td><a href="http://www.uohyd.ernet.in/academic/school_study/sciences/Vaibhav_V.pdf">www.uohyd.ernet.in/academic/school_study/sciences/Vaibhav_V.pdf</a></td>
</tr>
<tr>
<td></td>
<td>Department of Biochemistry</td>
<td><a href="http://www.uohyd.ernet.in/academic/school_study/Sciences/mission_biochemistry.html">www.uohyd.ernet.in/academic/school_study/Sciences/mission_biochemistry.html</a></td>
<td>Dr. Sharmishta Banerjee</td>
<td><a href="http://www.uohyd.ernet.in/academic/school_study/sciences/Sharmishta_B.html">www.uohyd.ernet.in/academic/school_study/sciences/Sharmishta_B.html</a></td>
</tr>
<tr>
<td></td>
<td>Department of Animal Sciences</td>
<td><a href="http://www.uohyd.ernet.in/academic/school_study/Sciences/mission_animal_sciences.html">www.uohyd.ernet.in/academic/school_study/Sciences/mission_animal_sciences.html</a></td>
<td>Prof. Manjula Sritharan</td>
<td><a href="http://www.uohyd.ernet.in/academic/school_study/sciences/Manjula_S.pdf">www.uohyd.ernet.in/academic/school_study/sciences/Manjula_S.pdf</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Radheshyam Maurya</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Institute of Life Sciences, University of Hyderabad</td>
<td><a href="http://www.ilsresearch.org">www.ilsresearch.org</a></td>
<td>Dr. Ritta Mathew</td>
<td><a href="http://www.ilsresearch.org/professional/pro_view.php?id=120">www.ilsresearch.org/professional/pro_view.php?id=120</a></td>
</tr>
<tr>
<td>7</td>
<td>Centre of Cellular and Molecular Biology, Hyderabad</td>
<td><a href="http://www.ccmb.res.in">www.ccmb.res.in</a></td>
<td>Dr. Raghunand R Tirumalai</td>
<td><a href="http://www.ccmb.res.in/scientistdetails.php?grpid=31">www.ccmb.res.in/scientistdetails.php?grpid=31</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Amitabha Chattopadhyay</td>
<td><a href="http://www.ccmb.res.in/scientistdetails.php?grpid=1">www.ccmb.res.in/scientistdetails.php?grpid=1</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Sunit Kumar Singh</td>
<td><a href="http://www.ccmb.res.in/scientistdetails.php?grpid=29">www.ccmb.res.in/scientistdetails.php?grpid=29</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Puran Singh Sijwali</td>
<td><a href="http://www.ccmb.res.in/scientistdetails.php?grpid=36">www.ccmb.res.in/scientistdetails.php?grpid=36</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Tushar Vaidya</td>
<td><a href="http://www.ccmb.res.in/scientistdetails.php?grpid=16">www.ccmb.res.in/scientistdetails.php?grpid=16</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Shailendra K. Saxena</td>
<td><a href="http://www.ccmb.res.in/scientistdetails.php?grpid=19">www.ccmb.res.in/scientistdetails.php?grpid=19</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Somdatta Sinha</td>
<td><a href="http://www.ccmb.res.in/scientistdetails.php?grpid=38">www.ccmb.res.in/scientistdetails.php?grpid=38</a></td>
</tr>
<tr>
<td>8</td>
<td>Center for DNA Fingerprinting and Diagnostics, Hyderabad</td>
<td><a href="http://www.cdfd.org.in">www.cdfd.org.in</a></td>
<td>Dr. Sangita Mukhopadhyay</td>
<td><a href="http://www.cdfd.org.in/labpages/sangita.html">www.cdfd.org.in/labpages/sangita.html</a></td>
</tr>
<tr>
<td></td>
<td>Lab of Bacterial Genetics</td>
<td><a href="http://www.cdfd.org.in/labpages/bacterial_group.html">www.cdfd.org.in/labpages/bacterial_group.html</a></td>
<td>Dr. Shekhar C. Mande</td>
<td><a href="http://www.cdfd.org.in/labpages/structural_biology_shekharcmande.html">www.cdfd.org.in/labpages/structural_biology_shekharcmande.html</a></td>
</tr>
<tr>
<td>9</td>
<td>National Institute of Pharmaceutical Education and Research, Hyderabad</td>
<td><a href="http://www.niperhyd.ac.in/index.aspx">www.niperhyd.ac.in/index.aspx</a></td>
<td>Dr. Ramakrishna Sistla</td>
<td><a href="http://www.niperhyd.ac.in/facultycv/RESUME_SISTLA_RAMAKRISHNA.pdf">www.niperhyd.ac.in/facultycv/RESUME_SISTLA_RAMAKRISHNA.pdf</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Tuberculosis Research Centre, Chennai</td>
<td><a href="http://www.trc-chennai.org">www.trc-chennai.org</a></td>
<td>Dr. Vasanathapuram Kumaraswami (Director-in-Charge)</td>
<td><a href="http://www.trc-chennai.org/pdf/staff/Dr.VK.pdf">www.trc-chennai.org/pdf/staff/Dr.VK.pdf</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Centre for Research in Medical Entomology, Madurai</td>
<td><a href="http://icmr.nic.in/pinstitute/crme.htm">http://icmr.nic.in/pinstitute/crme.htm</a></td>
<td>Dr. B.K. Tyagi (Officer-in-Charge)</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00011396">http://icmr.nic.in/icmrsql/biodata.asp?expno=00011396</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. N. Arunachalam</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00011226">http://icmr.nic.in/icmrsql/biodata.asp?expno=00011226</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. T. Mariappan</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00011239">http://icmr.nic.in/icmrsql/biodata.asp?expno=00011239</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. R. Rajendran</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00011415">http://icmr.nic.in/icmrsql/biodata.asp?expno=00011415</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mr. R. Paramasivan</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00011226">http://icmr.nic.in/icmrsql/biodata.asp?expno=00011226</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. M. Muniaraj</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00011725">http://icmr.nic.in/icmrsql/biodata.asp?expno=00011725</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. P. Philip Samuel</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00019347">http://icmr.nic.in/icmrsql/biodata.asp?expno=00019347</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Satish Chandra Tewari</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00011708">http://icmr.nic.in/icmrsql/biodata.asp?expno=00011708</a></td>
</tr>
<tr>
<td>13</td>
<td>Madurai Kamaraj University, Madurai</td>
<td><a href="http://www.mkuniversity.org">www.mkuniversity.org</a></td>
<td>Prof. K. Dharmalingam</td>
<td><a href="http://biotechmku.org/kd.html">http://biotechmku.org/kd.html</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Prof. Ramasamy Pitchappan</td>
<td><a href="http://www.firstgreatmigrations.org/CV/PITCHAPPAN.pdf">http://www.firstgreatmigrations.org/CV/PITCHAPPAN.pdf</a></td>
</tr>
<tr>
<td>14</td>
<td>Bharathidasan University, Tiruchirappalli</td>
<td><a href="http://www.bdu.ac.in">www.bdu.ac.in</a></td>
<td>Dr. K. Balakrishnan</td>
<td><a href="http://www.bdu.ac.in/depa/science/biotech/biotech.htm">www.bdu.ac.in/depa/science/biotech/biotech.htm</a></td>
</tr>
<tr>
<td></td>
<td>School of Life Sciences, Department of Biotechnology</td>
<td><a href="http://www.bdu.ac.in/depa/science/biotech/biotech.htm">www.bdu.ac.in/depa/science/biotech/biotech.htm</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Anna University Chennai</td>
<td><a href="http://www.annauniv.edu">www.annauniv.edu</a></td>
<td>Prof. P. Kaliraj</td>
<td><a href="http://www.annauniv.edu/BioTechCentre/Profile/pkalirajcv.pdf">www.annauniv.edu/BioTechCentre/Profile/pkalirajcv.pdf</a></td>
</tr>
<tr>
<td></td>
<td>Centre for Biotechnology</td>
<td><a href="http://www.annauniv.edu/BioTechCentre/index.php">www.annauniv.edu/BioTechCentre/index.php</a></td>
<td>Prof. R.B. Narayanan</td>
<td><a href="http://www.annauniv.edu/BioTechCentre/Profile/Dr.RBN-Director.pdf">www.annauniv.edu/BioTechCentre/Profile/Dr.RBN-Director.pdf</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Prof. K. Sankaran</td>
<td><a href="http://www.annauniv.edu/BioTechCentre/Profile/sankaran.pdf">www.annauniv.edu/BioTechCentre/Profile/sankaran.pdf</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Anuradha Dhanasekaran</td>
<td><a href="http://www.annauniv.edu/BioTech/Profile/anu.pdf">www.annauniv.edu/BioTech/Profile/anu.pdf</a></td>
</tr>
<tr>
<td>16</td>
<td>Indian Institute of Technology Madras,</td>
<td><a href="http://www.iitm.ac.in">www.iitm.ac.in</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chennai</td>
<td>Department of Biotechnology</td>
<td><a href="http://www.biotech.iitm.ac.in/">www.biotech.iitm.ac.in/</a></td>
<td>Prof. Mukesh Doble</td>
<td><a href="http://www.biotech.iitm.ac.in/doble_research">www.biotech.iitm.ac.in/doble_research</a></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. S. Mahalingam</td>
<td><a href="http://www.biotech.iitm.ac.in/Mahalingam">www.biotech.iitm.ac.in/Mahalingam</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Vidya Ramachandran</td>
<td><a href="http://www.nie.gov.in/BioData%20VR.pdf">www.nie.gov.in/BioData%20VR.pdf</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Srinivasan Balasubramanyam</td>
<td><a href="http://www.nie.gov.in/BioData%20Balasubramani.pdf">www.nie.gov.in/BioData%20Balasubramani.pdf</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Thilakavathi Subramanian</td>
<td><a href="http://www.nie.gov.in/BioData%20Thilaka.pdf">www.nie.gov.in/BioData%20Thilaka.pdf</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. C.P. Girish Kumar</td>
<td><a href="http://www.nie.gov.in/BioData%20Girish.pdf">www.nie.gov.in/BioData%20Girish.pdf</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. P. Manickam</td>
<td><a href="http://www.nie.gov.in/BioData%20PM.pdf">www.nie.gov.in/BioData%20PM.pdf</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Yuvaraj Jayaraman</td>
<td><a href="http://www.nie.gov.in/BioData%20Yuvaraj.pdf">www.nie.gov.in/BioData%20Yuvaraj.pdf</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mr. J. Arockiasamy</td>
<td><a href="http://www.nie.gov.in/BioData%20samy.pdf">www.nie.gov.in/BioData%20samy.pdf</a></td>
</tr>
<tr>
<td></td>
<td>Department of Microbiology</td>
<td><a href="http://www.cmch-vellore.edu/DeptMicro/tabid/272/Default.aspx">www.cmch-vellore.edu/DeptMicro/tabid/272/Default.aspx</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>National Institute of Malaria Research, Chennai Field Station</td>
<td><a href="http://www.mrcindia.org/chennai.htm">www.mrcindia.org/chennai.htm</a></td>
<td>Dr. Alex Eapen (Officer-in-Charge)</td>
<td><a href="http://www.mrcindia.org/chennai.htm">www.mrcindia.org/chennai.htm</a></td>
</tr>
<tr>
<td>20</td>
<td>Vector Control Research Centre, Puducherry</td>
<td><a href="http://vcrc.res.in">http://vcrc.res.in</a></td>
<td>Dr. S.L. Hoti</td>
<td><a href="http://vcrc.res.in/hoti.html">http://vcrc.res.in/hoti.html</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. K.P. Paily</td>
<td><a href="http://vcrc.res.in/paily.html">http://vcrc.res.in/paily.html</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. M. Kalyanasundaram</td>
<td><a href="http://vcrc.res.in/mk.html">http://vcrc.res.in/mk.html</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Nisha Mathew</td>
<td><a href="http://vcrc.res.in/nisha.html">http://vcrc.res.in/nisha.html</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. K. Gunasekaran</td>
<td><a href="http://vcrc.res.in/kg.html">http://vcrc.res.in/kg.html</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. N. Pradeep Kumar</td>
<td><a href="http://vcrc.res.in/npk.html">http://vcrc.res.in/npk.html</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. G. Rajendran</td>
<td><a href="http://vcrc.res.in/rajen.html">http://vcrc.res.in/rajen.html</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Sudhansu Sekhar Sahu</td>
<td><a href="http://vcrc.res.in/sahu.html">http://vcrc.res.in/sahu.html</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. L.K. Das</td>
<td><a href="http://vcrc.res.in/lalit.html">http://vcrc.res.in/lalit.html</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. R. Lourduraj John De Britto</td>
<td><a href="http://vcrc.res.in/britto.html">http://vcrc.res.in/britto.html</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. K. Krishnamoorthy</td>
<td><a href="http://vcrc.res.in/kk.html">http://vcrc.res.in/kk.html</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. D. Amalraj</td>
<td><a href="http://vcrc.res.in/amalraj.html">http://vcrc.res.in/amalraj.html</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Kapa Dasaradha Ramiah</td>
<td><a href="http://vcrc.res.in/ramai.html">http://vcrc.res.in/ramai.html</a></td>
</tr>
<tr>
<td>Serial No.</td>
<td>Name of Institution/ University/ School/ Division/ Department</td>
<td>Web-link</td>
<td>Name of Scientist / Clinical Investigator / Doctor</td>
<td>Web-link</td>
</tr>
<tr>
<td>-----------</td>
<td>---------------------------------------------------------------</td>
<td>----------</td>
<td>-------------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>1</td>
<td>National Chemical Laboratory, Pune</td>
<td><a href="http://www.ncl-pune.org">www.ncl-pune.org</a></td>
<td>Dr. Dhiman Sarkar</td>
<td><a href="http://www.ncl-india.org/ResearchGroups/showframe.jsp?personid=30">www.ncl-india.org/ResearchGroups/showframe.jsp?personid=30</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Mala Rao</td>
<td><a href="http://www.ncl-india.org/ResearchGroups/showframe.jsp?personid=35">www.ncl-india.org/ResearchGroups/showframe.jsp?personid=35</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Shubhada Ratnakar Thengane</td>
<td><a href="http://www.ncl-india.org/ResearchGroups/showframe.jsp?personid=152">www.ncl-india.org/ResearchGroups/showframe.jsp?personid=152</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Pankaj Poddar IS</td>
<td><a href="http://www.ncl-india.org/ResearchGroups/showframe.jsp?personid=188">www.ncl-india.org/ResearchGroups/showframe.jsp?personid=188</a></td>
</tr>
<tr>
<td>2</td>
<td>National Centre for Cell Sciences, Pune</td>
<td><a href="http://www.nccs.res.in">www.nccs.res.in</a></td>
<td>Dr. Gyan C. Mishra (Director)</td>
<td><a href="http://www.nccs.res.in/gcm1.html">www.nccs.res.in/gcm1.html</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Yogesh S. Shouche</td>
<td><a href="http://www.nccs.res.in/yss.html">www.nccs.res.in/yss.html</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Debasish Mitra</td>
<td><a href="http://www.nccs.res.in/mitra1.html">www.nccs.res.in/mitra1.html</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Bhaskar Saha</td>
<td><a href="http://www.nccs.res.in/saha1.html">www.nccs.res.in/saha1.html</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Samit Chattopadhyay</td>
<td><a href="http://www.nccs.res.in/Chattopadhyay2.html">www.nccs.res.in/Chattopadhyay2.html</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. M.S. Patole</td>
<td><a href="http://www.nccs.res.in/msp1.html">www.nccs.res.in/msp1.html</a></td>
</tr>
<tr>
<td>3</td>
<td>National AIDS Research Institute, Pune</td>
<td><a href="http://www.nari-icmr.res.in/index.php">www.nari-icmr.res.in/index.php</a></td>
<td>Dr. R.S. Paranjape (Director)</td>
<td><a href="http://www.nari-icmr.res.in/view_profile.php?profile=1">www.nari-icmr.res.in/view_profile.php?profile=1</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Sanjay Mehendale</td>
<td><a href="http://www.nari-icmr.res.in/view_profile.php?profile=2">www.nari-icmr.res.in/view_profile.php?profile=2</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Arun Risbud</td>
<td><a href="http://www.nari-icmr.res.in/view_profile.php?profile=3">www.nari-icmr.res.in/view_profile.php?profile=3</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Nita Mawar</td>
<td><a href="http://www.nari-icmr.res.in/view_profile.php?profile=4">www.nari-icmr.res.in/view_profile.php?profile=4</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Srikanth Tripathy</td>
<td><a href="http://www.nari-icmr.res.in/view_profile.php?profile=5">www.nari-icmr.res.in/view_profile.php?profile=5</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr. Raman Gangakhedkar</td>
<td><a href="http://www.nari-icmr.res.in/view_profile.php?profile=6">www.nari-icmr.res.in/view_profile.php?profile=6</a></td>
</tr>
<tr>
<td>Dr. Seema Sahay</td>
<td><a href="http://www.nari.icmr.res.in/view_profile.php?profile=7">www.nari.icmr.res.in/view_profile.php?profile=7</a></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. Smita Kulkarni</td>
<td><a href="http://www.nari.icmr.res.in/view_profile.php?profile=8">www.nari.icmr.res.in/view_profile.php?profile=8</a></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. Manisha Ghat</td>
<td><a href="http://www.nari.icmr.res.in/view_profile.php?profile=9">www.nari.icmr.res.in/view_profile.php?profile=9</a></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. Jayanta Bhattacharya</td>
<td><a href="http://www.nari.icmr.res.in/view_profile.php?profile=13">www.nari.icmr.res.in/view_profile.php?profile=13</a></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. Madhuri Thakar</td>
<td><a href="http://www.nari.icmr.res.in/view_profile.php?profile=10">www.nari.icmr.res.in/view_profile.php?profile=10</a></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. Sheela Godbole</td>
<td><a href="http://www.nari.icmr.res.in/view_profile.php?profile=12">www.nari.icmr.res.in/view_profile.php?profile=12</a></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. Vijay Nema</td>
<td><a href="http://www.nari.icmr.res.in/view_profile.php?profile=16">www.nari.icmr.res.in/view_profile.php?profile=16</a></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. Ashwini Shete</td>
<td><a href="http://www.nari.icmr.res.in/view_profile.php?profile=14">www.nari.icmr.res.in/view_profile.php?profile=14</a></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. Arti Mane</td>
<td><a href="http://www.nari.icmr.res.in/view_profile.php?profile=15">www.nari.icmr.res.in/view_profile.php?profile=15</a></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. Sampada Dhayarkar</td>
<td><a href="http://www.nari.icmr.res.in/view_profile.php?profile=17">www.nari.icmr.res.in/view_profile.php?profile=17</a></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dr. A.C. Mishra (Director)</th>
<th><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00011204">http://icmr.nic.in/icmrsql/biodata.asp?expno=00011204</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Cecilia Dayaraj</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00011227">http://icmr.nic.in/icmrsql/biodata.asp?expno=00011227</a></td>
</tr>
<tr>
<td>Dr. M. M. Gore</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00011210">http://icmr.nic.in/icmrsql/biodata.asp?expno=00011210</a></td>
</tr>
<tr>
<td>Mr. G. N. Sapkal</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00011697">http://icmr.nic.in/icmrsql/biodata.asp?expno=00011697</a></td>
</tr>
<tr>
<td>Dr. S.D. Chitambar</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00015136">http://icmr.nic.in/icmrsql/biodata.asp?expno=00015136</a></td>
</tr>
<tr>
<td>Dr. V. Gopal Krishna</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00011649">http://icmr.nic.in/icmrsql/biodata.asp?expno=00011649</a></td>
</tr>
<tr>
<td>Dr. R.P. Deolankar</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00011212">http://icmr.nic.in/icmrsql/biodata.asp?expno=00011212</a></td>
</tr>
<tr>
<td>Dr. Atanu Basu</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00015580">http://icmr.nic.in/icmrsql/biodata.asp?expno=00015580</a></td>
</tr>
<tr>
<td>Mr. P. George Jacob</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00011224">http://icmr.nic.in/icmrsql/biodata.asp?expno=00011224</a></td>
</tr>
<tr>
<td>Dr. C.G. Raut</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00011219">http://icmr.nic.in/icmrsql/biodata.asp?expno=00011219</a></td>
</tr>
<tr>
<td>Mr. Prasanna N. Yergolkar</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00011623">http://icmr.nic.in/icmrsql/biodata.asp?expno=00011623</a></td>
</tr>
<tr>
<td>Dr. S.N. Ranadive</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00011215">http://icmr.nic.in/icmrsql/biodata.asp?expno=00011215</a></td>
</tr>
<tr>
<td>Dr. Pragya D. Yadav</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00011699">http://icmr.nic.in/icmrsql/biodata.asp?expno=00011699</a></td>
</tr>
<tr>
<td>Dr. Rashmi Singh</td>
<td><a href="http://www.niv.co.in/departments/MicroArray/Rashmi_Singh.htm">www.niv.co.in/departments/MicroArray/Rashmi_Singh.htm</a></td>
</tr>
<tr>
<td>Dr. Paresh S. Shah</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00011608">http://icmr.nic.in/icmrsql/biodata.asp?expno=00011608</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dr. D.T. Mourya</th>
<th><a href="http://www.icmr.nic.in/icmrsql/biodata.asp?expno=00011209">www.icmr.nic.in/icmrsql/biodata.asp?expno=00011209</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Vijay P. Bondre</td>
<td><a href="http://www.icmr.nic.in/icmrsql/biodata.asp?expno=00011460">www.icmr.nic.in/icmrsql/biodata.asp?expno=00011460</a></td>
</tr>
<tr>
<td>Dr. Anuradha</td>
<td><a href="http://www.icmr.nic.in/icmrsql/bio">http://www.icmr.nic.in/icmrsql/bio</a></td>
</tr>
<tr>
<td>6</td>
<td>Indian Institute of Science Education and Research, Pune</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td><a href="http://www.iiserpune.ac.in">www.iiserpune.ac.in</a></td>
</tr>
<tr>
<td></td>
<td>Dr. Saikrishnan Kayarat</td>
</tr>
<tr>
<td></td>
<td>Dr. Sanjeev Galande</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7</th>
<th>University of Pune, Pune</th>
<th>Tripathy</th>
<th>data.asp?expno=00011795</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><a href="http://www.unipune.ac.in">www.unipune.ac.in</a></td>
<td>Prof. J.K. Pal (HOD)</td>
<td><a href="http://www.unipune.ac.in/dept/science/biotechnology/biotechnology_webfiles/pdfs/web%202010_JKPal.pdf">www.unipune.ac.in/dept/science/biotechnology/biotechnology_webfiles/pdfs/web%202010_JKPal.pdf</a></td>
</tr>
<tr>
<td></td>
<td><a href="http://www.unipune.ac.in/dept/science/biotechnology/default.htm">www.unipune.ac.in/dept/science/biotechnology/default.htm</a></td>
<td>Prof. Ashok S. Kolaskar</td>
<td><a href="http://www.unipune.ac.in/dept/science/biotechnology/biotechnology_webfiles/research_lab.htm">http://www.unipune.ac.in/dept/science/biotechnology/biotechnology_webfiles/research_lab.htm</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>8</th>
<th>King Edward Memorial Hospital and Seth Gordhandas Medical College, Mumbai</th>
<th>Tripathy</th>
<th>data.asp?expno=00011795</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><a href="http://www.kem.edu">www.kem.edu</a></td>
<td>Prof. Preeti R Mehta (HOD), Dept. of Microbiology</td>
<td><a href="http://www.kem.edu/dept/microbiology/faculty.htm">www.kem.edu/dept/microbiology/faculty.htm</a></td>
</tr>
<tr>
<td></td>
<td><a href="http://www.kem.edu/dept/science/biotechnology/default.htm">www.kem.edu/dept/science/biotechnology/default.htm</a></td>
<td>Prof. S.V. Parulekar (HOD), Dept. of Obstetrics and Gynecology</td>
<td><a href="http://www.kem.edu/dept/obstetrics/faculty.htm">www.kem.edu/dept/obstetrics/faculty.htm</a></td>
</tr>
<tr>
<td></td>
<td><a href="http://www.kem.edu/dept/biochemistry/default.htm">www.kem.edu/dept/biochemistry/default.htm</a></td>
<td>Prof. (Mrs) S.P. Dandekar (HOD), Dept. of Biochemistry</td>
<td><a href="http://www.kem.edu/dept/biochemistry/_staff.htm">www.kem.edu/dept/biochemistry/_staff.htm</a></td>
</tr>
<tr>
<td></td>
<td><a href="http://www.kem.edu/dept/science/biotechnology/default.htm">www.kem.edu/dept/science/biotechnology/default.htm</a></td>
<td>Prof. Anil V. Pathare (HOD), Dept. of Hematology</td>
<td><a href="http://www.kem.edu/dept/hematology/faculty.htm">www.kem.edu/dept/hematology/faculty.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Sanjay Juvekar</td>
<td><a href="http://www.kemhospitalvadu.org/staffs.asp">www.kemhospitalvadu.org/staffs.asp</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Senior Research Scientist, Vadu Rural Health Program, KEM Hospital, Pune</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>9</th>
<th>National Institute of Immunohaematology, Mumbai</th>
<th>Tripathy</th>
<th>data.asp?expno=00011795</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><a href="http://www.nih.org.in">www.nih.org.in</a></td>
<td>Dr. Kanjaksha Ghosh (Director)</td>
<td><a href="http://www.nih.org.in/departments/hematology_thrombosis/ghosh_k.htm">www.nih.org.in/departments/hematology_thrombosis/ghosh_k.htm</a></td>
</tr>
<tr>
<td></td>
<td><a href="http://www.nih.org.in/departments/hematology_thrombosis/shetty_s.htm">www.nih.org.in/departments/hematology_thrombosis/shetty_s.htm</a></td>
<td>Dr. Shrimati D. Shetty</td>
<td><a href="http://www.nih.org.in/departments/hematology_thrombosis/shetty_s.htm">www.nih.org.in/departments/hematology_thrombosis/shetty_s.htm</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>10</th>
<th>Enterovirus Research Centre, Mumbai</th>
<th>Tripathy</th>
<th>data.asp?expno=00011795</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><a href="http://www.icmr.nic.in/pinstitute/evrc.htm">www.icmr.nic.in/pinstitute/evrc.htm</a></td>
<td>Dr. J.M. Deshpande (Director)</td>
<td><a href="http://icmr.nic.in/icmrsql/biodata.asp?expno=00015222">http://icmr.nic.in/icmrsql/biodata.asp?expno=00015222</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>11</th>
<th>Advanced Centre for Treatment, Research</th>
<th>Tripathy</th>
<th>data.asp?expno=00011795</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><a href="http://www.actrec.gov.in">www.actrec.gov.in</a></td>
<td>Dr. Robin Mukhopadhyaya</td>
<td><a href="http://www.actrec.gov.in/pi-webpages/Robin/index-robin.htm">www.actrec.gov.in/pi-webpages/Robin/index-robin.htm</a></td>
</tr>
<tr>
<td>Page</td>
<td>Organization</td>
<td>Website</td>
<td>Professors</td>
</tr>
<tr>
<td>------</td>
<td>--------------</td>
<td>---------</td>
<td>------------</td>
</tr>
<tr>
<td>13</td>
<td>Indian Institute of Technology Bombay, Mumbai</td>
<td><a href="http://www.iitb.ac.in">www.iitb.ac.in</a></td>
<td>Prof. Rinti Banerjee, Dr. Swati Patankar</td>
</tr>
<tr>
<td>14</td>
<td>Mahatma Gandhi Institute of Medical Sciences, Wardha</td>
<td><a href="http://www.mgims.ac.in">www.mgims.ac.in</a></td>
<td>Dr. (Mrs) P. Chaturvedi</td>
</tr>
<tr>
<td></td>
<td>Department of Pediatrics</td>
<td><a href="http://www.mgims.ac.in/index.php?option=com_content&amp;view=article&amp;id=63">www.mgims.ac.in/index.php?option=com_content&amp;view=article&amp;id=63</a> &amp;Itemid=69</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Jamnalal Bajaj Tropical Disease Research Centre, Mahatma Gandhi Institute of Medical Sciences, Wardha</td>
<td><a href="http://www.jbtdrc.org">www.jbtdrc.org</a></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>National Centre for Biological Sciences, Bangalore</td>
<td>Dr. Satyajit Mayor</td>
<td><a href="http://www.ncbs.res.in/index.php?option=com_content&amp;task=view&amp;id=87&amp;Itemid=96">www.ncbs.res.in/index.php?option=com_content&amp;task=view&amp;id=87&amp;Itemid=96</a></td>
</tr>
<tr>
<td>18</td>
<td>Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore</td>
<td>Prof. Hemalatha Balaram</td>
<td><a href="http://www.jncasr.ac.in/hb/index.php?menu_id=16&amp;user_id=19&amp;page_id=190">www.jncasr.ac.in/hb/index.php?menu_id=16&amp;user_id=19&amp;page_id=190</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prof. Namita Surolia</td>
<td><a href="http://www.jncasr.ac.in/surolia">www.jncasr.ac.in/surolia</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prof. Tapas K. Kundu</td>
<td><a href="http://www.jncasr.ac.in/tapas">www.jncasr.ac.in/tapas</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prof. Udaykumar Ranga</td>
<td><a href="http://www.jncasr.ac.in/udaykumar/index.php?menu_id=1&amp;user_id=19&amp;page_id=175">www.jncasr.ac.in/udaykumar/index.php?menu_id=1&amp;user_id=19&amp;page_id=175</a></td>
</tr>
<tr>
<td>19</td>
<td>National Institute of Mental Health and Neuro Sciences, Bangalore</td>
<td>Prof. Jayashree Ramakrishna (HOD)</td>
<td><a href="http://www.nimhans.kar.nic.in/mentalhealthedu/faculty.htm">www.nimhans.kar.nic.in/mentalhealthedu/faculty.htm</a></td>
</tr>
<tr>
<td></td>
<td>Department of Mental Health Education</td>
<td>Prof. P. Satishchandra (Director-Vice-Chancellor)</td>
<td><a href="http://www.nimhans.kar.nic.in/neurology/faculty.htm">www.nimhans.kar.nic.in/neurology/faculty.htm</a></td>
</tr>
<tr>
<td></td>
<td>Department of Neurology</td>
<td>Dr. A. Nalini</td>
<td><a href="http://www.nimhans.kar.nic.in/neurology/faculty.htm">www.nimhans.kar.nic.in/neurology/faculty.htm</a></td>
</tr>
<tr>
<td></td>
<td>Department of Neuroimmunology</td>
<td>Prof. R. Ravikumar</td>
<td><a href="http://www.nimhans.kar.nic.in/neuromicrobiology/faculty.htm">www.nimhans.kar.nic.in/neuromicrobiology/faculty.htm</a></td>
</tr>
<tr>
<td>Neuromicrobiology</td>
<td>ault.htm</td>
<td>(HOD)</td>
<td><a href="http://www.nimhans.kar.nic.in/neuromicrobiology/faculty.htm">www.nimhans.kar.nic.in/neuromicrobiology/faculty.htm</a></td>
</tr>
<tr>
<td>-------------------</td>
<td>----------</td>
<td>-------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>Dr. Shripad A. Patil</td>
<td><a href="http://www.nimhans.kar.nic.in/neuromicrobiology/faculty.htm">www.nimhans.kar.nic.in/neuromicrobiology/faculty.htm</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. S. Nagarathna</td>
<td><a href="http://www.nimhans.kar.nic.in/neuromicrobiology/faculty.htm">www.nimhans.kar.nic.in/neuromicrobiology/faculty.htm</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Neupathology</td>
<td><a href="http://www.nimhans.kar.nic.in/neuropathology/default.htm">www.nimhans.kar.nic.in/neuropathology/default.htm</a></td>
<td>Prof. S.K. Shankar (HOD)</td>
<td><a href="http://www.nimhans.kar.nic.in/neuropathology/faculty.htm">www.nimhans.kar.nic.in/neuropathology/faculty.htm</a></td>
</tr>
<tr>
<td>Dr. Anita Mahadevan</td>
<td><a href="http://www.nimhans.kar.nic.in/neuropathology/faculty.htm">www.nimhans.kar.nic.in/neuropathology/faculty.htm</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Psychiatry</td>
<td><a href="http://www.nimhans.kar.nic.in/psychiatry/default.htm">www.nimhans.kar.nic.in/psychiatry/default.htm</a></td>
<td>Prof. Prabha S. Chandra</td>
<td><a href="http://www.nimhans.kar.nic.in/psychiatry/faculty.htm">www.nimhans.kar.nic.in/psychiatry/faculty.htm</a></td>
</tr>
<tr>
<td>Dr. A. Thirumooorthy</td>
<td><a href="http://www.nimhans.kar.nic.in/psychiatry/faculty.htm">www.nimhans.kar.nic.in/psychiatry/faculty.htm</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Psychiatric Social Work</td>
<td><a href="http://www.nimhans.kar.nic.in/psw/default.htm">www.nimhans.kar.nic.in/psw/default.htm</a></td>
<td>Dr. Ramachandra</td>
<td><a href="http://www.nimhans.kar.nic.in/psw/faculty.htm">www.nimhans.kar.nic.in/psw/faculty.htm</a></td>
</tr>
<tr>
<td>Department of Neurology</td>
<td><a href="http://www.nimhans.kar.nic.in/neurology/default.htm">www.nimhans.kar.nic.in/neurology/default.htm</a></td>
<td>Prof. V. Ravi (HOD)</td>
<td><a href="http://www.nimhans.kar.nic.in/neurology/faculty.htm">www.nimhans.kar.nic.in/neurology/faculty.htm</a></td>
</tr>
<tr>
<td>Dr. Anita S. Desai</td>
<td><a href="http://www.nimhans.kar.nic.in/neurology/faculty.htm">www.nimhans.kar.nic.in/neurology/faculty.htm</a></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| 20 | National Tuberculosis Institute, Bangalore | http://nti.india.kar.nic.in/ | Dr. Prahlad Kumar (Director) | http://nti.india.kar.nic.in/aboutus.htm |

| 21 | St. Johns Research Institute, Bangalore | www.sjri.res.in | | |
| Infectious Disease Unit & Molecular Diagnostics | www.sjri.res.in/html/RESEARCH-infectious.htm | Dr. John Kenneth Philip J (Head) | www.sjri.res.in/per-pages/per-john.htm |
| Infectious Disease Unit | NA | Prof. Reynold Gracio Washington | www.sjri.res.in/per-pages/per-reynold.htm |
| Infectious Disease Unit & Department of Pediatrics | NA | Dr. Anita Shet | www.sjri.res.in/per-pages/per-anitashet.htm |
| Epidemiology and Statistics Unit | NA | Dr. Prem Mony | www.sjri.res.in/per-pages/per-premmony.htm |
| Epidemiology Unit | NA | Dr. Divya Rajaraman | www.sjri.res.in/per-pages/per-divya_r.html |

| 22 | Dorabji Tata Centre for Research in Tropical Diseases, Bangalore | www.tataentropdis.org | Lt.Gen. D. Raghunath (Retd.) (Principal Executive) | www.tataentropdis.org/AboutUsFrame.htm |

| 23 | National Institute of Malaria Research, Bangalore Field Station | www.mrcindia.org/bangalore.htm | Dr. S.K. Ghosh (Officer-in-Charge) | www.mrcindia.org/scientist.htm#Ghosh,%20SK |

| 24 | Rajiv Gandhi Centre for Biotechnology, Thiruvananthapuram | www.rgcb.res.in | | |
| Dr. R. Ajay Kumar | http://rgcb.res.in/departments/mycobacteria_research_group/r-ajay-kumar/profile.html |
|----------------------------------|---------------------------------------------------------------|--------------------|-------------------------------------------------------------------------------------|
| Dr. Sabu Thomas                  | http://rgcb.res.in/departments/cholera_environmental_biology/sabu-thomas/profile.html |
| Sree Chitra Tirunal Institute for Medical Sciences & Technology, Thiruvananthapuram | www.scctimst.ac.in | Prof. T.K. Sundari Ravindran | www.scctimst.ac.in/amchss/faculty/sundaricv.htm |
| The Achutha Menon Centre for Health Science Studies | www.scctimst.ac.in/amchss/index.htm | Prof. V. Ramankutty | www.scctimst.ac.in/amchss/faculty/CV%20RKUTTY.pdf |
| Prof. K.R. Thankappan            | www.scctimst.ac.in/amchss/faculty/thankappancv.htm |
| Dr. P. Sankara Sarma             | www.scctimst.ac.in/amchss/faculty/sankarasarmacv.htm |