MEASLES ELIMINATION

DIAGNOSIS LABORATORY RRT

Guidelines for disease surveillance, outbreak control, treatment, and laboratory diagnosis in accordance with the international commitment to the elimination of measles

Ministry of Public Health Thailand

Measles Elimination in Thailand

Guidelines for disease surveillance, outbreak control, treatment, and laboratory diagnosis in accordance with the international commitment to the elimination of measles

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Chapter 1

Thailand's measles elimination project in accordance with the international commitment

Piyanit Tharmaphornpilas

Thailand's measles elimination project in accordance with the international commitment

Background

The goal of measles elimination was first initiated in the region of the Americas in 1994 (B.E 2537) and accomplished in 2002 (B.E 2545). The number of measles patients in the whole region was reduced from around 250,000 patients per year in 1990 (B.E. 2533) to zero indigenous cases in just twelve years. Since 2002, the only cases reported from the region have been imported.

This achievement in the Americas has brought about the possibility of measles elimination in other regions. Currently, four other regions have established target years for reaching this goal: Eastern Mediterranean region (2010; B.E. 2553), European region (2010; B.E. 2553), African region (2020; B.E. 2563), and Western Pacific region (2012; B.E. 2555). The 11 member countries, including Thailand, in the Southeast Asia region agreed in 2010 (B.E. 2553) on measles elimination for the region by 2020 (B.E. 2563) and endorsed a goal to decrease measles mortality by 95% compared to 2000 (B.E. 2543) by 2015 (B.E.2558).

Although achievement in other parts of the world may not be comparable with what happened in the Americas, substantial progress towards measles elimination has been reported. An assessment in 2008 (B.E. 2551) showed that global mortality had decreased by 78% compared to 2000 (B.E. 2543). Despite the fact that the South-East Asia region started measles

elimination later than other regions, the Expanded Programme on Immunization (EPI) (including measles vaccination) and vaccine preventable disease surveillance systems have been in place for many years in each Member State. This effort has resulted in a gradual decrease of measles cases and deaths in many countries. Most countries in the region have already conducted Supplementary Immunization Activities (SIA) for measles vaccination nationwide to increase the vaccine coverage in children. Therefore, it is not difficult for the region to accelerate implementation of activities on measles elimination. Thailand should take measles elimination seriously to achieve the goal by 2020 (B.E. 2563) as well.

Definition

"**Measles elimination**" means the absence of endemic measles cases in the country for at least 12 consecutive months under **an effective measles surveillance system**.

"**Measles eradication**" means all regions achieve measles elimination goals together globally.

Indicators and targets of measles elimination

The South-East Asia Regional Committee meeting in 2009 (B.E. 2552) recommended indicators and targets for measles elimination as shown in Table 1 below. These indicators and targets may have to be modified in the future in accordance with actual situation and experience.

Table 1: Indicators and targets for measles elimination

Measures	Indicators	Targets
1. Vaccine coverage	Coverage of the first and second measles vaccinations through either the EPI programme or supplementary immunization activity (SIA) campaigns.	Coverage of both the first and second measles vaccination must be ⩾95% at each sub-district (tambon) level and the overall national level
2. Outbreak size	Number of confirmed cases in each outbreak	Not more than 10 confirmed cases are found per outbreak for at least 80% of all outbreaks
3. Incidence of measles	Number of measles cases per 1,000,000 population	<1 measles case per 1,000,000 population (excluding imported cases)
4. Measles virus strains circulating in the country	Number of measles virus strains circulating in the country	No confirmed case infected by measles virus strains circulating in the country for at least 12 consecutive months.

Thailand's EPI programme has provided a first dose of a measles containing vaccine (MCV1) to children at 9 months of age since 1984 (B.E. 2527) and added a second measles containing vaccination (MCV2) for first year primary school children in 1996 (B.E. 2539). At present, average vaccine coverage nationwide for MCV1 and MCV2 are higher than 96% and 91% respectively. However, around 4,000-7,000 cases measles cases continue to be reported through the disease surveillance system each year. Measles outbreaks have been reported periodically due to low vaccine coverage in young children

in some areas. Sporadic outbreaks also occur among teenagers and young adults in educational institutes or workplaces due to missed vaccination opportunities during their childhood and few chances to gain natural immunity to measles while growing-up due to relatively low incidence in parts of Thailand. In addition, the continued lack of laboratory confirmation in many areas of the country limits using surveillance data to detect risk groups.

To achieve the measles elimination goal, strategies are set forth for implementation during the first 5 years (2011-2015 or B.E 2554-2558) as follows:

1. To increase and maintain MCV1 and MCV2 vaccine coverage of ≥95% in all areas.
2. To establish a network of standardized laboratories nationwide for measles testing.
3. To improve measles surveillance system by providing confirmatory laboratory services for testing >80% of suspected measles cases in all areas.
4. To conduct measles campaigns or other supplementary immunization activities (e.g. expansion of vaccination service) to the working-age population to increase measles vaccine coverage in populations at risk.

Chapter 2

Natural history and treatment of measles

Narumol Sawanpanyalert

Natural history and treatment of measles

Measles is an exanthematous fever often found in children.

Cause: Measles is caused by the measles virus, which is a single-stranded RNA virus in the family Paramyxovirus. The virus is found in infected patient's nose and throat.

Mode of transmission: Measles is an airborne disease spread by coughing and sneezing via close personal contact or direct contact with secretions from measles patients. Measles patients have infectious measles virus in their throats that can be spread one to two days before initial symptoms or from three to five days before appearance of an erythematous rash until four days after the rash disappears.

Incubation period: From contacting with the virus until beginning of onset of initial symptoms takes around 8-12 days. On average, the rash appears around 14 days after infection.

Signs and symptoms: The initial signs and symptoms of fever, runny nose (coryza) and dry cough are similar to the common cold, and it may not be possible to diagnose measles before the presence of more severe symptoms including high fever, heavy cough and coryza, conjunctivitis, eye irritation and red lips and nose. Children may have a high fever for 3-4 days before the beginning of the maculopapular rash. The rash appears first at the hairline, forehead, back of earlobes, face and neck before spreading to cover most of the torso, arms and legs within 2-3 days. Accompanied by a decrease in

fever, the early red color rash will become dark red or brownish and fade after 5-6 days. In total, the signs and symptoms last around 2 weeks. During the disappearance of the rash, a fine brawny desquamation may occur. Koplik's spots (fine white spots seen on the buccal mucosa) are usually found two days before the onset of rash and are pathognomonic for measles diagnosis.

When to contact medical professionals

Measles patients should immediately seek medical care if they develop any abnormal symptoms, including continued high fever for 3-4 days after appearance of rash, or fever decreases for a day but increases again with cough and shortness of breath. These symptoms may indicate onset of pneumonia or bronchitis.

Complications: Complications with measles are commonly found among malnourished children living in congested communities and young children. Common complications include:

- **Complications of respiratory system:** pharyngitis, bronchitis, pneumonia
- **Complications of ears:** Otitis media
- **Complications of eyes:** conjunctivitis due to corneal ulceration (leading to corneal scarring) in particular among children with vitamin A deficiency.
- **Complications of gastrointestinal tract:** diarrhea due to intestinal inflammation
- **Complications of central nervous system:** acute encephalitis, as demonstrated by high fever, headache and drowsiness.

Disease diagnosis

Clinical symptoms: Appearance of rash on the 4th day which spreads from face to arms and legs. Koplik's spots can be observed. (See "Signs and Symptoms")

Laboratory diagnosis of measles: A single blood sample drawn 4-30 days after appearance of rash can detect measles IgM antibodies by enzyme-linked immunosorbent assay (ELISA). Measles virus can be isolated by throat or nasal swab collected from 1-5 days after appearance of rash. Measles virus isolation is difficult, therefore it is recommended to be performed only in case of an outbreak.

Treatment

1. There is no specific treatment for measles. Treatment to relieve symptoms includes medicines and tepid sponge baths to decrease fever and medicines for cough.
2. There is no need for antibiotics except in case of complications, e.g. pneumonia, otitis.
3. Provide nutritious food. WHO and UNICEF recommend vitamin A supplements for all measles infected children in endemic areas of vitamin A deficiency and areas where measles case fatality rate is higher than 1%. Study results in several developing countries have proven that vitamin A supplements reduce the risk of death and complications in children

Isolation of patients

Isolate suspected measles patients until 4 days after appearance of rash.

Prevention

The most effective measures to prevent measles infection are vaccination and avoid contacting measles patients. Currently, the Ministry of Public Health provides the first measles vaccination to children at 9-12 months of age using MMR (Measles, Mumps, & Rubella) vaccine. The second vaccination is given to children at the first year of primary school.

MMR immunization may be given to close contacts if they are identified within 72 hours of exposure.

If contact with a measles case is longer than 72 hours but less than 6 days, 0.25 ml /kg immunoglobulin (IG) may be given by intramuscular injection at upper arm to lessen severity of the disease. IG may be given to populations at risk of severe measles complications, including children under 1 year old, persons with immune deficiencies, pregnant women, and children with malnutrition.

Chapter 3

Epidemiological surveillance, investigation, and reporting for measles

Darin Areechokchai and Somjate Tangcharoensathien

Epidemiological surveillance, investigation, and reporting for measles

Epidemiologic surveillance is an important measure for following disease trends, to identify subgroups of the population who are at a high-risk, and to promptly detect disease outbreaks. Disease surveillance has to be rapidly implemented and accurately reported. Currently, disease surveillance in Thailand is primarily based on clinical symptoms which can limit validity of reporting. However, this system provides rapid reporting from each geographical area on a weekly basis.

In conjunction with the decision to launch the measles elimination project, Thailand has strengthened measles surveillance to provide more accurate and detailed case data. The focus of reporting is still on providing wide coverage and rapid reporting in order for public health authorities to know about the targeted populations at risk and implement measures to control measles outbreaks effectively. The recent improvement of measles surveillance includes laboratory confirmation in all cases, reporting through a measles data base system, and improvement of guidelines for investigation of each individual case and outbreaks.

Measles elimination has to be carried out in parallel with an effective disease surveillance system to ensure that all measures are implemented in line with established indicators and targets. Indicators and implementations of measles surveillance are shown in table 2 below.

Table 2: Indicators for measles surveillance in accordance with measles elimination

Indicators	Implementation targets for measles surveillance
1. Patient reporting rate	1.1 Report of suspected measles cases of not less than 2 cases per 100,000 populations per year **at national** level. 1.2 Report of suspected measles cases of not less than 1 case per 100,000 population per year **from each district**.
2. Laboratory confirmation of suspected measles	Collect serum samples from ⩾80% of suspected measles patients for IgM confirmation by a WHO-certified laboratory. (Excludes suspected cases from outbreak investigations.)
3. Genotyping of measles virus	Collect samples from ⩾80% of measles outbreaks for genotyping analysis by a WHO-certified laboratory.
4. Disease investigation	Investigate⩾80% of suspected measles cases within 48 hours after initial identification.

Definitions and groups of patients for measles surveillance in accordance with measles elimination

B05	**Measles** **Includes:** morbilli **Excludes:** sub acute sclerosingpan encephalitis
B05.0+	**Measles complicated by encephalitis** Post-measles encephalitis

B05.1+	**Measles complicated by meningitis** Post-measles meningitis
B05.2+	**Measles complicated by pneumonia** Post-measles pneumonia
B05.3+	**Measles complicated by otitis media** Post-measles otitis media
B05.4	**Measles with intestinal complications**
B05.8	**Measles with other complications** Measles keratitis and keratoconjunctivitis
B05.9	**Measles without complications** Measles NOS (not otherwise specified)

*** German measles or rubella (group ICD-10 B06) is not counted as measles patient.

Definition of measles patient

1. Clinical criteria

Presence of fever > 38 °C and erythematous rash and cough in association with other symptom(s) as follows:

- Coryza (running nose)
- Conjunctivitis (red eyes)
- Koplik's spots are found 1-2 days before and after appearance of erythematous rash.

2. Laboratory criteria (see details on relevant period of time and how to collect and handle specimens as shown in diagram 1 on page 27).

2.1 Serology test: Measles IgM positive.

2.2 Viral isolation: cell culture of measles virus isolated from secretions of respiratory tract by throat swab culture.

Case Classification

1. **Suspected case:** a person with clinical symptoms of measles or a person diagnosed by a medical professional as a measles patient.
2. **Probable case:** a person with clinical symptoms of measles and epidemiologically linked to a confirmed measles case.
3. **Confirmed case:** a person with clinical symptoms and positive results for measles from laboratory diagnosis.

Close contact

Close contact means anyone meeting the following criteria:

- Living in the same house.
- Routinely sharing the same room at workplace or school
- History of being close (e.g. partner, close friends, medical care providers) to measles patient for at least 7 days before appearance of patient's rash.

Reporting criteria of disease surveillance system in accordance with measles elimination

All suspected measles cases have to be reported and specimens collected and processed for laboratory diagnosis.

Types and criteria for measles investigation

Individual investigation aims to detect details of each individual case and examine the possibility of an outbreak in the community. Outbreak investigation aims to detect any more cases in the community, determine information on severity and epidemiological pattern of the outbreak, and identify the original source of the outbreak. Investigation, including collecting and processing of specimens for laboratory diagnosis, should be implemented rapidly in order to effectively control the outbreak.

Types of investigations

1. **Individual case investigation**

   Investigate all suspected cases identified in either out-patient or in-patient services. Specimens have to be collected from all suspected cases and sent for laboratory diagnosis by measles IgM.

2. **Outbreak investigation**

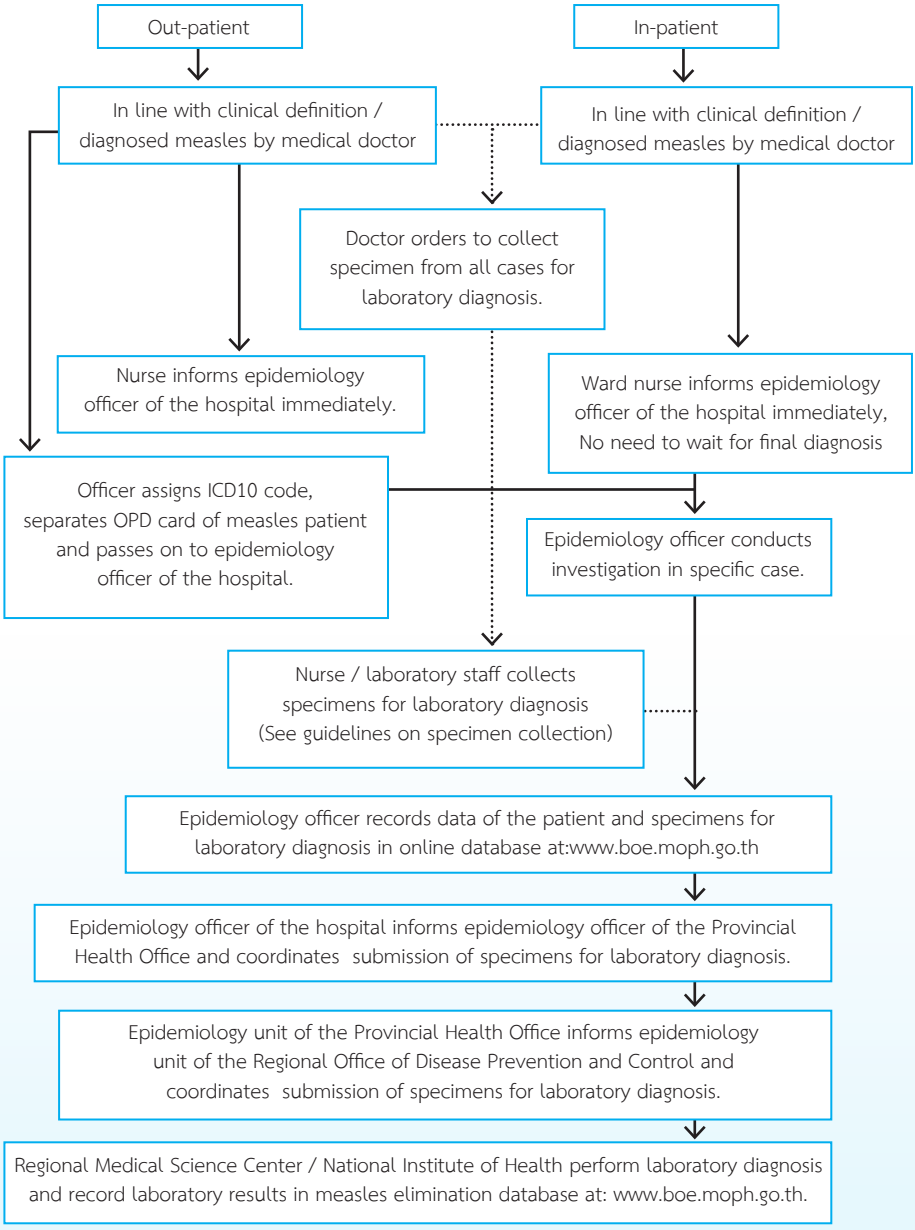
   In the event of a cluster of suspected measles cases, an outbreak investigation has to be implemented immediately to confirm both the etiologic agent and the existence of an outbreak. Collect data from indiviual cases using the Measles Elimination Form (ME 1 form) or using medical records (ME2 Form). Collect serum specimens from 10-20 suspected measles cases for laboratory diagnosis. In addition, collect not more than five throat/nasal swabs for genotyping analysis using PCR. (If the outbreak involves foreigners, samples of throat/nasal swab can be analyzed to determine whether the source of infection is an indigenous or imported virus.)

If any of the criteria below are met, a field investigation should be conducted to confirm the existence of an outbreak:

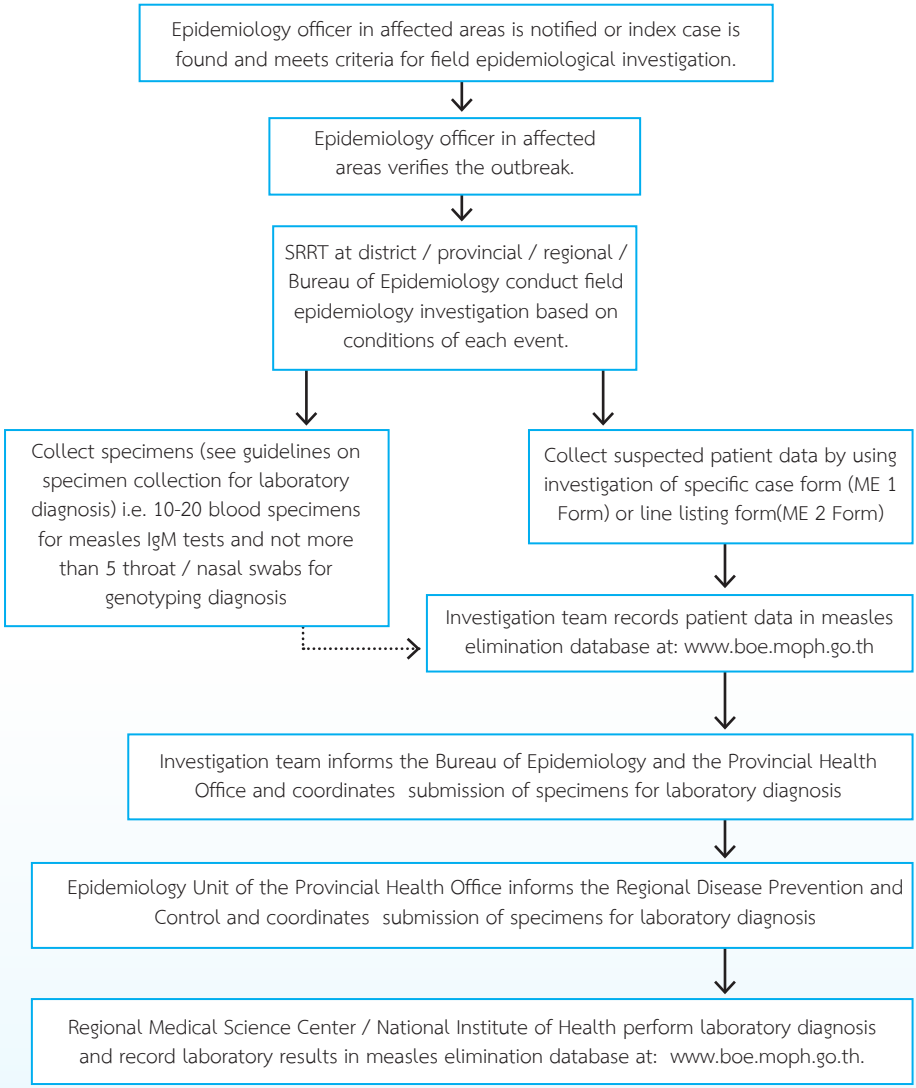
1. Receive notification of a cluster of suspected measles cases.
2. Information received from the index case indicating any close contacts with measles symptoms;
3. The index case was confirmed by laboratory diagnosis with measles IgM positive result.
4. The index case is from a “low measles/ MMR vaccine coverage area” as defined by either:
   - The coverage of M/ MMR first dose is lower than 95% in children of 1-2 years old (as of the onset of the index case) at sub-district (tambon) level; OR
   - The coverage of MMR second dose is lower than 95% in primary school student (grade 1-6).

Procedures for patient reporting

1. Patients at hospitals



2. Event of measles outbreak



Notes: → Patient data

⇢ Data on specimen for laboratory diagnosis

ME 1 form

Disease Investigation Form: specific measles case under measles elimination project

ID _____ (Automatically set from running number of the database)

General information

1. Name..... 2. Family name.....
3. Age.....years .....months (Date of Birth: Date/Month/Year ..../...../.....) 4. Sex... [ ] Male [ ] Female
5. Ethnicity [ ] Thai [ ] Chinese/ Hongkongese /Taiwanese [ ] Myanmar [ ] Malaysian [ ] Cambodian [ ] Laotian [ ] Vietnamese [ ] Others.....
6. Occupation ( ) Farmer ( ) Civil Servant ( ) Employee / labourer ( ) Merchant ( ) Housework ( ) Student ( ) Soldier, Policeman ( ) Fisherman ( ) Teacher ( ) Others ( ) Not known ( ) Animal farmer ( ) Priest ( ) Commercial Sex Worker ( ) Public health worker ( ) in custody
7. Address during onset.....
8. Educational Institute / Workplace .....Grade/Year/Department .....Class/Faculty.....

Illness history

9. Fever onset date __/__/____ (dd/mm/yyyy) Rash onset date__/__/____ (dd/mm/yyyy)
10. Date of investigation __/__/____ (dd/mm/yyyy)
11. Date of diagnosed measles__/__/____ (dd/mm/yyyy) Hospital.....Province of the hospital. .....
12. Type of patient [ ] Out-patient [ ] In-patient [ ] Patient detected from community
13. Treatment results [ ] Recovered [ ] Died Date of death __/__/____ [ ] Treatment is on-going [ ] don't know
14. Symptoms [ ] Fever [ ] Rash [ ] Cough [ ] Runnynose [ ] Red eyes / Conjunctivitis [ ] Watery diarrhea [ ] Pneumonia [ ] Otitis media [ ] others, specify.....

Risk factors and prevention factors

15. Measles or MMR vaccination history
    [ ] Received one dose [ ] Received two doses [ ] Received but do not know how many doses
    [ ] Never received [ ] Do not know / Unsure
    If received: Date of the first dose __/__/____ Date of the second dose__/__/____ (dd/mm/yyyy)
16. [ ] Travelled abroad during 2 weeks before onset of measles Specify the country.....
17. [ ] Had contact with patient with measles / exanthematous fever during 2 weeks before onset of measles
    Specify name of the patient..... Relationship to this patient.....

Contacts

18. Number of residents in the same house.....persons Number of suspected measles cases ..... persons
19. Number of students in the same institute / workers in the same workplace.....persons Number of suspected measles cases..... persons

Collection of specimens for laboratory diagnosis

20. Blood specimens: Date of collection __/__/____Date of transport __/__/____Results .....
21. Throat / Nasal swabspecimens: Date of collection __/__/____Date of transport __/__/____Results .....
22. Type of patient [ ] Suspected [ ] Probable [ ] Confirmed

Measles Outbreak Investigation Record Sheet

Place.....

ID	Name-Surname	Sex	Age	Address	School/ Office	Class/ Working unit	Room No.	date of onset	History of vaccine receiving M หรือ MMR	Blood specimen collection date	throat/nasal swab collection date	Consultancy type	Lab Result	Case classification
		1 =M 2= F						dd/mm/yyyy	1) one dose 2) two doses 3) received but cannot remember # doses 4) never received 5) do not know	dd/mm/yyyy	dd/mm/yyyy	1 OPD 2 IPD 3 Active case finding		1 suspect 2 probable 3 confirm

Chapter 4

Laboratory diagnosis for measles

Sirima Pattamadilok

Laboratory diagnosis for measles

Importance and role of laboratory for measles control and elimination in Thailand

The Ministry of Public Health has launched a measles elimination policy in Thailand targeting to reduce incidence of measles to less than 1 case per 1,000,000 populations by 2020 (B.E. 2563). Reaching the goal relies on achieving relevant national program objectives, including: 1) adequate coverage of measles vaccination; 2) an effective measles surveillance system; and 3) early detection of measles outbreaks. The second and third objectives cannot be implemented without results from laboratory confirmation.

Therefore, the country has to have a capable, widely accepted laboratory system which provides accurate, reliable, and timely results.

Thailand has a high quality measles laboratory located at the National Institute of Health, Department of Medical Sciences, and Ministry of Public Health. The lab is recognized by WHO and was certified as a Measles Regional Reference Laboratory (RRL) for the South-East Asia Region (SEAR). The role of the Measles RRL in SEAR is to provide laboratory confirmatory testing on routine surveillance serum samples from 11 Member States of WHO SEAR. The laboratory also performs genotyping for measles viruses circulating in each of these countries by comparing submitted samples to reference genotypes established by WHO. The data is used as an indicator to measure progress towards the 2020 (B.E. 2563) regional measles elimination goal.

Thailand has positive factors supporting the achievement of measles elimination, including good surveillance, a competent investigation system and a capable laboratory network. If all mechanisms can move and develop together with effective management and coordination, the measles elimination goal can be achieved as planned.

Roles of laboratory

Prior to launching the measles elimination project, Thailand's objectives were to control measles by decreasing infection and death rates, and reducing the severity of measles. In meeting these objectives, the laboratory played an important role in confirmation of suspected cases, especially to rapidly identify the initial cause of an outbreak in order to effectively investigate and control the disease. In addition, the laboratory developed a national database of measles virus genotypes circulating in Thailand.

The laboratory has a crucial responsibility to support reaching the new goal of measles elimination. The most important role for the laboratory is confirmatory testing for all suspected measles cases in order to provide early detection and rapid control of the disease. Another role of the laboratory is to conduct measles virus genotyping to determine whether the virus strain is local or imported. Genotypic data is also analyzed using both national and international measles virus data bases to track transmission routes. Classifying the measles virus genotype in each outbreak provides a useful indicator to measure effectiveness of control measures in the country.

According to WHO criteria for achieving the goal of measles elimination, a country *must not find any laboratory confirmed measles case infected by an indigenous strain measles virus for at least 12 consecutive months*. In accordance with these criteria, the laboratory has set indicators to measure effectiveness of routine work and established targets as shown in table 3

below. In order to meet these targets, the Department of Medical Sciences established a national measles laboratory network, including all 14 Regional Medical Science Centers.

Table 3: Indicators and targets to measure effectiveness of laboratory work

Indicator	Target	Notes
1. Performance of ELISA tests to confirm measles virus infection by detecting measles IgM	At least 90% of laboratory results should be reported within 48 hours	The Department of Disease Control takes responsibility on reporting system
2. Performance of genotyping analysis of measles virus	At least 90% of results should be reported within one month	

Objectives of laboratory diagnosis for measles

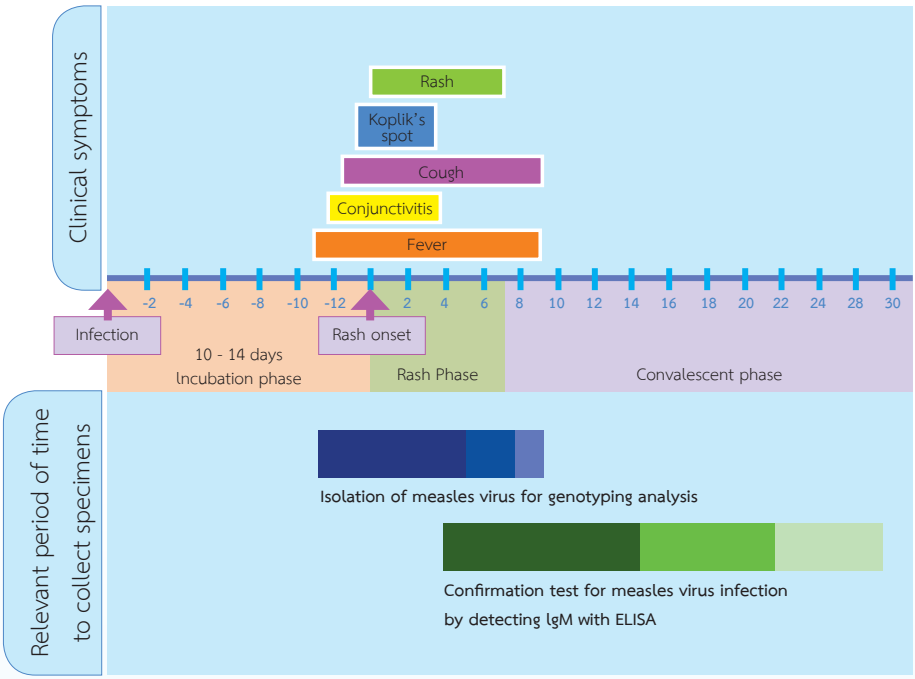
Objectives of laboratory diagnosis to support measles elimination are:

1 To perform laboratory confirmation tests of measles virus infection by detecting measles IgM with ELISA.

2 To perform measles virus genotyping.
Specimen collection should take into account the purpose of the tests, types of samples required, and the relevant period of time to collect samples. Differences in specimen collection criteria for IgM detection of measles virus infection and measles virus genotyping are shown in diagram 1 below.

Diagram 1: Characteristic of clinical symptoms and relevant period of time to collect specimens for laboratory diagnosis of measles.

Color shades are associated with possibility to detect measles virus for genotyping or IgM antibody in specimens



Guidelines on specimen collection for measles laboratory tests

1. Confirmation tests of measles virus by ELISA IgM

Serum: Draw approximately 3-5 ml blood only one time between 4-30 days after appearance of the patient's rash. Leave it at room temperature and wait until it coagulates. Take only serum. (If apparatus is available, serum should be separated by centrifuge). Keep serum in completely sealed sterile test tube. Label the tube with name and family name of the patient and date-month-year when the serum is collected.

2. **Genotyping of measles virus circulating in the country**
   - **2.1 Throat swab:** Collect specimen during the first 1-5 days after appearance of the patient's rash by inserting a sterile dry swab into the mouth and wipe along the back of the throat (posterior pharynx). Place cotton tip into a vial of viral transport media. Fracture the swabs handle and seal the vial completely, keeping as sterile as possible.
   - **2.2 Nasal swab:** Collect specimen during the first 1-5 days after appearance of the patient's rash by inserting a sterile dry swab into the nasal cavity and wipe the swab along the sides of the nasal passage. Wait 2-3 seconds and carefully pull out the swab. Place cotton tip into a vial of viral transport medium. Fracture the swabs handle and seal the vial completely, keeping as sterile as possible.

Notes:

1. Either throat or nasal swab can be used of genotyping of measles virus.
2. Viral transport media for influenza virus and avian influenza virus can be used for measles virus and can be requested from the National Institute of Health and Regional Medical Science Centers.
3. Each hospital in the measles surveillance network is responsible to pay for costs of blood drawing, specimen transport from the hospital to any laboratory. Costs of laboratory tests are borne by concerned agencies in the Ministry of Public Health.

Submission of specimens for laboratory diagnosis forms

Attach a copy of the Measles Elimination Form (ME 1) for individual suspected case or a copy of Measles Elimination Form (ME 2) for cluster outbreak to the specimens and send to the laboratory.

Transport of specimens for laboratory diagnosis

Serum: Put in ice box and transport to the laboratory immediately. If this is not practical, the serum can be stored at 2-8℃ for up to three days. If storage is anticipated for longer than three days, the specimen should be frozen and then transported as soon as possible in an ice box at 2-8 ℃.

Throat swab / Nasal swab: Put in ice box and transport to the laboratory immediately. If this is not practical, the swab can be stored at 2-8 ℃ for up to 24 hours.

Note: Should contact the laboratory in advance prior to transporting specimens.

Reporting of laboratory diagnosis results

1. Confirmation tests of measles virus infection are reported as “positive / negative / equivocal”.

Note: If an initial test result is equivocal, it will be reported online as and the test will be repeated twice. The final laboratory report as “positive / negative / equivocal” will reflect the results found in two of three tests.

2. Results of measles virus genotyping are reported as “names of genotypes” / “unable to detect measles nucleotide”.

Sending back the laboratory diagnosis results

Results of laboratory diagnosis for measles are recorded in the online database system.

Precautions

1. Confirmation tests of measles virus by ELISA IgM
   - Hemolysis of blood samples, blood lipids in samples, or contaminated blood samples.
2. Genotyping of measles virus
   - Contaminated samples or specimen collection does not follow sterilization protocol.
3. Specimens should be collected at relevant period of time. (See Diagram 1)

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List of Laboratories for measles

1. National Institute of Health, Department of Medical Sciences

Address: 88/7 Moo 4 Tambon Talad Kwan, Mueang district, Nonthaburi 11000
Telephone: 02 589 0022 Ext. 99312, 98362 **Facsimile:** 02 591 5449

2. Regional Medical Science Centers (RMSC)

Name of RMSC (new)	Addresses	Telephone	Facsimile
RMSC 1	153 Moo 4,Tambon Ban Kuan, Mueang District, Trang 9200	075-213 105 to 7	075-215 675
RMSC 2	54 Moo 1, Mittrapap Udon- Khon Kaen Rd.,Tambon Nong Pai, Mueang District, Udon Thani 41330	042-207 364 to 6	042-207 367
RMSC 3	59/2 Moo 3,Tambon Samet Administration Rd., Tambon Samet, Mueang District, Chon Buri 2000	038-455 200, 038-784 006 to 7, 038-455 235, 038-455 379	038-455 165
RMSC 4	136 Moo 4, Ekkachai Rd., Tambon Lad Yai, Mueang District, Samut Songkram 75000	034-720 668 to 71	034-720 540
RMSC 5	Ratchasima-Chok Chai Rd. Kilometer 7.5, Tambon Nong Bua Sala, Mueang District, Nakhon Ratchasima 30000	044-346 005 to 17	044-346 018
RMSC 6	400/2 In front of the Government Center Rd., Mueang District, Khon Kaen 40000	043-240 800	043-240 845
RMSC 7	82 Klang Arwut Rd., Tambol Kham Yai, Mueang District, Ubon Ratchathani 34000	045-312 230 to 3	045-312 230 ext. 104

Name of RMSC (new)	Addresses	Telephone	Facsimile
RMSC 8	2 Moo 4, Tambon Tha Nam Ooy, Payuha Khiri District, Nakhon Sawan 60130	056-267 423, 056-267 428	056-267 329
RMSC 9	Tambon Hua Ror Government Center, Moo 5, Tambon Hua Ror, Mueang District, Pitsanulok 65000	055-247 581 to 2	055-247 581 to 2 ext. 121
RMSC 10	191 Moo 8, Tambon Don Kaew, Mae Rim District, Chiang Mai 50180	053-112 188 to 90	053-112 194
RMSC 11	102 Tambon Khun Talay, Mueang District, Surat Thani 84100	077-355 301 to 6	077-355 300
RMSC 12	616/1 Moo 2, Tambon Pa Wong, Mueang District, Songkhla 90100	074-447 024 to 8	074-333 809
RMSC 13	148 Moo 3, Tambon Nang Lae, Mueang District, Chiang Rai 57100	053-176 225 to 6	053-176 224
RMSC 14	141 Moo 4, Tambon Si Sunthorn, Talang District, Phuket 83110	076-352 041 to 2	076-352 044

Chapter 5

Prevention and control of measles outbreaks

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Prevention and control of measles outbreaks

Measles is a highly contagious respiratory disease transmitted from person to person worldwide. The most effective prevention and control measure is to immunize target populations with a measles containing vaccine (MCV). Uniform coverage of at least 93-95 % is required to create herd immunity. Therefore, monitoring coverage of routine measles vaccination in children and follow-up measles vaccination campaigns in low-coverage areas are necessary to ensure effective prevention. In addition, public health authorities must rapidly provide measles vaccine to affected areas to control outbreaks.

Monitoring vaccination to prevent measles

The purpose of these guidelines is to ensure sufficient immunity levels to prevent and eliminate measles in target populations living in Thailand. The guidelines are divided into pre-outbreak and ongoing-outbreak periods.

Pre-outbreak period

The most important basic measure to achieve the goal of measles elimination is to prevent and control the disease by providing the highest possible coverage of measles vaccination to target children through routine immunization. Currently, the Ministry of Public Health routinely provides two doses of combined Measles, Mumps, and Rubella (MMR) vaccine to target children. The first dose is administered at age 9-12 months and the second dose for children entering primary school in Grade 1 (including children of this age outside the school system). Target for both the first dose coverage in each sub-district (tambon) and the second dose in each school is at least 95%. Responsibilities of public health authorities during the pre-outbreak period are:

1. **To examine vaccination history of target children for whom they are responsible and provide additional vaccination as necessary**

   To prevent measles, it is extremely important for public health authorities to regularly examine the MMR vaccination history of target children both at pre-school age (less than 7 years old) and at school age (more than 7 years old) and provide vaccination to all these children. This can be implemented per the following guidelines:

   1.1 **Examine measles /MMR vaccination history of all children at 1 year of age**. Review the quarterly vaccination coverage reports from each village and contact parents of any unvaccinated child to bring their children to receive a dose of MMR vaccine as soon as possible.

   1.2 **Examine measles/MMR vaccination history of children at less than 7 years old**. Review the village vaccination records and/or the individual child health record booklets at least once a year. Vaccination should be provided as follows:

   1.2.1 If a child was not vaccinated with measles/MMR vaccine or received the vaccine before aged 9 months or their vaccination status is unsure, administer one dose of MMR vaccine. **Another dose of MMR vaccine must be administered** when the child enrolls in the first year of primary school (Grade 1).

   1.2.2 If a child has already received the first dose of MMR vaccine after 9 months of age, **do not duplicate the MMR vaccine** until the children enrolls in the first year of primary school.

   1.3 **Examine measles/ MMR vaccination history of children in primary and secondary schools (grade 1 to grade 12).** Regularly review all school vaccination records and/or individual school health record booklets. Provide vaccination as follows:

   1.3.1 If a child has not received any dose of measles/MMR vaccine or their vaccination status is unsure, **administer one dose of MMR vaccine.**

1.3.2 If a child was vaccinated with the first dose of measles/MMR vaccine but did not receive a second dose upon enrolling in the first year of primary school, or status is unsure, **administer one dose of MMR vaccine.**

1.3.3 If a child was not vaccinated with a first dose of measles/MMR vaccine, but has already received MMR vaccine when enrolling in the first year of primary school, **there is no need to administer a MMR vaccine.**

1.4 In case vaccination records of target groups in item 1.1-1.3 are not available at health care facilities, responsible public health authorities at district and provincial level are requested to plan and conduct MMR vaccination campaigns targeting all children whose vaccination history could not be determined e.g. provide mass vaccination to all children in grade 6 in case of unavailability of MMR records during grade 1, etc.

2. To provide supplementary vaccination to high risk populations

Public health authorities at district and provincial level are requested to plan and conduct MMR vaccination campaigns targeting all high risk populations in their area regardless of prior vaccination history (e.g. give an additional dose of MMR even if the child has already received two prior doses). "High risk" populations include:

2.1 **Children in remote areas** (e.g. island or mountain areas) who have difficulty accessing vaccination services.

2.2 **Underprivileged children who are difficult to follow-up,** including those who live in congested areas; those who have stateless status; or whose parents are internal migrant workers.

2.3 **Children of foreign migrant workers (from Myanmar, Laos, Cambodia, etc.)** who are unlikely to be fully vaccinated.

Ongoing outbreak period

Vaccine must be rapidly administered during a measles outbreak in order to control the spread of the disease. Prompt action is critical since the effectiveness of disease prevention and control measures can decrease if the outbreak lasts longer than the incubation period of the measles virus (e.g. 8-12 days). However, there is no concrete data on how much the efficacy of measles vaccination to control an outbreak decreases during a prolonged outbreak. In practical terms, once a suspected measles case (based on definition of epidemiological surveillance of measles) is found, public health authorities are requested to examine measles/MMR vaccination history of target populations as done in the pre-outbreak period. If at least two suspected measles cases are found within 14 days in a village, community, or a mass gathering place (e.g. factory, educational institute, child center, etc.), control measures via vaccination must be implemented as follows:

1. Outbreak in pre-school children (<7 years old)

1.1 Assess completeness of prior disease prevention by evaluating the coverage of measles/ MMR vaccination in pre-school children in the outbreak area.

1.1.1 If vaccine coverage is higher than 95%, immediately administer MMR vaccine to all unvaccinated children 9 months to 6 years old.

1.1.2 If MMR vaccine coverage in pre-school children is less than 95%, or the coverage cannot be assessed, or there is doubt about the effectiveness of prior measles prevention work in the areas, administer one dose of MMR vaccine to all children aged 9 months up to 6 years in the village and in the villages visited by any confirmed measles cases.

1.2 Vaccination should be administered within 72 hours after notification of the first measles case.

1.3 MMR vaccination is not recommended for children less than 9 months old, but these children should not be in contact with a measles patient.

2. Outbreak in school age children

The Ministry of Public Health launched the second dose of measles vaccine in first year primary school children in 1996 (B.E. 2539) and then changed to MMR vaccine in 1997 (B.E. 2540). By 2012 (B.E. 2555) school children who received measles only vaccine are now around 22 years old and have already graduated from high school . However, there may be some children who missed the opportunity for vaccination during the first year of primary school. Therefore, if a suspected measles case is found in a school, public health authorities are requested to implement following measures:

2.1 Examine the MMR vaccination history of all children in the school

2.1.1 If a child has evidence that he/she was already vaccinated during their first year of primary school, then there is no need for MMR vaccine at this time.*

2.1.2 If a child does not have evidence that he/she was already vaccinated or their vaccination status is unsure, administer one dose of MMR as soon as possible.

**Note: MMR vaccine generates the same level of measles immunity for children who receive the vaccine just before or after enrolling in the first year of primary school. Therefore, if a school child has evidence of receiving MMR vaccine between 4-6 years old, there is no need to provide MMR vaccine as part of the outbreak response.*

2.2 Vaccination should be administered within 72 hours after notification of the first measles case.

3. Outbreak in adults

Numerous measles outbreaks after 2008 (B.E. 2551) have occurred among adults in a variety of settings (i.e. educational institute, workplace, factory, military camp, dormitory, prison, etc.) Measles outbreaks of this pattern usually strike in countries that have sustained high vaccination coverage through their Expanded Program on Immunization (EPI). In these situations, adults born before or during the early phase of the EPI remain susceptible as they are often unvaccinated and not exposed to natural measles infection.

If measles outbreaks occur in adults, public health authorities are requested to examine the age of suspected cases and attack rate of each age group using "Attack rate assessment form for requesting of MMR vaccine for prevention of measles in adults"*(see the form on page 42).*

To consider which age groups should be vaccinated, guidelines on vaccination are as follows:

3.1 If suspected measles cases were born before 1990 (B.E. 2533)

Patients born before 1990 received their first dose of measles vaccine when they were 9-12 years old. The Ministry of Public Health did not provide a second dose of measles containing vaccine to school children in the first year of primary school until 1996. Before that time measles virus had spread widely and many children had been exposed to measles virus while they were young. Surveillance data from the Bureau of Epidemiology demonstrates that adults who were born before 1977 (B.E. 2520) in particular have very low attack rates. However, since the risk for a particular age group depends on their level of vaccination coverage and prior exposure, epide miological investigation is required for each age group.

If attack rate in any age group is higher than 2%, MMR vaccine should be provided to everyone in that age group in the outbreak area.

3.2 If suspected measles cases were born since 1990 (B.E. 2533)

3.2.1 This group already received measles or MMR vaccine when they were in the first year of primary school. Therefore, if suspected measles cases and their contacts (e.g. people exposed to measles cases in the affected area) are from this group, their measles vaccination history during the first year of primary school should be examined for MMR vaccination as follows:

- If he/she already received measles or MMR vaccine, do not duplicate vaccination.
- If he/she never received measles or MMR vaccine or vaccination status is unknown or unsure, administer one dose of MMR.

3.2.2 Vaccination should be administered within 72 hours after notification of the first measles case.

3.2.3 Vaccination area depends on epidemiological linkage.

3.2.4 Do not provide MMR vaccine to pregnant women. If MMR vaccine is administered to reproductive age women, they must be informed to utilize contraception for one month to avoid pregnancy.

If the outbreak lasts longer than two times the incubation period, most of the susceptible population in the epidemic areas has likely already been exposed to the virus. Therefore, MMR vaccination may not affect control of the disease. In an area where measles has continuously spread longer than 1 month, public health authorities should implement control measures applicable to a pre-outbreak period.

4. Recommendations for adjacent areas without outbreak

Once a measles outbreak occurs, the concerned agencies at district and provincial level should notify adjacent sub-districts or tambon and district that have not yet been affected. Pre-outbreak measures as described above should be carried out by public health authorities of these adjacent areas, including: examination of measles/MMR vaccination history of children

<7 years and all school children from the first grade of primary school, identifying unvaccinated children in high risk populations and providing measles/MMR vaccination as required.

Request for MMR vaccine and distribution of MMR vaccine

Any Provincial Health Office (PHO) can request MMR vaccine from the Bureau of General Communicable Diseases, Department of Disease Control under the following conditions:

1. In the case of a MMR vaccination campaign for children less than 7 years old or for school children from grade 1 of primary level-grade 6 of secondary level who did not receive measles/MMR vaccine as scheduled, the PHO should submit the following details: name of requesting agency; reasons of the request; target groups and number of each group to be administered; expected dates to receive the vaccine, and expected date to administer the vaccine in the areas.

2. In case a MMR vaccination campaign for disease control or for supplementary vaccination in target group that vaccination history cannot be determined, the PHO should submit the following details including: name of request ing agency, reasons of the request; target groups and number of each group to be administered; expected dates to receive the vaccine, and expected date to administer the vaccine in the areas.

If the vaccine is urgently needed, request via telephone to Medical Supplies Administration Section is acceptable at 02 590 3222 and 02 590 3365 and send official request via facsimile number 02 591 7716 or via email address: phamagcd@gmail.com. The Medical Supplies Administration Cluster will distribute the vaccine by several means including self-delivery, collaborating with government agencies e.g. Government Pharmaceutical Organization, or using private transport service.

Attack rate assessment form for requesting of MMR vaccine For prevention of measles in adults

Primary data about the outbreak

Suspected Outbreak of .....

Measles (please select)..... Rubella .....

Places where patients are found .....Village .....Sub-district.....

District..... Province.....

Date of onset of the first case ...../...../.....

Date of finding the first case ...../...../.....

Attack rate by age ranges

Age range	Number of total population	Number of cases	Attack rate (%)
15-19 years			
20-24 years			
25-29 years			
30-34 years			
35-39 years			
40 years up			
Total			

Volume of requested vaccine .....bottles

Expected Date for vaccination ...../...../.....

Name of informant ..... Workplace .....

Office telephone number .....

Mobile phone number .....

Date to submit the assessment form ...../...../.....