FINAL REPORT

WHO PROJECT

Mapping of National Tropical-Disease Centers / Institutions in Thailand

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# ABBREVIATIONS AND ACRONYMS

**A**
ADB - Asian Development Bank  
AFRIMS - Armed Forces Research Institute of Medical Sciences  
AIDS – Acquired Immune Deficiency Syndrome  
AIDSVAX™ – AIDS Vaccine  
AKCC - AFRIMS-Kwai River Christian Hospital Clinical Center  
ALVAC™ – Weakened Canarypox Virus Vaccine  
ANSORP - Asian Network for Surveillance of Resistant Pathogens  
APEC EINet - Asia-Pacific Economic Cooperation Emerging Infections Network  
ARSN - Asian Rotavirus Surveillance Network  
ASEAN - Association of Southeast Asian Nations

**B**
BIDI - Bamrasnaradura Infectious Diseases Institute  
BIOTEC - National Center for Genetic Engineering and Biotechnology  
Bruc – Brucellosis  
BPHO - Buriram Provincial Health Office  
BUU – Burapha University

**C**
CDC - Center for Disease Control  
CDI – Chest Disease Institute  
CDPRG - Communicable Diseases Policy Research Group  
CHIK - Chikungunya Disease  
CHIKV - Chikungunya Virus  
Chula - Chulalongkorn University  
CIDA - Canadian International Development Agency  
CMU - Chiang Mai University  
CRH - Chonburi Regional Hospital  
CRI - Chulabhorn Research Institute  
CRRH - Chiang Rai Regional Hospital  
CRS - Cooperative Research Station  
CT - Computerized Tomography

**D**
DDC - Department of Disease Control  
Den – Dengue  
DHF - Dengue Hemorrhagic Fever  
Diarr - Diarrheal Disease  
DNA - Deoxyribonucleic Acid

**E**
ELISA - Enzyme-linked Immunosorbent Assay  
ELISPOT - Enzyme-Linked Immunosorbent Spot  
EMS – Emergency Medical Services  
ETEC - Enterotoxigenic E. coli

**G**
GC-MS - Gas Chromatography Mass Spectrometry  
GEIS - Global Emerging Infections Surveillance and Response System
GIS - Geographic Information Systems
GMO - Genetically Modified Organism
GSK - GlaxoSmithKline

H
H5N1 - Avian Influenza A
HCU - Huachiew Chalermprakiet University
Helm - Helminthiasis
HIV - Human Immunodeficiency Virus
HIV-NAT - The HIV Netherlands, Australia, and Thailand Research Collaboration
HPLC - High Performance Liquid Chromatography

I
IMPAACT - International Maternal Pediatric Adolescent AIDS Clinical Trials Group
InSTEDD - Innovative Support to Emergencies Diseases and Disasters

J
JE - Japanese Encephalitis
JEV - Japanese Encephalitis Virus

K
KAVRU - Kamphaeng Phet-AFRIMS Virology Research Unit
KKU - Khon Kaen University
KMH - Khumuang Hospital
KMU - King Mongkut's University of Technology, Thonburi
KPPH - Kamphaeng Phet Provincial Hospital
KPPHO - Kamphaeng Phet Provincial Health Office
KRCH - Kwai River Christian Hospital

L
LC-MS - Liquid Chromatography Mass Spectrometry
Lepto - Leptospirosis
LFCRC - Liver Fluke and Cholangiocarcinoma Research Center
LH - Loei Hospital
LRU - Loei Rajabhat University

M
Mal - Malaria
MBDS - Mekong Basin Disease Surveillance Network
Meli - Melioidosis
MIDRP - Military Infectious Diseases Research Program
MJU - Maejo University
MOPH - Ministry of Public Health
MORU - Mahidol-Oxford Research Unit
MoU - Memorandum of Understanding
MSGH - Mae Sot General Hospital
MSU - Mahasarakham University
MU - Mahidol University
MU-OUCRC Mahidol University-Osaka University Collaborative Research Center
MUT - Mahanakorn University of Technology
MVRC - Mahidol Vivax Research Center
N
NARST - National Antimicrobial Resistant Surveillance System of Thailand
NCRT – National Commission for Research of Thailand
NEREC - Northeastern Regional Epidemiology Center
NGO - Non Government Organization
NHSO - National Health Security Office
NIAD - National Institute of Allergy and Infectious Diseases
NIH - National Institute of Health (US or Thailand)
NICHD - Eunice Kennedy Shriver National Institute of Child Health and Human Development
NKPHO - Nong Khai Provincial Health Office
NRH - Narathiwatratchanakharin Hospital
NRRU - Nakhon Ratchasima Rajabhat University
NSTDA - National Science and Technology Development Agency
NU – Naresuan University

O
OHEC - Office of Higher Education Commission

P
PCM - Phramongkutklao College of Medicine
PCR – Polymerase Chain Reaction
PFGE - Pulsed field gel electrophoresis
PMK - Phramongkutklao Hospital
PfDHFRTS - Dihydrofolate Reductase-Thymidylate Synthase of Plasmodium falciparum

Q
QSMI - Queen Saovabha Memorial Institute
QSNICH - Queen Sirikit National Institute of Child Health

R
Rab – Rabies
RAND - Research and Development
RDI - Research and Development Institute
RMSU – Rajabhat Maha Sarakham University
RTIC - Rajanagarindra Tropical Disease International Centre
RT-PCR - Reverse Transcription Polymerase Chain Reaction
RTU - Ratchathani University
RU - Ramkhamhaeng University
RMUTTO – Rajamangala University of Technology Tawan-ok

S
SCRU - Supramolecular Chemistry Research Unit
ScTyph - Scrub Typhus
SEAMEO - Southeast Asian Ministers of Education
SEARO - Southeast Asia Regional Office (WHO)
SEM - Scanning Electron Microscopy
SiCRC - Siriraj Clinical Research Center
SMRU - Shoklo Malaria Research Unit
SPH - Sappasithiprasong Hospital
SPLO - Satun Provincial Livestock Office
STRU – Suratthani Rajabhat University
SU - Silpakorn University
SUT - Suranaree University of Technology
SWU - Srinakharinwirot University

T
T-2 - Thailand-Tropical Diseases Research Programme
TB - Tuberculosis
TEM - Transmission Electron Microscopy
TDRC - Tropical Disease Research Centre
Toxo - Toxoplasmosis
TRCARC - Thai Red Cross AIDS Research Centre
TRF - Thai Research Fund
TU - Thammasat University

U
URPH - Ubon Ratchathani Province Hospital
URRU - Ubon Ratchathani Rajabhat University
URU - Ubon Ratchathani University
USAID - United States Agency for International Development
UTRU - Udon Thani Rajabhat University

W
WHO - World Health Organization
WPRO - Western Pacific Regional Office (WHO)
WRAIR - Walter Reed Army Institute of Research
WRBRI - Walai Rukhavej Botanical Research Institute
WU - Walailak University
Introduction
Executive Summary

The field of “tropical medicine” is not clearly defined, so the first goal of this project was to define the parameters as to what does and what does not constitute tropical medicine research, based on what diseases/specialties are most relevant to Thailand. Thirteen (13) communicable diseases were chosen because of their significance in shaping Thai public-health policy. Some of these diseases are not limited to “The Tropics,” such as HIV and tuberculosis, but their inclusion is necessary because of the large impact these diseases have on the Thai population and the region. Our list is not identical to that of previous WHO Mapping Reports; diseases such as melioidosis, leptospirosis, scrub typhus, and toxoplasmosis are included because of their prevalence in Thailand and because of the special expertise Thai medico-scientific and social scientists possess in these diseases.

Thailand has a proven track record in the advance of modern tropical medicine research, education and services. It is a world leader in malaria research and treatment, for example. The WH has designated the Faculty of Tropical Medicine, Mahidol University, as a WHO Collaborating Center for malaria control. The US NIH has designated Thailand one of the key areas for dengue research. Successful Thai public policies have provided models for other countries for managing the HIV/AIDS pandemic.

This report summarizes the key personnel and centers of expertise for the tropical diseases in Thailand. They were chosen on the basis of their strengths and publication output, their scientific expertise and infrastructure; their funding (government, non-government, and international agencies), having national impact. The first chapter contains a comparative summary of all findings.

Institutes were identified within each of the four geographical zones (central, northern, northeastern, and southern) through publication and funding agency databases. Institute websites were consulted to confirm their work in the areas of tropical diseases. Investigators with access to significant funding and high publication outputs have been named and listed for each institute, where this information was available.

One of the most notable findings of this report is the fact that 75% of all Thailand’s publication output in tropical medicine is produced by only 5 institutions: Mahidol University, Chulalongkorn University, the Ministry of Public Health, Chiang Mai University, and the US Armed Forces Research Insitute of Medical Sciences (AFRIMS). Many of the other institutes within this report fall into one of the two categories: (A) a small/newer institute lacking the necessary resources and infrastructure to conduct extensive research, or (B) an institute more focused on technology, basic science, or chronic diseases. Many of the researchers from peripheral institutes transfer to one of those five key institutes once they have established a reputation in tropical medicine, further developing, broadening, and consolidating their strengths in tropical medicine.

Another obstacle deterring the advance of tropical medicine is the language barrier. Many of the peripheral institutes lack the capacity to produce English manuscripts and grant applications efficiently, putting them at a disadvantage.
This report maps the strengths and capabilities of various Thai institutes, and highlights some gaps and gray areas that may be considered for further development and support.

**Team Members**

The project entitled “Mapping of National Tropical-Disease Centres / Institutions in Thailand”, commissioned by WHO/SEARO, has been prepared by the Office of Research Services and the Office of International Cooperation, Faculty of Tropical Medicine, Mahidol University. The team members were:

1. Assoc. Prof. Pratap Singhasivanon, Project Leader and Dean, Faculty of Tropical Medicine, Mahidol University
2. Ms. Pornpimon Adams; Head, Office of Research Services
3. Mr. Paul R. Adams; Research Administrator, Office of Research Services
4. Mr. Tim Jackson, Assistant Research Administrator, Office of Research Services
5. Mr. Sethavudh Kaewviset, Head, Office of International Cooperation

**Diseases covered**

The following diseases were selected, based on their key significance to Thailand. They include both heavily-studied diseases and neglected tropical diseases (NTDs):

1. Malaria
2. Dengue
3. Helminthiases
4. Rabies
5. HIV / AIDS
6. Leptospirosis
7. Tuberculosis
8. Japanese encephalitis
9. Melioidosis
10. Toxoplasmosis
11. Chikungunya disease
12. Diarrheal diseases
13. Scrub typhus

**Project outline**

The project “Mapping of National Tropical-Disease Centres / Institutions in Thailand” involved thorough mapping of all national centres, as well as institutions, including medical, technological, research organizations, and universities, relevant to the project. The criteria for identifying the centres and institutions included their strengths, evidenced by their contributions to tropical medicine (especially research, education and training, and health services). The major aims and objectives of the project were to assess the profiles, strengths and comparative
advantages of the institutes and establish how each contributed to the control and elimination of tropical diseases in Thailand and the region.

Mapping strategies

Thailand is commonly divided into 4 geographically distinct regions, the Norther, Northeastern, Central, and Southern Regions:

Table 1: Provinces by Region

<table>
<thead>
<tr>
<th>Central</th>
<th>Northern</th>
<th>Northeastern</th>
<th>Southern</th>
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<tr>
<td>Angthong</td>
<td>Chiang Mai</td>
<td>Amnat Chaoen</td>
<td>Chumphon</td>
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<td>Ayutthaya</td>
<td>Chiang Rai</td>
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<td>Bangkok</td>
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<td>Chainat</td>
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<td>Chanthaburi</td>
<td>Mae Hong Son</td>
<td>Khon Kaen</td>
<td>Phitsanulok</td>
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<td>Chonburi</td>
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<td>Phrae</td>
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<td>Kanchanaburi</td>
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<td>Maha Sarakham</td>
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<td>Nakhon Pathom</td>
<td>Phichit</td>
<td>Nakhon Ratchasima</td>
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<td>Nonthaburi</td>
<td>Phitsanulok</td>
<td>Nong Bua Lamphu</td>
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<td>Pathum Thani</td>
<td>Prachinburi</td>
<td>Nong Kai</td>
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Areas addressed

Information about each institution, including its (i) profile and strengths, (ii) funding, and (iii) outputs, were collected to produce as balanced a report as possible on all institutions conducting tropical medicine research in Thailand. Some of this information, particularly funding information, was not readily available.

The profiles and strengths provide essential information about each institute, including the date of establishment, contact information, infrastructure, summary of basic research and contribution to tropical medicine, product development, and specific prominent researchers.

Another essential area addressed was funding obtained by scientists in the area of tropical diseases. Here, funding obtained from National and International agencies, as well as from NGOs was covered, as far as the accessible information permitted.

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 (an index based on the distribution of citations received by a given institute’s publications, which results in a publication “impact factor”), while patents were weighed on the basis of national and international scope of the patents filed and granted.

Finally, all institutes were compared analytically, to highlight the institutes making the major contributions to the tropical diseases and tropical medicine in Thailand. The various areas addressed, and the basis on which the chapters of the Final Report have been drafted, are summarized below.

1. Comparative Summary
   - Comparison of regions and individual tropical medicine institutes
2. Profile and Strengths
   - Name of Institution / University
   - Established
   - Province
   - Address and Contact Information
   - Vision and Mission
   - Contribution to Tropical Diseases
   - Disease(s) studies
   - Expertise – Scientists
   - Infrastructure – Facilities, Services
   - Basic Research
3. Funding
   - Grants – National, International, NGOs
4. Outputs
   - Publications & Patents
Methodology

To identify the relevant institutes and collect data from them, a multi-step process was adopted. The first step was to consult publication databases (Scopus), to identify which institutes were contributing to the literature of tropical diseases and tropical medicine. To gain preliminary research on each institution, their websites were consulted. All research institutes, hospitals, universities, and other institutes were then investigated to determine their contribution to tropical medicine.

Missing information was obtained from Annual Reports and Questionnaires sent 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 on the telephone.

After scanning all four regions of Thailand, we prepared a list of 38 institutions--universities, independent hospitals, research institutes, and government offices. Most of the institutes were in the Central and Northeastern regions, with far fewer in the Northern and Southern regions. At least one major tropical medicine institute was found in each region. It should be noted that only the main headquarters for tropical medicine of each institute has been counted, although many institutes have satellite locations throughout the different regions of Thailand. The institutes and their serial numbers, which will be used throughout the rest of this Report, are below:

<table>
<thead>
<tr>
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<th>Institution Name</th>
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<td>Asian Institute of Technology (AIT)</td>
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<td>AFRIMS</td>
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<td>Burapha University (BUU)</td>
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<td>Chonburi Regional Hospital (CRH)</td>
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<td>Chulabhorn Research Institute (CRI)</td>
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<td>Mahidol University (MU)</td>
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<td>Ministry of Public Health (MOPH)</td>
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</table>
In the Central Region of Thailand, there are 21 institutes in 5 provinces. Most appear in and around Bangkok. **Fourteen (14) institutes are located in Bangkok** and **4 more in provinces bordering Bangkok**, with 1 in Nonthaburi, 1 in Samut Prakan, and 2 in Pathum Thani. There were 3 more in Chonburi.

**Institutes in the Central Region**

The Northern region of Thailand has 5 institutes in 4 provinces, which are generally less active in tropical medicine research; there are 2 institutes in Chiang Mai, 1 in Chiang Rai, 1 in Phitsanulok, and 1 in Tak.

**Institutes in the Northern Region**
The Northeastern Region has the second largest number of institutes at 9 across 5 provinces. There are 2 in Loei, 1 in Khon Kaen, 2 in Maha Sarakham, 2 in Nakhon Ratchasima and 2 in Ubon Ratchathani.

**Institutes in the Northeastern Region**

The Southern Region had the fewest institutes, with only 3 across 3 different provinces. There is 1 institute in Nakhon Sri Thammarat, 1 in Narathiwat, and 1 in Songkhla.

**Institutes in the Southern Region**
Section I.
Comparative Summary
Introduction

This comparison was conducted to assess if the institutions as a whole had all the elements required for the control and elimination of tropical diseases. In this chapter, key institutes contributing to tropical disease control and elimination are analyzed and compared, based on their strengths. Perceived gaps are addressed, with suggestions for a way forward.

Key Institutes in Tropical Medicine

For this exercise, 38 universities, institutes, governmental organizations, and a few hospitals were mapped for: a) profile and strengths of the institute, b) profile of scientists contributing to tropical diseases c) research conducted by them, d) services rendered, and e) 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 for only some of the institutes; 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. All areas of research related to tropical medicine were included, from basic science to community studies.

Of the 38 Institutes mapped, the 15 key institutes were listed, based on the number of publications, the number of scientists working in the area of tropical diseases, their strengths, training capabilities, and whether they were conducting high-quality basic science and/or clinical research.

No new institutes for tropical medicine research were identified. Most capacity-building funding is dedicated to expanding already-existing institutes. Some of the universities listed among the 37 are very young and are still developing their reputations for research, such as WU and RMUTTO. Other more establish institutes, such as MU, continue to expand by undergoing large infrastructure projects, such as the Institute of Molecular Biosciences, completed two years ago.

Table 2, on the following page, shows all 38 institutes ranked by their cumulative $h$-index, which is a measure of publication output and impact (more detail will be shown in the Output section). Table 3 shows the strengths of the 15 key institutes at a glance.
# Table 2: Institutes Ranked by Cumulative $h$-index for All 13 Key Diseases

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Serial No.</th>
<th>Institute</th>
<th>$h$-Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
<td>Mahidol University (MU)</td>
<td>64</td>
</tr>
<tr>
<td>2</td>
<td>11</td>
<td>Ministry of Public Health (MOPH)</td>
<td>38</td>
</tr>
<tr>
<td>3</td>
<td>22</td>
<td>Chiang Mai University (CMU)</td>
<td>33</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>Armed Forces Research Institute of Medical Science (AFRIMS)</td>
<td>32</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>Chulalongkorn University (Chula)</td>
<td>30</td>
</tr>
<tr>
<td>6</td>
<td>20</td>
<td>Thai Red Cross AIDS Research Centre (TRCARC)</td>
<td>22</td>
</tr>
<tr>
<td>6</td>
<td>27</td>
<td>Khon Kaen University (KKU)</td>
<td>22</td>
</tr>
<tr>
<td>8</td>
<td>12</td>
<td>National Center for Genetic Engineering and Biotechnology (BIOTEC)</td>
<td>20</td>
</tr>
<tr>
<td>9</td>
<td>5</td>
<td>Chulabhorn Research Institute (CRI)</td>
<td>19</td>
</tr>
<tr>
<td>10</td>
<td>37</td>
<td>Prince of Songkla University (PSU)</td>
<td>17</td>
</tr>
<tr>
<td>11</td>
<td>14</td>
<td>Queen Saovabha Memorial Institute (QSMI)</td>
<td>16</td>
</tr>
<tr>
<td>12</td>
<td>15</td>
<td>Queen Sirikit National Institute of Child Health (QSNICH)</td>
<td>15</td>
</tr>
<tr>
<td>12</td>
<td>21</td>
<td>Thammasat University (TU)</td>
<td>15</td>
</tr>
<tr>
<td>12</td>
<td>13</td>
<td>Phramongkutklao College of Medicine (PCM)</td>
<td>15</td>
</tr>
<tr>
<td>14</td>
<td>17</td>
<td>Ramkhamhaeng University (RU)</td>
<td>14</td>
</tr>
<tr>
<td>15</td>
<td>33</td>
<td>Sappasithiprasong Hospital (SPH)</td>
<td>12</td>
</tr>
<tr>
<td>17</td>
<td>19</td>
<td>Srinakharinwirot University (SWU)</td>
<td>11</td>
</tr>
<tr>
<td>18</td>
<td>26</td>
<td>Naresuan University (NU)</td>
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<tr>
<td>19</td>
<td>1</td>
<td>Asian Institute of Technology (AIT)</td>
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<tr>
<td>19</td>
<td>3</td>
<td>Burapha University (BUU)</td>
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</tr>
<tr>
<td>21</td>
<td>18</td>
<td>Silpakorn University (SU)</td>
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</tr>
<tr>
<td>21</td>
<td>23</td>
<td>Chiang Rai Regional Hospital (CRRH)</td>
<td>6</td>
</tr>
<tr>
<td>21</td>
<td>28</td>
<td>Loei Hospital (LH)</td>
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</tr>
<tr>
<td>21</td>
<td>38</td>
<td>Walailak University (WU)</td>
<td>6</td>
</tr>
<tr>
<td>25</td>
<td>25</td>
<td>Mae Sot General Hospital (MSGH)</td>
<td>5</td>
</tr>
<tr>
<td>26</td>
<td>4</td>
<td>Chonburi Regional Hospital (CRH)</td>
<td>4</td>
</tr>
<tr>
<td>26</td>
<td>30</td>
<td>Mahasarakham University (MSU)</td>
<td>4</td>
</tr>
<tr>
<td>26</td>
<td>35</td>
<td>Ubon Ratchathani University (URU)</td>
<td>4</td>
</tr>
<tr>
<td>29</td>
<td>24</td>
<td>Maejo University (MJU)</td>
<td>3</td>
</tr>
<tr>
<td>30</td>
<td>7</td>
<td>Huachiew Chalermprakiet University (HCU)</td>
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</tr>
<tr>
<td>30</td>
<td>9</td>
<td>Mahanakorn University of Technology (MUT)</td>
<td>2</td>
</tr>
<tr>
<td>30</td>
<td>34</td>
<td>Suranaree University of Technology (SUT)</td>
<td>2</td>
</tr>
<tr>
<td>30</td>
<td>36</td>
<td>Narathiwatratchanakharin Hospital (NRH)</td>
<td>2</td>
</tr>
<tr>
<td>34</td>
<td>8</td>
<td>King Mongkut's University of Technology, Thonburi (KMITT)</td>
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<td>34</td>
<td>16</td>
<td>Rajamangala University of Technology Tawan-ok (RMUTTO)</td>
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<td>Loei Rajabhat University (LRU)</td>
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<td>34</td>
<td>31</td>
<td>Nakhon Ratchasima Rajabhat University (NRRU)</td>
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</tr>
<tr>
<td>38</td>
<td>32</td>
<td>Rajabhat Maha Sarakham University (RMSU)</td>
<td>0</td>
</tr>
<tr>
<td>S#</td>
<td>Profile Page Number</td>
<td>Institute</td>
<td>Diseases covered</td>
</tr>
<tr>
<td>----</td>
<td>---------------------</td>
<td>-----------</td>
<td>------------------</td>
</tr>
<tr>
<td>2</td>
<td>42</td>
<td>AFRIMS</td>
<td>Mostly malaria, dengue, and HIV</td>
</tr>
<tr>
<td>5</td>
<td>48</td>
<td>Chulabhorn Research Institute (CRI)</td>
<td>Mostly malaria and melioidosis</td>
</tr>
<tr>
<td>6</td>
<td>50</td>
<td>Chulalongkorn University (Chula)</td>
<td>All 13 Key Diseases</td>
</tr>
<tr>
<td>10</td>
<td>58</td>
<td>Mahidol University (MU)</td>
<td>All 13 Key Diseases</td>
</tr>
<tr>
<td>11</td>
<td>72</td>
<td>Ministry of Public Health (MOPH)</td>
<td>All 13 Key Diseases</td>
</tr>
<tr>
<td>12</td>
<td>76</td>
<td>BIOTEC</td>
<td>Malaria, dengue, HIV and tuberculosis</td>
</tr>
<tr>
<td>13</td>
<td>79</td>
<td>Phramongkutklao College of Medicine (PCM)</td>
<td>Malaria, HIV, dengue, TB, JE, helminthiases, diarrheal diseases</td>
</tr>
<tr>
<td>Institution</td>
<td>Main Research Areas</td>
<td>Location</td>
<td>Expertise/Projects</td>
</tr>
<tr>
<td>-------------------------------------------------</td>
<td>---------------------------------------------</td>
<td>----------</td>
<td>-------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Queen Saovabha Memorial Institute (QSMI)</td>
<td>Mainly rabies, but also leptospirosis, dengue, and malaria</td>
<td>Central (Bangkok)</td>
<td>Has a great expertise in rabies; has facilities to manufacture vaccines and serums; also has a number of specialized clinics for animal bites and travel medicine</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Over half of their publications are dedicated to rabies; also have significant research on snakebites and antivenoms</td>
</tr>
<tr>
<td>Queen Sirikit National Institute of Child Health (QSNICH)</td>
<td>Mostly dengue and HIV</td>
<td>Central (Bangkok)</td>
<td>Expertise in pediatric medicine; has the <strong>WHO CC The Case Management of Dengue/DHF/DSS</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Planning a major infrastructure building project, which should increase QSNICH's capacity for research</td>
</tr>
<tr>
<td>Ramkhamhaeng University (RU)</td>
<td>Malaria, TB, dengue, diarrheal diseases</td>
<td>Central (Bangkok)</td>
<td>Specialize in basic science research, especially microbiology and natural compound studies</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Has a high h-index (14) relative to its gross publication output; also has two patents for anti-tubercular compounds</td>
</tr>
<tr>
<td>Thai Red Cross AIDS Research Centre (TRCARC)</td>
<td>HIV, some tuberculosis/HIV co-infections</td>
<td>Central (Bangkok)</td>
<td>Speciality HIV center; conducts numerous clinical trials for therapeutics against HIV and HIV opportunistic infections</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Affiliated with Chulalongkorn University and HIV-NAT,</td>
</tr>
<tr>
<td>Thammasat University (TU)</td>
<td>Malaria, helminths, HIV and diarrheal diseases</td>
<td>Central (Bangkok)</td>
<td>The <strong>Faculty of Allied Health Sciences</strong> has an expertise in malaria and liver fluke research; has the <strong>WHO/TDR Clinical Coordination and Training Center</strong></td>
</tr>
<tr>
<td>Chiang Mai University (CMU)</td>
<td>Malaria, dengue, HIV, diarrheal diseases, helminthiasis, TB, JE</td>
<td>North</td>
<td>Location ideal for studying drug-resistant malaria on the Myanmar-Thailand-Laos border; conducts a lot of virology research and virus vaccine or therapeutics development</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Tropical Medicine research done mainly by the <strong>Faculty of Medicine and Research Institute of Health Sciences</strong></td>
</tr>
<tr>
<td>Khon Kaen University (KKU)</td>
<td>Helminthias, HIV, tuberculosis, diarrheal diseases and melioidosis</td>
<td>Northeast</td>
<td>Expertise in helminthiasis and melioidosis, both of which are more prevalent in the Northeast than other regions; has specialized <strong>Liver Fluke and Cholangiocarcinoma Research Center and Tropical Disease Research Laboratory</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Has the second largest number of publications for helminthiasis and melioidosis</td>
</tr>
<tr>
<td>Prince of Songkla University (PSU)</td>
<td>All 13 Key Diseases</td>
<td>South</td>
<td>Has a variety of research, from isolating natural plant extracts active against tropical diseases to clinical research; only large-capacity institute in the South</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Largest institute in the Southern Region</td>
</tr>
</tbody>
</table>

Figure 1 shows the location of all 38 tropical medicine institutes covered by this report. The national distribution is uneven, with most institutes in the Central Region:
Figure 1: 38 Tropical Medicine Research Institutes, incl. Central Region (Google Maps). Bangkok institutes are shown in Green, Central (not Bangkok) in Pink, North in Yellow, Northeast in Blue, and South in Orange.
Regional Comparisons

It is clear that the bulk of tropical medicine research in Thailand is performed by institutes in the Central region, mostly around Bangkok Metropolitan Area, as shown in Figure 1. Of 38 institutes reviewed for this report, 21 were in the Central region (13 in Bangkok), 5 in the North, 9 in the Northeast, and 3 in the South.

Figure 2: Tropical Medicine Research Institutes by Region (n=38)

The publication output confirms this distribution. Institutes in the Central region have produced 81% of all Thai tropical-medicine publications in the past 10 years, with Bangkok alone contributing over two-thirds of these.

Figure 3: Percentage of Publications from Thai Tropical Medicine Research Institutes by Region, 2001-2011
Table 4: Publication Output by Region 2001-2011

<table>
<thead>
<tr>
<th>Region</th>
<th>Mal</th>
<th>Den</th>
<th>Helm</th>
<th>Rab</th>
<th>HIV</th>
<th>Lepto</th>
<th>TB</th>
<th>JE</th>
<th>Meli</th>
<th>Toxo</th>
<th>CHIK</th>
<th>Diarr</th>
<th>ScTyph</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangkok</td>
<td>1276</td>
<td>504</td>
<td>199</td>
<td>192</td>
<td>1111</td>
<td>140</td>
<td>397</td>
<td>72</td>
<td>237</td>
<td>40</td>
<td>25</td>
<td>348</td>
<td>66</td>
<td>4231</td>
</tr>
<tr>
<td>Central (Not BKK)</td>
<td>183</td>
<td>109</td>
<td>41</td>
<td>11</td>
<td>384</td>
<td>24</td>
<td>188</td>
<td>9</td>
<td>10</td>
<td>4</td>
<td>5</td>
<td>53</td>
<td>11</td>
<td>871</td>
</tr>
<tr>
<td>North</td>
<td>89</td>
<td>42</td>
<td>41</td>
<td>2</td>
<td>283</td>
<td>2</td>
<td>52</td>
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<td>7</td>
<td>0</td>
<td>104</td>
<td>8</td>
<td>602</td>
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<tr>
<td>Northeast</td>
<td>11</td>
<td>11</td>
<td>92</td>
<td>0</td>
<td>105</td>
<td>20</td>
<td>51</td>
<td>3</td>
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<td>0</td>
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<td>32</td>
<td>2</td>
<td>414</td>
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<tr>
<td>South</td>
<td>28</td>
<td>22</td>
<td>4</td>
<td>1</td>
<td>62</td>
<td>8</td>
<td>43</td>
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<td>1</td>
<td>6</td>
<td>35</td>
<td>4</td>
<td>190</td>
</tr>
</tbody>
</table>

Table 4: Publication Output by Region. Publication output by region, according to Scopus. The highest values in each category are highlighted in blue, the second-highest in orange, and the third in green.

Figure 4: Publication Output by Thai Tropical Medicine Research Institutes by Region, by Disease

As Figure 4 and Table 4 show, Bangkok institutes dominate each disease in terms of the number of publications. Figure 5 shows only the Northern, Northeastern, and Southern Regions, for comparative purposes.

Outside the Central region, regions show a greater specialty in certain diseases, perhaps correlating with the more pressing public-health concern in these areas. In the North, there is a greater focus on malaria, dengue, HIV, Japanese encephalitis, toxoplasmosis, and diarrheal diseases. In the Northeast, there are more publications on helminthiases, melioidosis, and leptospirosis. In the South, there are more publications on Chikungunya disease than the other regions.
Training Programs in Tropical Medicine

Of the 38 institutes identified in this report, 23 are universities. The CRI also houses a graduate institute.

**Faculty of Tropical Medicine, Mahidol University (MU)**

Only one Thai institute offers higher degree programs specific to tropical medicine: Mahidol University. The Faculty of Tropical Medicine, established in 1960, offers 6 regular international post-graduate program in tropical medicine, as well as a wide variety of tropical medicine training programs, for medical doctors, scientists, nurses, and other tropical health personnel--the 6 regular programs are the Diploma in Tropical Medicine and Hygiene (DTM&H), Master of Clinical Tropical Medicine (MCTM), Master of Clinical Tropical Medicine in Tropical Pediatrics (MCTM (TP)), Master of Science in Tropical Medicine (MSc(TM)), Doctor of Philosophy in Tropical Medicine (PhD(TM)), and Doctor of Philosophy in Clinical Tropical Medicine (PhD(CTM)). The Faculty of Tropical Medicine admits approximately 100 new students every year, which includes doctors, clinicians, nurses, and scientists from all over the world. The school has been acknowledged and approved by the International Society of Travel Medicine and the American Society for Tropical Medicine and Hygiene (ASTMH). To date, participants from 56 different countries have attended these formal educational programs.

The Faculty of Tropical Medicine also offers regular short, long, and tailored training programs in collaboration with the on-campus Hospital for Tropical Diseases, the Ministry of
Public Health, Thailand, and the Faculty’s field training stations, in the following areas: clinical tropical medicine, helminthology, medical entomology, microbiology and immunology, protozoology, social and environmental medicine, tropical hygiene, tropical nutrition and food science, tropical pathology, tropical pediatrics, laboratory diagnosis and management, epidemiology of tropical diseases, geographic information system (GIS), management of tropical diseases including HIV/AIDS, management of malaria, infectious disease control, and others by arrangement.

The SEAMEO TROPMED Network is a regional cooperative network, established in 1966, for education, training and research in tropical medicine and public health under the Southeast Asian Ministers of Education Organization (SEAMEO). The Network serves as a focal point in higher education and research in tropical medicine and public health. SEAMEO has established the Faculty of Tropical Medicine, Mahidol University, Thailand as its Regional Center for tropical medicine.

Training Programs in Public Health or Allied Health Sciences
Many more universities offer programs in public health with relevance to tropical medicine. Only international programs are listed here.

Faculty of Public Health, Mahidol University (MU)
The Faculty of Public Health offers programs to earn a Master of Public Health, a Doctor of Public Health, a Doctor of Philosophy in Environmental Technology, and a Doctor of Philosophy in Public Health Microbiology. In addition to academic programs, the Faculty of Public Health offers short-course training programs and technical assistance to countries in the Asia-Pacific region.

Faculty of Public Health, Thammasat University (TU)
TU offers a Master of Public Health (MPH) degree. The mission of the Thammasat University’s MPH programs is to provide broad and holistic public health perspectives, knowledge, skills and analytic capabilities, necessary for individuals to assume effective leadership in public health practice and governance; to protect and promote the health of diverse populations at the local, provincial, national and international level.

Chiang Mai University (CMU)
CMU offers a multidisciplinary research-only program to obtain an MSc in Health Sciences, which is conducted under the collaborative auspices of the Graduate School, the Research Institute for Health Sciences (RIHES), and the six CMU Health Science faculties: Medicine, Dentistry, Pharmacy, Nursing, Associated Medical Sciences, and Veterinary Medicine, students will study in-depth and complete a thesis on an aspect of public health relevant to their own area of expertise. In the course of their research, students will develop their skills and knowledge in the field of research methodology and the ability to conduct effective research, and learn new management and leadership skills. Graduates from this program will be qualified health sciences researchers.
Khon Kaen University (KKU)
Various faculties offer degrees applicable to Tropical Medicine, which include the Doctor of Philosophy Program in Public Health and the Master of Science in Parasitology, Anatomy, Pharmacology, Medical Physiology, or Medical Microbiology.

Faculty of Medicine, Prince of Songkla University (PSU)
The PSU Faculty of Medicine offers a Master of Science Program in Epidemiology, Master of Science Program in Biomedical Sciences, Higher Graduate Diploma Program in Clinical Medical Science, Graduate Diploma Program in Epidemiology, Doctor of Philosophy in Biomedical Sciences.

Training Programs in Other Areas of Interest
Other programs that may be applicable to tropical medicine:

Chulabhorn Graduate Institute
The academic programs at CGI encompass a vast span of scientific frontiers. The intertwining of scientific discipline has brought together the basic principles (chemistry, biology, physics, mathematics, and computer programming) as well as generated new ways to investigate new problems that no scientists in the past ever imagined. Degree programs include an MSc or PhD in Applied Biological Sciences, Environmental Toxicology, and Chemical Biology.

School of Engineering and Technology, Asian Institute of Technology (AIT)
Although programs at AIT are generally more technology-based than medically-based, AIT offers graduate programs in information and communications enable access, connections and sharing in turn enable knowledge creation and economic opportunity, including offering a Master of Science or Doctor of Philosophy in Remote Sensing and Geographic Information Systems (RS-GIS), which is becoming more and more integrated into tropical medicine research.

New research institutes and infrastructure expansion

One challenge of developing research capacity in Thailand has been the concentration of leading universities in urban areas, particularly Bangkok. One of the government’s R&D clusters, focusing on district-level knowledge in Nonthaburi, aims to redress the balance. Some universities are following suit in the provinces as well, by developing small incubation centres into regional science parks. In 2007, Prince of Songkla University (PSU) started the Southern Thailand Science Park, targeting rubber, oil palm, food, nutraceutical and software research. Khon Kaen University (KKU) matched these developments in its region with the North-eastern Science Park, which aims for 70% incubation success. Chiang Mai University (CMU), in the north of the country, has established the Technology Development Centre for Industry (TDCI), temporarily based in its engineering department. This centre will become the Chiang Mai Science Park (CMSP) on 200 acres of land we secured near the Lamphun industrial estates.” However, R&D expansion at the moment seems to be focusing on more industrial ventures then biomedical.
Most of the tropical medicine institutes in this report are well-established, and were first founded a number of decades ago, with the exception of WU (1992) and RMUTTO (2005).

Many existing key institutes continue to expand their research and clinical capacity, which may influence their contribution to tropical medicine in the future. The following represent some of the new infrastructure developments over the last 5 years.

**QSNICH: The Children's Medical Center in Honor of Her Majesty The Queen's 80th Anniversary**
QSNICH has launched a campaign to realize the Children's Medical Center, a Multi-Purpose Building Project which will finish by the year 2013. It will offer convenient health services, be a children-friendly hospital, provide medical appliances, develop staff, and accommodation for doctors and medical personnel on duty, who need to stay focused on their jobs.

**Faculty of Tropical Medicine, Mahidol University (MU): 60th Anniversary of HM The King's Accession to the Throne Building**
Building Construction of the “60th Anniversary of HM The King’s Accession to the Throne Building” was completed in 2007. The 8 floors are designed to accommodate the Faculty’s Executive and Administration office spaces, the Office of the Dean, SEAMEO TROPMED Network, the Mahidol University-Oxford Research Unit (MORU), the WHO Collaborating Centre for Clinical Management of Malaria, the WHO Collaborating Centre for Environmental Management for Disease Vector Control in Sustainable Development, and the Office of the Mekong Malaria Programme.

**Faculty of Tropical Medicine, Mahidol University (MU): “Asia’s Center of Excellence for Tropical Diseases”**
Construction started in 2008. The building will serve as a Center of Excellence for clinical trials, research, and the treatment of tropical diseases

**Nutrition Studies in Tropical Medicine**

**Faculty of Tropical Medicine, Mahidol University (MU)**
At the Faculty of Tropical Medicine, Mahidol University, the Department of Tropical Nutrition and Food Science is responsible for two major international postgraduate programs, the Master of Science in Tropical Medicine and the Doctor of Philosophy in Tropical Medicine, i.e. Nutritional Epidemiology and Biochemical Nutrition, to develop and update knowledge of relevant theories, methods, techniques and research skills of scientists involved in the field of health, medical sciences, nutrition and molecular biology.

The academic staff have ongoing collaborations in various research fields involving nutritional problem in Thailand--malnutrition, obesity, dislipidemia, coronary heart disease, and cancer. Nutrigenomics and molecular carcinogenesis of cancers in Thai patients, such as breast cancer, cervical cancer, cholangiocarcinoma, colorectal cancer, and hepatocellular carcinoma, are also investigated. The department also provides technical services and information on nutrition for the public.
Thai Red Cross AIDS Research Center (TRCARC)

Since the establishment of the Clinical Nutrition Clinic in 2005, with the support of the TACHIN (Thai Australian Collaboration in HIV Nutrition), the Clinic has launched consultation services and training on nutrition for people who are both HIV positive and people not infected. The mission of the clinic is to promote the health of people infected with HIV both before and after starting antiretroviral therapy to have better health. They study the relationship between HIV, weight loss or gain, and the risk of chronic diseases such as diabetes, high blood pressure, high blood cholesterol, kidney disease. Therefore, nutritional advice and counseling is another way to help these groups healthy.

Clinical Trials

Clinical trials have always been a major factor in Thailand’s contribution to tropical medicine. Thailand exhibits its capability of carrying out large-scale clinical trials time and time again, particularly with HIV and AIDS. Table 5 shows some of the HIV/AIDS clinical trials, along with every clinical trial for the other 12 key tropical diseases from 2001-2011:

<table>
<thead>
<tr>
<th>Institute</th>
<th>Title</th>
<th>Condition</th>
<th>Sponsors</th>
<th>Phases</th>
<th>Intervention</th>
<th>Enrollment</th>
<th>Locations in Thailand</th>
<th>Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFRIMS</td>
<td>Follow-Up Study of Thai Children From Dengue-003 and Evaluation of a Booster Dose of Dengue Vaccine</td>
<td>Dengue</td>
<td>U.S. Army Office of the Surgeon General, GlaxoSmithKline</td>
<td>Phase I, II</td>
<td>Live attenuated tetravalent dengue (DEN) vaccine, Formulation 17</td>
<td>7</td>
<td>Phramongkutklao Hospital, Bangkok</td>
<td>March 2006</td>
</tr>
<tr>
<td>AFRIMS</td>
<td>A Phase I/II Trial of a Tetravalent Live Attenuated Dengue Vaccine in Flavivirus Antibody Naïve Children</td>
<td>Dengue</td>
<td>United States Medical Materiel Development Activity, GlaxoSmithKline</td>
<td>Phase I, II</td>
<td>Dengue vaccine</td>
<td>10</td>
<td>Phramongkutklao Hospital, Bangkok</td>
<td>May 2004</td>
</tr>
<tr>
<td>AFRIMS</td>
<td>A Phase II Trial of a Walter Reed Army Institute of Research (WRAIR) Live Attenuated Virus Tetravalent Dengue Vaccine in Healthy Adults in Thailand</td>
<td>Dengue</td>
<td>United States Medical Materiel Development Activity, GlaxoSmithKline</td>
<td>Phase II</td>
<td>T-DEN F17, T-DEN F-19, Placebo Control</td>
<td>120</td>
<td>Phramongkutklao Hospital, Bangkok</td>
<td>February 2008</td>
</tr>
<tr>
<td>AFRIMS</td>
<td>Phase II Dose Ranging Study of Artesunate</td>
<td>Falciparum Malaria, Uncomplicated Malaria</td>
<td>U.S. Army Office of the Surgeon General, Military Infectious Diseases Research Program (MIDRP), U.S. Army Medical Research and Materiel Command</td>
<td>Phase II</td>
<td>Artesunate for Injection</td>
<td>120</td>
<td>Kwai River Christian Hospital</td>
<td>January 2008</td>
</tr>
<tr>
<td>AFRIMS</td>
<td>Characteristics of Immune Cells in Gut Mucosa of HIV Negative and HIV Positive Thais</td>
<td>HIV-infection</td>
<td>South East Asia Research Collaboration with Hawaii: AFRIMS; TRCARC</td>
<td>n/a</td>
<td>Colon biopsy</td>
<td>20</td>
<td>TRCARC</td>
<td>October 2012</td>
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<tr>
<td>University/Institute</td>
<td>Project Title</td>
<td>Phase</td>
<td>Antimalarial Regimen</td>
<td>Result</td>
<td>Study Duration</td>
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<tr>
<td>MU (Faculty of Tropical Medicine)</td>
<td>Azithromycin Combination Therapy for Malaria</td>
<td>Phase II</td>
<td>Artesunate, Quinine</td>
<td>120</td>
<td>MU Hospital for Tropical Diseases</td>
<td>July 2005</td>
<td></td>
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<tr>
<td>MU (Faculty of Tropical Medicine)</td>
<td>Implementation Research of New Dengue Vector Control Tools</td>
<td>n/a</td>
<td>Insecticide treated curtains and insecticide treated covers</td>
<td>22</td>
<td>MU Faculty of Tropical Medicine</td>
<td>December 2009</td>
<td></td>
<td></td>
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<tr>
<td>MU (Faculty of Tropical Medicine)</td>
<td>Safety and Efficacy Study of WRSS1, a Shigella Sonnei Vaccine Candidate</td>
<td>Phase I, II</td>
<td>WRSS1 vaccine candidate, Placebo vaccine</td>
<td>20</td>
<td>MU Faculty of Tropical Medicine</td>
<td>December 2010</td>
<td></td>
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<tr>
<td>MU (Faculty of Tropical Medicine)</td>
<td>Safety and Efficacy Study of Adjunctive Rosiglitazone in the Treatment of Uncomplicated Falciparum Malaria</td>
<td>Phase I, II</td>
<td>Rosiglitazone</td>
<td>140</td>
<td>MU Faculty of Tropical Medicine</td>
<td>January 2006</td>
<td></td>
<td></td>
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<tr>
<td>MU (Faculty of Tropical Medicine)</td>
<td>A Exploratory, Open Label, Single Dose Regimen, Multiple Dose Testing Clinical Study to Assess the Preliminary Efficacy, Tolerability and Pharmacokinetics of OZ439 in Adult Patients With Acute, Uncomplicated Plasmodium Falciparum or Vivax Malaria Monoinfection</td>
<td>Phase II</td>
<td>Drug: OZ439</td>
<td>60</td>
<td>MU Faculty of Tropical Medicine</td>
<td>May 2011</td>
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<tr>
<td>MU (Faculty of Tropical Medicine)</td>
<td>Immunogenicity and Safety of Inactivated Vero Cell Derived Japanese Encephalitis Vaccine in Thai Children (JE0153)</td>
<td>Phase III</td>
<td>JEVAC</td>
<td>152</td>
<td>MU Faculty of Tropical Medicine</td>
<td>December 2012</td>
<td></td>
<td></td>
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<tr>
<td>MU (Faculty of Tropical Medicine)</td>
<td>Study to Evaluate the Efficacy and Safety of Tafenoquine for the Treatment of Plasmodium Vivax in Adults</td>
<td>Phase II</td>
<td>Tafenoquine; Chloroquine + Primaquine</td>
<td>70</td>
<td>MU Hospital for Tropical Diseases</td>
<td>January 2005</td>
<td></td>
<td></td>
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<tr>
<td>MU (MORU)</td>
<td>Tracking Resistance to Artemisinin (TRAC)</td>
<td>Phase IV</td>
<td>Artesunate 2, Drug: Artesunate 4</td>
<td>1800</td>
<td>SMRU</td>
<td>April 2013</td>
<td></td>
<td></td>
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<tr>
<td>MU (MORU)</td>
<td>Pharmacokinetic Study of Primaquine and Chloroquine in Healthy Subjects (PQCC)</td>
<td>Phase I</td>
<td>Mixed Primaquine and chloroquine regimens</td>
<td>16</td>
<td>MU Hospital for Tropical Diseases</td>
<td>March 2012</td>
<td></td>
<td></td>
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<tr>
<td>MU (Ramathibodi)</td>
<td>Paradoxical Tuberculosis Immune Reconstitution Inflammatory Syndrome (TB-IRIS) Treatment Trial</td>
<td>Phase II, III</td>
<td>Dexamethasone , Atorvastatin, Naproxen, Placebo</td>
<td>100</td>
<td>Ramathibodi di Hosp (MU), CMU, BIDI (MOPH)</td>
<td>September 2013</td>
<td></td>
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<tr>
<td>MU (Siriraj)</td>
<td>Safety and Immunogenicity of Single Dose CholeraGarde® in HIV-Seropositive Adults</td>
<td>Phase II</td>
<td>CholeraGarde®, Placebo</td>
<td>32</td>
<td>Siriraj Hospital, MU, Bangkok</td>
<td>September 2011</td>
<td></td>
<td></td>
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<tr>
<td>Project Code</td>
<td>Title</td>
<td>Lead Institute</td>
<td>Phase</td>
<td>Sponsor/Other Details</td>
<td>SMRU</td>
<td>Date</td>
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<tr>
<td>MU (Siriraj)</td>
<td>Ivermectin Versus Albendazole for Chronic Strongyloidiasis</td>
<td>Mahidol University, Atlantic Laboratory Ltd</td>
<td>Phase III</td>
<td>Ivermectin, Albendazole</td>
<td>Siriraj Hospital, Bangkok</td>
<td>June 2010</td>
<td></td>
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<tr>
<td>MU (Siriraj)</td>
<td>Nitazoxanide for the Treatment of Chronic Diarrhea in HIV Infected Children</td>
<td>NIAID, NICHD</td>
<td>Phase I, II</td>
<td>Nitazoxanide</td>
<td>Siriraj Hospital, MU, Bangkok</td>
<td>May 2007</td>
<td></td>
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<tr>
<td>MU (SMRU)</td>
<td>Randomised Trial of 3 Artemisinin Combination Therapy for Malaria in Pregnancy (DMA)</td>
<td>University of Oxford</td>
<td>Phase III</td>
<td>dihydroartemisin dinipiperazine, Artesunate-mefloquine, artemether-lumefantrin</td>
<td>SMRU</td>
<td>March 2013</td>
<td></td>
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<tr>
<td>MU (SMRU)</td>
<td>Sevuparin/DF02 as an Adjunct Therapy in Subjects Affected With Uncomplicated Falciparum Malaria</td>
<td>Dilaforette AB University of Oxford</td>
<td>Phase I, II</td>
<td>Sevuparin sodium + atovaquone/proguanil; atovaquone/proguanil</td>
<td>SMRU</td>
<td>September 2012</td>
<td></td>
<td></td>
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<tr>
<td>MU (SMRU)</td>
<td>Ultrasound Study in Pregnant Women With Malaria</td>
<td>University of Oxford</td>
<td>Observational, Ultrasound</td>
<td>Rabies</td>
<td>SMRU</td>
<td>December 2012</td>
<td></td>
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<tr>
<td>MU (SMRU)</td>
<td>Incidence of Vivax Along the Thai Burma Border (VHC)</td>
<td>University of Oxford, MU</td>
<td>n/a</td>
<td>Primaquine</td>
<td>SMRU</td>
<td>December 2013</td>
<td></td>
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<tr>
<td>MU (SMRU)</td>
<td>Study on the Treatment of Vivax Malaria (VHX)</td>
<td>University of Oxford, MU</td>
<td>Phase III</td>
<td>Artesunate, Chloroquine, Chloroquine/primaquine</td>
<td>SMRU</td>
<td>December 2013</td>
<td></td>
<td></td>
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<tr>
<td>MOPH</td>
<td>Study of Late Boost Strategies for HIV-uninfected Participants From Protocol RV 144</td>
<td>U.S. Army Medical Research and Material Command</td>
<td>Phase II</td>
<td>ALVAC-HIV; AIDSVAX B/E; ALVAC-HIV Placebo; AIDSVAX B/E Placebo</td>
<td>Chonburi</td>
<td>October 2013</td>
<td></td>
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<tr>
<td>MOPH</td>
<td>Early Rabies Vaccine Immunization in Primary School Children (i49P1)</td>
<td>MOPH</td>
<td>Phase III</td>
<td>Rabies vaccine</td>
<td>Provinicial Public Health Office, Phetchabun</td>
<td>November 2008</td>
<td></td>
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<tr>
<td>MOPH (BIDI)</td>
<td>Appropriate Timing of HAART in Co-infected HIV/TB Patients (TIME)</td>
<td>BIDI (MOPH), MU, TRCARC</td>
<td>Phase IV</td>
<td>tenofovir, lamivudine, efavirenz</td>
<td>BIDI (MOPH)</td>
<td>October 2013</td>
<td></td>
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<tr>
<td>PCM</td>
<td>Cost-effectiveness of Infloran (TM) in Treating Acute Childhood Diarrhea in Phramongkutklao Hospital (infloran)</td>
<td>PCM</td>
<td>n/a</td>
<td>Probiotic - Infloran</td>
<td>PCM</td>
<td>December 2011</td>
<td></td>
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<tr>
<td>QSMI</td>
<td>Immunogenicity and Safety Study of A New Chromatographically Purified Vero Cell Rabies Vaccine With ID Regimen and ERIG</td>
<td>QSMI</td>
<td>Phase IV</td>
<td>SPEEDA and TRCS SPEEDA</td>
<td>QSMI</td>
<td>February 2013</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRCARC</td>
<td>Pharmacokinetics (PK) and Safety of 2 Different Doses of Lopinavir/Ritonavir in HIV/Tuberculosis (TB) Co-infected Patients Receiving Rifaxampicin Containing Anti-tuberculosis Therapy</td>
<td>HIV Infections, TB</td>
<td>The HIV Netherlands Australia Thailand Research Collaboration</td>
<td>Phase II</td>
<td>LPV/r</td>
<td>40</td>
<td>TRCARC</td>
<td>July 2010</td>
</tr>
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<tr>
<td>TRCARC</td>
<td>Efficacy Safety Study Comparing 2 Doses of NVP After Initiating Rifampin-containing TB Therapy</td>
<td>HIV Infections, TB</td>
<td>HIV-NAT, MOPH, CRIH, BID, others</td>
<td>Phase II</td>
<td>HAART containing nevirapine</td>
<td>42</td>
<td>TRCARC, BID, CRIH, 3 other hospitals</td>
<td>December 2009</td>
</tr>
<tr>
<td>TRCARC</td>
<td>The Intensive Pharmacokinetics Sub-study of Encore 1 (ENCORE1-PK)</td>
<td>HIV Infection</td>
<td>Kirby Institute; Chelsea and Westminster NHS Foundation Trust</td>
<td>Phase III</td>
<td>Efavirenz</td>
<td>40</td>
<td>TRCARC</td>
<td>December 2012</td>
</tr>
<tr>
<td>CMU</td>
<td>Modified Dose and Schedule of Recombinant Hepatitis B Vaccination in HIV-infected Adult Subjects</td>
<td>HIV Infection</td>
<td>CMU</td>
<td>Phase III</td>
<td>Hepavax-Gene</td>
<td>132</td>
<td>CMU</td>
<td>April 2012</td>
</tr>
<tr>
<td>CMU</td>
<td>Discontinuation of Primary and Secondary Prophylaxis for Opportunistic Infections in HIV-infected Patients</td>
<td>HIV Infection</td>
<td>CMU</td>
<td>n/a</td>
<td>Discontinuation of prophylactic drugs</td>
<td>75</td>
<td>CMU</td>
<td>June 2011</td>
</tr>
<tr>
<td>CMU</td>
<td>Treatment of Cerebral Toxoplasmosis in HIV/AIDS</td>
<td>Toxoplasmic Encephalitis, AIDS</td>
<td>Rajavithi Hospital Chiang Mai University</td>
<td>Phase IV</td>
<td>TMX-SMX (Bactrim(R)), Pyrimethamine plus Sulfadiazine plus leucovorin</td>
<td>30</td>
<td>Chiang Mai University hospital</td>
<td>August 2004</td>
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<tr>
<td>KKU</td>
<td>Co-trimoxazole as Maintenance Therapy for Melioidosis</td>
<td>Melioidosis</td>
<td>KKU</td>
<td>n/a</td>
<td>Co-trimoxazole 12, Co-trimoxazole 20</td>
<td>800</td>
<td>KKU</td>
<td>December 2015</td>
</tr>
</tbody>
</table>

**COLLABORATIVE EFFORTS**

<table>
<thead>
<tr>
<th>MU with Columbia Univ.</th>
<th>Malaria and the Safety of Iron Supplements and Iron Fortification (MIA)</th>
<th>Malaria, Iron Deficiency</th>
<th>Columbia University, Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD)</th>
<th>n/a</th>
<th>Dietary Supplement: Ferrous sulfate</th>
<th>120</th>
<th>MU Hospital for Tropical Diseases</th>
<th>March 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>MU with MMV</td>
<td>RBx11160 Phase II Dose Ranging Study RBx/MMV05-06</td>
<td>Plasmodium Falciparum Malaria</td>
<td>Medicines for Malaria Venture, Rainbux Laboratories Limited, Swiss Tropical &amp; Public Health</td>
<td>Phase II</td>
<td>Treatment with 3 dose groups of RBx11160 over 7 days</td>
<td>255</td>
<td>MU Faculty of Tropical Medicine</td>
<td>January 2007</td>
</tr>
<tr>
<td>Health Institute</td>
<td>Health Institute</td>
<td>Health Institute</td>
<td>Health Institute</td>
<td>Health Institute</td>
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<tr>
<td>MU / LH</td>
<td>Desmopressin and Dexamethasone Adjunctive Treatment for Leptospirosis</td>
<td>Leptospirosis</td>
<td>MU, Thai Research Fund (TRF)</td>
<td>Phase II, III</td>
<td>Dexamethasone, desmopressin</td>
<td>64</td>
<td>Loei Hospital (LH)</td>
<td>October 2006</td>
</tr>
<tr>
<td>MU/CMU</td>
<td>Evaluation of 3TC or FTC Monotherapy Compared to Continuing HAART as a Bridging Strategy</td>
<td>HIV Disease</td>
<td>International Maternal Adolescent AIDS Clinical Trials Group; NIAID, NICHD</td>
<td>Phase IV</td>
<td>HAART regimen; 3TC or FTC monotherapy</td>
<td>344</td>
<td>Siriraj Hosp (MU), CMU</td>
<td>March 2016</td>
</tr>
<tr>
<td>MU / Novartis</td>
<td>Evaluation of Immunogenicity, Safety and Booster Response of a Rabies Vaccine Administered Concomitantly With Japanese Encephalitis Vaccine in Toddlers</td>
<td>Rabies, JE, Pre-Exposure Prophylaxis</td>
<td>Novartis, Novartis Vaccines</td>
<td>Phase II</td>
<td>Varying dosages of combination JE vaccines and Rabies vaccines</td>
<td>200</td>
<td>MU Faculty of Tropical Medicine</td>
<td>September 2004</td>
</tr>
<tr>
<td>MOPH (BIDI) / TRCARC</td>
<td>Progress Adult Study</td>
<td>AIDS, Depression</td>
<td>TRCARC, BIDI (MOPH)</td>
<td>n/a</td>
<td>standard regimens according to the MOPH guidelines</td>
<td>5600</td>
<td>TRCARC, BIDI (MOPH), Sanpatong Hospital</td>
<td>September 2015</td>
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<tr>
<td>AFRIMS/PC M</td>
<td>A Phase I/II Trial of Tetravalent Live Attenuated Dengue Vaccine in Flavivirus Antibody Naive Infants</td>
<td>Dengue</td>
<td>U.S. Army Medical Research and Materiel Command, GlaxoSmithKline</td>
<td>Phase I, II</td>
<td>Tetravalent live attenuated dengue vaccine, Varicella vaccine and Haemophilus influenzae Type b Conjugate vaccine</td>
<td>54</td>
<td>Pharamongkutkla Hospital, Bangkok</td>
<td>June 2009</td>
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<tr>
<td>TRCARC, MOPH (BIDI), MU, CRRH</td>
<td>Progress Pediatric Study</td>
<td>AIDS, Depression</td>
<td>TRCARC, BIDI (MOPH), MU, CRRH</td>
<td>n/a</td>
<td>standard ART according to the MOPH guidelines</td>
<td>840</td>
<td>TRCARC, BIDI (MOPH), MU, CRRH, Sanpatong Hospital</td>
<td>September 2015</td>
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<tr>
<td>CMU with Univ. of California San Francisco</td>
<td>Immediate Versus Deferred Start of Anti-HIV Therapy in HIV Infected Adults Being Treated for Tuberculosis</td>
<td>HIV Infections, TB</td>
<td>AIDS Clinical Trials Group National Institute of Allergy and Infectious Diseases (NIAID)</td>
<td>n/a</td>
<td>Efavirenz, Emtricitabine, Tenofovir disoproxil fumarate, Rifampin</td>
<td>800</td>
<td>CMU</td>
<td>July 2010</td>
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<tr>
<td>KKU / MOPH</td>
<td>Controlled Comparison of Two MoxifloxacinContaining Treatment Shortening Regimens in Pulmonary Tuberculosis (REMoXTB)</td>
<td>Pulmonary TB</td>
<td>University College, London and 28 collaborators</td>
<td>Phase III</td>
<td>Moxifloxacin, Ethambutol, Isoniazid, Pyrazinamide &amp; Rifampicin</td>
<td>2400</td>
<td>KKU, MOPH, Rajavithi Hospital</td>
<td>June 2013</td>
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<tr>
<td>Chula / TRCARC</td>
<td>Pediatric Study for Appropriate Dose of Ritonavir Boosted Lopinavir in Thai HIV-infected Children (PEARL)</td>
<td>HIV-infected Children</td>
<td>TRCARC, Chula, QSNICH, KKU, BIDI (MOPH), SPH, 6 other hosp.</td>
<td>Phase III</td>
<td>Kaletra</td>
<td>240</td>
<td>Multiple sites</td>
<td>June 2013</td>
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</table>

Source: ClinicalTrials.gov (Searched with Condition* and Thailand where* is one of the tropical diseases chosen for study). This shows clinical trials from the last 10 years conducted in Thailand with Thai primary investigators or co-investigators. Ongoing trials are shown in blue, completed ones in grey.
All registered clinical trials are shown for all diseases, except for HIV. Since HIV clinical trials are so numerous in Thailand, only the clinical trials that started in 2011 are shown for the purposes of this report. There have been **134 HIV-related clinical trials** in the last 10 years, according to the source website.

Several institutes have contributed to these clinical trials, as summarized in **Table 6:**

**Figure 6. Breakdown of Clinical Trials by Disease, excluding HIV, from 2001-2011**

![Figure 6](image)

**Table 6: Major Contributing Institutes to Thai Clinical Trials**

<table>
<thead>
<tr>
<th>Institute</th>
<th>Diseases</th>
<th>Phases of Trials</th>
<th>Types of Interventions</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFRIMS</td>
<td>Dengue</td>
<td>Phase I</td>
<td>Vaccines (dengue)</td>
<td>Often collaborates with PCM at Pharamongkutklao Hospital</td>
</tr>
<tr>
<td></td>
<td>Malaria (Falciparum)</td>
<td>Phase II</td>
<td>Therapeutics (malaria)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HIV</td>
<td></td>
<td>Diagnostics (HIV)</td>
<td></td>
</tr>
<tr>
<td>CMU</td>
<td>HIV</td>
<td>Phase III</td>
<td>Therapeutics (HIV, toxoplasmosis)</td>
<td>Clinical trials focus on HIV/AIDS and other diseases as opportunistic infections, such as hepatitis and toxoplasmosis</td>
</tr>
<tr>
<td></td>
<td>TB</td>
<td>Phase IV</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Toxoplasmosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KKU</td>
<td>TB</td>
<td>Phase III</td>
<td>Therapeutics (TB, Melioidosis)</td>
<td>Just recently started conducting clinical trials</td>
</tr>
<tr>
<td></td>
<td>Melioidosis</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Lepto, 1
Rab, 3
Helm, 1
Diarr, 4
Meli, 1
Toxo, 1
Mal, 13
JE, 2
TB, 7
### MU: TropMed
- Dengue
- Diarrhea (Shigella)
- Malaria (Falciparum)
- Malaria (Vivax)
- JE
- Rabies
- HIV
- Leptospirosis

<table>
<thead>
<tr>
<th>Phase</th>
<th>Therapeutics (malaria, leptospirosis)</th>
<th>Vaccines (shigella, JE, rabies)</th>
<th>Vector control (dengue)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>III</td>
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</tr>
</tbody>
</table>

Has many collaborators from all over the world, including universities from other countries and corporations; conducts clinical trials on the greatest number of diseases.

### MU: MORU
- Malaria (Falciparum)
- Malaria (Vivax)

<table>
<thead>
<tr>
<th>Phase</th>
<th>Therapeutics (malaria)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td></td>
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<tr>
<td>III</td>
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<tr>
<td>IV</td>
<td></td>
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</tbody>
</table>

Clinical trials are either run at SMRU, or MU TropMed.

### MU: SMRU
- Malaria (Falciparum)
- Malaria (Vivax)

<table>
<thead>
<tr>
<th>Phase</th>
<th>Therapeutics (malaria)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td></td>
</tr>
</tbody>
</table>

Focuses on malaria at their location in the province of Tak, where there is antibiotic-resistant malaria emerging.

### MU: Siriraj
- Diarrhea (Cryptococcus)
- Diarrhea (Cholera)
- HIV
- Helminthiasis (Strongyloidiasis)

<table>
<thead>
<tr>
<th>Phase</th>
<th>Therapeutics (HIV, helminthiasis, diarrhea)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td></td>
</tr>
</tbody>
</table>

Only test therapeutics in their hospital.

### MOPH: BIDI
- HIV
- TB

<table>
<thead>
<tr>
<th>Phase</th>
<th>Therapeutics (HIV, TB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV</td>
<td></td>
</tr>
</tbody>
</table>

Does a lot of work with HIV and TB co-infections.

### MOPH: other
- Rabies
- HIV

<table>
<thead>
<tr>
<th>Phase</th>
<th>Vaccines (HIV, rabies)</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td></td>
</tr>
</tbody>
</table>

MOPH is able to utilize a number of offices in any region of Thailand and two-thirds of all Thai hospitals.

### QSMI
- Rabies
- HIV

<table>
<thead>
<tr>
<th>Phase</th>
<th>Vaccines (rabies)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV</td>
<td></td>
</tr>
</tbody>
</table>

Rabies is their primary focus.

### TRCARC
- HIV
- TB

<table>
<thead>
<tr>
<th>Phase</th>
<th>Therapeutics (HIV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td></td>
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<tr>
<td>III</td>
<td></td>
</tr>
</tbody>
</table>

HIV is their primary focus; also interested in AIDS-opportunistic infections, like TB.

---

**Surveillance Networks**

As part of Southeast Asia and the Greater Mekong Subregion (GMS), Thai institutes do not often limit surveillance networks within the borders of the country. With the influx of immigrants and refugees from other Southeast Asian countries, Thailand has approached disease surveillance from the angle of making networks regional, rather than national.
The highly successful Mekong Basin Disease Surveillance (MBDS) Network, which was established in 1999, has served as a model for other countries, to demonstrate great capacity in international disease surveillance. The general objective of the MBDS is to strengthen national and Mekong sub-regional capabilities in disease surveillance and response to outbreaks of priority diseases, so that they can be effectively controlled. Priority diseases are potentially vaccine-preventable diseases, including malaria, dengue, cholera, and outbreaks of those of unknown etiologies. It piloted cross-border cooperation, with the exchange of regular disease information on a daily, weekly, monthly or quarterly basis, cross-border meetings, monitoring and evaluation, multi-sector engagement (especially immigration, local authorities), cross-border epidemiologic case history, cross-border medical care and clinical follow-up to nearby provincial areas. It has used 2-way ICT-based communications between local, provincial and central levels in routine surveillance reporting and outbreak investigation. Their response to the avian influenza outbreak was particularly noteworthy.

Below is a summary of some of the surveillance networks that include Thai institutes, along with a list of their international partners:

### Table 7: Disease Surveillance Networks Involving Thai Institutes

<table>
<thead>
<tr>
<th>Surveillance Networks</th>
<th>Diseases</th>
<th>Thai Institutes</th>
<th>International Partners</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Antimicrobial Resistant surveillance system of Thailand (NARST)</td>
<td>Various pathogens exhibiting antimicrobial resistance, including melioidosis and diarrheal diseases such as <em>E. coli</em>, Salmonella, Shigella, Cholera</td>
<td>MOPH (coordinator), Chula, SWU, MU</td>
<td>NA</td>
</tr>
<tr>
<td>Asian Rotavirus Surveillance Network (ARSN)</td>
<td>Rotavirus (diarrheal disease)</td>
<td>MOPH</td>
<td>U.S. CDC (Coordinator); Chinese CDC; Southeast Univ., Nanjing, China; Chinese Univ. of Hong Kong; Gadjah Mada Univ., Indonesia; International Vaccine Institute, Korea; Chonbuk National Univ. Medical School, Korea; Hanyang Univ. School of Medicine, Korea; Institute of Pediatrics, Malaysia; Kuching Hospital, Kuching, Malaysia; Ministry of Health, Yangon, Myanmar; Dept. of Health, Taipei, Taiwan; Poliomyelitis Vaccine Research and Production Center, Vietnam; Pasteur Institute, Vietnam</td>
</tr>
</tbody>
</table>
Gaps Perceived by Questionnaire Respondents

1.) **The English language barrier is a major obstacle** that is prohibiting researchers from obtaining international grants and publishing articles in international journals. There is a need to either improve English education within graduate school programs or to increase the number of staff that provides services such as grant application assistance, English editing, etc.

2.) Culture and societal norms place too much importance on accomplishments and resumes. **There is a need to expand “Young Investigator” directed grant mechanisms**, to allow inexperienced researchers a chance to start their careers.

3.) **The Southern Region remains largely unrepresented by tropical medicine research.** Diseases and risk factors of the Northern, Northeastern, and Central provinces are heavily studied, but the South is not. This could be primarily due to the unrest and political instability of certain provinces.

4.) A common platform (e.g. a web resource) where all information pertaining to a tropical disease in Thailand is available was suggested as one way to avoid duplication and to increase awareness about funding opportunities.

5.) Mathematical modeling and bioinformatics should be encouraged at all levels as “case prevalence over time” is not enough for predictive purposes. There is a need for capacity building in this area, as well.
6.) Lack a culture of ethical data sharing and financial accountability causes fragmentation of efforts and misuse of funds. Stricter guidelines by funding agencies about progress reporting, financial reporting, and data sharing should be encouraged and enforced.

7.) **Universities’ capacity for research administration needs to be expanded**, to meet the needs of researchers and ensure financial accountability for the funding agency. A set of guidelines needs to be established.

8.) **Knowledge and training about research ethics needs to be expanded**, to meet the requirements and standards of international funding agencies.

9.) According to one researcher at BIOTEC, a culture of modesty and shyness often inhibits researchers from submitting grants and publications to international agencies. Again, expanding administrative capacity and assistance for researchers may improve this situation.

**Conclusion and Way Forward**

Reducing and eliminating the burden of tropical diseases in Thailand is going to require more collaboration between institutes and the expansion of expertise to areas outside of Bangkok, especially the South. There is a need to either improve the research capacity of peripheral institutions, or instead increase the number of field sites that key institutes already have. This is especially true around border sites, where mobile immigrant populations contribute to the spread of diseases, such as drug-resistant malaria. Currently, many researchers rely on collecting field samples and transporting them back to their laboratories in Bangkok. This large investment in traveling back and forth is not efficient. Long-term investments in high-quality field sites, or long-term collaborations with already existing smaller institutes in provinces remote from Bangkok, should be made.

The current tropical medicine research situation in Thailand is somewhat unbalanced. The most prestigious organizations with the greatest research capacity are located within Bangkok. Most institutes located in the North, Northeast, and South do not have the infrastructure, funding, or expertise to conduct tropical medicine research effectively. However, their locations should situate them ideally to conduct research. The ideal way to solve this problem is by establishing joint laboratories, facilities, or research groups between the large Bangkok institutes and the smaller provincial ones. In addition to solving the logistical problem of transport and field site facilities, it would also give smaller institutes a greater opportunity for funding and training by working alongside the top Thai experts in tropical medicine.

The solution to the challenges of conducting research in Southern Thailand remains unclear. Political unrest and acts of violence are still prevalent in the three southernmost provinces: Yala, Narathiwat, and Pattani. However, these provinces are significant for public-health policy. For example, it is believed that leishmaniasis could become an emerging threat in coming years for Thailand, and the first reported autochthonous case came from the South. Chikungunya disease seems to be more prevalent in the South, as well. During a 2009 outbreak, the largest number of cases occurred in the southern provinces of Songkhla, Narathiwat, and Pattani. Ignoring research
in this region of Thailand may leave important gaps, making it impossible to develop sound public-health policies for the Nation.

The capacity for research administration needs to expanded, and Thai funding mechanisms such as NSTDA, TRF, or NCRT should start to provide funding for this purpose. The English language barrier is a difficult one for Thai researchers to overcome. Without the necessary support, I can prevent them from obtaining funding and from being published. With the expansion of administrative capacity, financial and activity transparency and accountability within institutes needs to be encouraged and enforced. In developing this report, many institutes were reluctant to share information, especially financial information. These practices make it difficult to reach the financial accountability standards that are required by international funding agencies, such as the National Institutes of Health (NIH), the Gates Foundation, and the European Union.

Funding opportunities for young researchers and neglected diseases should be expanded upon. Currently, even the T-2, which is the only fund specific to tropical medicine, does not offer grants for neglected diseases such as helminthiases, Chikungunya, and Japanese encephalitis. More funding mechanisms are needed to train young researchers and give them opportunities to manage their own projects, to ensure the next generations of tropical medicine researchers are well-prepared.
Section II
Profiles and Strengths
Central Thailand

*Which includes the following provinces:*

- Anangthong
- Ayutthaya
- Bangkok
- Chachoengsao
- Chainat
- Chanthaburi
- Chonburi
- Kanchanaburi
- Lopburi
- Nakhon Nayok
- Nakhon Pathom
- Nonthaburi
- Pathum Thani
- Phetchaburi
- Prachinburi
- Prachuap Khirikhan
- Ratchaburi
- Rayong
- Sa Kaeo
- Samut Prakan
- Samut Sakhon
- Saraburi
- Singburi
- Suphanburi
- Trat

The following institutions are relevant to tropical diseases and located in the Central region:

<table>
<thead>
<tr>
<th>#</th>
<th>Institute</th>
<th>Province</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Asian Institute of Technology (AIT)</td>
<td>Pathum Thani</td>
<td>41</td>
</tr>
<tr>
<td>2</td>
<td>Armed Forces Research Institute of Medical Sciences (AFRIMS)</td>
<td>Bangkok</td>
<td>42</td>
</tr>
<tr>
<td>3</td>
<td>Burapha University (BUU)</td>
<td>Chonburi</td>
<td>45</td>
</tr>
<tr>
<td>4</td>
<td>Chonburi Regional Hospital (CRH)</td>
<td>Chonburi</td>
<td>47</td>
</tr>
<tr>
<td>5</td>
<td>Chulabhorn Research Institute (CRI)</td>
<td>Bangkok</td>
<td>48</td>
</tr>
<tr>
<td>6</td>
<td>Chulalongkorn University (Chula)</td>
<td>Bangkok</td>
<td>50</td>
</tr>
<tr>
<td>7</td>
<td>Huachiew Chalermprakiet University (HCU)</td>
<td>Samut Prakan</td>
<td>53</td>
</tr>
<tr>
<td>8</td>
<td>King Mongkut's University of Technology, Chonburi (KMUUT)</td>
<td>Bangkok</td>
<td>55</td>
</tr>
<tr>
<td>9</td>
<td>Mahanakorn University of Technology (MUT)</td>
<td>Bangkok</td>
<td>57</td>
</tr>
<tr>
<td>10</td>
<td>Mahidol University (MU)</td>
<td>Bangkok†</td>
<td>58</td>
</tr>
<tr>
<td>11</td>
<td>Ministry of Public Health (MOPH)</td>
<td>Nonthaburi</td>
<td>72</td>
</tr>
<tr>
<td>12</td>
<td>National Center for Genetic Engineering and Biotechnology (BIOTEC)</td>
<td>Pathum Thani</td>
<td>76</td>
</tr>
<tr>
<td>13</td>
<td>Phramongkutklao College of Medicine (PCM)</td>
<td>Bangkok</td>
<td>79</td>
</tr>
<tr>
<td>14</td>
<td>Queen Saovabha Memorial Institute (QSI)</td>
<td>Bangkok</td>
<td>81</td>
</tr>
<tr>
<td>15</td>
<td>Queen Siritk National Institute of Child Health (QSNICH)</td>
<td>Bangkok</td>
<td>83</td>
</tr>
<tr>
<td>16</td>
<td>Rajamangala University of Technology Tawan-ok (RUTT)</td>
<td>Chonburi</td>
<td>85</td>
</tr>
<tr>
<td>17</td>
<td>Ramkhamhaeng University (RU)</td>
<td>Bangkok</td>
<td>86</td>
</tr>
<tr>
<td>18</td>
<td>Silpakorn University (SU)</td>
<td>Bangkok</td>
<td>88</td>
</tr>
<tr>
<td>19</td>
<td>Srinakarinwirot University (SWU)</td>
<td>Bangkok</td>
<td>90</td>
</tr>
<tr>
<td>20</td>
<td>Thai Red Cross AIDS Research Centre (TRCARC)</td>
<td>Bangkok</td>
<td>92</td>
</tr>
<tr>
<td>21</td>
<td>Thammasat University (TU)</td>
<td>Bangkok</td>
<td>94</td>
</tr>
</tbody>
</table>

† For the purposes of this study, Mahidol University is counted within the province of Bangkok, in spite of its main campus being in Nakhon Pathom. This is because most of the divisions of MU focusing on tropical medicine, including the Faculties of Tropical Medicine, Science, Medicine-Siriraj, Medicine-Ramathibodi, and MORU are in Bangkok, not Nakhon Pathom.
[1] Asian Institute of Technology (AIT)
Established: 1959
Province: Pathum Thani
Address and Contact Information: 58 Moo 9, Km. 42, Paholyothin Highway, Klong Luang, Pathumthani 12120 Thailand. Phone: +66(0)2-516-0110-44; Fax: +66(0)2-516-2126
Website: http://www.ait.ac.th/about
Director: Prof. Said Irandoust; e-mail: president@ait.ac.th

Vision and Mission: AIT will strive to become a leading and a unique regional multicultural institution of higher learning, offering state of the art education, research and training in technology, management and societal development.

Contribution to Tropical Diseases: Researchers at the Remote Sensing and Geographic Information Systems (RS-GIS) unit specialize in GIS applications to various fields. Many of their projects have dealt with spatio-temporal analysis in regards to tropical diseases, such as dengue, malaria, diarrheal diseases, and scrub typhus.

Tropical Disease(s) studied: Mainly dengue, diarrheal diseases, and malaria; some helminthiases, scrub typhus, and melioidosis

Infrastructure: AIT has 3 Schools and 15 Research and Outreach Centers. Besides the usual labs and academic buildings, the main campus includes housing, sports, and medical facilities, a conference center, and a library with over 230,000 volumes and 830 print and on-line periodicals.

Research: Tropical medicine research is only done by Remote Sensing and Geographic Information Systems (RS-GIS) Unit, on topics that apply tropical diseases to remote sensing (RS), geographic information system (GIS), global positioning system (GPS), digital mapping technology, and digital photogramming

Prominent Researchers/Clinicians:
Dr. Nitin Kumar Tripathi, of the Remote Sensing and Geographic Information Systems (RS-GIS) unit, focuses on the application of Geoinformatics in environment, marine, health and agriculture fields. He works on the development of wireless GIS using the concept of Internet GIS and wireless devices such as wireless LAN, personal digital assistant (PDA) with mobile phone (GPRS) for real-time spatial data logger and also air-pollution monitoring. He has previously applied his research to spatio-temporal diffusion pattern and hotspot detection of dengue and exploring spatial patterns and hotspots of diarrhea in Thai provinces.

Dr. Kiyoshi Honda, of the Remote Sensing and Geographic Information Systems (RS-GIS) unit, used satellite technology to investigate the potential association of dengue hemorrhagic fever incidence and remote senses land surface temperature
[2] Armed Forces Research Institute of Medical Sciences (AFRIMS)

Agency: AFRIMS is the result of a collaboration between the Walter Reed Army Institute of Research (WRAIR) and the Royal Thai Army.

Established: 1959

Province: Bangkok

Address and Contact Information: 315/6 Ratchawithi Road, Ratchathewi, Bangkok 10400, Thailand. Phone: +66(0)2-644-4888; Fax: +66(0)2-354-7873

Website: http://www.afrims.org/

Director: Colonel Robert A. Bowden; e-mail: rbowden@afrims.org

Vision and Mission: To achieve excellence in research, medicine, and military science and thusly, reduce the loss of life in the Army by developing modern technology. To research and develop medical science, for clinicians, policymakers, and all mankind.

Contribution to Tropical Diseases: Our relevant and novel research continues to arm primary and public health providers with a plethora of new tools to thwart multiple infectious disease threats. AFRIMS delivers by testing the latest vaccines and therapeutics, sharing the wealth of knowledge on current and emerging disease agents, and developing or validating the means to identify these culprits.

Tropical Disease(s) studied: Malaria, typhus, melioidosis, tuberculosis, HIV, Chikungunya, dengue, Japanese encephalitis, diarrheal diseases.

Hospital Facilities/Field practice area: The Kamphaeng Phet-AFRIMS Virology Research Unit (KAVRU) is a field station of the Department of Virology, located in the province of Kamphaeng Phet. KAVRU was established in 1980 and is located on the grounds of the Kamphaeng Phet Provincial Hospital (KPPPH) and has a long history of collaborative research with the Ministry of Public Health and KPPPH. Highlights of the collaboration include the conduct of two phase 3 vaccine trials (Japanese encephalitis and hepatitis A) and 10 years of conducting prospective dengue surveillance in cohorts of primary school children. Current projects include conduct of influenza surveillance and studies of dengue virus evolution and vector-host-virus interactions.

Additionally, the AFRIMS-Kwai River Christian Hospital Clinical Center (AKCC) in Kanchanburi, is another field/hospital site. Located in the epicenter of drug resistant malaria, Malaria prevention and treatment have historically been prime objectives at AFRIMS. The development of an effective anti-malarial vaccine is a highly desirable goal, and AFRIMS has ongoing projects to evaluate several promising new vaccine candidates in both laboratory and field studies. AFRIMS completed testing of a blood-stage vaccine in 1350 volunteers at a remote field site near the Myanmar (Burmese) border. Other efforts have focused on field trials of new anti-malarial compounds, and evaluation and testing of new mosquito repellents, insecticides and barriers to reduce human/mosquito contact. A study to evaluate the antibiotic Azithromycin as a malaria prophylactic is currently underway in Kanchanaburi province. New treatment strategies to combat multiple drug-resistant strains of malaria include the testing of combinations of existing FDA-approved drugs, the testing of more active forms of known drugs and the development of members of a promising new class of drugs: the artemisinin derivatives.
Outside of Thailand, AFRIMS also has sites in Nepal and the Phillipines.

**Major Equipment:** AFRIMS has well-equipped microbiology, immunology, and molecular biology laboratories. Equipment includes multiple real-time PCR machines, Luminex machine, PFGE equipments, column sequencer, ELISPOT reader, automated plate-washer, low-density microarray reader, ultracentrifuges, incubators, freezers, etc. Also, there are multi-channel flow cytometers with cell sorting capability, multicolumn sequencers, high-pressure liquid chromatography, etc. The AFRIMS Biomedical Maintenance Section coordinates and documents periodic maintenance, repair, and calibration of equipment.

**Research:** The following departments contribute to tropical disease research:

**Department of Enteric Diseases:**
The department actively participates in the evaluation of enteric vaccines. The department also actively develops and evaluates of new diagnostics for diarrheal diseases. The Department has developed real-time polymerase chain reaction assays for the bacterial pathogens Shigella, Salmonella, enterotoxigenic *E. coli* (ETEC), *Campylobacter*, and *Vibrio* as well as the hard to diagnose Noroviruses and the parasites *Cyclospora* and *Cryptosporidia.*

**Dr. LadaPorn Bodhidatta** studies a number of diarrheal diseases. Recent studies include a study of rotavirus disease in young Vietnamese children, *Vibrio parahaemolyticus* in expatriates living in Thailand,

**Department of Entomology:**
The department specializes in vector biology, surveillance, and control research, malaria research, ectoparasitic and zoonotic disease research, vector-borne and zoonotic disease diagnostics programs, and GIS and spatial-temporal analyses of vector-borne and zoonotic diseases. Recent studies are focused on gametocytogenesis in *Plasmodium falciparum* and *P. vivax* and the production of different stages of human and animal malaria parasites in order to support drug and vaccine development and transmission blocking strategies.

**Dr. Kriangkrai Lerdthusnee** specializes in studying the *Leptotrombidium* vectors of scrub typhus. A recent study involved testing natural repellents against the *Leptotrombidium* chiggers and the transstadial and transovarial transmission of scrub typhus in *Leptotrombidium imphalum* and *Leptotrombidium chiangraiensis.*

**Dr. Alongkot Ponlawat** specializes in vector identification and surveillance and has conducted numerous studies on the dengue vector, including studying the insecticide susceptibility of *Aedes aegypti* and *Aedes albopictus* across Thailand.

**Department of Immunology:**
The department’s research addresses the threats produced by falciparum and vivax malaria by evaluating new or improved vaccines, prophylactic and therapeutic drugs, rapid diagnostics and by focusing on the basic biology and epidemiology of drug-resistant malaria. Secondly, research also assess emerging febrile diseases throughout high risk regions of Southeast Asia.

**Dr. Sathit Pichyangkul** conducts studies on the malaria vaccine, including studies on the safety and immunogenicity of rts,s+trap malaria vaccine, formulated in the as02a adjuvant system, in infant rhesus monkeys and a pre-clinical evaluation of the malaria vaccine candidate *P. falciparum* MSP1(42) formulated with novel adjuvants or with alum.
Department of Retrovirology:
The department prepares for and conducts clinical trials (phases I-III) of preventive HIV vaccines for use in U.S. military members deployed to HIV endemic areas outside the United States. This mission is supported through i) the evaluation of candidate vaccines for safety, immunogenicity and efficacy, ii) the identification and characterization of potential cohorts for phase III vaccine trials, iii) the establishment of diagnostic assays which differentiate infection from vaccine-induced immune responses, and iv) the establishment of virologic methods to characterize the HIV viruses circulating in risk areas and potential sites of vaccine trials and immunological methods to characterize the responses induced by candidate vaccines.

Dr. Sorachai Nitayaphan works on HIV-1 vaccine development and was recently part of the clinical trial vaccination with ALVAC and AIDSVAX to prevent HIV-1 infection in Thailand.

Department of Veterinary Medicine:
The department provides suitable research animals, free of confounding factors, and ensures the humane, proper and safe care, and appropriate use of animals supporting AFRIMS research into disease mechanisms and phase I/II trials of product development. Independent research activities are conducted in support of the AFRIMS mission.

Dr. Duangporn Phulsuksombati has conducted numerous studies on leptospirosis in animals. Recently, she investigated the expression of TNF-α, TGF-β, IP-10 and IL-10 mRNA in kidneys of hamsters infected with pathogenic Leptospira.

Department of Virology:
The department develops and evaluates products, and collects epidemiologic data on infectious diseases such as influenza, dengue, Chikungunya, Japanese encephalitis, and several others. Efforts include clinical trials, field site development and capacity building, epidemiology studies and service sample collection.

Dr. Ananda Nisalak has recently completed a spatial and temporal clustering of dengue virus transmission in Thai villages and a study on actors influencing dengue virus isolation by C6/36 cell culture and mosquito inoculation of nested PCR-positive clinical samples.

Dr. Stephen J. Thomas primarily works on vaccine development, including ones for dengue and Japanese encephalitis. He recently published a commentary on the necessity and quandaries of dengue vaccine development.

Kamphaeng Phet-AFRIMS Virology Research Unit
MORU and KPPPH regularly collaborate together, especially on projects related to dengue and influenza. There are 6 researchers at KPPPH that collaborate with KAVRU to conduct research, which has resulted in the Kamphaeng Phet Prospective Dengue Surveillance Study and the Prospective Surveillance of Febrile Illness for Dengue-Endemic Areas in Asia.

Dr. Kamchai Rungsinsunpaiboon, of the Department of Pediatric and Internal Medicine at KPPPH, has assisted AFRIMS with projects studying dengue virus circulation, evolution, virus-vector, and virus-host interactions in Kamphaeng Phet Province.
[3] Burapha University (BUU)
Established: 1955
Province: Chonburi
Address and Contact Information: 169 Long-Hard Bangsaen Road, Saensook Municipality, Muang District, Chonburi Province, 20131. Phone: +66(0)3810-2222; Fax: +66(0)3839-0351
Website: http://www.buu.ac.th/en/index.php
Director: Prof. Sompol Pongthai, MD, President; e-mail: sompolp@buu.ac.th

Vision and Mission: To generate qualified and intellectual individuals through world-class standard education for a long-lasting Thai society with knowledge richness. This will be done through generating intellectual knowledge and management practices to enhance social development, providing world-class standard education in order to produce ethically minded, specialized, and potential graduates, providing academic services to the society in order to establish it an intellectual richness and self-reliant society, supporting and maintaining Thai arts, culture and Thai identity and enhancing strengths of the University through the establishment of highly effective management system making it independent and self-sufficient.

Contribution to Tropical Diseases: BUU has published studies on a number of different tropical diseases. Researchers there study social issues related to disease stigmas, public policy and its effect on disease control, vaccine studies, and molecular and microbiology studies.

Tropical Disease(s) studied: Helminthiases, HIV, tuberculosis, malaria.

Infrastructure: Burapha University (BUU) is one of Thailand's major public universities located in the Bangsaen, Chonburi. The 256-acre campus hosts approximately 36,245 students (as of 2009), aided by 992 teaching staff and 300 general employees. BUU has two branch campuses. One branch of BUU is in Amphur Ta-Mai, Chantaburi. It was set up in 1996 and opened in 2001. Another branch is in Amphur Wattananakorn, Sakaeo Province. It was set up in 1997.

Hospital Facilities: The Burapha University Health Sciences Center serves as the training center for all nursing and medical students. The Health Science Center, with a capacity equivalent to that of a 150-bed hospital, is an organization concentrating on research as well as the provision of health services for students, university personnel, and the general public. The University, through the University Hospital which is located on campus, provides medical services round the clock.

Research: Tropical Medicine research at BUU ranges from community level to molecular level. The Faculty of Public Health is very active in malaria research and other mosquito-borne diseases. They have carried out projects such as “Health Education for Mosquito Borne Disease Awareness and Prevention Strategies Based on the Social Ecology of different Cultural Groups on The Thai Borders” and “Human activities Contributing to a malaria outbreak in Kanchanaburi.”
Prominent Researchers/Clinicians:

Dr. Thirapong Thiramanus, of the Faculty of Public Health, is interested in public-health policy and sustainable community development, as well as vector control strategies. He recently investigated the efficacy of insecticide-treated curtains for controlling the dengue vector *Aedes aegypti*.

Dr. Prapa Nunthawarasilp, of the Faculty of Public Health, studies the malaria transmission dynamics by *Anopheles* in Trat and the mutation of *mdr* 1 gene and dihydrofolate reductase gene of *Plasmodium vivax* sporozoite stage in *Anopheles* salivary by nested PCR.

Dr. E. Suchart Upatham, of the Department of Medical Science at the Faculty of Science, has devoted his career to studying schistosomiasis. He recently completed a study on the DNA-sequence variation among *Schistosoma mekongi* populations and related taxa to reveal the phylogeography and the current distribution of Asian schistosomiasis.

Dr. Wilaiphan Sawatphanit, of the Faculty of Nursing, has interests in HIV infections in pregnant women. She has published multiple articles about depression in HIV-positive mothers and other psychological issues.

Dr. Somsak Pantuwatana, of the Department of Medical Science at the Faculty of Science, is interested in microbial insecticides (*Bacillus thuringiensis* and *Bacillus sphaericus*) and biological control of insect pests and tropical disease vectors. Also, he works on developing vaccines against Japanese B encephalitis and Hepatitis B viruses.

Dr. Amporn Thongkukietkul, of the Department of Biology at the Faculty of Science, is interested in cell and molecular biology, particularly in molluscs. She has also published on a study entitled “Plasmodial ortholog of *Toxoplasma gondii* rhoptry neck protein 3 is localized to the rhoptry body.”
[4] Chonburi Regional Hospital (CRH)
Agency: CRH is affiliated with the MOPH
Established: 1919
Province: Chonburi
Address and Contact Information: 69 Moo, 2 Sukhumvit, Ban Suan, Muang, Chonburi 20000.
Phone: +66(0)3893-1000; Fax: +66(0)3893-1100
Director: Dr. Chatree Tantiyawong, Director;
Website: http://www.cbh.moph.go.th/index.php (Thai only)

Vision and Mission: To become a top health care center in Thailand by providing quality standards from primary to tertiary level care, to increase the capacity available to support public health policies for people both inside and outside the region, to be an institution of academics, healthcare, manufacturing, and knowledge of public health needs of the country.

Contribution to Tropical Diseases: CRH has collaborated with several other institutes on studies of dengue and HIV. They have also participated in several clinical trials, most recently out of the IMPAACT network.

Tropical Disease(s) studied: HIV, dengue, rabies

Infrastructure: CRH is composed of several specialty buildings, including a General Services Building, a Pharmacy, a Nutrition building, a Cardiac center, an Out-Patient department building, a Bone-Related Diseases building, Psychiatric Building

Research: Most research has been part of clinical trials that were collaborations with other institutes, on dengue and HIV.

Prominent Researchers/Clinicians: Dr. Suchat Hongsiriwon, of the Department of Pediatrics, has conducted numerous clinical studies on dengue and HIV in children, including studies of dengue hemorrhagic fever in infants and epidemiologic survey of malignancies in children infected with human immunodeficiency virus.
[5] Chulabhorn Research Institute (CRI)

Established: 1955
Province: Bangkok
Address and Contact Information: 54 Kamphaeng Phet, 6 Talat Bang Khen, Lak Si, Bangkok 10210. Phone: +66(0)2-574-0622; Fax: +66(0)2-574-0618
Website: http://www.cri.or.th/en/index.php
Director: Professor Dr. Her Royal Highness Princess Chulabhorn, President; e-mail: offrs@cri.or.th

Vision and Mission: The ultimate goal of CRI is to utilize science and technology to improve "Quality of Life", a concept first propounded and practice by His Majesty the King in the Royal Initiated Projects. This is done through promoting and conducting basic as well as applied research of national importance, in particular, that which will improve "Quality of Life," acting as a centre for education and developing high caliber personnel in the field of science and technology, bringing together local and foreign scientists to discuss and solve emerging problems, promoting scientific exchange, acting as a center for international cooperation, and identify, catalyse and mobilize resources for research and development in science and technology.

Contribution to Tropical Medicine: Research is the core activity of the institute. CRI will initiate and conduct fundamental and advanced research with particular emphasis on key major disciplines. Currently, priority research is undertaken in Natural Products, Medicinal Chemistry and Organic Synthesis, Biomedical Research, Environmental Toxicology, and Biotechnology. Although much of the CRI’s research is devoted to more basic science than tropical medicine, there are still a number of laboratory groups that directly or indirectly do research on tropical disease.

Tropical Diseases Studied: Malaria, tuberculosis, HIV, melioidosis, and diarrheal diseases such as cholera.

Facilities & equipment: Major research facilities include various state-of-the-art research equipment readily available for the 9 laboratories, the integrated research program, and the central facilities. The major equipments for the biomedical, environmental health sciences and biotechnology research includes MicroArray System; Gene Expression System; Cytogenetic Analysis System; Histopathology Equipments: Microtome, Tissue Embedding, Tissue Processor; Electrophoresis System; Nucleic Acid Isolation System; Gel Documentation System; DNA Sequencer; Bioanalyzer; Laser Capture Microdissector; ELISA Reader; Bio-assay Reader; Phosphor Imager; Polymerase Chain Reaction; Coulter Counter; and Lumi-Aggregometer.

Hospital Facilities: Chulabhorn Hospital has an affiliation with CRI, but is more devoted to cancer treatment than communicable diseases. It has devoted itself for the provision of health care treatment, both physical and mental, to cancer patients. With the facilities of 100 inpatient beds, the hospital encourages a full range of services, along with Cancer Risk Assessment Clinic which offers accurate diagnosis & staging, and other modernized medical services such as cancer operation, radiation oncology, and chemotherapy to provide palliative cares for cancer patients. Besides, the hospital also houses cancer-related research, such as translational research, clinical
research, and community research, leading to appropriate and modern diagnosis, treatment and prevention of cancer, with the principal aim of giving patients the opportunity of being cured of cancer and improving the patients’ quality of life, as well as reducing the risks of cancer development and the overall incidence of cancer in Thailand.

Training and services: The CRI regularly coordinates short-term training programs on various topics. Recent tropical medicine relevant topics include “Molecular Genetic Approaches to Define Efflux Pump Function in *Burkholderia pseudomallei*,” “The Role of Vaccines and Translational Research in Emerging Diseases and Environmental Health,” and general topics on malaria.

Also, through the *Chulabhorn Graduate Institute* (CGI), graduate courses that incorporate an intertwining of scientific disciplines has brought together the basic principles (chemistry, biology, physics, mathematics, and computer programming) as well as generated new ways to investigate new problems that no scientists in the past ever imagined. Current curriculums offered include Applied Biological Sciences, Biological Chemistry, and Environmental Toxicology.

Research: The researchers at the CRI focusing on tropical diseases are from 3 main laboratories: the Laboratory of Medicinal Chemistry (LMC), the Laboratory of Organic Synthesis (LOS), and the Laboratory of Immunology (LI). The LMC studies anti-malarial activities of mefloquine and its derivative. They devote effort into developing some alternative approaches for the synthesis of the key intermediates, not only for mefloquine itself, but also for its derivatives. They aim is to incorporate flexibility in our synthetic routes to allow for an easy access to a large number of structurally diverse analogs for further anti-malarial evaluation. The LOS focuses on developing new antiviral agents against HIV, such as nevirapine derivatives, wrightiadiione, and michellamines. The LI is developing diagnostic kits for the detection of antigens/antibodies of *Vibrio cholerae*, *Fasciola gigantica* and *Pythium insidiosum*.

Prominent Researchers/Clinicians:  
**Dr. Somsak Ruchirawat**, of the Laboratory of Medicinal Chemistry, studies organic chemistry, medicinal chemistry, organic synthesis, natural products chemistry. Recent publications relevant to tropical medicine include studies investigating the antiplasmodial and antimycobacterial activities of various indigenous Thai plants.  
**Dr. Nisachon Khunnawutmanotham**, of the Laboratory of Organic Synthesis, focuses her research on the synthesis of bioactive compounds, including a recent study of the novel 2-chloro-8-arylthiomethylidipyridodiazepinone derivatives that exhibited anti HIV-1 reverse transcriptase activity.  
**Dr. Suvit Loprasert**, of the Laboratory of Biotechnology, has interests in the biodegradation of the environmental pollutant compounds and protein engineering of lipase enzymes. He has contributed work to molecular studies on *B. pseudomallei*, which include a study on its oxyR gene expression mutant characterization, as well as the regulation of the katG-dpsA operon and the importance of KatG in survival of *B. pseudomallei* exposed to oxidative stress.
Chulalongkorn University (Chula)

Established: 1917
Province: Bangkok
Address and Contact Information: 254 Phayathai Road, Pathumwan, Bangkok 10330 Thailand. Phone: +66(0)2-215-0871-3; Fax: +66(0)2-215-4804
Website: http://www.chula.ac.th/cuen/
Director: Professor Pirom Kamolratanakul, MD, President; e-mail: pirom.k@chula.ac.th

Vision and Mission: To become “The Pillar of the Kingdom” by becoming a world-class university, serving as the kingdom’s source of knowledge, establishing a quick, close-knit and efficient management system, and being a welcoming home for the righteous and competent

Contribution to Tropical Medicine: Chula’s research activities include basic science studies, transitional and clinical research. Activities include research on advanced technology-based research, cancer, degenerative diseases, transitional research, public health research, emerging infectious diseases, and tropical diseases. There are more than thirty-five research programs and research centers within the university.

Tropical Diseases Studied: Malaria, dengue, rabies, helminthiases, tuberculosis, HIV, leptospirosis, toxoplasmosis, melioidosis, and many others.

Infrastructure: Chulalongkorn University is composed of a total of 41 faculties, departments, colleges, academic, research, and service institutes, and academic offices.

Hospital facilities: The Chulalongkorn Department of Medicine, in cooperation with the Thai Red Cross Society, has the King Chulalongkorn Hospital. In addition to offering examination and treatment services to the public, King Chulalongkorn Memorial Hospital also provides training facilities to domestic doctors of Chulalongkorn University's Faculty of Medicine and, through its School of Radiology, supplies medical personnel specialized in the field. The Hospital has been a center of academic excellence in various fields of medicine in Thailand and is determined to maintain the quality of its health care services in line with the motto "service-minded devotion to society." With an in-patient capacity of 1,479 beds, it is one of the largest hospitals in Thailand.

Services: Through the Faculty of Science, industrial services such as product proximate analysis, nutrition analysis for packaging labeling, vitamin analysis, heavy metal analysis, pesticide and drug residues, melamine analysis, GMOs testing, bimolecular testing, and serum testing are provided.

Research: Chulalongkorn University conducts approximately 1000 studies annually, including studies on the following:

Rabies and Nipah virus: Having been established for more than 25 years, our research group has worked on rabies from molecular epidemiology, and pathophysiology to clinical research. Our work has been published in several leading journals such as the New England Journal of Medicine and Lancet. Most importantly, regimens for rabies vaccines currently used worldwide
are based largely on the results obtained from Chula’s work. Recently, our work has expanded to include other neurotropic viruses such as the Nipah virus.

HIV/AIDS: In collaboration with the **Thai Red Cross AIDS Research Center**, Chula has a strong clinical center known as **HIV-NAT (The HIV Netherlands, Australia, and Thailand Research Collaboration)**. The work focuses on antiretroviral therapy appropriate for Thailand and developing countries, new drug clinical development, therapeutic strategies, pharmacokinetics and vaccine trial. Results have been published in several journals and some have been implemented by the WHO. For transitional research, Chula focuses on DNA vaccine preclinical development, HIV T-cell immunology, epitope mapping and low cost HIV monitoring assays to support the HIV treatment and care program in the country.

Dengue: The dengue research group is interested in dengue pathogenesis and transmission. They have demonstrated that the dengue virus is present in several types of secretion fluids such as urine and saliva of acutely-infected patients. In addition, the virus in urine is live and can be transmitted to mosquitoes. In dengue-hyperendemic areas such as Thailand, the virus genome is present in the bone marrow of selected adults. They are in the process of exploring the possibility of dengue persistence in infected hosts and its potential contribution to severe clinical manifestations.

Malaria: Over the past 2 decades, the malarial research group has focused mainly on molecular epidemiology, molecular characterization of malaria vaccine candidate genes, molecular diagnosis, population genetics, molecular evolution and phylogenetics of malaria. Several field studies have been conducted involving malaria-infected individuals, anopheline vectors, human and nonhuman primate malarias in various disease endemic areas of Thailand where a number of samples have been obtained and available for subsequent large-scale analysis. The recent discovery of nonhuman primate malaria in humans have reaffirmed the potential significance of the fifth human malaria species and the role of macaque monkeys as reservoir hosts for disease transmission via mosquitoes to humans under natural condition. Similar aspects of these studies have expanded to include other opportunistic parasites that are of clinical importance, especially enteric coccidiosis in immunocompromised patients.

Vaccine Research & Development: The main focus of the vaccine research center is to develop a DNA vaccine technology for 3 major diseases: HIV, dengue and house dust mite allergy. The development includes human codon optimization to make recombinant DNA construct with CpG motif and includes immunizing mice with needle free injectors. The center is also involved in a phase I HIV vaccine trial (DNA primed/Fowl pox boost strategy) to evaluated the safety and to use HIV immunogenicity testing (intracellular cytokine staining) to prove the vaccine’s efficacy in eliciting an immune response against HIV.

**Prominent Researchers/Clinicians:**
**Dr. Yong Poovorawan**, of the Faculty of Medicine, originally focused on the fields of pediatric hepatology and viral hepatitis, especially in applications to the Thai healthcare system, on which such works have had significant impact. Now, he also studies virology. Dr. Yong is widely recognized for his work on genetic sequencing and detection of the H5N1 avian influenza virus.
Dr. Viroj Wiwanitkit, of the Department of Laboratory Medicine at the Faculty of Medicine, is interested in environmental toxicology and chemistry, clinical tropical medicine and public health. He has contributed to past studies on HIV, dengue, *E. coli*, and many more.

Dr. Kiat Ruxrungtham, of the Faculty of Medicine, has been a major contributor to research on HIV/AIDS, allergy and asthma, and vaccine development. For AIDS, his research addresses the topic of antiretroviral clinical trials, immunotherapy, drug resistance, pharmacokinetics, CTL epitope mapping, and vaccine development on HIV-1.

Dr. Praphan Phanuphak, primarily works on AIDS and rabies, and past studies have focused on anti-HIV agents, HIV protease inhibitors, ritonavir, reverse transcriptase inhibitors, rabies vaccines, stavudine, and indinavir.

Dr. Vorapong Phupong, of the Department of Obstetrics and Gynecology at the Faculty of Medicine, focuses mainly on infectious diseases and pregnancy. Her recent studies have looked at case reports of scrub typhus occurring in pregnant women, and how to diagnose that with a serum immunofluorescent assay and treat with chloramphenicol.

Dr. Somchai Jongwutiwes, of the Department of Parasitology at the Faculty of Medicine, studies falciparum, vivax, and knowlesi malaria in terms of molecular sequencing and phylogeny. His most recent studies have looked at saliva and urine as alternative DNA sources for malaria diagnosis by mitochondrial DNA-based PCR assays and the heterogeneity and complexity of malaria in the Greater Mekong Subregion.

Dr. Chaturong Putaporntip, of the Department of Parasitology at the Faculty of Medicine, is a parasitologist primarily interested in molecular protozoology and *Plasmodium vivax*. 
[6] Huachiew Chalermprakiet University (HCU)

Established: 1941
Province: Samut Prakarn
Address and Contact Information: 18/18, Bangna-Trad Road, k.m.18, Bangplee District, Samut Prakarn, 10540, Thailand. Phone: +66(0)2-312-6300; Fax: +66(0)2-312-6237.
Website: http://www.hcu.ac.th/ (Thai only)
Director: Dr. Prachak Poomvises, President; e-mail: prachak@hcu.ac.th

Vision and Mission: Produce graduates who are up to standard. It is recognized internationally and technical excellence.

Contribution to Tropical Medicine: HCU’s Faculty of Medical Technology is very involved in tropical medicine, studying malaria, helminthiases, leptospirosis, melioidosis, tuberculosis, and other tropical diseases. However, perhaps due to language constraints, they rarely publish in English, instead relying on local journals and newsletters.

Tropical Diseases Studied: Helminthiases, malaria, tuberculosis

Infrastructure: HCU has 13 Faculties or Schools, including the Faculty of Business Administration, Faculty of Liberal Arts, Faculty of Pharmacy, Faculty of Law, Faculty of Arts, Faculty of Physical Therapy, Faculty of Nursing, the School of Chinese Medicine, Faculty of Science and Technology, Faculty of Public and Environmental Health, Faculty of Social Administration and Social Welfare, the School of Chinese Language and Culture.

The Faculty of Medical Technology has laboratories that specialize in Clinical Chemistry, Microbiology, Clinical Microscopy, Immunology/Blood Bank, and Parasitology.

Research:
The Faculty of Medical Technology has several ongoing projects related to tropical diseases. Currently, these include:
- A comparison of antibodies to the virus Leptospira by IIP and IFA for the diagnosis of Leptospirosis.
- An indirect comparison, immune-fluorescent, The use of a single antigen and the use of two types of antigens to detect antibodies against Leptospira interrogans and Burkholderia pseudomallei.
- Development of a single test IgM IFA diagnostic technique for acute phase leptospirosis, scrub typhus, and melioidosis.

Prominent Researchers/Clinicians:
Dr. Choosak Nithikathkul studies various parasitic infections, including malaria, taeniasis, and opisthorchiasis, particularly in hill tribe populations and schoolchildren. He recently conducted a study on malaria and enterobiasis among the Karen Long-neck tribe in Mae Hong Son.
Dr. Watcharin Rangsiapanuratn, of the Department of Clinical Microbiology at the Faculty of Medical Technology, studies the chemical compositions and anti-microbial activities of various natural herbal extracts.
Dr. Sarawut Suttirat, of the Department of Immunology at the Faculty of Medical Technology, is interested in developing tools for diagnosing leptospirosis by immunological methods and recently studied a comparison of microplate hybridization with gel electrophoresis and dot blot hybridization for the rapid detection of Mycobacterium tuberculosis PCR products.
[8] King Mongkut's University of Technology, Thonburi (KMUTT)  
**Established:** 1960  
**Province:** Bangkok  
**Address and Contact Information:** 54 Kamphaeng Phet, 6 Talat Bang Khen, Lak Si, Bangkok 10210. **Phone:** +66(0)2-427-0039;  
**Website:** http://www2.kmutt.ac.th/en_index.aspx  
**Director:** Assoc. Prof. Sakarindr Bhumiratana, President; **e-mail:** sakarindr.bhu@kmutt.ac.th

**Vision and Mission:** KMUTT is committed to the search for knowledge, determined to be at the forefront of technology and research, maintaining the development of morally correct and proficient graduates, endeavouring for success and honor in order to be the pride of our community, and striving to become a world-class university.

**Contribution to Tropical Medicine:** KMUTT’s contribution to tropical medicine is limited to a small number of researchers from the Faculties of Science and Engineering that apply technology and basic science theories to studying tropical diseases. With KMUTT shifting focus onto the biological sciences and biological engineering, perhaps it will become a key player in tropical medicine in the future.

**Disease(s) studied:** Malaria, dengue, HIV, tuberculosis

**Infrastructure:** Several multidisciplinary research laboratories were established for the Faculty of Science in the year 2002, including the Risk and Decision Analysis Lab (RADAL), Ozone Research Lab, Software Development, and Food Evaluation and Analysis Laboratories. The laboratories aim to respond to the research needs of the country and deliver outputs for real applications in small & medium enterprises.

**Services:** The Faculty of Engineering provides industrial services that include engineering testing and analysis, providing advice and consultancy services such as education, research, surveys, feasibility studies, acting as a consultant to prepare a standardized system, providing technical advice, designing and constructing and installing systems, etc.

**Research:** The university focuses on developing the 7 following areas of research, in each of which the university already has some expertise:
1. Energy, Environment and Clean Technology  
2. Engineering Technology  
3. Biotechnology, System Biology, Food Technology and Agro-based Technology  
4. ICT and Applied Mathematics  
5. Learning and Industrial Education  
6. Humanities  
7. Policy Studies

In addition to the above 7, the university has started the development of the following new interdisciplinary research areas:
1. Material Science and Engineering  
2. Biological Science and Engineering
Prominent Researchers:

**Dr. Asawin Meechai**, of the Department of Chemical Engineering, is interested in applying metabolic engineering, systems biology and bioinformatics approaches to understand complex mechanisms in *Saccharomyces cerevisiae, Mucor rouxii, Spirulina platensis, Plasmodium falciparum, Mycobacterium tuberculosis*, and *Cassava*.

**Dr. Wudhichai Assawinchaichote**, of the Department of Electronic and Telecommunication Engineering, studies innovative theory and application aspects of control, automation and system in regards to HIV/AIDS. He recently designed a new approach of $H_{\infty}$ fuzzy controller design for nonlinear positive HIV/AIDS infection dynamic model.

**Dr. Pongsak Khunrae**, of the Department of Microbiology at the Faculty of Science, studies the molecular basis of PfEMP1 protein and resetting in malaria and the structural characterisation of VAR2CSA in placental malaria.

**Dr. Kosin Chamnongthai**, of the Department of Electronic and Telecommunication Engineering, has studied ways to apply electronic engineering principles to develop an automatic prediction system of dengue haemorrhagic-fever outbreak risk by using entropy and artificial neural network.
[9] Mahanakorn University of Technology (MUT)
Established: 1990
Province: Bangkok
Address and Contact Information: 140 Chueam Samphan Road, Nong Chok, Bangkok 10530.
Phone: +66(0)2-988-3655;
Website: http://www.mut.ac.th/index_eng2.html
Director: Dr. Sujate Jantarang, President; e-mail: sujate@mut.ac.th

Vision and Mission: MUT will be a leading international university of science and technology and produce excellence in research, teaching, and innovation to society.

Contribution to Tropical Diseases: MUT’s contribution is only based on the work of two researchers. They primarily conduct basic science research.

Name of the Tropical Disease(s) handled are: Malaria, toxoplasmosis

Infrastructure: At present there are four faculties, Engineering, Information Science and Technology, Veterinary Medicine and Business Administration. The main campus of the university is located in Nong chok District, Bangkok. Another campus is located at Vanit2 Building on New Petchaburi Road, Central Bangkok. A massive and continuing investment is located in the field of teaching competence and research laboratories which match facilities found anywhere in the world in most area. Students become familiar with the most modern instrumentation in a learning environment reflecting contemporary industrial practice.

Research: Research interests of the Faculty of Veterinary Medicine are animal health, food safety, herbal medicine, animal endocrinology, swamp buffalo reproduction, goat theriogenology, wildlife medicine and reproduction and animal nutrition. The Molecular and Biotechnology Center was established for researches in scientific field, especially OPU, IVF, IVM, ET, bio-molecular diagnostics and livestock nutrition. The Department of Chemistry researches natural compound extracts from plants and fungi.

Prominent tropical medicine researchers:
Dr. Damrong Sommit, of the Chemistry Department of the Faculty of Science, studies natural extracts from plants and fungi and tests their antimalarial activity. He recently studied 11-hydroxymonocerin from the plant endophytic fungus Exserohilum rostratum and found it to display activity against a multi-drug resistant strain of Plasmodium falciparum.

Dr. Jitbanjong Wiengcharoen, head of the Mahanakorn Veterinary Diagnostic Center in the Faculty of Veterinary Medicine, studies toxoplasmosis in animals and previously collaborated with Mahidol University to develop a PCR technique for detecting Toxoplasma gondii in animal amniotic fluid. She also studies transplacental transmission of the disease in cattle.

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[10] Mahidol University (MU)
Established: 1888
Province: Nakhon Pathom and Bangkok

Main Campus Address and Contact Information: 999 Phuttamonthon 4 Road, Salaya, Nakhon Pathom 73170, Thailand. Phone: +66(0)2849-6231-3; Fax: +66(0)2849-6237;
Website: http://www.mahidol.ac.th/mueng/
Director: President Piyasakol Sakolsatayadorn; e-mail: president@mahidol.ac.th

Vision and Mission: Mahidol University is determined to be a world-class university. Its Mission is to excel in health, sciences, arts, and innovation with integrity for the betterment of Thai society and the benefit of mankind.

Contribution to Tropical Diseases: Mahidol University comprises 17 Faculties, 6 Colleges, 7 Research Institutes and 3 Centers: offering courses in a wide range of disciplines in medicine; public health; nursing, pharmacy; dentistry; engineering; natural sciences; computer science; health sciences; social sciences; applied sciences; applied arts; humanities and arts. It has 2 Faculties of Medicine, a Faculty of Tropical Medicine, 4 teaching hospitals that produce around 1,000 medical doctors annually, and serve as centers for comprehensive specialist medical training and patient care, with a total of around 4,000 beds serving nearly 4.4 million outpatients and 120,000 in-patients per year. Mahidol University offers 148 international degree and diploma programs, excluding short training courses, has international students from over 50 countries enrolled, hosts regular international academic conferences in many disciplines, and had > 1,450 research papers published in international academic journals in 2008. The University collaborates with over 130 overseas academic institutions and international agencies in research, curriculum development, staff and student exchange. It hosts 8 WHO Collaborating Centers, SEAMEO TROPMED Network, HIV/AIDS Regional Coordination Center, Cooperative Research Station (CRS) in Southeast Asia, International Center for Biotechnology, Osaka University, and Mahidol University-Osaka University Collaborative Research Center (MU-OUCRC), Mahidol-Oxford Tropical Medicine Research Unit (MORU), the Communicable Diseases Policy Research Group (CDPRG) (London School of Hygiene and Tropical Medicine), and Kyushu University branch office.

The major faculties that contribute to the field of tropical medicine are the Faculties of Medicine, Public Health, Science, and its Faculty that is dedicated to the field: the Faculty of Tropical Medicine. These faculties cover a wide range of diseases and vary in their approaches to studying the disease, from molecular biology studies, policy studies, epidemiological studies, statistical modeling, pediatrics, etc. The Faculties that contribute to the field of tropical medicine are explained in detail below.

[10.1] Faculty of Tropical Medicine, Mahidol University
Established: 1960
Province: Bangkok
Address and Contact Information: 420/6 Ratchawithi Road, Ratchathewi, Bangkok 10400, Thailand. Phone: +66(0)2354-9100-4; Fax: +66(0)2354-9139
Website: http://www.tm.mahidol.ac.th/eng/index-eng.php
Director: Assoc. Prof. Pratap Singhasivanon, Dean; e-mail: tmpsh@mahidol.ac.th

Contribution to Tropical Diseases: The Faculty remains the leader in Asia in publishing research studies on tropical diseases. They continue to encourage, support, and facilitate research in tropical diseases and other related global health problems. In 2010-11, the Faculty published 220 international scientific papers, of which > 70% are listed in ISI Web of Science databases. During the period 2010-2011, 280 research projects were undertaken, of which 51 started in 2010 and 11 in 2011. Forty-seven papers were presented at international conferences and 10 papers at national conferences.

Tropical Disease(s) studied: Research activities range from molecular studies to community level, covering social and community health, nutrition, and more than 20 diseases including:
- HIV/AIDS
- helminthic diseases
- protozoal diseases
- soil- and water-borne diseases
- malaria
- dengue
- melioidosis
- leptospirosis
- tuberculosis

Infrastructure: The Faculty has 11 departments and 5 Centers of Excellence. After commencing construction in 2008, progress continues on the new building, “Asia’s Center of Excellence for Tropical Diseases.” Upon completion, it will serve as a new Center of Excellence for clinical research and a provider of medical care for patients with tropical diseases. Additionally, the Faculty is the WHO Collaborating Centre for Environmental Management for Disease Vector Control in Sustainable Development and the WHO Collaborating Centre for Clinical Management of Malaria.

Finally, SEAMEO TROPMED Thailand is hosted by the Faculty of Tropical Medicine and offers training on endemic tropical diseases, parasitology, community and preventive medicine. It also conducts research on alternative control measures of diseases and the promotion of lifestyles, including trials of new chemotherapeutic compounds and new vaccines. It provides medical care to patients suffering from tropical diseases as well as academic services for laboratory diagnosis of tropical diseases.

Hospital facilities: The Hospital for Tropical Diseases is located right next to the Faculty of Tropical Medicine and in 1961. It forms an integral part of the services provided by the Faculty of Tropical Medicine, Mahidol University. At the start, the Hospital had only one in-patient ward with 20 beds. The Outpatient Department was later established, in September 1962. The number of patients increased dramatically.

Nowadays, the Hospital has 250 beds. Although it is a center for tropical diseases treatment and research, our staffs can treat patients with general medical problems and pediatric problems, such
as diabetes, hypertension, lung diseases, renal diseases and liver diseases. We have many special clinics, including clinics for gnathostomiasis, dermatological diseases, travel medicine, chest diseases, nephrology (kidney diseases), Thai traditional medicine, and Chinese traditional acupuncture.

Field practice area: There are currently two field stations operated by the Faculty of Tropical Medicine: the Rajanagarindra Tropical Disease International Centre (RTIC) located in Ratchaburi and the Tropical Disease Research Centre (TDRC) located in Kanchanaburi. The RTIC is managed by the Department of Tropical Hygiene and has served as the field site for numerous research projects with focus on the further study of malaria and intestinal parasites in the region. The TDRC is the field site of the newly established Mahidol Vivax Research Center (MVRC), which focuses on *Plasmodium vivax* malaria.

Services: The Faculty of Tropical Medicine offers various services to the public, clinicians, and other research institutes, which include:

1.) Through the local people are provided with free diagnostic services of malaria and free medications such as antipyretics, antimalarials and anthelminthics.
2.) The Department of Medical Entomology provides such specialty services as identification of medically important insects / arthropods, laboratory diagnosis of microfilaria, providing mosquito specimens for teaching / research, testing insecticide susceptibility and efficacy in medically important insects.
3.) The Department of Protozoology provides services that include diagnosing Toxoplasmosis with the Dye-Test technique, Cryptosporidiasis, Cyclospora spp., Microsporidia by special staining techniques, and identifying Amoebiasis and Trichomoniasis by nucleus staining.
4.) The Department of Helminthology gives services of worms identification, serodiagnosis tests and fecal examination for helminthic infections.
5.) The Department of Immunology provides diagnostics services for diseases including leptospirosis, scrub typhus, *Aeromonas* spp. infections, and cytomegalovirus.
6.) The Department of Tropical Nutrition and Food Science provides services of running blood tests to determine various vitamin levels.

International Postgraduate Education Programs
The Faculty of Tropical Medicine offers 6 regular international post-graduate program in tropical medicine, as well as a wide variety of tropical medicine training programs, for medical doctors, scientists, nurses, and other tropical health personnel--the 6 regular programs are the Diploma in Tropical Medicine and Hygiene (DTM&H), Master of Clinical Tropical Medicine (MCTM), Master of Clinical Tropical Medicine in Tropical Pediatrics (MCTM (TP)), Master of Science in Tropical Medicine (MSc(TM)), Doctor of Philosophy in Tropical Medicine (PhD(TM)), and Doctor of Philosophy in Clinical Tropical Medicine (PhD(CTM)). The Faculty of Tropical Medicine admits approximately 100 new students every year, which includes doctors, clinicians, nurses, and scientists from all over the world. The school has been acknowledged and approved by the International Society of Travel Medicine and the American Society for Tropical Medicine and Hygiene (ASTMH). To date, participants from 56 different countries have attended these formal educational programs.
International Training Programs: the Faculty of Tropical Medicine offers regular short, long, and tailored training programs in collaboration with the on-campus Hospital for Tropical Diseases, the Ministry of Public Health, Thailand, and the Faculty’s field training stations, in the following areas: clinical tropical medicine, helminthology, medical entomology, microbiology and immunology, protozoology, social and environmental medicine, tropical hygiene, tropical nutrition and food science, tropical pathology, tropical pediatrics, laboratory diagnosis and management, epidemiology of tropical diseases, geographic information system (GIS), management of tropical diseases including HIV/AIDS, management of malaria, infectious disease control, and others by arrangement. All departments run a wide variety of training courses on a wide variety of clinical and laboratory related topics, for clinicians, researchers, nurses, and the general public.

Conferences: In addition to the training courses, the Faculty of Tropical Medicine plans and hosts an annual international research conference, the Joint International Tropical Medicine Meeting (JITMM) as well as the Food- and Water-Borne Zoonoses (FBPZ) conference every three years.. They were also the local coordinators of the 2012 AIDS Vaccine Conference.

Research: There are **109** scientists working on Tropical Diseases and **165** projects were carried out in 2010.

Prominent tropical medicine researchers:
As the only institute solely directed at tropical medicine, there are a large number of faculty members that have significant contributions to the field. **Table 8** features some of them:

<table>
<thead>
<tr>
<th>Table 8. Tropical Medicine Researchers at the Faculty of Tropical Medicine, MU</th>
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<tr>
<td><strong>Name</strong></td>
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<td>Srivicha Krudsood</td>
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<td>Varunee Desakorn</td>
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<td>Nathanej Luplerdlop</td>
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<tr>
<td>Karunee Kwanbanjan</td>
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<tr>
<td>Rungsun Tungtrongchitr</td>
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<td>Songsak Petmitr</td>
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<td>Parmpen Viriyavejakul</td>
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<tr>
<td>Arunee Sabchareon</td>
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<tr>
<td>Chukiat Sirivichayakul</td>
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<tr>
<td>Krisana Pengsaa</td>
</tr>
</tbody>
</table>

**[10.2] Faculty of Medicine, Ramathibodi Hospital, Mahidol University**

**Established:** 1969  
**Province:** Bangkok  
**Address and Contact Information:** 270 Rama VI Road, Ratchatewi, Bangkok 10400, Thailand.  
**Phone:** +66(0)2246-0024, +66(0)2246-1057; **Fax:** +66(0)2354-7233  
**Website:** http://www.ra.mahidol.ac.th/en  
**Director:** Prof. Rajata Rajatanavin, Dean; **e-mail:** deanra@mahidol.ac.th

**Contribution to Tropical Diseases:** Because this Faculty mainly focuses on chronic, non-communicable diseases, there are only a small number of projects related to tropical medicine.
These are mainly handled by the Research Centre’s Infectious Disease Unit, and mainly include research on HIV/AIDS and tuberculosis.

**Name of the Tropical Disease(s) handled are:** HIV/AIDS and tuberculosis.

**Hospital facilities:** Ramathibodi Hospital has two principal buildings to serve 5,000 out-patients per day. The Main Building provides more than 1,000 beds for tertiary care of complicated and severely ill patients in various specializing departments and units. The second building, the Sirikit Medical Center, serves as a center for modern research projects. It also houses modern operating rooms and intensive care units.

**Infrastructure:** In addition to the Hospital, the Research Centre was established in 1969 for developing and coordinating interdepartmental research. The centre provides facilities and opportunities for those who are interested in conducting research. A dynamic and scientific atmosphere with a wide variety of modern instruments and supporting personnel are available. The centre is unique in the possession of a clinical research ward for metabolic study, and its well-equipped laboratories are located on the Research Centre Building. Approximately 90 projects are carried out per year in basic, clinical, medical and applied sciences.

A new and state-of-the-art medical center named “Somdech Phra Debaratana Building” which will be completed in the near future serves as the most excellent service complex for thousands of out-patients. The building will have well-equipped facilities to perform high standards of healthcare in the Southeast Asian region. It will provide 350 beds, 16 operating rooms and 14 Intensive Care Units, and also comprehensive service centers such as Stem Cell Transplantation, Minimal Invasive Endoscopic Surgery Center, Elderly Care Unit, Child Development Center and Complicated Diseases Service by specialized doctors.

**Services:** Special tests are offered upon request in several research areas e.g. hormone analysis, auto antibody profiles, semen analysis, heavymetal analysis, food analysis, food safety evaluation, toxicity testing, lipid and vitamin determination.

**Prominent tropical medicine researchers:**

**Dr. Sasisopin Kiertiburanakul** studies HIV and conducts CD4 lymphocyte counts, highly active antiretroviral therapy, and combination drug therapy clinical trials.

**Dr. Somnuek Sungkanuparph** also studies HIV and recently looked at evaluating the role of etravirine in the second-line antiretroviral therapy after failing an initial non-nucleoside reverse transcriptase inhibitor-based regimen in a resource-limited setting.

**Dr. Wasun Chantratita** recently did a study on HIV-1 drug resistance mutations in children who failed non-nucleoside reverse transcriptase inhibitor-based antiretroviral therapy and risk factors for nevirapine-associated rash among HIV-infected patients with low CD4 cell counts in resource-limited settings.
Faculty of Medicine, Siriraj Hospital, Mahidol University

Established: 1888
Province: Bangkok

Address and Contact Information: 2 Prannok road, Siriraj, Bangkoknoi, Bangkok 10700, Thailand. Phone: +66(0)2419-7000; Fax: +66(0)2412-1995
Website: http://www.si.mahidol.ac.th/eng/Index.asp

Director: Clinical Prof. Teerawat Kulthanan, Dean; e-mail: deanra@mahidol.ac.th

Contribution to Tropical Diseases: Siriraj Hospital

Tropical Diseases Studied: HIV/AIDS, tuberculosis, dengue, malaria, parasitic diseases (angiostrongyliasis, filariasis), leptospirosis, melioidosis, influenza

Hospital Facilities: Siriraj Hospital is recognized as one of the biggest hospitals in Southeast Asia occupying 73 rais of land with 75 buildings. In 1996, it housed 2,600 beds, 1,200 physicians, 7,783 nurses and 1,974 nurse assistants as well as 1,117 additional personnel working wholeheartedly with their full strength for patient treatment.

The administrative structure in the Faculty comprises the office of the Dean, office of the Director, Her Majesty Cardiac Center, 24 departments, including the office for Research and Development, the Medical Education Technology Center, as well as 8 paramedical schools, namely for Nurse Assistants, Physiotherapy, Medical Audio Visual, Medical Science Technicians, Nurse Anesthetists, Radio Technicians, Sports Science Medicine, and Transfusion Medicine.

Services: Many services are carried out by the Siriraj Clinical Research Center (SiCRC). The SiCRC is responsible for promoting and supporting clinical studies on research and development of healthcare products. Siriraj Clinical Research Center has provided the services for government and private institutions. The main services provided by SiCRC are bioequivalence study of generic drugs, and conducting and co-ordinating phase I - IV clinical studies.

Prominent tropical medicine researchers:

Dr. Yupin Suputtamongkol studies melioidosis, falciparum malaria, leptospirosis, scrub typhus, and bacteremia. He conducts prospective studies and treatment outcome studies on various medications such as antimalarials, artemisinins, sesquiterpenes, ceftazidime, quinine, doxycycline and clavulanic acids.

Dr. Kulkanya Chokephaibulkit, of the Department of Pediatrics, studies HIV infections, vertical infectious disease transmission, AIDS-related opportunistic infections, pneumococcal infections, and human influenza, especially in children and infants.

Dr. Angkana Chaiprasert, of the Department of Immunology, studies the diagnostic value of gastric aspirate smear and polymerase chain reaction in smear-negative pulmonary tuberculosis and helped develop the one-tube multiplex PCR method for rapid identification of mycobacterium tuberculosis.

Dr. Prida Malasit is interested in the immunology and pathophysiology of shock and leakage in dengue hemorrhagic fever/shock syndrome, and the immunopathogenetic processes in tropical diseases. He oversees the Mahidol Network of Dengue Hemorrhagic Fever and Dengue Virus Research, which discovered a way to diagnose dengue fever before patients go into shock.
[10.4] Faculty of Science, Mahidol University

Established: 1958
Province: Bangkok
Address and Contact Information: 272 Rama VI Road, Ratchathewi, Bangkok 10400, Thailand. Phone: +66(0)2201-5007; Fax: +66(0)2354-7165
Website: http://www.sc.mahidol.ac.th/index_en.htm
Director: Prof. Skorn Mongkolsuk, Dean; e-mail: scsmk@mahidol.ac.th

Contribution to Tropical Diseases: The Faculty of Science has established a strong national reputation for quality research and research training. Research excellence has been recognized both nationally and internationally through prestigious awards and funding support to our outstanding staff and student researchers. The Faculty consistently ranked first nationally in scientific research, producing the highest number of research articles in reputable journals listed in the ISI Web of Science.

Tropical Diseases Studied: Tuberculosis, dengue, malaria, parasitic diseases (fasciolosis), leptospirosis, melioidosis, and influenza

Infrastructure: Currently, the Faculty of Science consists of 12 departments: Anatomy, Biochemistry, Biology, Biotechnology, Chemistry, Mathematics, Microbiology, Pathobiology, Pharmacology, Physics, Physiology, and Plant Science.

Major Equipment: The Central Instrument Facilities have High Performance Liquid Chromatography (HPLC), Liquid Chromatography Mass Spectrometry (LC-MS), Gas Chromatography Mass Spectrometry (GC-MS), Phosphorimager (Typhoon Multipurpose Scanner), Flow Cytometer, Automated Microplate Reader, Chemiluminescence, Ultracentrifuge, Nanodrop, Realtime PCR, Freeze Dryer and a wide range of analytical equipment.

Research: Research is one of the most important responsibilities of the Faculty of Science. The emphasis of research is generally on problems of local relevance, so researchers have the advantage of greater accessibility to samples, local expertise and potential benefits to the community. Presently, the Faculty is now an internationally known research center for science, technology and medical science. Academic staff publish some 300-350 articles per year in reputable international journals, more than any other institutions in Thailand for the past 10 years.

The Faculty’s academic staff has excelled in many areas of research, particularly those that are relevant to the national and regional needs. Major research projects undertaken by biomedical science groups involve the application of innovative biotechnology and genetic engineering techniques for the diagnosis, prevention and treatment of tropical diseases in humans and animals, i.e. malaria, melioidosis, schistosomiasis, filariasis, liver flukes, babesiosis, dengue and thalassemia; the reproduction of cattle and important food and medical substances for man and animals from indigenous natural materials; the control and improvement of the environment.

Some currently ongoing projects include basic research on vectors and pathogens, the invention and evaluation of vector control methodologies, the molecular ecology of malarial parasites and
their vectors, monitoring of insecticide resistance and mapping of malaria vectors, postgenomic analysis of malaria parasites, the mechanism of antimalarial drug resistance, the development of a dengue vector control and surveillance system, characterization and genetic engineering of densoviruses for vector control, molecular ecology of ticks and chigger mites and their associated pathogens, the characterization of dengue virus 5'NCR variants, and the pathogenesis and immunogenesis of dengue viruses.

**Prominent tropical medicine researchers:**

**Dr. Stitaya Sirisinha,** of the Department of Microbiology, is interested in the immunology and molecular biology of several tropical diseases, including a number of parasitic diseases (e.g., a liver fluke infection caused by *Opisthorchis viverrini*, and nematode infections caused by *Gnathostoma spinigerum* and *Angiostrongylus cantonensis*), and melioidosis. He studies several aspects of host-parasite relationship of these diseases and development of diagnostic methods in these diseases, particularly relying on the use of monoclonal-antibody (MAb) based assays. His group has produced a number of MAbs against *O. viverrini*, *G. spinigerum*, *B. pseudomallei*, and a tumor marker for cholangiocarcinoma.

**Dr. Rachanee Udomsangpetch,** of the Department of Pathobiology, studies malaria and in particular the immunological aspects in *Plasmodium* infection.

**Dr. Prasert Sobhon,** of the Department of Anatomy, studies the reproductive biology of parasite host crustaceans and mollusks, the cellular and molecular biology of parasites, and is a specialist of fasciolosis and Schistosomiasis.

**Dr. Sukathida Ubol,** of the Department of Microbiology, researches the molecular pathogenesis of viral infection using dengue virus, avian H5N1 virus and Chikungunya virus as models, and studies methods of viral prevention focusing on development of viral nanovaccine.

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**[10.5] Faculty of Public Health, Mahidol University**

**Established:** 1948  
**Province:** Bangkok  
**Address and Contact Information:** 270 Rama VI Road, Ratchatewi, Bangkok 10400, Thailand.  
**Phone:** +66(0)2246-0024, +66(0)2246-1057; **Fax:** +66(0)2354-7233  
**Website:** [http://www.ph.mahidol.ac.th/index_en.html](http://www.ph.mahidol.ac.th/index_en.html)  
**Director:** Prof. Rajata Rajatanavin, Dean; **e-mail:** deanra@mahidol.ac.th

**Contribution to Tropical Diseases:** The multidisciplinary research projects are organized in many research programs, which are categorized in three clusters: Health Promotion, Infectious diseases, and Environmental Health. Research at the Faculty of Public Health covers a broad range of topics. Its emphasis lies on multidisciplinary applied research including health promotion, nutrition, infectious disease, environmental health, environmental microbiology, occupational health and safety, biostatistics and health informatics, family health, mental health, health services, and health policy.

**Infrastructure:** The Faculty of Public Health has 13 departments and one Office of Rural Health Training and Research.
Prominent tropical medicine researchers:
**Dr. Usa Lek-Uthai**, of the Department of Parasitology and Entomology, studies diagnosis, treatment, control strategies in molecular and cellular parasitology and entomology. Special interests include bio-nano-molecular diagnostic and drug resistance for malaria, filaria, dengue and chikungunya. Also, she researches the molecular epidemiology of infectious diseases and conducts protein analyses on the molecular susceptibility of *Anopheles* spp. to malaria, *Aedes* spp to dengue and CHIKV, and *Mansonella* sp to filariasis.

**Dr. Mathuros Tipayamongkholgul**, of the Department of Epidemiology, studies spatial epidemiology, particularly epidemiological studies of dengue, tuberculosis and HIV. She also applies the epidemiological studies to statistical modeling and integration into public-health policy.

**Dr. Unchalee Tansuphasiri**, of the Department of Microbiology, uses PCR, ELISA, and microbial sensitivity tests to the sensitivity and specificity of diagnostic tests for *Clostridium perfringens*, multiple drug resistant tuberculosis, and leptospira.

**Dr. Mayuna Srisuphanunt**, of the Department of Parasitology and Entomology, has studied dengue, HIV, and filariasis. Recently, she published a study showing ELISA as an alternative tool for epidemiological surveillance for dengue in mosquitoes.

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**Established:** 1979  
**Province:** Bangkok  
**Address and Contact Information:** 3/F, 60th Anniversary Chalermprakiat Bldg., 420/6 Rajvithi Rd., Bangkok 10400 Thailand. **Phone/fax:** +66(0)2-203-6333  
**Website:** [http://www.tropmedres.ac/](http://www.tropmedres.ac/)  
**Director:** Dr. Nicholas Day, **e-mail:** nickd@tropmedres.ac

**Contribution to Tropical Diseases:** MORU conducts research on tropical infectious diseases affecting populations in the rural tropics. Drug-resistant pathogens commonly evolve in the region and spread across the world so our research is of vital significance to populations worldwide as well as the local region. Our research efforts are focussed on the following public health problems: malaria, melioidosis, leptospirosis, cryptococcal meningitis, pneumococcal disease, enteric fever, rickettsial diseases, beriberi, diagnosis of unexplained fever and septicaemia, and counterfeit anti-infective drugs.

**Tropical Disease(s) studied:** Malaria, leptospirosis, typhus, melioidosis, tuberculosis

**Field practice area:** In 1986, the *Shoklo Malaria Research Unit (SMRU)* was established to study the epidemiology, treatment and prevention of multi-drug resistant falciparum malaria in the Burmese Karen refugee camps on the Thai-Burma border. At that time, malaria was the most serious health problem facing the displaced population living along the border - it was the primary cause of death and represented over 45% of out-patient consultations.

**Infrastructure and resources:** MORU has a network of organizations that consists of:
- Three major research centres, in Bangkok, Mae Sot (SMRU) on the Thai-Burma border, and Vientiane, all equipped with excellent clinical research and laboratory facilities and
staffed with a critical mass of well-trained local and international research physicians and scientists.

- A network of clinical study sites in Thailand, Laos, Bangladesh, Cambodia, and India, equipped with clinical malaria and microbiology laboratories as appropriate.
- Well established malaria research laboratories in Bangkok and Mae Sot (SMRU)
- Microbiology research laboratories in Bangkok, Mae Sot, Ubon Ratchathani, and Vientiane.
- New, international standard BioSafety Level 3 laboratories in Bangkok and Vientiane.
- Two new healthy volunteer wards at the Hospital for Tropical Diseases in Bangkok for conducting detailed pharmacokinetic and Phase I studies to full Good Clinical Practice standards.
- A world class pharmacology laboratory in Bangkok for developing and conducting assays of drugs in biological fluids.
- Statistical support and mathematical modeling groups.

Research: For malaria, in addition studies on antimalarial treatment, adjuvant treatments and the improvement of supportive care have the potential to lower the high case fatality rates of severe malaria. They are currently testing the benefit of the anti-helminth drug levamisole as an adjuvant to artesunate for the treatment of severe malaria. Levamisole has shown in the laboratory and in patients with uncomplicated malaria to decrease the ‘stickiness’ of red blood cells harbouring the mature parasites, so that they no longer become stuck in small blood vessels and compromise blood flow in vital organs.

MORU also studies the epidemiology of sepsis at Sappasithiprasong hospital in Ubon Ratchathani, northeast Thailand, where the most common cause of bacterial sepsis in adults is *B. pseudomallei*. Additionally, typhus studies at MORU concentrate on determining the epidemiology and incidence of the disease using hospital-based fever studies at centres in northern and north-eastern Thailand as well as Laos. From these studies, MORU has examined and compared the antigenic and genetic composition of strains that cause infection.

Some prominent researchers include:

**Dr. Nicolas Day** is particularly interested in the epidemiology, pathophysiology and treatment of malaria, melioidosis, leptospirosis, rickettsial infections, *Staphylococcus aureus* infections, influenza, dengue and other communicable diseases afflicting rural populations throughout Asia and beyond.

**Dr. Nick White**’s diverse interests include the epidemiology, pathophysiology and management of uncomplicated and severe malaria, melioidosis, enteric fever, tetanus, dengue haemorrhagic fever, Japanese encephalitis and tuberculosis. His particular interests at present include the pathophysiology and treatment of severe malaria and the prevention of antimalarial drug resistance using artemisinin-based combinations.

**Dr. François Nosten** concentrates on uncomplicated malaria and he has conducted the largest ever drug trials in malaria in an area which has the world’s most drug-resistant parasites, including a detailed study of the SPf66 malaria vaccine. Recent studies have concentrated on the efficacy and effectiveness of combination antimalarial therapy. Dr Nosten has also investigated malaria prophylaxis and antimalarial treatment in pregnancy and the identification of thiamine deficiency (beri-beri) as a major cause of infant mortality amongst Karen refugees.
Dr. Stuart Blacksell studies scrub typhus and dengue and recently studied the diagnostic accuracy of a loop-mediated isothermal PCR assay for detection of Orientia tsutsugamushi during acute scrub typhus infection.

Dr. Arjen Dondorp has research interests that include the pathophysiology and treatment of severe malaria, antimalarial drug resistance and improvement of intensive care practice in developing countries.

Dr. Niklas Lindegardh uses bioanalytical method development with various sample preparation techniques (such as solid-phase extraction, liquid-liquid extraction) in combination with LC-MS, LC-MS/MS and LC-UV for quantification of antimalarial, anti-TB and anti-retroviral drugs.

[10.7] Institute of Molecular Biosciences, Mahidol University
Established: 2009
Province: Nakhon Pathom
Address and Contact Information: 25/25 Phuttamonthon 4 Road, Salaya, Nakhon Pathom 73170, Thailand. Phone: +66(0)2441-9003-7; Fax: +66(0)2441-1013;
Website: http://www.st.mahidol.ac.th/index.php
Director: Professor Prasert Aeewarakul, Director; e-mail: directst@mahidol.ac.th

Contribution to Tropical Medicine: a limited number of research activities are dedicated to tropical diseases, but the Center for Vaccine Development and the Molecular Pathology Laboratory investigate a number of infectious viral diseases.

Tropical Disease(s) studied: dengue, chikungunya, Japanese encephalitis

Infrastructure: The Institute of Molecular Biosciences is the newest research institute established under the new structure of Mahidol University. The institute has been setup by combining the research strength from the two research institutes: Institute of Molecular Biology and Genetics (IMBG) and the Institute of Science and Technology for Research and Development (ST). The two institutes have long been internationally recognized for their research capability, academic and service contribution.

Major Equipment: The MB is equipped with a High Performance Liquid Chromatography (HPLC), Freeze Dryer: Labconco, Centrifuge, High Speed Centrifuge (upto 250ml), Microcentrifuge (50ul, 200ul, 1.5ml), a bright field microscope for Fluorescent* FITC DAPI, a PCR Thermocycler, a Transmission Electron Microscope (TEM); Hitachi H-7500, a High Pressure Cell Breaker (French Pressure Cell), and a ELISA Microplate Reader.

Services: Includes routine procedures such as DNA sequencing, genotyping, specific gene detection by PCR, complete blood count, hemoglobin typing, molecular diagnosis services such as beta thalassemia testing and alpha thalassemia testing, and parental siagnosis

Research: Of the 56 academic staff, approximately 7 researchers are dedicated solely to studying tropical diseases. Their projects include aiming to develop a 1-2 dose dengue vaccine which could be able to produce a life-long protective immunity, a JE live and inactivated vaccine
are also in progress with satisfactory outcome. Additionally, the Institute conducts research on the molecular pathology of viral diseases of significance to Thailand and continues research on the dengue virus, on topics of host-cell interaction.

Prominent tropical medicine researchers:
Dr. Sutee Yoksan, of the Center for Vaccine Development, focuses on developing live attenuated and live molecular dengue vaccines, live molecular and inactivated Japanese encephalitis vaccines, and inactivated and live attenuated Chikungunya vaccines.

Dr. Duncan Smith, of the Molecular Pathology Laboratory, investigates, using modern molecular biology techniques, how the dengue virus enters into cells, how the virus is propagated within cells as well as the cellular consequences of virus infection. It is hoped that these studies will lead to novel therapeutic treatments. In parallel, work on other arboviruses including Japanese encephalitis virus and chikungunya virus is also being undertaken.
Ministry of Public Health (MOPH)
Province: Nonthaburi
Address and Contact Information: Ministry of Public Health, Tivanond Road, Nonthaburi 11000, Thailand. Phone/fax: +66(0)2-590-1000
Website: http://eng.moph.go.th/
Director: Minister Wittaya Buranasiri

Vision: The MOPH is the main organization in the development of quality-performing health systems. It seeks equal participation by all sectors of the community to create a social awareness of health to increase the quality of life in Thailand.

Contribution to Tropical Medicine: The MOPH defines the health policy and strategy of the country. It manages several surveillance networks to prevent diseases and health threats and encourages all sectors of society involved. It also sets the policy direction of research and assists with knowledge management. The Department of Disease Control (DDC) is very active in policy and surveillance for tropical medicine. And the Bamrasnaradura Infectious Diseases Institute also contributes a lot of research to tropical medicine.

Tropical Disease(s) studied: Mainly HIV and TB, also dengue, helminthiases, leptospirosis, malaria, diarrheal diseases, and several other tropical diseases.

Infrastructure: The MOPH has an Office of the Permanent Secretary and then has an additional 9 departments, which include the Department of Medical Services, the Department of Disease Control (DDC), the Department for Development of Thai Traditional and Alternative Medicine, the Department of Health Service Support, the Department of Mental Health, the Department of Health, the Food and Drug Administration, and the Government Pharmaceutical Organization.

Hospital Facilities: The MOPH is affiliated with over two-thirds of all Thai hospitals, which amounts to 875 hospitals. The MOPH-affiliated hospitals have a total in-patient capacity of 86,667 beds. When broken down by region, there are 4838 in Bangkok, 17622 in the North Region, 24119 in the Northeastern Region, 13571 in the Southern Region, and 26517 in the Central Region.

Department for Disease Control (DDC)
Province: Nonthaburi
Address and Contact Information: Thanon Tiwanond, Muang, Nonthaburi 11000, Thailand. Phone/fax: +66(0)2-590-3000
Website: http://www.ddc.moph.go.th/index.php
Director: Dr. Manit Teeratantikanon; e-mail: manit@health.moph.go.th

Infrastructure: There are 12 regional offices which are located in Bangkok, Saraburi, Chonburi, Ratchaburi, Nakhon Ratchasima, Khon Kaen, Ubon Ratchathani, Nakhon Sawan, Phitsanulok, Chiang Mai, Nakhon Si Thammarat, and Songkhla. There are also 4 sub-departments of the DDC that are pertinent to tropical medicine in Thailand—the Bureau of HIV, the Bureau of Tuberculosis, the Bureau of Emerging Infectious Diseases, and the Bureau of Vector-Borne Diseases.
**Research:** The DDC mainly collaborates with other tropical medicine institutes in Thailand to investigate various diseases. Their goal is to shape public policy and improve current methods for disease control and spreading awareness. The 4 previously-stated bureaus all address different tropical diseases.

**Prominent Figures:**
**Dr. Kanungnit Congpuong** has assisted with a number of studies on vivax and falciparum malaria, including a study on the subject of tracking origins and spread of sulfadoxine-resistant *Plasmodium falciparum* dhps alleles.

**Dr. Surachart Koyadun** often collaborates with staff of MU to study filariasis and other helminthiases. He recently assisted with a study on imported bancroftian filariasis and the diethylcarbamazine response and benzimidazole susceptibility of *Wuchereria bancrofti* in dynamic cross-border migrant population targeted by the National Program to Eliminate Lymphatic Filariasis in South Thailand.

**Dr. Waraluk Tangkanakul** is interested in leptospirosis and has collaborated to investigate the disease in both Cambodia and Thailand.

**Dr. Sriprapa Nateniyom,** of the Bureau of Tuberculosis, helps shape public policy for the tuberculosis surveillance and control and recently assisted in a study that investigated the relationship between and risk factors of multi-drug resistant TB and HIV in Thailand.

**[11.2] Bamrasnaradura Infectious Diseases Institute (BIDI)**
**Province:** Nonthaburi
**Address and Contact Information:** No. 126, Moo 4 Taladkwan Tiwanon Muang, Nonthaburi, 11000. **Phone/fax:** +66(0)2-951-1170-79
**WebSite:** http://www.bamras.org/th/ (Thai only)
**Director:** Dr. Preecha Tantanatip; e-mail: preecha@health.moph.go.th

**Infrastructure:** With 11 different departments, including Internal Medicine, Surgery, Obstetrics and Gynecology, Pediatrics, Otolaryngology, Ophthalmology, Physical Therapy, Anesthesiology, Dentistry, and Radiology, BIDI is also a functional hospital that is equipped with 300 beds.

**Research:** BIDI seeks to develop research to expand knowledge and technologies in diagnostics, treatment and rehabilitation. They also aim to control communicable diseases and spread awareness and public knowledge on both national and international levels. BIDI focuses its research on AIDS and AIDS-related opportunistic infections, such as tuberculosis, cryptococcal meningitis, and diarrheal diseases.

**Prominent Researchers/Clinicians:**
**Dr. Weerawat Manosuthi** studies HIV and AIDS-related opportunistic infections. He has published several papers on HIV co-infections and recently investigated renal impairment in HIV-1 infected patients receiving antiretroviral regimens including tenofovir in a resource-limited setting.
Dr. Wisit Prasithsirikul is interested in the clinical treatment of HIV and recently completed a two-year safety and tolerability study of enfuvirtide use in salvage therapy of Thai HIV-1 experienced cases.

Dr. Supeda Thongyen studies the efficacy of a number of anti-HIV drugs and anti-tubercular drugs, such as Nevirapine, Benzoxazines, Rifampin, and Reverse Transcriptase Inhibitors.

Dr. Achara Chaovavanich is interested in vertical transmission and pregnancy complications of infectious diseases, including AIDS.

[11.3] Chest Disease Institute (CDI)
Province: Nonthaburi
Address and Contact Information: 39 Moo 9 Tivanon Bangkrasor Muang, Nonthaburi 11000.
Phone/fax: +66(0)2-580-3423
WebSite: http://www.cdi.thaigov.net/cdi/
Director: Dr. Sukhum Karnchanapimai; e-mail: sukumkan@health.moph.go.th

Infrastructure: CDI contains a 350-bed hospital and several specialty clinics for heart diseases and surgery.

Research: Most research studies focus on heart disease or other chronic illnesses. However, pulmonary tuberculosis is also one of their focus areas. One current project studies the effectiveness of HPLC in sputum in the classification of bacterial tuberculosis infection using cattle as a model.

Prominent Researchers/Clinicians:
Jirakan Boonyasopun, has collaborated on projects involving tuberculosis, and recently studied mutations in the rpoB gene of the rifampicin resistant M. avium complex strains from Thailand.

Province: Nonthaburi
Address and Contact Information: The National Institute of Health, Department of Medical Sciences, Ministry of Public Health, 88/7 Tiwanon Road, Muang, Nonthaburi 11000. Phone: +66(0)2-589-9850; Fax: +66(0)2-591-5449
WebSite: http://nih.dmsc.moph.go.th/indexeng.html
Director: Laojana Chowanadisai, Deputy Director; e-mail: laojana@dmsc.moph.go.th

Infrastructure: In addition to the administrative offices, such as the Quallity and Technical Development Group, Laboratory Quality System Development Office, Foreign Affair Section, Laboratory Supporting Section, Laboratory Central Resources Section, there are also specialty research groups, which includes the Medical Genetics Section, Coordinating Center for Laboratory Testing and Surveillance, Coordinating Center for Technical Collaboration, Medical Bacteriology Group, Medical Virology Group, Clinical Immunology Group, Toxicology and Biochemistry Group, Mycology and Parasitology Group, Medical Entomology Group, and the Laboratory Animal Center.
Research: Two main objectives of the NIH are providing laboratory services and conducting research. The laboratory service includes diagnosis for infectious diseases, analysis for consumer protection and quality improvement of laboratories nation-wide. Various research projects have been carried out, both applied science and basic science, from laboratory scale to field trial. With advancement of technical skills of staffs, scientific research produced in the institute have been accepted by the key international journals and presented at international conferences. Furthermore, those research results have been profitable for the progress of diagnostic techniques, as well as domestic vaccine production that greatly benefit Thai people.

Current projects include the transovarial transmission of dengue viruses in field populations of *Aedes aegypti* (L.) and *Aedes albopictus* (Skuse) (Diptera: Culicidae) in the South, rodents as a major reservoir of leptospirosis in Thailand, and the epidemiology and burden of rotavirus diarrhea in Thailand, which is the result of sentinel surveillance.

Prominent Researchers/Clinicians:
Dr. Surapee Anantapreecha investigates Dengue, Dengue Hemorrhagic Fever, and Japanese encephalitis, and Chikungunya disease, most recently studying the protection from arthritis and myositis in a mouse model of acute chikungunya virus disease by bindarit, an inhibitor of monocyte chemotactic protein-1 synthesis.

Dr. Wattana Auwanit mostly studies the H5N1 influenza and HIV infection and recently looked at the design and evaluation of antiretroviral peptides corresponding to the C-terminal heptad repeat region (C-HR) of human immunodeficiency virus type 1 envelope glycoprotein gp41.

Dr. Pathom Sawanpanyalert mostly studies H5N1 influenza and HIV infection. He recently collaborated with Japanese governmental agencies to investigate unique CRF01_AE Gag CTL epitopes associated with lower HIV-viral load and delayed disease progression in a Cohort of HIV-infected Thais.
[12] National Center for Genetic Engineering and Biotechnology (BIOTEC)
Agency: Part of the National Science and Technology Development Agency (NSTDA)
Established: 1983
Province: Pathum Thani
Address and Contact Information: 113 Thailand Science Park, Phahonyothin Road, Klong 1, Klong Luang, Pathumthani 12120. Phone: +66(0)2-564-6700; Fax: +66(0)2-564 6701-5
Website: http://www.biotec.or.th/EN/
Director: Dr. Kanyawim Kirtikara, Executive Director; e-mail: Kanyawim@biotec.or.th

Vision and Mission: To advance science and technology to fulfill our commitment to building a stronger society and enhancing the competitiveness of the country.

Contribution to Tropical Medicine: As a premier research institute in Thailand and Asia, BIOTEC operates research units located at Thailand Science Park and specialized laboratories hosted by various universities, covering a wide spectrum of research topics from agricultural science to biomedical science and environmental science. Apart from research laboratories, BIOTEC activities also include policy research, an outreach program, training and international relations. They have groups that specialize in malaria research, dengue research, and tuberculosis research.

Tropical Disease(s) Studies: mainly malaria, tuberculosis, and dengue

Facilities: BIOTEC has established multiple laboratories for conducting research and/or providing technical services. Some laboratories act as stand-alone research centers in their own right, while others are collaborative ventures set up jointly with government agencies and universities. BIOTEC’s research units and specialized laboratories conduct basic and applied research covering a wide spectrum from agricultural science to biomedical science and environmental science. The units pertinent to Tropical Medicine are the Bioresources Technology Unit at the Thailand Science Park, the Medical Molecular Biology Research Unit at the Thailand Science Park, the Genome Institute at the Thailand Science Park, the Biochemical Engineering and Pilot Plant Research and Development Unit at King Mongkut’s University of Technology Thonburi, the Medical Biotechnology Research Unit at Siriraj Hospital, and the Biomedical Technology Research Center at Chiang Mai University.

Major Equipment: Some of the resources available include: high performance computing (HPC); 10 TeraFLOPs cluster computer, DNA Sequencing using Dye Terminator and 454 Life Sciences Technologies, Flow Cytometric Analysis Using Fluorescence Activated Cell Sorter, FACS, Proteomics, 2 Dimension Electrophoresis, Spot Handling Workstation, Image Processing and Analysis, MALDI-TOF MS, and LC-MS-MS

Services: BIOTEC provides a selected range of special services to the private and public sector in order to facilitate R&D in Thailand. These include bioactive compound screening, animal cell service, mycoplasma testing of cultured cells, cytotoxicity testing, enzyme screening services, NMR techniques (1D and 2D NMR), LC-MS and MS Analyses, Technical service for IR (Infrared) Spectrophotometer, DNA Sequencing, and Flow Cytometric Analysis Using Fluorescence Activated Cell Sorter.
Research:
Some highlights of BIOTEC research include the following:

Malaria
The group at the BIOTEC Protein-Ligand Engineering and Molecular Biology Laboratory has long been engaged in research towards developing antimalarial drugs to overcome multi-drug resistant malaria. The main strategies revolve around rational drug design and the synthesis of new effective antimalarials based on the structures of the drug targets. The team has discovered the protein structure of dihydrofolate reductase-thymidylate synthase of *Plasmodium falciparum* (PfDHFR-TS), an important drug target of *Plasmodium* parasites. The Laboratory also took part in a preclinical evaluation of antifolate QN254 launched by Novartis Institute for Tropical Diseases and Wellcome Trust. BIOTEC researchers performed the inhibitory activity test of QN254 against pfDHFR and determined the crystal structure of compounds in PfDHFR-TS.

Dengue
In a joint study between scientists from the Medical Biotechnology Research Unit, it was for the first time found that rhesus macaques inoculated intravenously with a high dose of dengue virus serotype 2 (strain 16681) produced dengue hemorrhage, one of the key clinical manifestations detected in dengue patients. The Unit also presented a novel alternative concept regarding how the dengue virus disseminates during the acute viremia period based on its intimate relationship with platelets. They demonstrated that dengue viral particles are present within platelets isolated from dengue patients and that dengue viral products could be detected within platelets experimentally infected in vitro. The Unit also analysed a panel of dengue specific human monoclonal antibodies from human B cells isolated from dengue infected patients. These antibodies are highly cross-reactive among the dengue virus serotypes and, even at high concentrations, do not neutralize infection but potently promote antibody dependent enhancement.

Tuberculosis
The research projects currently being conducted are development of high-throughput drug screening, drug target identification and validation, and study of emerging drug resistance mechanisms. BIOTEC also studies the variation of the gene regulatory networks among isolates of *M. tuberculosis* and their relationship to drug resistance and pathogenesis. Also, BIOTEC aims to identify potential drug targets for the development of new antituberculous drugs. And in collaboration with various institutions both domestic and abroad, our group has studied the molecular epidemiology of tuberculosis in Thailand. Our database contains the DNA profile of more than 2000 isolates of *M. tuberculosis*, mostly from the WHO drug surveillance program and from an epidemiological study in Chiang Rai conducted by the Research Institute of Tuberculosis, Japan.

Prominent researchers/clinicians include:
It should be noted that there are several researchers that are affiliated with BIOTEC, but their primary affiliation is with other institutes listed in this report, such as Mahidol University, Chulalongkorn University, Chiang Mai University, and others. Here, only researchers primarily affiliated with BIOTEC are included:
**Dr. Yongyuth Yuthavong**, of the Medical Molecular Biology Research Unit, has an interest in the broad issues of public policies, especially concerning application of science and technology for development and human development in general. Currently, he works on the development antimalarial drugs to overcome multi-drug resistant malaria. The main strategies evolve around rational drug design and the synthesis of new effective antimalarials based on the structures of the drug targets.

**Dr. Chunya Puttikhunt**, of the Medical Biotechnology Research Unit, focuses on the dengue virus and dengue hemorrhagic fever, human genetic diseases, and basic immunology. These include the pathogenesis of dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS), the use and application of dengue infectious cDNA clones to study the molecular biology of dengue virus and generation of dengue vaccine candidates, and genetics/genomics of other prevalent diseases in Thailand.

**Dr. Masahiko Isaka**, of the Bioresources Technology Unit, is an organic chemist that specializes in bioactive compound screening. His recent work has involved testing chemicals with anti-*Mycobacterium tuberculosis* assays and anti-*Plasmodium falciparum* assays.

**Dr. Sittiruk Roytrakul**, of the Genome Institute, specializes in proteomics, protein bioinformatics, and biochemistry. His recent work has contributed to diarrheal diseases, including publishing a rapid and simple method for construction and expression of a synthetic human growth hormone gene in *Escherichia coli*. Also, he has done studies on the determination of the *Plasmodium vivax* schizont stage proteome and a proteomics study on Chikungunya.

**Dr. Wandee Yindeeyoungyeon**, of the Tuberculosis Research Laboratory, completed a study on the cloning, expression, and purification of the gene for MPT64 of *Mycobacterium tuberculosis*. She is now working on the construction of *M. bovis* BCG auxotroph strain and antibiotic resistance gene-free plasmids to enable the development of BCG as a vaccine delivery vector.
Phramongkutklao College of Medicine (PCM)

Established: 1975
Province: Bangkok
Address and Contact Information: Ratchawithi Road, Thung Phaya Thai, Ratchathewi, Bangkok 10400, Thailand; Phone: +66(0)2354-9011; Fax: +66(0)2354-9011
Website: www.pcm.ac.th/web/index.php (Thai only)
Director: Colonel Assoc. Prof. Suthee Panichkul; e-mail: sthpanich@hotmail.com

Vision and Mission: To produce medical graduates with knowledge of military medicine of the highest standard and to produce research of international quality consistently to be applied in the development of health services provided to patients.

Contribution to Tropical Medicine: PCM often collaborates with AFRIMS to conduct clinical trials on dengue and other tropical diseases. They also conduct genetic studies on HIV, malaria, and various helminthias.

Tropical Disease(s) Studies: malaria, dengue, diarrheal diseases, dengue, chikungunya, HIV

Hospital Facilities: Phramongkutklao Hospital (PMK) has a service capacity for up to 2000 daily in-out-patient services, and 1200-1600 beds in in-patient services. They have a Division of Nursing, a Center for Quality Management, a Department of Epidemiology, a Medical Dental Division, Division of Otolaryngology, a Division of Infectious Diseases, the Heart Center, a Division of Internal Medicine, a Rehabilitation Division, a Surgery Division of Radiation, a Division of Pediatrics, a Department of Pathology, and a Division of Obstetrics and Gynecology.

Research:
Phramongkutklao College of Medicine
The Department of Parasitology in particular is active in conducting tropical medicine research. Using molecular and genetic studies, the Department has published papers on various helminthic diseases and malaria.

Dr. Mathirut Mungthin, of the Department of Parasitology, has been involved in studies of diseases such as malaria, giardia, hookworm, and TB. He most recently completed studies on the incidence and risk factors of hookworm infection in rural communities and the Sequence and gene expression of chloroquine resistance transporter (pfcrt) in the association of in vitro drugs resistance of Plasmodium falciparum.

Dr. Saovanee Leelayoova, of the Department of Parasitology, also has investigated a wide variety of parasites, including malaria, giardia, hookworm, and TB and previously published on using the simple technique of PBS incubation to release the miracidia of Opisthorchis-like eggs for DNA extraction.

Phramongkutklao Hospital:
Together with AFRIMS and WRAID, PMK collaborates on a number of clinical trials, especially for flavivirus vaccines, such as those against dengue, Chikungunya, and Japanese encephalitis.

Dr. Veerachai Watanaveeradej and Dr. Sriluck Simasathien, of the Department of Pediatrics, conducts immunology studies dengue and dengue vaccines, and is currently working on a Phase
II trial of the live-attenuated dengue vaccine in infants, children, and adults. The also conduct sentinel human surveillance for influenza in the hospital.
Queen Saovabha Memorial Institute (QSMI)

Established: 1913
Province: Bangkok
Address and Contact Information: 1871 Rama 4 Road, Pathumwan, Bangkok 10330. Phone: +66(0)2-252-0161-4; Fax: +66(0)2-254-0212
Website: http://www.saovabha.com/en/default.asp
Director: Dr. Visith Sitprija, Director; e-mail: visith@redcross.or.th

Vision and Mission: To manufacture and distribute rabies vaccine and spread rabies awareness, to give current advice to travelers to Thailand and other countries on health risks and protective needs, and to use the snake farm as an educational organization about snake for public, tourists, government and private organization, school and university in order to understand snakes habit and improve attitude on snakes.

Contribution to Tropical Medicine: The idea to found the center for rabies prevention was conceived in 1912 by His Royal Highness Prince Damrong, whose daughter, Princess Banlusirisarn, had died of rabies because Thailand at that time had no place where people could go for vaccination. Prince Damrong proposed the idea to King Rama VI, who subsequently granted him permission to use Luang Building on Bamrung Muang Road as the center for producing and giving the vaccine. The center also incorporated the manufacturing of vaccine against smallpox in Nakorn Pathom and it occasionally conducts malaria and leptospirosis research.

Tropical Disease(s) studied: mainly rabies, but also malaria, dengue, HIV, and leptospirosis

Hospital Facilities and Infrastructure: There are 5 clinics, including the newest Animal Toxin Clinic. Also, the QSMI houses a snake farm in a new five-story building named “Simaseng building.” The 1st and 2nd floor serve as exhibition area for 35 species of living snakes, 100-seat arena for venom extraction, museum and exhibition about snakes evolution, anatomy, life cycle, reproduction, toxicology and snake bites first-aid.

There are vaccine, antivenin, and serum production laboratories. Additionally, a laboratory of Quality Assurance is permanently set up to provide analytical services to the Institute’s Production Departments. They consist of chemical, microbiological, biotechnology and animal testing laboratories. The laboratory is permitted to produce microorganisms and snake venoms according to the Pathogen and Toxin Act B.E. 2510

Services: The QSMI offers many services related to our mission to the public. Dissemination of rabies knowledge and the harmful effect of various toxins are our responsibilities. Through the Animal Bite and Rabies Immunization Clinic, they provide care for animal bite victims to prevent rabies infection and the invariable death that this disease causes. Besides, the QSMI a learning center for study groups of medical personnel both from in-country and aboard to observe and study rabies prevention and animal rabies control. They offer post-exposure rabies immunization, pre-exposure rabies immunization, and training services in rabies control. The Immunization and Travel Clinic also provides pre- and post- travel counseling, international
certificates of vaccination, health check-up and certification, and malaria counseling and tuberculin skin (PPD) tests.

**Vaccine Production:** The new production building for biological products of QSMI was renovated in 2002. All the facilities were designed to comply with GMP standards and the manufacturing of Bacillus Calmette-Guérin (BCG) vaccine was moved to the new facilities. The production process involved modernized equipment and is validated by the principles of GMP. QSMI was approved by the Thai FDA for Standards of Good manufacturing practice (GMP) and quality assurance with the specifications established for BCG vaccine in June 2003. QSMI is the sole manufacturer of BCG vaccine in Thailand and supplies the vaccine to Ministry of Public Health of Thailand. The number of BCG vaccine for distribution nationwide is about 2 million doses per year.

**Research:** The QSMI is the leading institute for rabies research in Thailand. It also specializes in snakebite treatment and travel medicine.

**Prominent Researchers/Clinicians:**
**Dr. Visith Sitprija,** the director of QSMI, has been part of numerous studies on leptospirosis, rabies, and snake bites. He is an expert on kidneys and has done past research on the effects of animal toxins on the kidneys. Recently, he looked at using the latex agglutination test to determine rabies antibodies in production of rabies antisera in horses.
**Dr. Henry Wilde,** one of the head researchers at QSMI, researches methods of rabies control in South and Southeast Asia. He has also investigated the case studies of clinical failures of post-exposure rabies prophylaxis.
**Dr. Kanitta Suwansrinon** has studied rabies, snake venoms, and the roundworm infection trichinellosis in humans. Recently, she investigated the adverse reactions to human rabies immune globulin manufactured by the Thai Red Cross and a prospective study on human trichinellosis from Laos.
Queen Sirikit National Institute of Child Health (QSNICH)
Established: 1955
Province: Bangkok
Address and Contact Information: 420/8 Rajvithi Road, Rajthevi, Bangkok 10400. Phone: +66(0)2-354-8333-43; Fax: +66(0)2-2457580
Website: http://www.childrenhospital.go.th/eng/index_eng.html Director: Surapee Ruangsawan, MD, Director; e-mail: n/a
Contact: Siripen Kalayanarooj; e-mail: sirip@health.moph.go.th

Vision and Mission: To be Thailand's Center of Children's Illnesses and to develop the medical knowledge in pediatrics through education, research, and training program in order to provide holistic standard medical service to children.

Contribution to Tropical Medicine: QSNICH is the national hub renowned for providing treatment to children through the collaboration of physicians in countless pediatric specialties. Offering comprehensive, state-of-the-art medical care through the providence of diagnosis, treatment, and recovery, it is an institute overflowing with up-to-date information, knowledge, and expertise gained from pediatric analyses and research, strongly aided by the promotion of education through ongoing training.

Through the WHO Collaborating Center for Case Management of Dengue/DHF/DSS, QSNICH is one of the leading institutes on dengue research in Thailand, especially for pediatrics.

Tropical Disease(s) studied: mainly dengue, also HIV and some diarrheal diseases

Hospital Facilities and Infrastructure: Children’s Hospital comprises 426 beds providing wide-ranging medical care to the public, along with an interdepartmental medical team whose cooperation/collaboration ensures readiness in times of crises, such as the H1N1 and Avian Flu epidemics. It is the only hospital in Thailand that is dedicated to the treatment of pediatric patients. Every year around 350,000 pediatric patients visit the hospital for treatment and at the same time approximately 15,000 patients are admitted for inpatient treatment. 5,000 operations are carried out each year.

There are 4 National Centers of Excellence. The Case Management of Dengue/DHF/DSS Center of Excellence complies with international standards and cooperates with the World Health Organization (WHO), the Pediatric Cardiac Center treats over 1,000 congenital heart disease patients in Thailand every year, the Neonatal Center provides health services to patients under National Health Insurance; 30% of these patients are in the tertiary level of their disease. The Neonatal Surgery Center operates on 300-400 patients a year.

QSNICH is planning a major infrastructure expansion, by building the Children's Medical Center, a multi-purpose building project, which will finish by the year 2013.

Services: Since QSNICH is a functioning hospital, it offers many services. These include Emergency Medicine, Blood Bank, Coagulation, Hematology, Immunology, Microbiology, Toxicology, X-ray, CT Scans like CTA, Spiral CT, 4D Angiography Volume Rendering, 3D
Multi-tissue image Display and Bone mass density, Fluoroscopy, Ductogram, Angiograms, T-Tube cholangiogram, Venogram, Fistulogram and Ultrasounds.

**Research:** Most projects are carried out through the WHO Collaborating Center. Current studies involve dengue and improving the knowledge of the immunopathology of severe dengue contributing to the development of a safe and efficacious vaccine and eventually to improved treatment, improving case-management through a modified dengue case definition and treatment guidelines and eventually the identification of early warning signs for severe disease, and improving protection from disease transmission by means of novel vector control tools which are applied through a new cost-effective strategy.

**Prominent Researchers/Clinicians:**
**Dr. Siripen Kalayanarooj,** the director of the WHO Collaborating Center for Case Management of Dengue/DHF/DSS, is an accomplished researcher interested in dengue hemorrhagic fever (DHF) and Japanese encephalitis, particularly in children and in infants. He recently investigated the impacts of the new classification system of dengue on clinical practice, dengue research, and public-health policy, are discussed.

**Dr. Tawee Chotpitayasunondh,** of the Department of Pediatrics, is a virologist with an interest in pediatric infectious diseases, tuberculosis/HIV co-infections, and pediatric vaccines. He recently investigated social factors related to quality of life among HIV infected children in Ubon Ratchathani.
[16] Rajamangala University of Technology Tawan-ok (RMUTTO)
Established: 2005
Province: Chonburi
Address and Contact Information: No. 43 Moo 6, Tambon Bang Phra, Sriracha, Chonburi, 20110. Phone: +66(0)3835-8137; Fax: +66(0)3834-1808-9
Website: http://web47.rmutto.ac.th/english/index.htm
Director: Assoc. Prof. Paiboon Makchan, President; e-mail: paiboon@rmutto.ac.th

Vision and Mission: RMUTTO is a leading university in professional and vocational education, developing quality human resources, upon the basis of science and technology, to meet the international standards and to increase the competitive capability leading to the development of better community economy and quality of life.

Contribution to Tropical Medicine: The contribution is limited to only one Department’s research.

Tropical Disease(s) studied: dengue, Japanese encephalitis

Infrastructure: RMUTTO, as a science and technology based university, offers a wide range of education. Providing quality professional education, 8 faculties of RMUTTO are located in 4 campuses to produce quality graduates entering both government and private enterprises.

Research: The Department of Biotechnology is the only department conducting research on tropical diseases. Most projects are dedicated to aquaculture studies and probiotic bacteria. However, some researchers experiment with mosquito cells.

Prominent Researchers/Clinicians: Nipaporn Kanthong, of the Department of Biotechnology at the Faculty of Science and Technology, is researches the identification and characterization of molecular inhibitors to dengue introduction into mosquito cells.
Ramkhamhaeng University (RU)

Established: 1971
Province: Bangkok
Address and Contact Information: Ramkhamhaeng Road, Hua Mark, Bangkapi, Bangkok 10240. Phone: +66(0)2-310-8000; Fax: +66(0)2-310-8022
Website: http://www.ru.ac.th/english/index.html
Director: Assoc. Prof. Kim Chaisansook, President; e-mail: president@ram1.ru.ac.th

Vision and Mission: Ramkhamhaeng University concentrates on developing graduates who have both professional knowledge and high ethical standards. The University supports research in order to develop technical skills and equality in higher education to all people in both urban and rural areas of Thailand.

Contribution to Tropical Medicine: Most research dedicated to tropical diseases is designed to test the efficacy of natural products against tropical diseases. It does not currently have a medical program, so all research is basic science. As RU has rapidly expanded in recent years, it is expected that it may develop more medicine-related research in the future.

Tropical Disease(s) studied: tuberculosis, diarrheal diseases, malaria

Infrastructure: Ramkhamhaeng University has developed in a rapid and efficient manner in terms of academic standards, curriculum development, research, teaching and learning systems, and quality assurance, as well as the campus sites, including RU Main Campus and RU Bang Na Campus. RU has established 22 RU Regional Campuses covering all regions of Thailand, as well as 37 regional examination centers. The university provides various Special Programs at the Bachelor’s and Master’s Degree levels, as well as short-courses, in 44 provinces, as well as in Bangkok

Research: One of the university’s objectives is to promote the advancement of knowledge through research in a variety of fields, both at the Master’s and Ph.D. levels, as well as research studies conducted by Ramkhamhaeng University lecturers in their respective fields. As a result, in a relatively short period of time, Ramkhamhaeng University has earned itself a reputation with regard to the important research work that it has produced.

There are a few tropical medicine projects currently being undertaken by the Faculty of Science at RU. The Department of Biology is currently working to improve the efficiency of PCR for the detection of Salmonella and Shigella bacteria contamination of drinking water and beverages in the University. The Department of Chemistry and Biotechnology often work on extracting natural medications and testing the efficacy of them.

Prominent Tropical Medicine Researchers:
Dr. Apichart Suksamrarn, of the Department of Chemistry at the Faculty of Science, studies methods on how to isolate and structural elucidation of bioactive natural products, the use of chemistry and biotechnology to modify the structures and enhance the biological activities of natural products, microbial transformation, and natural products drug discovery. He has tested several chemicals for activity against malaria and tuberculosis, such as a study entitled
“antimycobacterial anthraquinone-chromanone compound and diketopiperazine alkaloid from the fungus *Chaetomium globosum* KMITL-N0802.”

**Dr. Wimon Chanchaem**, of the Department of Biology at the Faculty of Science, studies medical bacteriology, molecular biology, and microbiological water quality. She has conducted molecular studies of tuberculosis, including a study on a variable number of tandem repeats result in polymorphic a- isopropylmalate synthase in *Mycobacterium tuberculosis*.

**Dr. Nuanchawee Wetprasit**, of the Department of Biotechnology at the Faculty of Science, is interested in general biochemistry, molecular biology, immunology and microbiology. She has previously studied the implementation of early diagnosis of HIV infection in infants born to infected mothers and the prevalence of intestinal parasitic infestation among Thai school children.
[18] Silpakorn University (SU)
Established: 1943
Province: Bangkok
Address and Contact Information: 22 Boromratchonnee Road, Taling Chan, Bangkok 10170.
Phone: +66(0)2880-7374; Fax: +66(0)2880-7372
Website: http://www.su.ac.th/index.asp (Thai only)
Director: Dr. Uthai Dulyakasem, President; e-mail: uthai.d@su.ac.th

Vision and Mission: SU is a leading creative university in art and science, to promote wisdom in Thailand.

Contribution to Tropical Medicine: SU is primarily a fine arts university, although it has been expanding its capacity for scientific research and education. Currently, specific researchers in the Faculty of Science and Faculty of Pharmacy are the main producers of tropical medicine research.

Tropical Disease(s) studied: some malaria, tuberculosis, HIV, helminthiases.

Infrastructure: SU has 4 campuses, 13 Faculties, and one international college.

Major Equipment: The SU Center for Science and Technology is equipped with modern tools for teaching, research and technical services, including an SEM and X-ray Microanalysis System, Gaschromatography-Mass Spectrometer (GC-MS) Particle Size Analyzer and Inductively Coupled, and Plasma Emission Spectrometer (ICP Specmeter).

Research: The Faculty of Pharmacy carries on the research and development of pharmacy especially in pharmaceutical technology, biological pharmacy, clinical pharmacy, and local pharmacy. Above all, the goal was to make pharmacists possess responsibility to their jobs abiding by missions and visions of a pharmacy career in order to play an important role in giving care to consumers (medicine, food, cosmetic, and environment) in both private and public sector. The Faculty of Science also studies certain tropical diseases, including research on the anti-pathogen activities of natural plant extracts, parasite-host relationships of certain helminthiases, and vaccine studies.

Prominent Tropical Medicine Researchers:
Dr. Jundee Rabablert, of the Department of Biology at the Faculty of Science, has interests in dengue and vaccine development, as shown by the recent study on the attenuated D2 16681-PDK53 vaccine. He is also interested in the proliferative T cell responses to dengue vaccines were studied using the parental strains of dengue vaccines as antigens.
Dr. Pittaya Tuntiwachwuttikul, of the Department of Chemistry at the Faculty of Science, isolates and researches active natural compounds from various plant species. Compounds are tested for antimalarial activities. Plants such as Prismatomeris malayana, Piper sarmentosum, and Harrisonia perforata have most recently been studied.
Dr. Duangduen Krailas, of the Department of Biology at the Faculty of Science, studies trematodes and their hosts. He focuses primarily on Fasciola gigantica, and the parasite-host dynamics between that and freshwater fish and snails.
Dr. Nalinee Poolsup, of the Department of Pharmacy at the Faculty of Pharmacy, typically studies chronic diseases and disorders. However, recently she evaluated the efficacy of antiretroviral therapies in reducing the risk of mother-to-child transmission of HIV infection.

Dr. Suang Rungpragayphan, of the Department of Health-Related Informatics of the Faculty of Pharmacy, is currently developing a database of drug information via the Internet for health personnel and the general public. He has also conducted molecular studies to identify of candidate host proteins that interact with LipL32, the major outer membrane protein of pathogenic Leptospira, by random phage display peptide library.
[19] Srinakharinwirot University (SWU)
Established: 1974
Province: Bangkok
Address and Contact Information: 114 Sukhumvit 23, Bangkok 10110, Thailand. Phone: +66(0)2649-5000; Fax: +66(0)2258-4007
Website: http://www.swu.ac.th/en/
Director: Prof. Wiroon Tungcharoen, Ph.D., President; e-mail: wiroon@psm.swu.ac.th

Vision and Mission: To create knowledge, public morality, and inimitable service. SWU is one of the leading research and learning organizations on a basis of virtue and education oriented to international innovation and creativity. To generate personnel development with quality and virtue for society through the learning process and a learning society. To create quality, beneficial and sustainable research and innovation for national and international society. To provide services with quality, awareness, and accountability for society. To study, analyze and foster arts and culture. To develop administration systems with quality and good governance.

Contribution to Tropical Medicine: SWU is primarily a fine arts and education university, and although it has expanded its science and health program and made research a primary goal, research in all Health Sciences only accounts for 25% of the funded research. Currently, specific researchers in the Faculty of Science and Faculty of Pharmacy are the main producers of tropical medicine research. With the recent completion of the Faculty of Health Sciences, it is expected that SWU will have a greater capacity for tropical medicine research.

Tropical Disease(s) studied: some leptospirosis, malaria, tuberculosis, and diarrheal diseases

Infrastructure: In the past, Srinakharinwirot University consisted of six faculties: the Faculty of Education, the Faculty of Humanities and Science, the Faculty of Social Science, the Faculty of Science, the Faculty of Physical Education, and the Graduate School. Later, in phase 5 of the Higher education development plan (1982-1986), the Faculty of Medicine was set up; in phase 7 (1992-1996), the Faculty of Engineering, the Faculty of Fine Arts, the Faculty of Dentistry, and the Faculty of Pharmacy; and in Phase 8 (1997-2001), the Faculty of Health Science and Nursing.

Hospital Facilities: The HRH Princess Maha Chakri Sirindhorn Medical Center was completed in 1999 and was officially opened on 2 November 2001 with the aim of being an institute for teaching and learning in the Faculty of Medicine, and for other students in health-related sciences.

The Medical Center is a 360-bed hospital with a total area of 58,595 square meters of open treatment with medical experts. The current branches include Obstetrics & Gynecology, Pediatrics, Internal Medicine, Surgery, Dentistry, Radiology, Otolaryngology, Ophthalmology. It also houses the Faculty of Rehabilitation Medicine.

Research: The Faculty of Science actively researches phenomena occurring in Thailand at its Bioactive Substances Research Unit, which is part of the Department of Chemistry. The Faculty of Medicine carries out applied research that continuously improves the nature of that health
care. The most relevant departments for tropical medicine are Microbiology, Pathology, and Biochemistry.

**Prominent Researchers/Clinicians:**

**Dr. Supaluk Prachayasittikul** of the Department of Chemistry at the Faculty of Science, is interested in natural bioactive compounds, including ones against malaria, and recently investigated bioactive extracts of *Polyalthia debilis* with antimicrobial, antimalarial and cytotoxic activities.

**Dr. Kosum Chansiri**, of the Department of Biochemistry at the Faculty of Medicine, conducts molecular studies on *Brugia* spp. nematodes and certain diarrheal diseases, such as *E. coli* infections. He is an expert in the diagnosis of infectious microorganisms in human and animals using PCR based methods, molecular studies of gene encoding for enzymes involved in nucleotide and fatty acid metabolism as drug targets for treatment and control parasites, and filariasis, especially molecular biological studies and drug treatment pahangi in cat reservoirs based on internal transcribed spacer region 1.

**Dr. Paisarn Khawsak**, of the Department of Biochemistry at the Faculty of Medicine, researches on how to diagnose infectious microorganisms in human and animals using PCR based method, surveillance and epidemiology of dengue virus serotypes in Thailand using PCR based method, molecular studies of gene encoding for lipases from thermotolerant *Bacillus* sp., use of bioactive substances extracted from medicinal plants as the antimalarial drugs.

**Dr. Patcharin Saengjaruk**, of the Department of Pathology, research leptospirosis and recently developed humanized-monoconal antibody against heterologous *Leptospira* infection.

**Dr. Sunit Suksamrarn**, of the Department of Chemistry at the Faculty of Science, studies natural compounds active against tuberculosis and malaria. She recently did a study on ceanothane- and lupane-type triterpenes with antiplasmodial and antimycobacterial activities from *Ziziphus cambodiana*.

**Dr. Supinya Pongsunk**, of the Department of Microbiology, is interested in molecular studies of melioidosis and has recently done a proteomics study on the expression and purification of 30 kilodalton protein antigen of Ara- *Burkholderia pseudomallei*.

____________________________________
Thai Red Cross AIDS Research Centre (TRCARC)

Agency: Affiliated with Chula, part of HIV-NAT
Established: 1989
Province: Bangkok
Address and Contact Information: 104 Ratchadamri, Pathumwan, Bangkok 10330 Phone: +66(0)2256-4107-9; Fax: +66(0)2254-7577
Website: http://www.trcarc.org/index.php
Director: Prof. Praphan Phanuphak; e-mail: ppraphan@chula.ac.th

Vision and Mission: TRCARC is a leader in AIDS research and service by providing services related to AIDS, both medical and social, driving and support the AIDS policy of the country and the region.

Contribution to Tropical Medicine: The TRCARC is one of Thailand’s leading institutions in HIV and HIV-related research. They regularly conduct clinical trials and clinical research, as well as provide much-needed services to the community.

Tropical Disease(s) studied: primarily HIV/AIDS; other diseases, such as TB, as a co-infection with HIV.

Infrastructure: TRCARC is part of the multi-centre clinical research organization HIV Netherlands Australia Thailand Research Collaboration (HIV-NAT) established in Thailand to address a need for more affordable HIV treatments in Thailand and other resource limited settings, and the reluctance on the part of the pharmaceutical companies and other sponsors to move HIV related clinical research to areas where HIV is most prevalent.

Services: TRCARC has the first clinic set up in Thailand and Asia to provide anonymous consultation and early detection of HIV infection to the general public. The priorities of the clinic are to ensure confidentiality of people using the service and provide good advice, both before and after the tests. The services are listed as the following:
1. Blood test for AIDS.
2. The CD4 immune level test.
3. The levels of virus in the blood (viral load).
5. Screening for parasitic infection in the female reproductive system.
6. Check for latent tuberculosis infection.

Research: TRCARC’s core research areas include pharmacokinetics of HIV therapy, co-infections with Hepatitis B, tuberculosis and HPV, new drug development and cohort and strategic studies. With the rest of HIV-NAT, there are approximately 60 studies that are currently running.

Prominent Researchers/Clinicians include:
**Dr. Praphan Phanuphak**, primarily works on AIDS and rabies, and past studies have focused on anti-HIV agents, HIV protease inhibitors, ritonavir, reverse transcriptase inhibitors, rabies vaccines, stavudine, and indinavir.

**Dr. Thanyawee Puthanakit** is a pediatric infectious disease specialist and started her clinical research in pediatric HIV/AIDS focusing on opportunistic infections and antiretroviral therapy. She has lead the pediatric randomized early versus deferred treatment initiation among HIV-infected children in Thailand and Cambodia (the PREDICT study).
[21] Thammasat University (TU)
Established: 1934
Province: Bangkok
Address and Contact Information: 2 Prachan Road, Bangkok 10200 Thailand.
Phone: +66(0)2-613-3333
Website: http://www.tu.ac.th/eng/
Director: Prof. Dr. Somkit Lertpaithoon; e-mail: lsomkit@tu.ac.th

Vision and Mission: To generate graduates who are skillful, virtue and ethical, to provide education and training to promote academic development in the careers of medicine and post graduated science, to conduct researches with national and international impact as well as create extended knowledge, to offer high international quality services to communities.

Contribution to Tropical Medicine:

Tropical Disease(s) studied: Mostly malaria, also HIV, helminthiases, diarrheal diseases, tuberculosis, leptospirosis, and some melioidosis and dengue

Infrastructure: TU has 4 campuses, 17 faculties, 3 colleges, and 2 institutes. The TU Faculty of Allied Health has been divided into sub-divisions as follows; Department of Medical Technology; Department of Physical Therapy. Moreover, they intend to extend an additional two divisions which are Department of Radiological Technology and Department of Occupational Therapy. They also have developed various research-related units to serve various functions:
1. Pharmacology Research Unit and Department of Infectious Diseases.
2. Research and Academic Services for diagnosis and prevention of infectious diseases.
3. Research and Academic Services for Health Science and Environment.
In 2006, they also established two new research units, a pharmacology research unit for malaria and a research unit dedicated to developing technology for diagnosis, treatment and vaccines against diseases Opisthorchiasis and Fasciolosis.

Hospital Facilities: Thammasat University Hospital is autonomous from TU. It runs under the Office of the President, with the mission of providing academic, medical and public health in general. The hospital is also the source of the clinical practice for Faculty of Medicine as well. Thammasat Hospital has in-patient capacity of 600 beds.

Research: The Faculty of Allied Health Sciences conducts numerous projects relevant to tropical medicine. Currently, such projects include using single multiplex PCR for the rapid identification of all pathogenic *Escherichia coli* in diarrheic patients, searching for a potential new drug against drug-resistant malaria, and the development of a diagnostic tool for *Opisthorchis viverrini* based on a recombinant glutathione S-transferase.

Clinical Trials: TU is the site for Thailand’s WHO/TDR Clinical Coordination and Training Center. The Clinical Coordination and Training Center is dedicated to training and quality management for health research by promoting and evaluating models of integrated systems and facilitating the formation and maintenance of sustainable networks globally.
Prominent Tropical Medicine Researchers:

**Dr. Kesara Na-Bangchang**, of the Faculty of Allied Health Sciences, studies pharmacokinetics, drug metabolism, pharmacogenetics, pharmacology of malaria and other tropical diseases, mechanisms of drug action and resistance, traditional medicine, and drug research and development.

**Dr. Wanna Chaijaroenkul**, of the Faculty of Allied Health Sciences, is interested in pharmacology and toxicology, especially in malaria or tropical diseases. She is currently conducting studies on mechanism of action of dihydroartemisinin based on metabolomics change and the molecular mechanism of chloroquine resistance of genes that regulate glutathione (GSH) metabolism of *Plasmodium falciparum* malaria.

**Dr. Vithoon Viyanant**, of the Faculty of Allied Health Sciences, studies the immunology of Liver Fluke infection in human and domestic animals.

**Dr. Potjanee Srimanote**, of the Faculty of Allied Health Sciences, is interested in the molecular diagnosis and epidemiology of bacterial infection, bacterial pathogenesis, and host-pathogen interaction. She is currently undertaking a project to type *Leptospira* isolates from human and animals in Thailand using multiple-locus variable number of tandem repeat analysis (MLVA).

**Dr. Anucha Apisarnthanarak**, of the Thammasat University Hospital, is an infectious disease specialist and hospital epidemiologist interested in preventing and controlling nosocomial infections, antimicrobial stewardship and epidemiology of drug resistance microorganisms with a secondary focus on investigating outbreaks and emerging infectious diseases.
Northern Thailand

Which includes the following provinces:

- Chiang Mai
- Chiang Rai
- Kamphaeng Phet
- Lampang
- Lamphun
- Mae Hong Son
- Nakhon Sawan
- Nan
- Phayao
- Phetchabun
- Phichit
- Phrae
- Sukhothai
- Tak
- Uthai Thani
- Uttaradit

The following institutions are relevant to tropical diseases and located in the North region:

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<td>24</td>
<td>Maejo University</td>
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<td>Mae Sot General Hospital</td>
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<tr>
<td>26</td>
<td>Naresuan University</td>
<td>Phitsanulok</td>
<td>103</td>
</tr>
</tbody>
</table>
Chiang Mai University (CMU)
Established: 1964
Province: Chiang Mai University
Address and Contact Information: 239 Huay Kaew Road, Muang District, Chiang Mai, Thailand, 50200. Phone: +66(0)53-941000; Fax: +66(0)53-217143
Website: http://www.cmu.ac.th/index_eng.php
Director: Pongsak Angkasith, President; e-mail: pongsak@chiangmai.ac.th

Vision and Mission: CMU is a Leading University with Academic Excellence in International Standards, focusing to become a research-oriented institution of higher education and producing graduates with high moral and ethical standards, equipped to practice good governance under the Sufficiency Economy Philosophy and Sustainable Development.

Contribution to Tropical Medicine: CMU has sought to track emerging demographic, environmental and health trends and their consequences, at population and community level, for human exposures, behaviors and health outcomes. Certain groups within faculties and institutes concentrate on HIV/AIDS, malaria and dengue; pollution and environmental health and human nutrition and metabolism. The CMU research portfolio includes field-based community surveys, clinical and vaccine trials to test new drug regimens and vaccine candidates for prevention of HIV/AIDS and health systems research.

Tropical Diseases Studied: malaria, dengue, helminthiases, tuberculosis, HIV, leptospirosis, toxoplasmosis, melioidosis, and many others.

Infrastructure: CMU conducts tropical medicine research within its Research Institute of Health Sciences (RIHES), its Faculties of Science and Medicine. There are currently three laboratory units at RIHES (a fourth unit is under construction). The Clinical Laboratory (CL) performs tests relevant to HIV, such as HIV serology (EIA, Western Blot, HIV-RNA PCR and lymphoimmunotyping [CD4/CD8]). The laboratory also has expertise in hematology, clinical microscopy, clinical chemistry, serology, molecular microbiology and parasitology. The cellular immunity laboratory has expertise in cellular immunology and is currently working on assessment of humeral-mediated immunity (HMI) and cell-mediated immunity (CMI) responses in malaria and HIV.

A new laboratory, dedicated to TB diagnostics, has just received approval from DAIDS in recognition that co-infection with HIV and TB is a serious public health problem in resource-limited countries. The cellular immunity laboratory has expertise in cellular immunology and is currently working on assessment of humeral-mediated immunity (HMI) and cell-mediated immunity (CMI) responses in malaria and HIV. The RIHES Pharmacy has a storage room with a work area and office space for the research pharmacists, dispensing window, locked shelf drug storage separated by protocol, -70C freezer and refrigerator.

Hospital facilities: The Maharaj Nakorn Chiang Mai Hospital consists of several buildings: an old 7-story building, the 15-story Sujinno Building, and the 15-story Sripat Building, which is under construction. The Sujinno Building was finished in 1983. The new Sripat Building is in commemoration of Queen Sirikit's 60th birthday, which is for patients with more severe
problems and complications. The hospital with all three buildings has 1,800 beds and serves 414,362 outpatients and 49,200 inpatients per year. Many joint programs have been set up with other hospitals and health centers both inside and outside the Chiang Mai area to provide medical and educational support for physicians and medical students. In cooperation with the Ministry of Public Health, physicians from the Faculty of Medicine provide medical services at rural health centers or give special lectures for doctors and other health personnel at provincial hospitals.

Research: In addition to departmental research, there are three institutes at CMU that conduct interdisciplinary research, two of which are pertinent to tropical medicine.

The RIHES was founded in as a research centre for anemia and childhood malnutrition, and at the behest of the Government the Institute rapidly broadened its research parameters to include all of the major health problems affecting the populations of northern Thailand and its neighbors, Laos, Cambodia, Vietnam, Southern China and Myanmar

The Science and Technology Institute’s primary function is to provide an organizational structure, comprised of research centers and research units, to facilitate the initiation, coordination and support of multi-disciplinary science and technology research projects. The majority of its research projects involve science, engineering, agriculture and agro-industry.

Prominent Researchers/Clinicians:
Dr. Watchara Kasinrerk, of the RIHES, conducts research on dengue to develop high-efficiency hybridoma technique for monoclonal antibody production, biochemical and functional studies of leukocyte surface molecules, and the development of immunodiagnostics reagents

Dr. Thira Sirisanthan, of the RIHES, conducts risk factor studies, retrospective studies, cohort studies and incidence studies of HIV and AIDS-related opportunistic infections. He has also investigated procedures such as highly active antiretroviral therapy and CD4 lymphocyte count as well as treatments with various anti-HIV agents and itraconazole.

Dr. Pradya Somboon, of the Department of Parasitology at the Faculty of Medicine, specializes in medical entomology and medical parasitology. His group conducts vector population studies on Aedes spp, including a recent study on the mitochondrial pseudogenes in the nuclear genome of Aedes aegypti mosquitoes, which has implications for past and future population genetic studies.

Dr. Malai Muttarak, of the Department of Radiology at the Faculty of Medicine, serves as a radiology consultant for a variety of research projects. Recently, she has conducted a pictorial review that aimed to highlight the clinical and imaging features of melioidosis in various organ systems and a study that attempted to optimize radiology-based diagnosis of tuberculosis of the genitourinary tract.

Dr. Nopporn Sittisombut, of the Department of Microbiology at the Faculty of Medicine, studies the molecular biology of dengue virus and dengue vaccine development. He has recently studied the influence of pr-M cleavage on the heterogeneity of extracellular dengue virus particles.

Dr. Malee Mekaprateep, of the Department of Microbiology at the Faculty of Medicine, is recently been investigating applications of a non-species dependent ELISA for the detection of antibodies in sera of Burkholderia pseudomallei-immunized goats and the use of indirect hemagglutination test for the serodiagnosis of melioidosis.
Dr. Chalobol Wongsawad, the leader of the Parasitology Research Laboratory of the Department of Biology at the Faculty of Science, is currently conducting ultrastructural studies on helminths, using TEM and SEM technology. He is also studying the biodiversity, biology, and life history of intestinal trematodes that infect humans, such as *Haplorchis taichui*. Additionally, he works to develop molecular methods for identifying and detecting the larval stage of heterophyid trematodes.
[23] Chiang Rai Regional Hospital (CRRH)
AKA: Chiang Rai Prachanukraw Hospital, Chiangrai Prachanukroh Hospital
Established: 1932
Province: Chiang Rai
Address and Contact Information: 1039 Sathan Payabam Road, Mueang Chiang Rai, Chiang Rai, 57000. Phone/Fax: +66(0)53-711300
Website: http://www.crhospital.org (Thai only)
Director: Dr. Suthat Sriwilai, Director; e-mail: crh-research@hotmail.com

Vision and Mission: To have excellent quality service by providing holistic health services and tertiary care, having integrated management, promoting knowledge in material science, medicine and health, and developing a cooperative health network.

Contribution to Tropical Medicine: CRRH has contributed a number of clinical studies of scrub typhus, HIV, and tuberculosis in the North region.

Tropical Disease(s) Studied: Tuberculosis, HIV, scrub typhus, dengue

Infrastructure: CRRH has 600 beds in its ICU and CCU, and another 738 beds combined from all of its specialized centers. It occupies more than 20 acres of land in the central district of Chiang Rai.

Research: There are 7 clinicians/researchers studying tropical diseases at CRRH. Current projects include a comparative study of both clinical and laboratory findings between dengue hemorrhagic fever and scrub typhus in children and hepatic dysfunction in pediatric scrub typhus.

Prominent Researchers/Clinicians:
Dr. Chulapong Chanta, of the Department of Pediatrics, studies scrub typhus and dengue hemorrhagic, most recently studying the importance of performing a liver function test to diagnose and mark the disease severity to find hepatic dysfunction in pediatric scrub typhus.
Dr. Pacharee Kantipong, of the Department of Medicine, studies various infectious diseases and recently evaluated a multi-test strip dotblot immunoassay for the diagnosis of typhoid fever, scrub typhus, murine typhus, dengue virus infection and leptospirosis in Thai adults presenting to hospital with acute, undifferentiated fever
Dr. Supalert Nedsuwan, of the Department of Social and Preventive Medicine, studies tuberculosis and recently completed a 12 year surveillance study to determine the time of highest tuberculosis death risk and associated factors.
Maejo University
Established: 1934
Province: Chiang Mai
Address and Contact Information: 1001 Nong Han, San Sai, Chiang Mai 50290, Thailand
Phone/fax: +66(0)53-873000;
Website: http://www.mju.ac.th/tri_versions/eng_index.php
Director: Dr. Chamnian Yosraj; e-mail: chamnian@mju.ac.th

Vision and Mission: Focus towards the development of the university as a foremost international institution of academic excellence in the region and to become a learning center for all people, while having self-reliance and dependence of Thai society.

Contribution to Tropical Medicine: Only certain researchers from various faculties are investigating tropical diseases. The Department of Chemistry is investigating the molecular structure of malaria. The Department of Biology studies various vectors and hosts of tropical parasitic diseases. The Faculty of Engineering and Agro-Industry has studied various food-borne disease outbreaks.

Tropical Disease(s) Studied: Malaria, helminthiasis, and diarrheal diseases.

Infrastructure: Maejo University main campus at Chiang Mai is composed of the Faculties of Agricultural Business, Agricultural Production, Science, and Engineering and Agro-Industry. In addition to these, the university has two smaller campuses in Phrae and Chumphon.

Major Equipment: Laboratories are equipped with modern research equipment. Some of this includes a Voltammeter, Conductometer, Coulometer, Amperometric Detector, pH Meter, Electrochemical Analyzer, Expandable Ion Analyzer, GC system, Fourier Transform Infrared Spectrometer, Differential Scanning Calorimeter, Ballistic Bomb Calorimeter, Magnetic Susceptibility Balance, Mercury Analyzer Cold Vapor, HPLC, UV-Vis Spectrophotometer, Luminescence Spectrometer, Atomic Absorption Spectrometer, and Flame Photometer.

Research: Research is limited to a few researchers from different departments.

Prominent Researchers/Clinicians:
Dr. Thararat Chitov, of the Faculty of Engineering and Agro-Industry, has studied various food-borne outbreaks of diarrheal diseases, including an incidence of large foodborne outbreak associated with Vibrio mimicus and the antagonistic growth of Vibrio spp. Important in the safety of seafood.

Dr. Saengtong Pongjareankit, of the Department of Biology at the Faculty of Science, conducts genetic and molecular studies of enzymes from the Anopheles mosquito, which is the vector for malaria. A recent study investigated the expression and characterization of three new glutathione transferases, an epsilon (AcGSTE2-2), Omega (AcGSTO1-1), and Theta (AcGSTT1-1).

Dr. Ratchadaporn Puntharod, of the Department of Chemistry at the Faculty of Science, studies the structure and synthesis of the malaria pigment and related hemes, using spectroscopy and crystallography.
[25] Mae Sot General Hospital (MSGH)

Established: 1957
Province: Tak
Address and Contact Information: 175/16 Sri Panit Rd., Tetsaban, Maesot District, Maesot, Tak, Thailand. Phone: +66(0)55-531229; Fax: +66(0)55-533046
Website: http://www.maesot-hospital.com/home.html (Thai only)
Director: Dr. Ganganat Pisuttagul; e-mail: N/A

Vision: A public hospital that provides quality health care that meets the national standards and participate in mechanisms to strengthen health policy and public sector health care system.

Contribution to Tropical Medicine: Mae Sot district is an area directly on the border of Myanmar and Thailand. The mobile immigrant population that moves back and forth between countries makes Mae Sot and important focus for tropical disease control strategies. This is especially true for drug-resistant malaria, which Mae Sot has been experiencing a lot in recent years. It is no surprise then that MSGH has a number of studies on malaria and has collaborated with other institutions in clinical trials.

Tropical disease(s) studied: Mostly malaria; also melioidosis, HIV, TB, diarrheal diseases

Research: Research projects are usually collaborations with other institutes, such as TU or MU. MSGH clinicians are currently studying polymorphisms of molecular markers of antimalarial drug resistance and relationship with artesunate-mefloquine combination therapy in patients with uncomplicated Plasmodium falciparum malaria.

Prominent Researchers/Clinicians:
Dr. Ronnatri Ruengweerayut often collaborates with Thammasat University to conduct studies on malaria therapeutics, recently researching the distribution of mefloquine in the blood of Thai patients with acute uncomplicated falciparum malaria following administration of therapeutic doses of artesunate.
Dr. Witaya Swaddiwudhipong, of the Department of Community and Social Medicine, is interested in diarrheal disease surveillance, particularly cholera.
[26] Naresuan University (NU)

Established: 1967
Province: Phitsanulok

Address and Contact Information: 99 moo 9 Tha-Pho, Pitsanulok 65000, Thailand. Phone: +66(0)5596-2380; Fax: +66(0)5596-2380;
Website: http://www.nu.ac.th/english/
Director: Prof. Dr. Sujin Jinahyon, President; Sujin@nu.ac.th.

Vision: Naresuan University will become a research-based university before 2017. In pursuit of a 'free from ignorance society,' the university has pledged to fulfill the following four key missions; well-qualified students, research excellence, a wide range of academic services, and arts and culture conservation.

Contribution to Tropical Medicine: NU has been expanding its research capacity in recent years and has a number of health science-related faculties and researchers. Most of their current research in tropical medicine is on malaria and HIV.

Tropical Diseases Studied: Malaria, HIV, diarrheal diseases, some melioidosis.

Infrastructure: Naresuan University has 18 Faculties and 5 colleges.

Hospital Facilities: The Naresuan University Hospital is run directly by the Faculty of Medicine. It has a Community Primary Health Care Service Unit, a Nutrition Unit, a Clinical Pathology Unit, a Health Service Support Unit, a 4A Special In-Patient Ward, a 5B In-Patient Ward, and a Pharmacy Department

There are 6 hospitals in 6 different provinces affiliated with NU. Those are Phrae Hospital, Phichit Hospital, King Taksin the Great Hospital, Chiang Rai Regional Hospital, Uttaradit Hospital, and Buddhachinaraj Phitsanulok Hospital.

Research: Naresuan University has developed a strategic plan for research, which covers the next four years. Strategic elements include practicing good research governance/ management, increasing research competitiveness, enhancing research competencies, and delivering high quality research outputs and outcomes. NU’s major research strengths currently lie in our centers of excellence, namely Applied Chemistry Research Unit and Greater Mekong Sub-region Research Unit. These contribute to the National Network of Excellent Centers distributed throughout Thailand. Because Naresuan University is a relatively new, comprehensive university, it has many young, enthusiastic scientists in other disciplines and several more research groups are presently being formed. These include research units for Biodiversity, Agricultural Technology, Energy, Traditional Medicine, Epidemiology, and Nanotechnology.

Prominent Researchers/Clinicians:
Dr. Tawesak Nopkesorn, of the Faculty of Medicine, conducted research on prevention of HIV transmission and recently did a study on sexual practice among Thai HIV-Infected patients: Prevalence and risk factors for unprotected sex.
Dr. Sutatip Pongcharoen, of the Department of Medicine at the Faculty of Medicine, studies melioidosis and recently did a comparative study of interleukin-1β expression by peripheral blood mononuclear cells and purified monocytes experimentally infected with *Burkholderia pseudomallei* and *Burkholderia thailandensis*.

Dr. Maitree Suttajit, of School of Science and Technology, studies nutrition support to enhance the quality of life in patients with HIV/AIDS.

Dr. Sunee Seethamchai, of the Department of Biology at the Faculty of Science, studies zoonotic malaria in monkeys as a model of human malaria. She continues her research on the ecology of malaria parasites infecting Southeast Asian macaques, using evidence from cytochrome b sequences.
Northeastern Thailand

Which includes the following provinces:

Amnat Charoen  Maha Sarakham  Sakon Nakhon
Bueng Kan  Mukdahan  Sri Saket
Buriram  Nakhon Phanom  Surin
Chaiyaphum  Nakhon Ratchasima  Ubon Ratchathani
Kalasin  Nong Bua Lamphu  Udon Thani
Khon Kaen  Nong Kai  Yasothon
Loei  Roi Et

The following 12 institutions are relevant to tropical diseases and located in the Northeastern Region:

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<td>Loei Rajabhat University (LRU)</td>
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<td>Mahasarakham University (MSU)</td>
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<td>Nakhon Ratchasima Rajabhat University (NRRU)</td>
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<td>Sappasithiprasong Hospital (SPH)</td>
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<td>34</td>
<td>Suranaree University of Technology (SUT)</td>
<td>Nakhon Ratchasima</td>
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<td>35</td>
<td>Ubon Ratchathani University (URU)</td>
<td>Ubon Ratchathani</td>
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[27] Khon Kaen University (KKU)
Established: 1964
Province: Khon Kaen
Address and Contact Information: Phone; Fax:
Website: http://www.kku.ac.th/eng/main.php
Director: Assoc. Prof. Kittichai Triratanasirichai, President; e-mail: president@kku.ac.th

Vision and Mission: Khon Kaen University is a leading university in the ASEAN, and is a learning-based, research-based, quality-based, and community and national development-based university with good governance. In order to achieve the internationally recognized standards and strengthen the community and society, Khon Kaen University has the mission to produce graduates with well-balanced knowledge, morals and wisdom, to promote and expand the university research, to provide academic services to the community through the university community outreach programs, and to preserve and promote the arts, culture and heritage.

Contribution to Tropical Medicine: KKU has conducted a lot of research on pathogenesis of the liver fluke, *Opisthorchis viverrini*, and cholangiocarcinoma in Thailand. They are also expanding expertise into other related fields and aims to foster broader research and educational programs related to tropical diseases. Researchers study pathology, parasitology, immunology, cellular and molecular biology, clinical trials, and epidemiology & data management system. There are tropical medicine investigators in the Departments of Pathology, Parasitology, Radiology and Surgery of the Faculty of Medicine, the Department of Biostatistics and Demography of the Faculty of Public Health, and the department of Pathobiology, Faculty of Veterinary Medicine, Khon Kaen University.

Tropical Disease(s) studied: Mainly melioidosis and helminthiases such as *O. viverrini*, although also HIV, malaria, dengue, diarrheal diseases, and tuberculosis.

Infrastructure: The campus is located in the northwest sector of Khon Kaen, just a few kilometres from the center of the city. Situated in a most attractive park, the campus covers approximately 900 hectares. From small beginnings, KKU has grown enormously and is today home to more than 2,110 staff in seventeen faculties, four academic support centers, two academic services centers, a hospital and many research institutes, centres of excellence and specialist centres. There is also a Research and Development Institute (RDI) established to manage research activities in KKU, and in 1981 became the center of research and development of the Northeast Thailand. The RDI has driven forwards hundreds of projects with financial support from USAID and CIDA. The RDI is in charge of linking networking of public, private and non-governmental organizations to manage the sustainable development in Northeastern Thailand. Additionally, they KKU has two specialized research centers called the *Liver Fluke and Cholangiocarcinoma Research Center* and the *Tropical Disease Research Laboratory*, both of which focus on tropical medicine.

Hospital Facilities: Srinagarind Hospital is used as a training site for the medical students of KKU. It was originally founded as a specialty center for leprosy, but is now one of the largest and most reputable hospitals in the Northeast. There are state-of-the-art surgery rooms and diagnostic and treatment services to people who underwent surgery.
Services: KKU provides parasitic diagnostic services for patients at Srinagarind Hospital. They also supply sample parasites and materials for education and research to support student activities, conduct annual campaigns on parasitic diseases, and does parasite monitoring. They host regional and national workshops on how to diagnose parasitic diseases and control the Aedes mosquito, the vector for dengue hemorrhagic fever.

Research: Currently, there are ongoing projects to apply multidisciplinary integrated approach (Lawa Model) in controlling Opisthorchis viverrini infection in Mekong countries including Lao PDR, Cambodia, Vietnam and Thailand and the pathogenesis of liver fluke induced cancer in Thailand.

Research on other infectious diseases is divided into two main areas: (1) HIV infection is widespread Northeast Thailand. The immediate problem is to tackle opportunistic infections such as cryptococcal meningitis and tuberculosis. KKU is working toward developing the HIV therapeutic vaccine; and (2) Melioidosis caused by Burkholderia pseudomallei is endemic in Northeast Thailand. Research is being undertaken on diagnosis and treatment. Nosocomial infections are also being studied using molecular biological techniques.

BIOTEC-NSTDA provided a research grant to Khon Kaen University to develop a test for red cell antigen-antibody detection. The test can be mass produced domestically at a relatively low cost, allowing for a cost of 5-10 Baht/test, while the imported test can cost up to 25 Baht. The technology was licensed to Innov (Thailand) Co., Ltd.

Prominent Researchers/Clinicians:
Dr. Pewpan M. Intapan and Dr. Wanchai Maleewong, of the Department of Parasitology at the Faculty of Medicine, often collaborate together to study a variety of helminthes, including Gnathostoma, Paragonimus, Angiostrongylus cantonensis, Fasciola, and Opisthorchis. They recently tested the specificity of immunoblotting analyses in eosinophilic meningitis, which is caused by the angiostrongyloid parasite. They also developed a method for the molecular identification of Trichinella papuae from a Thai patient with imported trichinellosis.

Dr. Paiboon Sithithaworn, of the Department of Parasitology at the Faculty of Medicine, studies opisthorchiasis recently developed a method for the detection of salivary antibodies to crude antigens of Opisthorchis viverrini in opisthorchiasis and cholangiocarcinoma patients.

Dr. Ploenchlan Chetchotisakd, of the Department of Medicine at the Faculty of Medicine, studies melioidosis, non-tuberculous mycobacteria, HIV, and fungal infection.

Dr. Ganjana Lertmemongkolchaisai, of the Faculty of Associated Medical Sciences, works in the Research and Development in Laboratory Diagnosis for Infectious Diseases unit of the Centre for Research and Development of Medical Diagnostic Laboratory. She develops diagnostic methods for melioidosis, as in her previous study entitled “Genomic transcriptional profiling identifies a candidate blood biomarkers signature for the diagnosis of septicemic melioidosis.”
Loei Hospital (LH)

Established: 1951
Province: Loei
Address and Contact Information: 32/1 Maliwan Road, Gutpong, Muang District, Loei, 42000
Phone: +66(0)42-811541
Website: http://www.loeihospital.go.th/2011/
Director: Dr. Pramote Boonjian;

Vision and Mission: To have a high-quality standard of hospital management through the participation of all sectors in order to keep people in good health and make all service providers happy.

Contribution to Tropical Medicine: LH is responsible for developing the Clinical Practice Guide for how to treat patients with leptospirosis. They also participated in the HIVQUAL-T forum to develop a standard of care for people infected with HIV and AIDS.

Tropical Disease(s) studied: Leptospirosis, HIV, helminthiases, scrub typhus.

Infrastructure: LH is a hospital with over 300 beds and various speciality clinics. They have attempted to expand their capacity for patient care and research, and have recently added an IT database to store medical records and information systems, and EMS service with a Coordination Center, a neurosurgical unit with computerized tomography (CT scan), a tertiary cardiology clinic for heart disease and treatment services, including echocardiogram and exercise stress test, and many other infrastructure projects.

Research: LH often collaborates with KKU and other universities within the region. It has conducted a number of leptospirosis and angiostrongyliasis studies. They often report on the clinical presentations of leptospirosis, recommended treatments, and previously reported on hypotension, renal failure, and pulmonary complications in leptospirosis.

Prominent Researchers/Clinicians:
Dr. Kanigar Niwattayakul has done studies on leptospirosis and helminthiases, most recently conducting an open randomized controlled trial of desmopressin and pulse dexamethasone as adjunct therapy in patients with pulmonary involvement associated with severe leptospirosis.
Dr. Taweesak Santivarangkana recently assisted with a study of cerebrospinal fluid u-plasminogen activator and matrix metalloproteinase-9 levels in human eosinophilic meningitis associated with angiostrongyliasis.
[29] Loei Rajabhat University (LRU)
Established: 1973
Province: Loei
Address and Contact Information: 234 Loei-Chieng Kan, Loei 42000, Thailand. Phone: +66(0)42-835224-8; Fax: +66(0)42-811143
Website: http://www.lru.ac.th/html/eng/index.php
Director: Assistant Professor Sanit Loengbudnark; e-mail: lrupresident@hotmail.com

Vision and Mission: Loei Rajabhat University is a Leading University of Learning Organization, Integrating Local and International Disciplines for Rural Development towards the Greater Mekong Sub-region.

Contribution to Tropical Medicine: There is only one researcher at LRU that is studying tropical diseases.

Tropical Diseases Studied: Malaria, diarrheal diseases

Infrastructure: LRU has 5 faculties. The Faculty of Science hosts the University Science Center, which is equipped with research labs for physics, chemistry and biology. Also recently built in 2010 is the Clinical Technology Center, which was done to accelerate LRU’s research and strengthen research capacity.

Major Equipment: The University Science Center has laboratories of Chemistry and Biology, equipped with such equipment as an Inverted Microscope, Phase Contrast Microscope, Freeze Dryer, Lyophilizer, Refrigerator / Freezer, Shaker Incubator; refrigerated, Water Bath and Shaker, Autoclave, high-performance liquid chromatography, gas chromatographic's graph (the GC, Spectrophotometer, Automatic Titrator, Electrophoresis Apparatus, COD Test Set, and a Rotary Evaporator)

Research: Currently, there is only one statistician conducting research on tropical diseases.

Prominent Researchers Include:
Dr. Jurairat Ardkaew, of the Faculty of Statistics, is an expert in statistical modeling. She has worked on the statistical modeling of childhood diarrhea and modeling the hospital burden of common infectious diseases in Northeast Thailand.
[30] Mahasarakham University (MSU)
Established: 1968
Province: Maha Sarakham
Address and Contact Information: Phone/Fax: +66(0)4375-4241
Website: http://www.inter.msu.ac.th/
Director: Dr. Supachai Samappito, President; e-mail: samappito@msu.ac.th

Vision and Mission: MSU is a community-based institution of knowledge and wisdom, academically serving the community with varieties of educational systems and proper technologies, in addition to taking a leading role in research and integration of local wisdom for international recognition.

Contribution to Tropical Medicine: The Chemistry department works on drug design for HIV. The Faculty of Medicine has numerous studies focusing on helminthiases and dengue. Most of the other research involves environmentalists conducting ecological or population studies on the animal hosts and vectors of tropical diseases.

Tropical Disease(s) studied: Malaria, dengue, HIV, tuberculosis, helminthiases, Chikungunya, and diarrheal diseases

Infrastructure: MSU is expanding rapidly to meet increasing demand for higher education in this relatively underdeveloped part of rural Thailand, and there are a number of small satellite centres in locations such as Udon Thani and Yasothon. With 17 faculties and two colleges currently operating, MSU has been widely recognized as one of Thailand’s fastest-growing universities.

Hospital Facilities: MSU cooperates with a number of northeastern regional hospitals under the Ministry of Public Health to train medical students. However, they do not have hospital facilities of their own.

Research: The main contributors to tropical medicine are the Department of Chemistry’s Supramolecular Chemistry Research Unit (SCRU) and the Walai Rukhavej Botanical Research Institute (WRBRI). The WRBRI aims to stress the fundamental and applied research in science and technology integrated with local wisdom to promote rural development. Second, the institute has a responsibility to conserve, promote and exploit biodiversity in the Greater Mekong Sub-region for social development and to upgrade local people’s quality of life. Third, the institute focuses its research on setting up a database of biological resources and local wisdom so as to create sustainable community development and a network between public and private sectors. Finally, the institute emphasizes publication of biotechnology for conservation and exploitation of native plants and products derived from local materials.

The SCRU specializes in molecular recognition, such as anion and cation recognition, molecular catalysts, nanotechnology of functionalized single-walled carbon nanotubes, and computer Aided molecular (drug) design and molecular dynamics simulation – often for potential tropical disease medications.
The Faculty of Medicine also contributes to tropical medicine through its research on helminthiases and dengue in terms of prevalence, GIS, health behavior, and prevention and control.

**Prominent Researchers/Clinicians Include:**

**Dr. Weerachai Saijuntha**, of the Walai Rukhavej Botanical Research Institute, is currently monitoring the genetic diversity of Southeast Asian species, including fresh water fish and parasitic zoonosis (helminthiases). Genetic analysis of these organisms are explored in terms of spatio-temporal scales, population genetic, genetic differentiation and genetic identification in genetic analysis using molecular markers, e.g. microsatellite, mitochondrial DNA, ribosomal DNA, RAPD, PCR-RFLP and allozyme markers have been used in his research.

**Dr. Rojchai Satrawaha**, of the Walai Rukhavej Botanical Research Institute, is currently studying the temporal dynamics of fish in Songkram River Basin and its implication for monitoring fish population and community. Many of these freshwater fish are hosts to various helminthic parasites.

**Dr. Nadtanet Nunthaboot**, of the Supramolecular Chemistry Research Unit at the Department of Chemistry at the Faculty of Science, is interested in quantum chemistry and QM/MM calculations, molecular dynamics simulation, binding free energy calculation using MM-PB(GB)SA method, computer Aided Molecular (Drug) design, and bioinformatics. She studies this in the context of computational studies of HIV-1 integrase and its inhibitors.

**Dr. Choosak Nithikathkul**, of the Faculty of Medicine, studies *Opisthorchis viverrini* infection in minute intestinal fluke endemic areas of Chiang Mai and enterobiasis infections among Thai school children spatial analysis using a geographic information system (GIS).

**Dr. Teabpaluck Sirithanawuticha**, of the Faculty of Medicine, studies the comparative of behavior in prevention and control of dengue hemorrhagic fever in normal villages, medium risk villages, and high risk villages in the Northeastern Region.
[31] Nakhon Ratchasima Rajabhat University (NRRU)  
Established: 1913  
Province: Nakhon Ratchasima  
Address and Contact Information: 340 Suranarai Road, Muang District, Nakhon Ratchasima 30000. Phone: +66(0)4425-4000; Fax: +66(0)4424-4739  
Website: http://www.nrru.ac.th/web/ennrru/main.php?pack=data&page=about1  
Director: Dr. Sauwanit Saunananda, President; e-mail: president@nrru.ac.th

Vision and Mission: NRRU is an educational leader and a source of knowledge for local community development research. The university’s vision is to serve as an international knowledge resource that aims to develop the quality of human resources and strengthen society in a sustainable and effective manner.

Contribution to Tropical Medicine: The Department of Public Health does community-level research on sociological aspects of tropical Diseases.

Tropical Disease(s) studied: HIV

Infrastructure: In addition to the 5 Faculties and the Graduate School, there is also the Science Center, which has the goal to promote research in science and technology within NRRU. They oversee more than 15 scientific research projects per year.

The Nakhon Ratchasima Rajabhat University Community Medical Center 9 is a small health center to provide health care for NRRU students and the community and provide training medical students. The center provides care in the field of clinical obstetrics and gynecology, family planning, dermatology, and pediatric care.

Research:  
Dr. Chupasiri Apinundecha, of the Department of Public Health in the Faculty of Science and Technology and the Community Health Development Program, is an expert in advanced nursing and midwifery. She studied the HIV/AIDS stigma in the socio-cultural context of Nakhon Ratchasima Province in the northeastern region of Thailand and used action research to develop a community participation intervention.
[32] Rajabhat Maha Sarakham University (RMSU)
Established: 1925
Province: Maha Sarakham
Address and Contact Information: 80 Nakhon Sawan Rd., Muang District, Maha Sarakham 44000
Phone: +66(0)4371-3080-9; Fax: +66(0)4372-2117
Website: http://eng.rmu.ac.th/
Director: Dr. Somjet Phusri; e-mail: President@rmu.ac.th

Vision and Mission: To implement educational and advanced professional programs, conduct research, provide academic services to the community, improve, transfer, and develop technologies, conserve and support art and culture, and produce teachers and upgrade teacher qualifications.

Contribution to Tropical Medicine: Currently, the contribution to tropical medicine is limited to one research team investigating zoonotic helminthic infections.

Tropical Disease(s) studied: Zoonotic helminthiases.

Infrastructure: Beyond the 5 Faculties and Graduate School, there is also a Science Center, which is well-equipped with scientific research facilities for students and faculty members. The Center also extends its services to include co-operation with local sectors, both private and government, in conducting research and study projects that benefit the local community development.

Research: Dr. Sittisak Khampa, of the Faculty of Agricultural Technology, has conducted several studies on the antihelminthic activities of cassava hay chemicals. He most recently investigated the influences of the supplementation of cassava hay as anthelmintics on fecal parasitic egg in native cattle grazing on ruzi grass pasture.
Sappasithiprasong Hospital (SPH)
Established: 1962
Province: Ubon Ratchathani
Address and Contact Information: 383 Warin-Phiboon Road, Saen Suk, Warinchamrab, Ubon Ratchathani, 34190. Phone/fax: +66(0)45-244-973;
Website: http://www.ksp-hosp.com/index1.php
Director: Dr. Charnchai Tikabanyo, Hospital Director; e-mail: charntik@yahoo.com

Vision and Mission: As far as research, the major focus is to improve diagnostics, and to determine the clinical impact of early diagnosis and treatment, as well as conduct therapeutic trials that aim to reduce mortality.

Contribution to Tropical Diseases: Through a collaboration with the Mahidol-Oxford Research Unit, SPH has conducted a number of studies focusing on melioidosis, Staphylococcus aureus infection and cryptococcal meningitis.
Tropical Disease(s) studied: Mostly melioidosis, some HIV

Infrastructure: Sappasithiprasong Hospital is a 1000-bed hospital located in the center of Ubon Ratchathani. The Melioid Laboratory, which has been established by MORU, is situated in the grounds of Sappasithiprasong Hospital. The SPH screen patients on the wards for suspected melioidosis prior to inclusion into treatment trials, provide a rapid diagnostic test (direct immunofluorescence assay) to the hospital, undertake culture of clinical samples together with bacterial identification, and devise and evaluate new diagnostic tests.

Services:
The Clinical Medicine Unit provides diagnostic services, treatment and counseling for such complications as high blood pressure, diabetes, hyperlipidemia, high blood pressure, thyroid disease, myocardial infarction, myocardial failure, anemia, Thalassemia, kidney disease, flu, influenza, hepatitis viruses, jaundice, liver, pancreas, stomach inflammation, and ulcers. It also provide vaccines for the flu, chicken pox, and hepatitis A and B. The Department of Pediatrics provides children with care from doctors and nurses in the form of diagnostic services, treatment, counseling, and child immunization services.

The Clinical Obstetrics-Gynecology Unit offers family planning advice and care for STIs such as syphilis and gonorrhea. It also provides HPV vaccines and cervical cancer checks. The General Surgery Clinic has special equipment to help with diagnosis and treatment of patients. Equipment includes CT Scans, Ultrasound machines, X-ray machines, etc.

Prominent Researchers/Clinicians Include:
Dr. Wipada Chaowagul focuses his research on melioidosis and has completed several collaboration studies with MORU, including one investigating the human immune responses to Burkholderia pseudomallei characterized by protein microarray analysis.
Dr. Adul Rajanuwong studies co-infections of cryptococcal meningitis and HIV. He previously conducted a randomized trial to test the efficacy of combination antifungal therapies for HIV-associated cryptococcal meningitis.
Suranaree University of Technology (SUT)

Established: 1990
Province: Nakhon Ratchasima
Address and Contact Information: 111 University Avenue, Muang District, Nakhon Ratchasima 30000. Phone: +66(0)44-223000; Fax: +66(0)44-224070
Website: http://web.sut.ac.th/sutnew/sut_en/
Director: Dr. Prasart Suebka, President; e-mail: prasart@sut.ac.th

Vision and Mission: SUT is a science and technology-oriented university, which aims at researching, adapting, transferring and developing technology for the sustainable development of society. SUT also produces graduates with high quality, integrity-led knowledge; provides public services; and preserves arts and culture by adhering to the principles of academic freedom and good governance in its administration.

Contribution to Tropical Medicine: Main contributions have been in molecular studies in malaria (by a staff member now at MJU) and biochemical studies on melioidosis.

Tropical Disease(s) studied: Malaria, melioidosis

Infrastructure: SUT is located in Nakhon Ratchasima, about 260 kilometers northeast of Bangkok. The campus covers a sizeable 1,120 hectares, including academic zone, Technopolis, residential facilities for staff and students, the Surasammanakhan Convention Center and the university farm. There are university facilities to support student's academic needs and enhance the student's quality of life. The university facilities include the Center for Library Resources and Educational Media, the Center for Computer Services, the Center for Scientific and Technological Equipment, the Center for Education Services, the Institute of Research and Development, the Education Media Development and Production Unit, the Sport and Health Center, university dormitories, a medical clinic, the CU & SUT Book Center, a bank, a post office, convenience stores, and free transportation on campus.

Equipment: Many high performance chemical analysis and structure determination facilities are available at the School of Biochemistry and the Center for Scientific and Technological Equipment. These include facilities for NMR, single crystal x-ray diffraction (small molecules) and optical spectroscopy (FTIR, UV-Visible and AAS). Chromatography equipment includes an AKTA protein purifier (FPLC), HPLC, LC-MS, GC and GC-MS. Other equipment available include that for thermo-chemistry (TGA, DTA and DSC), CHNS elemental analysis, inductively couple mass spectrometry and electron microscopy (SEM and TEM).

Research: Following successful cloning and expression, studies are at present directed towards structural and functional analysis of outer membrane porin (Omp38) from Burkholderia pseudomallei and B. thailandensis, including channel conductance properties. Better understanding the structural basis of ion, nutrient and antibiotic transport by the oligomeric B. pseudomallei Omp38 could have an important impact on the development of effective treatments for melioidosis.
Dr. Wipa Suginta, of the Biochemistry-Electrochemistry Research Unit at the Schools of Chemistry and Biochemistry, studies the structure and function of bacterial porins and chitinases from gram negative bacteria. This includes conducting research on the melioidosis agent, *Burkholderia pseudomallei*, and certain diarrheal diseases, such as cholera.
[36] Ubon Ratchathani University (URU)
Established: 1990
Province: Ubon Ratchathani
Address and Contact Information: Warin Chamrap-Det Udom Road, Warin Chamrap, Ubon Ratchathani 34190, Thailand. Phone: +66(0)4535-3052; Fax: +66(0)4528-8394;
Website: http://www.ubuenglish.ubu.ac.th/
Director: Associate Professor Nongnit Teerawatanasuk PhD; e-mail: nongnit.t@oup.ubu.ac.th;

Vision: URU is a university of quality. The focus on innovation and learning. To enhance the capabilities of graduates and the public on the wisdom of East and South and sub-Mekong Region. To produce graduates with international standards, to conduct research and innovation to achieve new knowledge and creative works, and to foster the restoration of local arts and culture. And other regions to learn about. And maintained under the context of globalization.

Contribution to Tropical Medicine: As a relatively new university, UBU is in the process of establishing itself as an institution involved in and promoting fields of research that are beneficial to the local area, the north-east region, the country and the international community. The contribution of UBU is limited to a few chemists, biologists, and pharmacologists working on various tropical diseases.

Tropical Disease(s) studied: HIV, Japanese encephalitis, dengue, tuberculosis.

Infrastructure: The university occupies a 2,100-acre (8.5 km2) campus in the Warin Chamrap district of Ubon Ratchathani Province, approximately 15 kilometers south of Ubon Ratchathani city. It has around 5000 students in 10 faculties and 1 College.

Research: There are 4 researchers at the College of Medicine and Public Health has carried out various projects, mostly GIS and prevalence-based, including:
1. The Application of Geographic Information System (GIS) for Dengue Vector Mosquito and Haemorrhagic Fever Prevention and Control in Ubonratchathani Province.
2. Remote Sensing and Geographic Information System for Epidemiology of Malaria in Ubonratchathani and Srisaket Province.
3. The Spatial Study for Leptospirosis Surveillance and Control in Srisaket Province.
4. Prevalence and Intensity of Opisthorchis viverrini and hookworm in Ubon Ratchathani province.

Additionally, in other faculties, there are current research projects from the Faculties of Science and Pharmaceutical Sciences that include genetic engineering, industrial biotechnology, food biotechnology, organic chemistry and bioprocess engineering. In tropical medicine, there are a limited number of researchers/projects.

Prominent Researchers/Clinicians:
Dr. Anun Chaikoolvatana, of the Faculty of Pharmaceutical Sciences, is a clinical pharmacology expert who has conducted studies on tuberculosis and dengue. He has done work on developing a therapeutic drug monitoring protocol for second line agents in multi-drug-resistant tuberculosis patients.
Dr. Sasithorn Lorroengsil, of Department of Biological Sciences, research Japanese encephalitis and recently studied on Cloning and expression of envelope protein of Thai genotype I strain KE-093 of Japanese encephalitis virus.

Dr. Pornpan Pungpo, of Department of Chemistry, is conducting research on developing an HIV-1 inhibitor. He uses computer-aided inhibitor design of HIV-1 reverse transcriptase inhibitors: Structural conformational analysis and molecular docking study of efavirenz derivatives, active against mutant type HIV-1 RT.

Dr. Wacharapong Saengnill, of the College of Medicine and Public Health, specializes in GIS and its application to disease surveillance and for determining the prevalence and severity of hookworm and liver fluke infections. He has also studied GIS applications to study local areas for risk of malaria and dengue hemorrhagic fever.
**South Thailand**

*Which includes the following provinces:*

- Chumphon
- Krabi
- Nakhon Sri Thammarat
- Narathiwat
- Pattalung
- Pattani
- Phang Nga
- Phuket
- Phang Nga
- Ranong
- Satun
- Songkhla
- Surat Thani
- Trang
- Yala

The following 4 institutions are relevant to tropical diseases and located in the Northeastern Region:

<table>
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<tr>
<th>#</th>
<th>Institute</th>
<th>Province</th>
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<tbody>
<tr>
<td>36</td>
<td>Narathiwatratchanakharin Hospital</td>
<td>Narathiwat</td>
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<tr>
<td>37</td>
<td>Prince of Songkla University</td>
<td>Songkla</td>
<td>121</td>
</tr>
<tr>
<td>38</td>
<td>Walailak University</td>
<td>Nakhon Sri Thammarat</td>
<td>123</td>
</tr>
</tbody>
</table>
[39] Narathiwatratchanakharin Hospital (NRH)
Established: 1941
Province: Narathiwat
Address and Contact Information: 180 Ra-ngamanka Road, Muang, Narathiwat, 96000.
Phone: +66(0)73511379; Fax: +66(0)73513481
Website: http://www.narahospital.com/index1.php
Director: Dr. Wiroon Pornpatkul; e-mail:

Vision and Mission: To provide adequate quality services and promote health and happiness in the community. To provide and promote medical services, health promotion, disease prevention, rehabilitation, according to professional standards and consistent with the cultures and beliefs of the people in the area. To develop the hospital into a knowledge-based society based on combining local culture, medical knowledge, and practical experience to research and innovation.

Contribution to Tropical Medicine: NRH’s contribution is limited to a few researchers’ clinical studies on Chikungunya disease. They also treat patients with infectious diseases, especially dengue or DHF, diarrheal diseases, and tuberculosis.

Tropical Disease(s) studied: Chikungunya disease.

Infrastructure: The NRH was previously just a medical station, but was upgraded to a hospital in 1997. After undergoing many infrastructure development projects, it is now it is a general hospital with 360 beds and almost 30 acres of land.

Services: NRH provides various services, such as dental services, CT scans, and heart disease treatment.

Research: Research from NRH has been limited to only a few researchers and occurring during specific disease outbreaks.

Prominent Researchers/Clinicians:
Dr. Norra Wuttirattanakowit studies Chikungunya disease and its clinical presentation. She has previously investigated an outbreak of chikungunya in Southern Thailand from 2008 to 2009 caused by African strains with A226V mutation.
[40] Prince of Songkla University (PSU)
Established: 1967
Province: Songkla
Address and Contact Information: 15 Karnjanavanit Road, Khorhong, Hat Yai, 90110.
Phone: +66(0)74-282 000; Fax: +66(0)74-212-828
Website: http://www.psu.ac.th/en
Director: Assoc. Prof. Dr. Boonsom Siribumrungsukha, President; e-mail: boonsom.s@psu.ac.th

Vision and Mission: Prince of Songkla University is a leading research-based university in Asia, fulfilling its inspiration of producing internationally recognized graduates, actively engaging in providing services to community, taking a leading role in the preservation and enhancement of national heritage in arts and culture. The primary goals are to develop the university into a society of learning based on multi-culture background and sufficiency economy principles, and allow general public an easy and convenient access to learn and gain from whatever forms an sources of knowledge available in the university; to build up expertise and take a leading role in areas of study consistent with the inherent potential of our locality and create a linkage to the global network; and to integrate and apply knowledge based on practical experiences to teaching in order to instill intellectual wisdom, virtue, competency and international world-view vision in our graduates.

Contribution to Tropical Diseases: As the largest tropical medicine institute in the Southern Region of Thailand, PSU has a number of cutting-edge research projects on tropical diseases.

Name of the Tropical Disease(s) handled are: Mainly malaria, dengue, helminthiases, HIV/AIDS, tuberculosis, and diarrheal diseases.

Infrastructure: PSU has 29 Faculties and Institutes on 5 different campuses The university's capability to assist in the country's economic and social development, especially in the southern region, has been recently strengthened by the establishment of several support units.

Hospital facilities: Songklanagarind Hospital was formally opened in 1986. At present Songklanagarind Hospital has the capacity to accommodate up to 855 beds. Of the 3,731 staff who work for the Faculty of Medicine: 234 are teachers, 2,614 graduate staff and 1,117 non-graduate staff. The Hospital was also established to facilitate medical practice by both the medical students and specialty physicians. Songklanagarind gives medical practice not only to the medical students and specialists but also to sub-specialists including other health sciences students such as nursing students, dental students, and pharmaceutical students.

Research: Different faculties and departments typically have different specialty areas, although some relevant collaborative efforts exist as well. This includes the Natural Products Research Unit, which involves the detection, extraction, purification and mechanisms of action of biologically active plant compounds. This unit was recently established to coordinate these activities. In Chemistry they purify and determine the chemical structures of extracted biologically active compounds. Microbiology department studies their effects on microorganisms, particularly human pathogens and the human immune system. Pharmacology is
interested in their pharmacological and toxicity properties. Physiology studies their effects on the cardiovascular, renal and nerve systems of the body. The Department of Microbiology also has research that includes the pathogenesis and epidemiology of the food borne pathogenic bacteria, *V. parahaemolyticus* and *E. coli*. Also, there are studies on the *in vitro* activities of extracts from medicinal plant against intestinal protozoan parasites and antibacterial substances isolated from medicinal plants active against methicillin-resistant Staphylococcus aureus (MRSA) and other potential pathogens.

**Prominent tropical medicine researchers:**

**Dr. Chaweewan Jansakul**, of the Department of Physiology at the Faculty of Science, collaborates with the Faculty of Agro-industry and the Faculty of Pharmaceutical Science to develop procedures for commercial applications and sales of any plant product with potential use as an alternative medicine against tropical diseases.

**Dr. Athip Nilkaeo**, of the Department of Microbiology at the Faculty of Science, recently did a study on the induction of cell cycle arrest and apoptosis in JAR trophoblast by antimalarial drugs.

**Dr. Pornpimol Pruekprasert**, head of the Infectious Diseases Unit in the Department of Pediatrics at the Faculty of Medicine, dedicates much of her research to Dengue Hemorrhagic Fever, most recently studying the outcome of dengue hemorrhagic fever-caused acute kidney injury in Thai children.

**Dr. Waricha Janjindamai**, of the Neonatal Medicine Unit in the Department of Pediatrics at the Faculty of Medicine, studies dengue infections in newborns and premature babies.

**Dr. Varaporn Vuddhakul**, of the Department of Microbiology at the Faculty of Science, studies bacterial pathogenesis and the epidemiology of bacteria, including many diarrheal diseases. She has also recently evaluated the antimycobacterial activity of extracts from plants used as self-medication by AIDS patients in Thailand.

____________________________________
[42] Walailak University (WU)

Established: 1992
Province: Nakhon Sri Thammarat
Address and Contact Information: 222 Thaiburi, Thasala, Nakhonsithammarat 80160, Thailand. Phone: +66(0)7538-4000; Fax: +66(0)7567-3708;
Website: http://www.wu.ac.th/2553
Director: Dr. Keerath Sanguansai, President; e-mail: skeerath@wu.ac.th

Vision: Walailak University has a vision and to be a reliable community-based, resourceful learning organization fully committing to render good governance services and world-class academic practices. WU aims to produce graduates with a high level professional skills and moral integrity to meet the need for human resources required for the social and economic development of the southern region and the country; to generate new knowledge through research and scholarship to strengthen regional and national economics self-reliance and international competitiveness; to provide academic and technical services to state and private enterprises through research, training, and consultancy activities in order to ensure an efficient transfer of necessary and appropriate technology for social and economic development at regional and national levels; and to conserve and promote the traditional arts and culture of the region and the nation so that the University is perceived as a model centre of community life worthy of emulation.

Contribution to Tropical Diseases: As WU is a very young university, it does not yet have a large research capacity and output. Most existing research in tropical medicine has been on natural compounds extracted from indigenous plants or social and community-based studies. Additionally, the Faculty of Medicine also conducts research on Chikungunya infections.

Name of the Tropical Disease(s) handled are: Malaria, dengue, tuberculosis, Chikungunya.

Infrastructure: The campus is 780 kilometres south of Bangkok, two hours and a half drive from the beach resorts of Samui Island and Krabi, and from the busy commercial center and international airport of Hat Yai. The University has a total area of 3600 acres, making it the largest campus of any university in Thailand. Besides the main campus at Thasala WU also has a coordinating office in Bangkok and a service center in neighbouring Surat Thani province. The University's administration is wholly outside the Thai civil service system. WU has faculties in science, liberal arts, engineering and resource management, agricultural technology, economics and management, information technology, allied health sciences and public health, nursing, medicine, pharmacy, and architecture and design.

In addition to the existing research facilities for faculty members, the University operates modern, fully equipped science laboratories for undergraduate and postgraduate research programs in science and technology. Research facilities are also provided for academic service activities. All laboratories also provide an online computer and video conferencing system to facilitate long-distance teaching and learning activities.
Hospital facilities: WU is currently affiliated with Vachiraphuket Hospital and Trang Hospital. It also has commissioned a 1.1 million baht project to build the Walailak University Hospital in the near future.

Research: WU places equal emphasis on both basic research for new knowledge and applied research, the outcomes of which are of direct and immediate benefit to the development of the community. The pro-active approach to basic research is designed to keep us at the forefront of global research activities, while preserving and maintaining cultural activities, coordinating research-based teaching and learning, and providing academic services to the community.

Research carried out by University faculty and graduate students is focused primarily in computer science, environmental science, experimental physics, computational sciences, and gives particular attention to areas that are of direct social and economic benefit to the southern region of Thailand. For tropical medicine, the main research areas are in extracting natural products and herbal medicines for tropical diseases from plants. The Faculty of Nursing also has some social medicine studies in tropical medicine.

The Faculty of Medicine has also carried out two projects related to Chikungunya disease over recent years.

Prominent Researchers/Clinicians:
Dr. Kan Chantrapromma, of the Research Unit of Natural Products Utilization, studies natural plant extracts and their anti-pathogenic properties, especially for Plasmodium falciparum. She conducted drug screening assays and recently studied antimalarial, antimycobacterial and cytotoxic limonoids from Chisocheton siamensis.
Dr. Charuai Suwanbamrung, of the School of Nursing, is interested in the management of patients with dengue problem and capacity development for dengue prevention and control. She recently studied the community capacity for sustainable community-based dengue prevention and control, including domain, assessment tool and capacity building model.
Dr. Putrada Ninla-aesong, of the Faculty of Medicine, has been studying immunological factors associated with arthritis and persistant myalgia after Chikungunya infection in patients from the Southern Region.
Section III
Sources of Funding
General Information

Information regarding funding was very difficult to obtain. Thai institutes were very reluctant to share the information about how much money they have access to and who is awarding them. Because of this, we had to communicate with the actual funding agencies to see what money was being awarded for.

Another source of difficulty is that the funding agencies do not classify tropical medicine as a distinct research field. Rather, tropical medicine projects are lumped into the “medicine and health” category or, to a lesser extent, “science and technology.” In general, research expenditure in all of Thailand amounted to **18,255,250,000 THB in 2007**, or **0.22% of the Thai GDP**. The government allocates **2,792,100,200 THB to the MOPH**, who spent **3,673,735,578** in 2010.

Figure 7. Research Expenditure in Thailand by Sector, based on 2007 data

![Research Expenditure in Thailand by Sector](image)

Governmental funding agencies that provide money for Tropical Medicine research include the National Research Council of Thailand (NRCT), Office of Higher Education Commission (OHEC), Thailand Research Fund (TRF), National Science and Technology Development Agency (NSTDA), and the National Center for Genetic Engineering and Biotechnology (BIOTEC).

National Research Commission of Thailand (NRCT)

The Office of the National Research Council of Thailand (NRCT) is the central organization in research and reports directly to the Prime Minister’s office. Its main duty is to formulate national research policies and strategies, develop national research standard and system, promote and support research cooperation, nationally and internationally, handle information system serving as the center for research information, research results and dissertations. In addition, it
plays an important role in promoting and enhancing researches, invention, innovation and technology transfer to social, industrial, and commercial sectors.

The NRCT does not exclusively award money to Tropical Medicine research. In fact, only 16% of its annual budget is dedicated to medicine and public health. Much more attention is given to Agriculture, which is featured in Figure 7.

**Figure 8. NRCT Annual Grant Budget, separated by focus area**

![NRCT Annual Grant Budget](image)

**Figure based on 2009 budget

In 2009, the NCRT awarded 502,188,562 THB to researchers proposing projects in medicine and public health. Another 648,323,654 THB went to science and technology. Tropical medicine, as an interdisciplinary field, most likely gets a percentage of the medicine and public health budget, as well as a smaller percentage of science and technology. The NCRT awarded 7.12% of its total grant budget to Prince of Songkhla University (PSU), 7.08% to Chulalongkorn University (Chula), and 5.14% to Mahidol University (MU). It should be noted that these figures include all 4 focus areas as mentioned above, as data separated by focus area was not readily available.

In 2010, approximately 650 projects dealing with the subject of “Disease prevention and Health maintenance” were accepted for funding by the NCRT.

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

**Office of Higher Education Commission (OHEC)**

The Office of Higher Education Commission (OHEC) has been one of the key players in the innovation effort. Thailand has too often developed what the World Bank calls “logistical, as opposed to true technological, clusters”. To resolve this, the OHEC launched the
National Research Universities Project in 2009. Research is a priority for the government, so the OHEC wished to upgrade nine universities to become research universities.

As a result, the OHEC chose 9 universities to receive an award of 100-500million THB annually from 2009 through 2012 to develop their R&D capacities. These 9 universities are the Suranaree University of Technology (SUT), King Mongkut’s University of Technology Thonburi (KMUTT), Chulalongkorn (Chula), Thammasat (TU), Khon Kaen (KKU), Chiang Mai (CMU), Mahidol (MU), Prince of Songkhla (PSU) and Kasetsart universities.

**Thai Research Fund (TRF)**

The Thai Research Fund (TRF) was established in response to the 1992 Research Endowment Act. It is a juristic body that investigates the overall picture of research in Thailand in order to promote useful research results. TRF’s intentions are to help construct a strong Thai research infrastructure. Policy, budgeting, expenses, research institutions, researchers, and research culture are areas identified by TRF as needing focus. Development requires improving research investment in terms of quality and amount. This fiscal year there is an investment of about 9 billion baht.

There are several funding mechanisms run by the TRF and utilized by Tropical Medicine researchers:

1. TRF Grant for New Researcher – up to 480,000 THB per project
2. TRF-CHE Research Grant for New Scholar – up to 480,000 THB per project
3. TRF-CHE Research Grant for Mid-Career University Faculty – up to 1,200,000 THB per project
4. Research Career Development Grant – up to 1,200,000 THB per project
5. TRF Basic Research Grant – up to 3,000,000 THB per project
6. TRF Research-Team Promotion Grant
7. Strategic Basic Research Grant
8. Translation Research Grant – up to 3,000,000 THB per project
9. Royal Golden Jubilee Ph.D. Grant – up to 2,000,000 THB per scholarship.

**National Science and Technology Development Agency (NSTDA)**

NSTDA is an umbrella organization that plans and executes the four mandated missions: research and development, technology transfer, human resources development and infrastructure development. NSTDA comprises of four national research centers. The one most pertinent to Tropical Medicine is BIOTEC (National Center for Genetic Engineering and Biotechnology). BIOTEC, which conducts independent research on dengue, malaria, and TB and also give grants to external institutions for those diseases, had a total budget of 1,029,000,000THB in 2010.
The NSTDA awarded a total of 493,477,352 THB in research grants in the last fiscal year and an additional 131,845,135 THB in scholarships.

Thailand Tropical Diseases Research Programme (T-2)

Thailand Tropical Diseases Research Programme (T-2) was a funding agency established in January 1997 under the interagency cooperation and participation between three research organizations, the TRF, NSTDA/BIOTEC and TDR/WHO. The mission of T-2 is to combat 7 tropical diseases and other appropriate diseases in Thailand through the promotion of discovery and development of new medical products and through technology transfer by strengthening collaborative activities between Thai and foreign scientists.

T-2 mainly awarded research on Malaria, Dengue Haemorragic Fever, Tuberculosis, HIV opportunistic infections, and hepatitis. T-2 aims to:

1.) Support Research to Develop Medical Products such as new drug, new diagnostic kits for rapid and accurate diagnosis and, potentially, new effective vaccines against tropical diseases
2.) Support Basic Research for New Knowledge, which would be evident in the form of publications, patents, and technical know-how.
3.) Strengthen Collaborations between Thai and foreign scientists by supporting exchange of investigators and to promote their training in specialized fields in Thailand and abroad
4.) Develop Human Resource by encourage scientists to accomplish specific goals which would build up their capabilities and fortify their career patterns.

Unfortunately, the T-2 mechanism has been discontinued. However, for the purposes of this report, the results from the T-2 are indicative of who the major players are in Tropical Medicine and what diseases the majority of the money is going to. Table 9 shows the amount of money the T-2 mechanism granted during its last 12 years of operation:

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<tr>
<th>Year</th>
<th>NSTDA/BIOTEC</th>
<th>TRF</th>
<th>TDR/WHO</th>
<th>Total Amount Granted through T-2</th>
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<tr>
<td>1999</td>
<td>18,600,000</td>
<td>28,000,000</td>
<td>3,620,000</td>
<td>50,220,000</td>
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<td>-</td>
<td>2,110,000</td>
<td>27,150,000</td>
</tr>
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<td>2001</td>
<td>10,000,000</td>
<td>20,000,000</td>
<td>-</td>
<td>30,000,000</td>
</tr>
<tr>
<td>2002</td>
<td>-</td>
<td>-</td>
<td>1,540,000</td>
<td>1,540,000</td>
</tr>
<tr>
<td>2003</td>
<td>7,000,000</td>
<td>-</td>
<td>1,450,000</td>
<td>8,450,000</td>
</tr>
<tr>
<td>2004</td>
<td>3,000,000</td>
<td>10,000,000</td>
<td>-</td>
<td>13,000,000</td>
</tr>
<tr>
<td>2005</td>
<td>17,000,000</td>
<td>10,000,000</td>
<td>-</td>
<td>27,000,000</td>
</tr>
</tbody>
</table>
Over the course of 10 years, a total of **194,760,000 THB** was awarded through the T-2 for research on tropical diseases.

Looking research by disease, **101,020,000 THB** was awarded for malaria-related research, **57,590,000 THB** for dengue-related research, **13,230,000** for tuberculosis-related research and **19,600,000** for research in other tropical diseases. This data is summarized in **Figure 9:**

![Figure 9. Percentages of T-2 Funding by Disease](image)

In the course of its existence, the T-2 supported a total of **68 tropical medicine related projects** from **13 different institutes.** Nearly half (30 projects, 44.1%) of those projects belonged to Mahidol University, followed by Khon Kaen University (7 projects, 10.3%), and Chulalongkorn University (6 projects, 8.8%). **Table 10** and **Figure 10** summarize this information:

<table>
<thead>
<tr>
<th>Institute</th>
<th>Number of Projects</th>
<th>Research topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>MU</td>
<td>30</td>
<td>HIV, malaria, TB, Dengue,</td>
</tr>
<tr>
<td>Chula</td>
<td>6</td>
<td>malaria, lymphatic filariasis</td>
</tr>
<tr>
<td>KKU</td>
<td>7</td>
<td>O.viverrini, Dengue</td>
</tr>
</tbody>
</table>
During its final award cycle in 2006, T-2 committed to awarding a total of $28,008,437 THB to only 3 different institutions. Mahidol University was awarded 26,433,020, Khon Kaen University was awarded 812,072, and Prince of Songkla University was awarded 763,345. This is shown in Figure 11:
International agencies

Several International Agencies also provide financial assistance to various Institutes in India for Tropical diseases through their different programmes and schemes. Some of those agencies are listed below:

- United Nations Development Programme (UNDP)
- Drugs for Neglected Diseases initiative (DNDi)
- UNICEF
- United States Agency for International Development (USAID)
- Department for International Development (DFID)
- Medicines for Malaria Venture (MMV)
- Bill and Melinda Gates Foundation (BMGF)
- Program for Appropriate Technology in Health (PATH):
  - Howard Huges Medical Institute (HHMI)
  - MacArthur Foundation
  - Rockefeller Foundation,
  - European Commission
- Centers for Disease Control and Prevention (CDC)
- National Institute of Health (NIH)
- Wellcome Trust
- National Science Foundation (NSF)
- Walter Reed Army Institute of Research (WRAIR)
- Henry M. Jackson Foundation
- International AIDS Vaccine Initiative (IAVI)
- World Health Organization (WHO)
Section IV
Outputs
Following the protocol done by Prof. N.K. Ganguly in his report about Tropical Medicine institutes in India, the SCOPUS database was used as a tool to estimate the output of publications each institute produced about each particular tropical disease.

“AFFIL(name) AND TITLE-ABS-KEY(disease or pathogen name) AND PUBYEAR > 2000”

Wherein, ABS stands for abstract, KEY for keywords, AFFIL for affiliation and “PUBYEAR > 2000” to include only publications of the last 10 years.

SCOPUS database includes abstracts from 1966 onwards and cited reference from 1996 onwards. The database contains 19,000 titles (including 18,000 peer-reviewed journals) and 45.5 million records.

A total number of 5,287 publications on the selected tropical diseases from Thailand were produced between the years 2001-2011 (Table). It is important to note that many of these papers investigated more than one disease and involved collaborations between two or more of the chosen institutes. The highest number of publications was devoted to HIV (1,725), followed by malaria (1,427), tuberculosis (601) and dengue (562). Diseases among the lowest numbers of publications were Chikungunya disease (26), toxoplasmosis (52), Japanese encephalitis (81) and scrub typhus (86), all of which are combined in the “Other” category in the Figure 12:

**Figure 12. Tropical Medicine Publication Output by Thai Institutes by Disease**

![Pie chart showing publication output by disease]

The institutes that led on producing the most publications were Mahidol University with 2,365 followed by Chulalongkorn University (685), Thailand’s Ministry of Public Health (640), and Chiang Mai University (515). This can be seen in Figure 13:
When broken down by disease, Mahidol University had the most publications for every disease except Chikungunya disease and rabies, where Chulalongkorn University had the most, and rabies, which is the specialty of the Queen Saovabha Memorial Institute. However, other institutes showed a specialty for certain diseases. AFRIMS had the second highest publication output for both dengue (97) and malaria (132). The Ministry of Public Health had the second highest output for HIV/AIDS (345) and tuberculosis (123). Another significant contribution is seen in Khon Kaen University, who had the second highest publication output for helminthiases (82) and melioidosis (49).

To assess the combination output and impact of institutions, we calculated the h index for each disease at each institution. A cumulative h index then was calculated for each institution, which considered all of the institution’s publications within the selected tropical diseases.†

**MALARIA**
Mahidol University had the highest h index at 52. They are co-authors on a very frequently cited report on the global distribution of falciparum malaria. Other notable papers include multiple studies of the emergence of artemisinin-resistance strains of malaria in Thailand. The next highest h indexes were with AFRIMS (25) and Chulalongkorn University (17).

**DENGUE**
Mahidol University had the highest h index at 30. The most frequently-cited papers are cell biology studies on the pathogenesis of dengue in dendritic cells, dengue inducing programmed

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† To interpret the h index: An institute with an index of *x* in the topic of malaria will have *x* malaria publications that have been cited *x* times.
cell death in CD8+ T cells, and vaccine studies. Institutes with the next highest h indexes were AFRIMS (21) and the MOPH (16).

**HELMINTHIASIS**
Mahidol University had the highest h index at 19. Their most cited publications include a study done on an angiostrongyliasis-induced meningitis outbreak, co-infections between intestinal helminthes and malaria, and an overview of the emergence of gnathostomiasis. The next highest h indexes were with Khon Kaen University (14) and Chulalongkorn University (9).

**RABIES**
The Queen Saovabha Memorial Institute specializes in rabies research, so it is no surprise that they have the highest h-index at 15. Their most cited publications include a report on the ineffectiveness of a therapeutic coma and ketamine as a treatment for rabies and a travel medicine update. Chulalongkorn also had an h-index of 15, with their most popular publication being an overview of the current rabies situation. Mahidol University had an h-index of 8.

**HIV/AIDS**
Mahidol University had the highest h index at 44. It is no surprise that a report on the landmark clinical trial of the ALVAC/AIDSVAX™ vaccine regimen, which was the first report of any vaccine against HIV having any significant efficacy. Also frequently cited were studies of preventing mother-to-child transmission of HIV and other vaccine trials. The next highest h indexes were with the MOPH (30) and Chulalongkorn University (27).

**LEPTOSPIROSIS**
Mahidol University had the highest h index at 12. The most highly-cited publications were two reports on separate clinical trials of the efficacy of different medications for severe leptospirosis, including penicillin, doxycycline, and cefotaxime. The next highest h indexes were with the MOPH (9) and the Queen Saovabha Memorial Institute (6).

**TUBERCULOSIS**
Mahidol University had the highest h index at 24. The most popular publications were studies with TB co-infections with HIV and/or malaria. The next highest h indexes were with the MOPH (19) and Chulalongkorn University (16).

**JAPANESE ENCEPHALITIS**
Mahidol University had the highest h index at 12. ChimeriVax™ vaccine trials were among the highest-cited publications for this disease. The next highest h indexes were with AFRIMS (8) and Chiang Mai University (6).

**MELIOIDOSIS**
Mahidol University had the highest h index at 22. The most popular publications on the disease were overviews of the current situation of melioidosis in Thailand, including its pathogenicity and genomic plasticity. The next highest h indexes were with the CRI (15) and Khon Kaen University (13).

**TOXOPLASMOSIS**
Mahidol University had the highest h index at 8. An overview of how *Toxoplasma gondii* is transmitted from animals to humans was the most highly-cited paper, followed by a study of opportunistic infections of *T. gondii* in HIV patients. The next highest h index was with Chiang Mai University (4). No other institution had a significant h index.

**CHIKUNGUNYA DISEASE**
Chulalongkorn University and AFRIMS had the highest h indexes at 3. Their most cited publications included a characterization of Chikungunya disease in the Southern Region of Thailand and population studies of the Chikungunya virus vector *Aedes* spp. The next highest h indexes were with Mahidol University (2) and Narathiwatratchanakharin Hospital (2).

**DIARRHEAL DISEASES**
Mahidol University had the highest h index at 25. Their most cited publications included a vaccine trial for cryptococcal infections and a genomic study of cholera. The next highest h indexes were with Chulalongkorn University (17) and Chiang Mai University (16).

**SCRUB TYPHUS**
Mahidol University had the highest h index at 12. Their most cited publications included case reports of febrile illnesses occurring in hospitals in Thailand and Laos, which were commonly found to be scrub typhus. The next highest h indexes were with AFRIMS (7) and the MOPH (5).
<table>
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<th>Den</th>
<th>Helm</th>
<th>Rab</th>
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<th>JE</th>
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Table 11. Publication Output for Thai Institutes between the Years 2001-2011. The number of publications was determined with the SCOPUS abstract search engine. The far right column displays the institute’s cumulative output in all of the selected tropical diseases. The bottom row shows the cumulative output for all of Thailand by disease and then overall. The highest values in each category are highlighted in blue, the second-highest is in orange, and the third-highest is in green.

Figure 14: Cumulative Number of Publications from Thai Institutes, 2001-2011

Figure 14. Cumulative number of publications from Thai institutes between 2001-2011. The number of publications was determined with the SCOPUS abstract search engine. Publications with contributing authors from multiple institutions were only counted once

As is apparent in the above graph, Thai institutes have produced the most publications in the area of HIV/AIDS (1725), followed by malaria (1427). Dengue (562), Tuberculosis (601), and diarrheal diseases (533) are also areas of significant publications.

§ For calculating cumulative values, publications addressing multiple diseases or with authors from multiple institutions were only counted once
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<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>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>30</td>
<td>MSU</td>
<td></td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>31</td>
<td>NRRU</td>
<td></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>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>
Table 12. Calculated h-indexes for Thai institutes. The h-indices, which were calculated with the assistance of the SCOPUS abstract search engine, are displayed above. The far right column displays the institute’s cumulative h-index in all of the selected tropical diseases. The bottom row shows the cumulative h-index for all of Thailand by disease and then overall. The highest values in each category are highlighted in blue, the second-highest is in orange, and the third-highest is in green.

Figure 15: Cumulative h-index from Thai institutes between 2001-2011

Figure 15. Cumulative h-index from Thai institutes between 2001-2011. The cumulative h-indices, which were calculated with the assistance of the SCOPUS abstract search engine since they are not additive, are displayed above. As h-index is a measurement of both output and impact, Thailand shows to have more impact for malaria (h-index = 58) than for HIV/AIDS (h-index = 52), in spite of having a larger overall number of publications for HIV/AIDS.

Thai Institutes, when all of their publications are pooled together to calculate a cumulative “Thai” h-index, earn a higher score for Malaria (58) than HIV (52), in spite of the fact that there is a higher gross output of HIV applications. As an h-index is a measurement of impact, this indicates that Thailand has a higher impact in malaria research than HIV.
<table>
<thead>
<tr>
<th>No.</th>
<th>h-index</th>
<th>Institute/University</th>
<th>Disease</th>
<th>Cumulative Citation (2001-2011)</th>
<th>Number of Papers Published</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>52</td>
<td>MU</td>
<td>Malaria</td>
<td>15719</td>
<td>865</td>
</tr>
<tr>
<td>2</td>
<td>44</td>
<td>MU</td>
<td>HIV</td>
<td>6592</td>
<td>559</td>
</tr>
<tr>
<td>3</td>
<td>30</td>
<td>MOPH</td>
<td>HIV</td>
<td>4858</td>
<td>345</td>
</tr>
<tr>
<td>4</td>
<td>27</td>
<td>Chula</td>
<td>HIV</td>
<td>3494</td>
<td>317</td>
</tr>
<tr>
<td>5</td>
<td>26</td>
<td>CMU</td>
<td>HIV</td>
<td>2872</td>
<td>266</td>
</tr>
<tr>
<td>6</td>
<td>25</td>
<td>AFRIMS</td>
<td>Malaria</td>
<td>2159</td>
<td>132</td>
</tr>
<tr>
<td>7</td>
<td>24</td>
<td>MU</td>
<td>Diarrhea</td>
<td>2416</td>
<td>191</td>
</tr>
<tr>
<td>8</td>
<td>22</td>
<td>TRCARC</td>
<td>HIV</td>
<td>1682</td>
<td>104</td>
</tr>
<tr>
<td>9</td>
<td>21</td>
<td>AFRIMS</td>
<td>Dengue</td>
<td>1377</td>
<td>97</td>
</tr>
<tr>
<td>10</td>
<td>19</td>
<td>MU</td>
<td>Helminthiasis</td>
<td>1051</td>
<td>130</td>
</tr>
<tr>
<td>11</td>
<td>17</td>
<td>MOPH</td>
<td>Tuberculosis</td>
<td>1170</td>
<td>123</td>
</tr>
<tr>
<td>12</td>
<td>16</td>
<td>KU</td>
<td>HIV</td>
<td>801</td>
<td>89</td>
</tr>
<tr>
<td>13</td>
<td>15</td>
<td>CRI</td>
<td>Melioidosis</td>
<td>457</td>
<td>24</td>
</tr>
<tr>
<td>14</td>
<td>15</td>
<td>Chula</td>
<td>Rabies</td>
<td>510</td>
<td>81</td>
</tr>
<tr>
<td>15</td>
<td>15</td>
<td>QSMI</td>
<td>Rabies</td>
<td>380</td>
<td>86</td>
</tr>
</tbody>
</table>

Table X. Citations from 2001 to 2011 from the Institutes with an h index ≥ 15. The highest h-indices found by disease and by institute are shown above. Only 10 of the 42 institutes are listed for 8 of the 13 diseases. The number of publications and the cumulative citation numbers for those publications are also shown.

**Patents**

Only 4 institutes out of the 38 responded about patents. The majority of patented materials were new compounds, isolated from indigenous plant species or organic compounds, which exhibited anti-pathogenic activity. Additionally, there were some new diagnostic tools, newly identified pathogen strains, and various biochemical assays. The most reported patents for tropical medicine were from BIOTEC.
### Table 14: List of Tropical Medicine Patents and Countries Where Granted

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Institute/University</th>
<th>Country where patent was granted</th>
<th>Title of the patent</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>MU</td>
<td>European Union</td>
<td>Attenuated strains of dengue virus and their use in a vaccine composition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thailand</td>
<td>Crêqetkkhabenkiqnekfkhf (helminthiasis)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thailand</td>
<td>ความรุกการเกิดการเปลี่ยนแปลงกับการบรรจุเกี่ยวกับเชื้อไวรัสที่สั้นขึ้นชั่วคราว ไว 1 (anti-HIV-1 activity) พิสูจน์ได้ในสัตว์สัตว์</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thailand</td>
<td>การใช้ปันตันเหยี่ยว 1 และเซอร์โมนิคออกจากเกณฑ์กิจชีพแล้วในภาวะการผลิตเชื้อไวรัสอับดับและพยากรณ์การผลิตไวรัสอับดับหลักก่อน (dengue)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thailand</td>
<td>สารปันตัน O-methylmukonal ซึ่งกระscripciónชั่วคราว ไว 1 (anti-HIV-1 activity) พิสูจน์ได้ในสัตว์สัตว์ (Clausena excavata)</td>
</tr>
<tr>
<td></td>
<td>M/BIO/TEC</td>
<td>United States</td>
<td>Antimalarial pyrimidine derivatives and methods of making and using them</td>
</tr>
<tr>
<td></td>
<td></td>
<td>United States</td>
<td>Antituberculosis Compounds, Hirsutellones A,B and C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>United States</td>
<td>Determination of risk of developing dengue hemorrhagic fever/dengue shock syndrome, methods and compositions therefor</td>
</tr>
<tr>
<td>12</td>
<td>BIOTEC</td>
<td>Thailand</td>
<td>1'-Acetoxychavicol acetate เพื่อการรักษาวัณโรค (tuberculosis treatment)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thailand</td>
<td>Identification of Mycobacterium tuberculosis and nontuberculous mycobacteria by one tube multiplex PCR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thailand</td>
<td>TB detection kit using one-tube nested PCR technique</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thailand</td>
<td>เพื่อการวิเคราะห์แยกชั่วคราว MBU 01-2002 (dengue virus strains)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thailand</td>
<td>เพื่อการวิเคราะห์แยกชั่วคราว (malaria)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thailand</td>
<td>เพื่อการวิเคราะห์แยกชั่วคราว (malaria)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thailand</td>
<td>เชื้อที่สามารถแยกชั่วคราวพันธุกรรมส่วน_BASE (malaria)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thailand</td>
<td>พิสูจน์การวิเคราะห์รับผู้ป่วยที่มีอาการติดเชื้อไวรัสอับดับในรายใหม่ (dengue detection method)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thailand</td>
<td>การวิเคราะห์แยกชั่วคราว (dengue)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thailand</td>
<td>การจัดทำและแยกชั่วคราว Mycobacterium tuberculosis และ nontuberculous mycobacteria โดยใช้ one-tube multiplex PCR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thailand</td>
<td>การจัดทำและแยกชั่วคราว dihydrofolate reductase ของเชื้อแยกกันในกรณีที่แยกชั่วคราวมีสัตว์ชั่วคราวแบบในความ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thailand</td>
<td>(malaria enzymes)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thailand</td>
<td>การจัดทำและแยกชั่วคราว trimethoprim เพื่อใช้ทดสอบลำดับชั่วคราว (antimalarial)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thailand</td>
<td>ซึ่งมีชั่วคราว 5-ethyl-6-oxo-2,4,5,6-tetrahydroimidazol-2-ylidene (5-aryl-6- substitutions,2,4-diaminopyrimidine)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thailand</td>
<td>และการวิเคราะห์เชื้อไปชมที่มิค (antimalarial)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thailand</td>
<td>ซึ่งมีชั่วคราว 5-ethyl-6-oxo-2,4,5,6-tetrahydroimidazol-2-ylidene (5-aryl-6- substitutions,2,4-diaminopyrimidine)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thailand</td>
<td>และการวิเคราะห์เชื้อไปชมที่มิค (antimalarial)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>United States</td>
<td>Antimalarial Compounds with flexible side-chains</td>
</tr>
<tr>
<td></td>
<td></td>
<td>United States</td>
<td>Dengue virus mutant strain, MBU 01-2002</td>
</tr>
<tr>
<td></td>
<td></td>
<td>United States</td>
<td>Malaria Vaccine</td>
</tr>
<tr>
<td>17</td>
<td>RU</td>
<td>Thailand</td>
<td>Xanthones with antimycobacterial activity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thailand</td>
<td>Isoxazole analogues of curcuminoids and their mixture with antimycobacterial activity</td>
</tr>
<tr>
<td>22</td>
<td>CMU</td>
<td>United States</td>
<td>Methods for large scale production of recombinant DNA-derived tPA or K2S molecules</td>
</tr>
<tr>
<td></td>
<td></td>
<td>United States</td>
<td>Methods for large scale protein production in prokaryotes</td>
</tr>
</tbody>
</table>
Appendices
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 tmpww@mahidol.ac.th

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

1. Sources of Funding: __________________________________________________________________________
   i. National: _________________________________________________________________________________
   ii. International: _____________________________________________________________________________
   iii. NGO: __________________________________________________________________________________

2. Total Funding for the institute in the past 10 years (in THB):
__________________________________________________________________________________________

3. Funding allotted for Tropical Diseases in the past 10 years (in THB):
__________________________________________________________________________________________

SECTION – D

OUTPUT OF THE PROJECT

No. of Research Paper(s) published in the last 10 years:

         National                        International
a) Published in Journals    [ ]          [ ]
b) Presented in conference(s) [ ]          [ ]

<table>
<thead>
<tr>
<th>Item</th>
<th>Number</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<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>
</tbody>
</table>

146
New Instrument(s) developed: ____________________________________________
Prototype(s) developed: ____________________________________________
IPR’s registered: ____________________________________________
Patents filed: National ____________________________________________
_________________________
International ____________________________________________
Patents Sealed/granted: National ____________________________________________
International ____________________________________________
Copyright(s) ____________________________________________
New Principle/Theory developed ____________________________________________
Clinical Trials completed and ongoing ____________________________________________

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 tmpww@mahidol.ac.th

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. __________________________________________________________________________________

__________________________________________________________________________________
iii. ........................................................................................................................................

........................................................................................................................................

iv. ........................................................................................................................................

........................................................................................................................................

v. ........................................................................................................................................

........................................................................................................................................

4. Department & Institute, where project was implemented:

........................................................................................................................................

SECTION – C
FUNDING PROFILE

2. Sources of Funding: .........................................................................................................

i. National: ............................................................................................................................

ii. International: ....................................................................................................................

iii. NGO: ...............................................................................................................................

2. Total Funding allotted for Tropical Diseases in the past 10 years (in THB):

........................................................................................................................................

SECTION – D
OUTPUT OF THE PROJECT

No. of Research Paper(s) published in the last 10 years:

<table>
<thead>
<tr>
<th>National</th>
<th>International</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Published in Journals</td>
<td></td>
</tr>
<tr>
<td>b) Presented in conference(s)</td>
<td></td>
</tr>
<tr>
<td>c) Top 5 most cited papers</td>
<td></td>
</tr>
</tbody>
</table>

i. .................................................................................................................................

ii. .................................................................................................................................

iii. .................................................................................................................................

iv. .................................................................................................................................

v. .................................................................................................................................

Any Monograph/Book/Technical report produced out of the project (Please give numbers):
### New Product(s) developed:

<table>
<thead>
<tr>
<th>Item</th>
<th>Number</th>
<th>Details</th>
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<tbody>
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### New Process(es) developed:

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<th>Number</th>
<th>Details</th>
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</table>

### New Instrument(s) developed:

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<th>Item</th>
<th>Number</th>
<th>Details</th>
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</table>

### Prototype(s) developed:

<table>
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<tr>
<th>Item</th>
<th>Number</th>
<th>Details</th>
</tr>
</thead>
<tbody>
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</table>

### IPR's registered:

<table>
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<tr>
<th>Item</th>
<th>Number</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
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</tbody>
</table>

### Patents filed:

<table>
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<th>National</th>
<th>International</th>
</tr>
</thead>
<tbody>
<tr>
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</table>

### Patents Sealed/granted:

<table>
<thead>
<tr>
<th>Item</th>
<th>National</th>
<th>International</th>
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### Copyright(s)

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<th>Item</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
</tr>
</tbody>
</table>

### New Principle/Theory developed:

<table>
<thead>
<tr>
<th>Item</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Brief Description of the problem(s)/constraints faced in implementing the project:

<table>
<thead>
<tr>
<th>Item</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Any other specific comment(s)/suggestion(s) (please specify):

<table>
<thead>
<tr>
<th>Item</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# | Name of Institution/ University/ School/ Division/ Department | Web-link | Name of Scientist / Clinical Investigator / Doctor |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Asian Institute of Technology School of Engineering and Technology</td>
<td><a href="http://www.afrims.org/">http://www.afrims.org/</a></td>
<td>Nitin Kumar Tripathi</td>
</tr>
<tr>
<td></td>
<td></td>
<td><a href="http://www.set.ait.ac.th/people/profile/nitinkt">http://www.set.ait.ac.th/people/profile/nitinkt</a></td>
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<td></td>
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<td><a href="http://www.set.ait.ac.th/people/profile/honda">http://www.set.ait.ac.th/people/profile/honda</a></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Armed Forces Research Institute of Medical Technology (AFRIMS) Department of Virology</td>
<td><a href="http://www.afrims.org/virology.html">http://www.afrims.org/virology.html</a></td>
<td>Ananda Nisalak</td>
</tr>
<tr>
<td></td>
<td>Department of Veterinary Medicine</td>
<td><a href="http://www.afrims.org/vetmed.html">http://www.afrims.org/vetmed.html</a></td>
<td>Duangporn Phulsuksoombati</td>
</tr>
<tr>
<td></td>
<td>Department of Entomology</td>
<td><a href="http://www.afrims.org/entomology.html">http://www.afrims.org/entomology.html</a></td>
<td>Kriangkrai Lerdtusnnee</td>
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<td>Alongkot Ponlawat</td>
</tr>
<tr>
<td></td>
<td>Department of Enteric Diseases</td>
<td><a href="http://www.afrims.org/enteric.html">http://www.afrims.org/enteric.html</a></td>
<td>Ladaporn Bodhidatta</td>
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