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ONE HEALTH FIELD EPIDEMIOLOGY TRAINING MANUAL

Introductory Course

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Published by

NATIONAL COORDINATING OFFICE (NCO)

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CONTENT

FOREWORD BY CHAIRMAN OF MALAYSIA ONE HEALTH UNIVERSITY NETWORK (MyOHUN)

Malaysia One Health University Network (MyOHUN) is thriving with One Health Workforce (OHW) Emerging Pandemic Threat II (EPT-2) projects. Many of the successes and achievements gained over the years include inter-agency collaborations, in-service and pre-service training, and our highly beneficial programs and activities that demand strong networking between people from universities, ministries, and communities. Through the years, MyOHUN has also produced educational materials for the use of the workforce in Malaysia.

With every product MyOHUN has published, I reiterate the fact that MyOHUN successes will never be achieved without an endless commitment from MyOHUN members and staff. It is the involvement of members from multiple disciplinary backgrounds that sit together, find common ground, share intellects, and networks that develop the product that is beneficial for all.

This is yet another completed product from dedicated MyOHUN members, the One Health Field Epidemiology Training Manual. MyOHUN has organized One Health Field Epidemiology Training programs since 2017 under the OHW EPT-2 project by partnering with the Epidemiology Intelligence Program Malaysia (EIP Mas). Trainers and participants involved with the program comprised a multidisciplinary team from universities and government agencies. Through these experiences and document references from Southeast Asia One Health University Network (SEAOHUN), the World Organization for Animal Health (OIE), the European Centre for Disease Control (ECDC), and the USCDC, this training manual was created tailored to the conditions in Malaysia to ensure efficiency for trainers using this manual.

I am incredibly grateful to the contributors of this book, led by Professor Dr. Razitaham Safii from Universiti Malaysia Sarawak (UNIMAS) and team members from universities, ministries, and agencies for their time and determination leading towards its completion. It is an exceptional commitment of members of MyOHUN to chart the future and educate our workforce in fighting against emerging infectious and zoonotic diseases. Thank you.

Professor Dr. Mohd Hair Bejo
Chairman of Malaysia One Health University Network
Dean of Faculty of Veterinary Medicine
Universiti Putra Malaysia

FOREWORD BY COORDINATOR OF MALAYSIA ONE HEALTH UNIVERSITY NETWORK (MyOHUN)

"Nature chose to rage in 1918, and it chose the form of the influenza virus in which to do it. This meant that nature first crept upon the world in familiar, almost comic, form. It came in masquerade. Then it pulled down its mask and showed its fleshless bone."

The Great Influenza – The story of the Deadliest Pandemic in History

The One Health Field Epidemiology Training Program (OH- FETP) is a health capacity-building training program under MyOHUN that develops disease detectives with an elevated level of One Health appreciation and skills. Disease detectives are core members of investigation teams who help track, contain, and eliminate outbreaks before they become epidemics. With the looming disease threats, these trained disease detectives should be able to quickly communicate crucial information about health problems in a community, including those arising from the interaction between animals and humans. With the changing disease landscape and narrower wildlife-livestock-human interface, OH-FETP training has become more relevant as it requires a holistic approach in responding to disease threats and disease management. As COVID-19 has taught us, a pandemic is just a plane ride away, and therefore, disease detectives help countries identify and stop health threats close to the source. At the time of this write-up, COVID-19 has robbed us of almost 1 million lives, with a more than 3% mortality rate worldwide.

One Health FETP training is a shortened adaptation of the FETP training program, perhaps not as intensive or as involved but nevertheless able to provide useful skills for collecting, analyzing, and interpreting disease information, using evidence to take quick action and save lives. The occurrence of major zoonotic disease outbreaks has had a significant impact on health systems. As a result, this has justified the need to identify creative strategies to address the threat of emerging and re-emerging infectious diseases to enhance early detection and response at the human-animal-environmental interface.

In line with the global need for more trained field epidemiologists, this manual was created with a robust multi-discipline health approach to train the workforce to address problems across the human, animal, and environmental health sectors. This training module emphasises collaboration and outbreak investigations across sectors. It is our sincere hope that the outcome will be a workforce with improved skills to implement multi-disciplinary surveillance and respond to disease outbreaks.

Professor Dr. Latiffah Hassan
Coordinator Malaysia One Health University Network (MyOHUN)
Head, Veterinary Laboratory Diagnostics
Faculty of Veterinary Medicine
Universiti Putra Malaysia

PREFACE

Emerging infectious diseases, mainly zoonotic, threaten Malaysia. Past experiences with Nipah, SARS, MERs-Cov, and the rabies outbreak emphasized the importance and urgent need for strong multisectoral collaboration. In view of this, the One Health Workforce (OHW) needs to be trained in handling infectious diseases.

The workforce includes public health professionals, veterinarians, environmental scientists, entomologists, environmental engineers, laboratory staff, health education staff, wildlife and forestry staff, local council officers, and other relevant personnel. By incorporating the One Health concept, the transformation of work culture from "silo" to integrated collaboration and partnership can be achieved.

The One Health Field Epidemiology training program is one of the activities under a five-year work plan for Malaysia One Health University Network (MyOHUN). It is in line with objective 3: In-service One Health Education and Training and Strategy 3.1: In-service & Professional Development Training.

In years three (2017) and four (2018), MyOHUN successfully conducted One Health Field Epidemiology training by partnering with the Epidemiology Intelligence Program Malaysia (EIP Mas). Based on these experiences, EIP Mas, SEAOHUN One Health course modules, the World Organization for Animal Health (OIE), and technical documents from the European Centre for Disease Control (ECDC) and the USCDC, the competency domains for the FETP One Health approach were selected. These domains were compiled as 'One Health Field Epidemiology' modules.

Trainers and participants comprise a multidisciplinary team from universities and government agencies. To ensure sustainability and efficiency, it is vital to have a training manual tailored to the conditions in Malaysia. This manual will be updated periodically in collaboration with potential users. In the future, it can be used as a platform for the development of an online One Health Field Epidemiology course, curriculum development, accreditation of training programs, and evaluation of participants.

We would like to thank those who worked on the development of this training manual and of special note is the support of EIP Malaysia. Our gratitude and appreciation to USAID for the financial support and MyOHUN for the training support.

Professor Dr. Razitasham Safii

Chief Editor

HOW TO USE THIS MANUAL

This training manual targets mid-level OHWs with an intermediate level of competency. Mid-level OHWs are defined as those with experience as unit supervisors for surveillance, preparedness, and response activities, as opposed to junior or senior epidemiologists. This manual serves as a guideline for trainers in training OHWs involved in the management of zoonotic diseases. This is in line with Malaysia's need to have more trained field epidemiologists among mid-level professionals.

This one-week modular course consists of both classroom teaching and field training. The modules cover:

- One Health concept and competencies
- Introduction to One Health field epidemiology
- Fundamentals of infectious diseases (Human Health and Animal Health)
- Prevention and control of infectious diseases (Human Health and Animal Health)
- Ecosystem and Health
- Surveillance of zoonotic diseases (Human Health and Animal Health)
- Laboratory intelligence in disease outbreaks (Human Health and Animal Health)
- Outbreak investigations (Human Health and Animal Health)
- Risk assessment
- Data management
- Risk communication (Human Health and Animal Health)

TRAINING SCHEDULE

Day 1	Briefing & Ice-Breaking [1h]	Chapter 1: Introduction to One Health Epidemiology (1h)	B R E A K	Chapter 2: One Health Concepts & Competencies (2h)	B R E A K	Chapter 3: Fundamentals of Zoonotic Infectious Disease (1.5h)	Chapter 4: Infectious Disease Control & Prevention (1.5hr)
Day 2	Chapter 5: Ecosystem & Health (45m)	Chapter 6: Laboratory Intelligence in Infectious Disease Management (1.5h)		Chapter 7: Disease Surveillance (1.5h)		Chapter 8: Outbreak Investigation (1.5h)	Outbreak Management & Challenges: Outbreak Movie
Day 3	Field visit (surveillance/environment/disease control) (8h)						
Day 4	Chapter 9: Risk Assessment (3h)		B R E A K	Chapter 11: Risk Communication (2.5h)	B R E A K	Chapter 10: Data Management & Analysis (3h)	
Day 5	Chapter 12: Prevention of Occupational-acquired Zoonotic Diseases among One Health Workforce (1.75h)			Field Visit Presentation (1.5h)			

ACKNOWLEDGEMENTS

We would like to thank USAID and MyOHUN, especially Professor Dr. Mohd Hair Bejo, Chairman of MyOHUN, and Professor Dr. Latiffah Hassan, Coordinator of MyOHUN, for their support and encouragement and for their vision in supporting this innovative endeavour.

We would also like to thank our colleagues from various agencies for their understanding and support:

Department of Veterinary Services	Universiti Kebangsaan Malaysia
Ministry of Health Malaysia	University of Malaya
National Public Health Laboratory	Universiti Malaysia Sarawak
Veterinary Research Institute	Universiti Putra Malaysia
Universiti Teknologi MARA	AIMST University
Universiti Sains Malaysia	RAAS Consultant Management

We would like to extend our warmest gratitude to the reviewers who helped with the vetting of the contents:

Dato Dr. Fadzilah Kamaludin, EIP (Malaysia)

Dato' Dr. Wan Mansor Hamzah, EIP (Malaysia)

Datu Prof. Dr. Andrew Kiyu, Consultant Epidemiologist (UNIMAS)

Prof. Dr. Aziz Saharee, Department of Veterinary Clinical Studies (UPM)

We would also like to extend our gratitude to Mr. Raja Khairul Adli Bin Raja Kamalzaman and MyOHUN National Coordinating Office for their invaluable help in making this project a success.

MODULE ONE

INTRODUCTION TO
ONE HEALTH FIELD EPIDEMIOLOGY

Razitasham Safii, Latiffah Hassan, Thilaka Chinnayah

Introduction

Field Epidemiology is the application of epidemiologic methods to unexpected health problems when a rapid on-site investigation is necessary for timely intervention. A more expansive definition is: The practice of Epidemiology in the field.

The One Health approach has become a significant principle in field epidemiology. It emphasizes a collaborative effort of multi-agencies for disease prevention and control. Incorporating the One Health approach in Field Epidemiology Training Programs (FETPs) ensures a more holistic, competency-based, in-service training for personnel from multiple agencies involved in field epidemiological practices.

Training Outcomes

By the end of the session, participants will be able to:

1. Recognize the concept of Epidemiology and Field epidemiology.
2. Apply the concept of epidemiology in disease investigation (system thinking).
3. Apply One Health approach in managing infectious diseases.

Training Plan

Topic	Method	Material	Duration
Introduction to the Field of Epidemiology.	Interactive lecture, group work	Slides, scenario, newspaper cutting	20 minutes
Application of the One Health Approach in Field Epidemiology.	Interactive lecture, group work	Slides, scenario, newspaper cutting	30 minutes
Reflection.	Individual / group discussion	Learning reflection questions	10 minutes

Training Guide

1. Define epidemiology, Field epidemiology, and One Health concept.

a. Epidemiology.

Epidemiology is the method used to find the causes of health outcomes and diseases in populations. Epidemiology is the study (scientific, systematic, and data-driven) of the distribution (frequency, pattern) and determinants (causes, risk factors) of health-related states and events (not just diseases) in specified populations (animals, livestock, wildlife, environment, neighbourhood, school, city, state, country, global).

> "Veterinary epidemiology, like human epidemiology, looks at the association between adverse effects and a selected potential 'cause' of interest, such as exposure to a chemical or a disease agent. For example, veterinary epidemiology can play a key role in emerging

and global disease outbreaks, helping in the understanding and prevention of infections and other emerging diseases, including those transmitted from an animal to other animals and those possibly transmitted from animals to humans."

S.C. Gad, in Encyclopedia of Toxicology (Third Edition), 2014

The application of this study is also to control health problems, including human and animal health.

(Source: Principles of Epidemiology, 3rd Edition).

b. Field Epidemiology.

Field epidemiology is defined as "epidemiology with the goal of immediate action to address public and health problems of concern."

(Source: CDC Field Epidemiology Manual).

A primary goal of field epidemiology is to guide, as quickly as possible, the processes of selecting and implementing interventions to lessen or prevent morbidity and mortality when such problems arise.

c. One Health Concept.

One Health is a collaborative approach that involves multi-experts in human, animal, environmental health, and other relevant disciplines and sectors to understand risks for human and animal health and ecosystem health in monitoring, controlling and preventing further threats and damages to these whole systems.

The Professionals, including those in human health (doctors, nurses, public health practitioners, epidemiologists), animal health (veterinarians, veterinary epidemiologists, animal keepers/para veterinarians, agricultural workers), the environment (ecologists, wildlife experts), and other areas of expertise, need to communicate, collaborate on, and coordinate activities.

(Source: CDC. One Health. 2008)

2. The role of epidemiologist and veterinary epidemiologist.

They are disease detectives. Disease detectives begin by looking for clues. They systematically gather information, asking questions such as:

- Who is sick?
- Which animals are involved?
- Why are they/it sick?
- What are the symptoms in humans and animals?
- When did those symptoms occur?
- When did these animals show signs or experience mortality?
- Where could they have been exposed?
- How did they/it become sick/ill?

The competencies are organized into four skill levels, called tiers; each level depends on experience, knowledge, and job responsibilities expected within each tier. Tiers are organized as follows:

- Tier 1 – Entry-level or basic
- Tier 2—Mid-level
- Tier 3a—Supervisory
- Tier 3b—Senior scientist

(Source: CDC. Competencies for Applied Epidemiologists in Governmental Public Health Agencies)

3. One Health approach in managing zoonotic diseases.

Zoonotic diseases, or zoonoses, are diseases shared between animals, including livestock, wildlife, pets and people. They can pose severe risks to animal and human health and may have far-reaching impacts on economies and livelihoods. Zoonotic diseases commonly spread at the human-animal-environment interface, where people and animals interact in a shared environment. Zoonotic diseases can be foodborne, waterborne, or vector-borne, transmitted through direct contact with animals or indirectly by fomites or environmental contamination.

One sector alone cannot effectively address health issues at the human-animal-environment interface. Collaboration across all sectors and disciplines responsible for health is required to address zoonotic diseases and other shared health threats at this interface. This approach to collaboration is referred to as One Health.

The One Health approach in epidemiology can be applied based on the areas and domains in field epidemiology (Appendix 1).

Supporting Material

1. Apply Epidemiology Concept in Disease Investigation.

Rabies death reported in Sarawak, Malaysia; 3rd case of 2021

by NEWS DESK

May 24, 2021 | Asia | No Comments

By NewsDesk **@infectiousdiseasenews**

The Malaysia Ministry of Health reported a human rabies death in Sarawak, which was confirmed positive on 5 May 2021.

The 45-year-old female citizen was living in Rh Janggu, Sungai Tepus, Selangau, Sarawak. She has a history of being bitten by her pet dog on the left hand while disposing of the dog who was fighting with another dog on March 9, 2021.

The case had washed the wound and sought treatment at the Tepus Health Clinic the same day. Wound treatment was performed, anti-tetanus

Group work: What do you know and what else do you want to know?

Participants are divided into groups. Using the newspaper cutting, participants should be able to answer based on 5W1H.

a. What

- What happened to the dog?
- What type of dog - owned or stray?
- What are the symptoms and signs in humans and dogs?

b. Who

- Have any human death cases related to Rabies in the area before?
- Any dogs with abnormal behavior or dead dogs in the area?
- Are there any bats around here?
- Are there any stray dogs wandering around here?

c. Where

- Are there any bats or wildlife around here?
- Are there any stray dogs wandering around here?
- Observe the surroundings, e.g., the area near border country, near jungle/forest, which has many strays, etc.
- Is the area positive for rabies?
- Are any rabies areas nearby?
- Where was/were the dogs kept (indoors or outdoors)?

d. When

- When was the onset of symptoms?
- When did the dog start showing signs (date of onset)?
- When veterinarians/vet epidemiologists have to do a thorough investigation to look for the source of infections?

e. Why

- Any stray dogs or wildlife, especially bats, in the area?
- Any bite cases in the area?
- Has any surveillance (animal surveillance, especially of stray dogs and wildlife) been done in this area?
- Did owned dogs routinely vaccinated for rabies?
- Why is Post-Exposure Prophylaxis not given?

f. How

- How did the bite happen?
- How do we inform villagers about the case?
- How many dogs are showing signs of suspected rabies?

https://www.woah.org/en/disease/rabies/#ui-id-2
https://www.fao.org/common-pages/search/en/?page=0&query=rabies&category=

2. Identify One Health Workforce.

   Group work: Divide into four groups.

   Materials: Rabies Video SEAOHUN UNIMAS.

   Aim:

   a. To identify disease triad: host-agent-environment OR animal-human-environment interface.
   b. To identify who is involved in managing rabies (One Health workforce).

   The One Health approach is applied at all levels, from basic or community level to intermediate and advanced levels, as has been practised in Thailand.

Figure 1.1: Target of Field Epidemiology in Thailand.

(Source: Adapted from Springer link. Sopon Iamsirithaworn, Karoon Chanachai and David Castellan, 2014)

3. Outcome of One Health Approach**.**

a. Work culture transformation.

b. Develop a standardized approach, procedures, and tools.

- The process must be transparent to all.
- The assessment should be evidence-based.
- Methods must be standardized so that stages are comparable across regions.
- The process must be user-friendly and not too arduous.

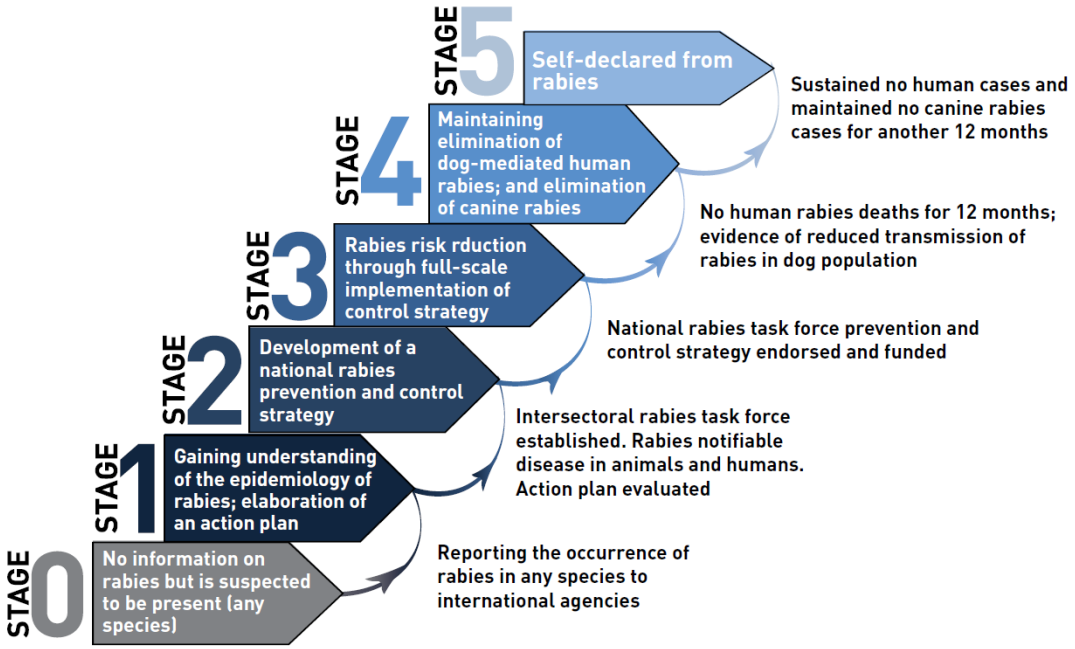

Figure 1.2: A Stepwise approach to rabies control.

(Source: DEVELOPING A STEPWISE APPROACH FOR RABIES PREVENTION AND CONTROL, FAO/GARC Workshop, Rome, Italy, 6-8 November 2012 pg.: 29)

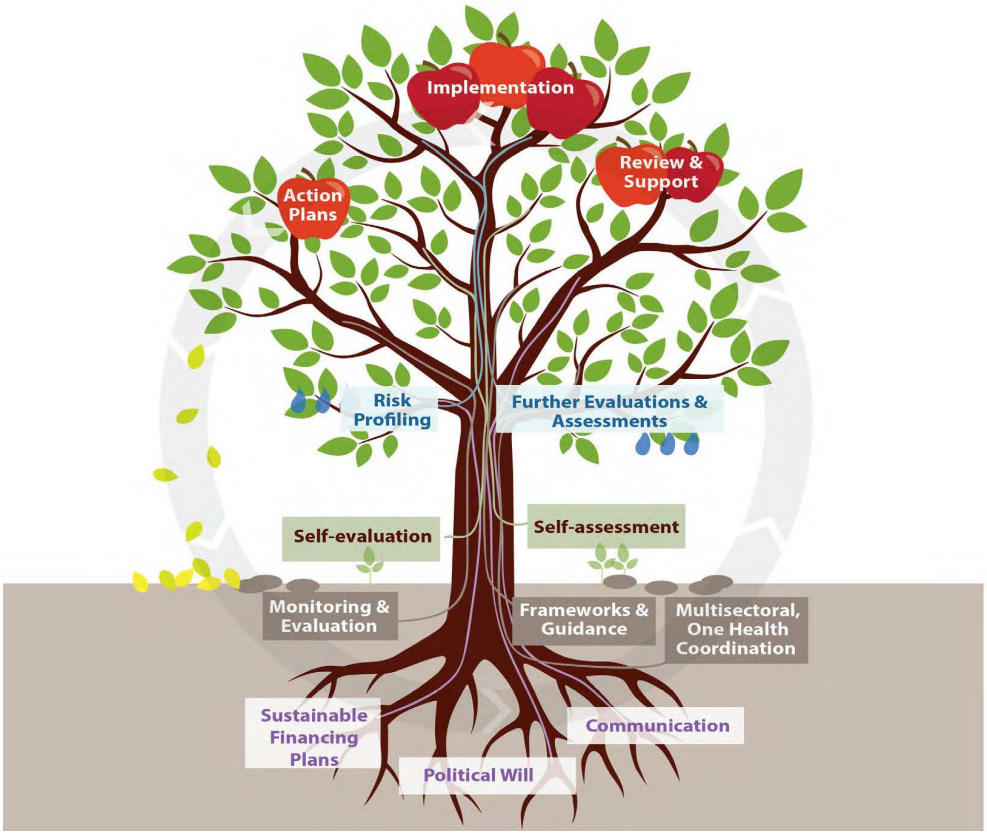

Figure 1.3: A Growing with the One Health Approach.

(Source: DEVELOPING A STEPWISE APPROACH FOR RABIES PREVENTION AND CONTROL, FAO/GARC Workshop, Rome, Italy, 6-8 November 2012 pg: 36)

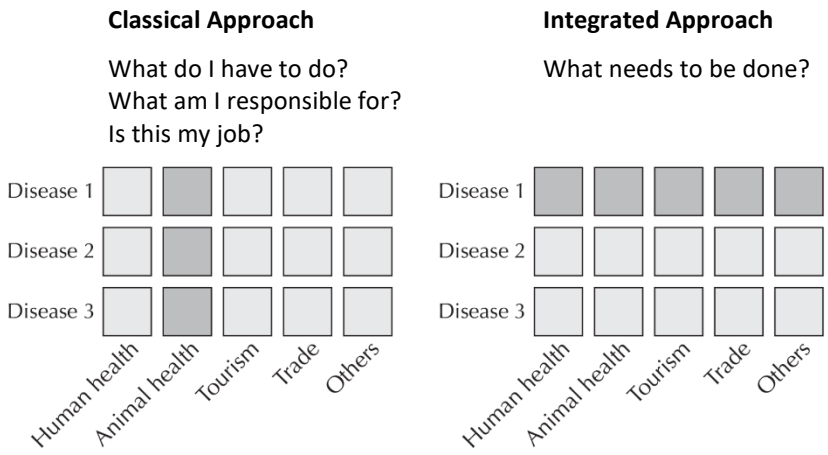

Figure 1.4: Vertical and Horizontal Orientation in Disease Prevention and Control.

(Source: The World Bank, 2010, p26)

4. Video Outbreak (1995) official trailer.

   Available at: https://www.youtube.com/watch?v=Y5povsMKfT4

   The participants will be divided into groups of ten (10). Before watching the video, the participants will be instructed to:

   a. State what they observed from the video, using technical competencies and core competencies of One Health.
   b. What else do they want to know more?

   After watching this video, each group will write each answer on Post-it notes.

   The trainer will then guide the participants to identify concepts of epidemiology of:

   - How
   - What
   - When
   - Who
   - Why

5. Learning Reflection Questions

   Participants will reflect on their learning experiences throughout the session. They will present their ideas and thoughts at the end of the session. Examples of questions to help with the reflection include:

   - What was new or surprising to you?
   - What was new or surprising to you?
   - What have you changed your mind about?
   - What are you still unsure about?
   - What interests you the most, and what would you like to explore more?
   - What new behaviors will you try based on this class?
   - What messages from the lesson would you want to share with others outside the class?

Resources

1. European Union (2008) Technical Document. Core competencies for public health epidemiologists working in communicable disease surveillance and response, in the European Union. https: //ecdc.europa.eu /sites/portal/files/media/en/publications /Publications/ 0801_TED_Core_Competencies _for_ Public_ Health_ Epidemiologists.pdf
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6. https://www.fao.org/3/ca2942en/CA2942EN.pdf
7. https://www.cdc.gov/globalhealth/healthprotection/fetp/. Content source: Division of Global Health Protection, Global Health, Centers for Disease Control and Prevention.2021. video on Field Training Programs Save Lives

MODULE TWO

ONE HEALTH CONCEPT AND COMPETENCIES

Nor Azwany Yaacob, Rosalia Saimon, Yap Wei Boon, Latiffah Hassan

Introduction

The One Health approach recognizes the interconnectivity among human, animal, and environmental/ecosystem health. The One Health competencies are outlined to help improve multi-sectorial and interprofessional collaboration among the public and private sectors and non-governmental organizations (NGOs) on disease surveillance and management at both national and international levels. This module aims to empower the One Health Workforce (OHW) in managing infectious diseases.

The One Health approach is to respond to zoonotic disease events and emergencies more promptly and effectively. The competencies expected from the multisectoral collaborations are outlined below:

- All sectors have the information needed.
- Decisions are based on accurate and shared assessments of the situation.
- Accountability to each other and to decision-makers ensures action by all sectors.
- Regulations, policies, and guidelines are realistic, acceptable, and implementable by all sectors.
- All sectors understand their specific roles and responsibilities in the collaboration.
- Technical, human, and financial resources are effectively used and equitably shared.
- Gaps in infrastructure, capacity and information are identified and filled.
- Advocacy for funds, policies, and programmes is more effective.

Training Outcomes

By the end of the session, participants will be able to:

1. Describe the importance of the One Health approach in infectious disease management, especially zoonoses.
2. Apply One Health competency in field epidemiology according to the respective professions.

Training Plan

Topic	Method	Material	Duration
Introduction to the One Health Concept.	Interactive lecture	Slides, Videos	20 minutes
Introduction to the One Health Core Competencies.	Interactive lecture	Slides, Videos	20 minutes
System Thinking, Partnership and Collaboration.	Group work and presentation	Game, scenario	80 minutes

Training Guide

1. Explain the importance of the One Health approach and the One Health professionals involved in field investigation and disease management, especially zoonoses.

2. The provided videos can be used to:
   - Identify One Health profession.
   - Understand how One Health competencies prepare various professions and agencies to tackle health-related issues, such as managing infection outbreaks.

3. Discuss the One Health core competencies and their importance in field epidemiology.
   - Management
   - Culture and belief
   - Leadership
   - Values and ethics
   - Collaboration and partnership
   - Communication and informatics
   - Systems thinking

4. Discuss One Health technical competencies:
   - One Health concepts and knowledge
   - Fundamentals of infectious diseases
   - Infectious diseases management
   - Epidemiology and risk analysis
   - Fundamentals of public health
   - Ecosystem health
   - Behaviour change

   Collaboration, Partnership, Communication, and Informatics

   Excellent and effective collaborations and communication will ensure efficient and effective response and investigation of zoonotic diseases in humans, animals, and the environment by bringing together expertise and capacities in all relevant sectors to investigate emerging or endemic diseases.

Figure 2: Steps in setting up and undertaking coordinated investigation and response.

(Source: Taking a Multisectoral, One Health Approach: A Tripartite Guide to Addressing Zoonotic Diseases in Countries, 2019, pg: 63)

Supporting Materials

1. Videos.

   Participants are divided into small groups. After watching these videos, each group will spend 10 minutes discussing and then recording their discussion major points on sticky notes. Below are several points to be covered in their discussion:

   - Who are One Health professionals?
   - What are their roles in disease management?
   - How can One Health competencies facilitate disease management?

   Examples of the videos are:

   - One Health: From Concept to Action, available at (2.33 min) https://www.youtube.com/watch?v=TG0pduAYESA
   - One Health explained, available at (3.45 min) https://www.youtube.com/watch?v=oYfTLL9AxfA
   - One Health: From Idea to Action, available at (2.06 min) https://www.youtube.com/watch?v=gJ9ybOumITg

2. Scenario-based group work.

   Participants are divided into the following groups:

   - Hospital management
   - Animal Health Management (UPM, UMK, DVS, MAVMA-Malaysian Veterinary Medical Association, private sector)
   - Local authority/ wildlife
   - Laboratory
   - Health District

Each group is provided with a case study in the form of newspaper cuttings.

Example of newspaper cutting:

> *News headline*:
>
> Tuesday, 5th March 2019, a young woman was bitten by her own dog, becoming the 10th rabies fatality in Sarawak.
>
> *Content*:
>
> Kuching: A 21-year-old woman in Serian died of rabies last night, becoming the 10th fatality of the viral outbreak, which began in July last year. The woman from Kg. Joran Bari was bitten on her right arm by her own dog while she was bathing the dog on April 20th. The woman was given treatment for her wound and an anti-tetanus injection at the Serian hospital on the night of the incident. She was advised to get further treatment at the dog bite clinic at Serian Hospital the next day, but she did not turn up. The woman was admitted on May 20th to the emergency and trauma department at Sarawak General Hospital after she complained of pain and weakness in her right shoulder for four days.

Each group is then requested to discuss and extract the following information from the case. They will then present their findings:

- Describe the roles of the assigned group in managing the case.
- Describe how these agencies/professions could collaborate as a One Health team to manage health issues (apply system thinking).
- Describe One Health competency required to solve the health issues effectively.

Resources

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MODULE THREE

FUNDAMENTALS OF ZOONOTIC DISEASES

Rafdzah Ahmad Zaki

Introduction

Fundamentals of infectious disease include knowledge, skills and abilities to manage infectious diseases based on the transmission dynamic. This module focuses on the fundamentals of zoonotic infectious disease. The module emphasizes the use of the One Health approach to examine various important zoonotic infectious diseases of humans and animals. It helps participants understand the fundamentals of infectious disease ecology and their impacts on humans, animals and the environment. The emphasis on disease management includes the cooperation among national, regional and district-level government health officials, along with multilateral health agencies such as the World Health Organization (WHO), World Organization of Animal Health (WOAH), as well as non-governmental organizations (NGOs) and private industries.

Training Outcomes

1. Describe the aetiology and epidemiology of important infectious diseases and zoonotic diseases.
2. Apply fundamental concepts of infectious diseases to develop a One Health approach to controlling and preventing an infectious disease.
3. Identify and classify the types of infectious disease endemics in a given area in humans and animals.
4. Give examples of infectious diseases in humans and animals and explain their effects on the daily lives of the affected populations.
5. Describe the fundamental concepts of an infectious disease and how they are related.
6. Describe how various stakeholders are involved in infectious disease management and how the disease may impact them.

Training Plan

Topic	Method	Material	Duration
Fundamental Concepts of Infectious Diseases.	Lecture, Group activity	Slides, flipchart, markers, handout	30 minutes
One Health Team Activity.	Group activity	Slides, flipchart, markers, handout, student guide	30 minutes
Human Impacts on Infectious Disease Transmission.	Group activity	Slides, flipchart, markers, student guide	30 minutes

Training Guide

Topic 1: Fundamental Concepts of Infectious Diseases

Lecture (15 minutes)

Give a presentation on the key terms and concepts of infectious diseases. Topic to be covered during the presentation:

- Introduction to infectious diseases of medical and veterinary importance
- Concept of zoonotic diseases
- Biological classification of the causative agents
- Common nomenclatures
- Concepts of host-pathogen relationships
- Concepts of interaction between the meaning of infectious, communicable, and transmissible (This is important, especially when dealing with diseases such as 'animal/vector –human.'

Group activity: Spread of infection (15 minutes)

This activity will demonstrate how infection is spread to participants. The multiplication of numbers represents the interaction that drives the spread of an epidemic.

Topic 2: One Health Team Activity

Group activity: Interdisciplinary Approaches to Zoonotic Disease (30 minutes)

Use specific zoonotic diseases (e.g., Nipah virus) as an example for discussion. Ask participants to discuss how they can apply the One Health approach in managing selected diseases. Allow 10 minutes for group discussion and 20 minutes for presentation and discussion.

Topic 3 & 3a: Human & Animal Impacts on Infectious Disease Transmission

Group activity: Large group discussion (30 minutes)

Prior to the class, participants should read the following article and come to class prepared to discuss it in detail:

- Article: Murray, K.A., and P. Daszak. Human ecology in pathogenic landscapes: two hypotheses on how land use change drives viral emergence. *CurrOpinVirol*. Feb 2013; 3(1): 79–83.

This session focuses on how humans can drive the emergence of infectious diseases, as well as how diseases can impact humans at both a local and global level. Deliver a brief lecture to orient students to the different human factors (including high-risk behaviours) that can be involved in infectious disease transmission:

a. How do humans alter the ecosystem, possibly resulting in disease emergence at the local or global levels?

b. Effects of infectious diseases on:
   - Individuals
   - The family
   - A local community
   - The Global Community
   - Animals (Terrestrial, wildlife and aquatic animals)
   - Environment

Supporting Materials

1. Group activity on the spread of infection.

   One participant will be assigned the number zero, while the rest will be assigned the number one. As they multiply their numbers in pairs, the repeated multiplication process will cause more and more products to result in zero. In other words, the number zero simulates the infective agent spreading through the population.

   Procedure:

   - Explain the rules without telling participants the name of the game and emphasize the importance of secrecy.
   - Give the card with the starting number 0 to a student who is reliable about following directions and who is likely to exchange numbers with a variety of participants at random.
   - Let participants mingle freely. Every 30 seconds, participants were asked to stop and record their multiplication product (either 0 or 1) at every stage.
   - Ask participants to notice the last product on their sheets. Most, if not all, of the participants should have the number zero. Ask who started with the number zero.
   - Plot the number of new and total participants with 0 against time. Ask participants to describe the graph.

   Example of graph:

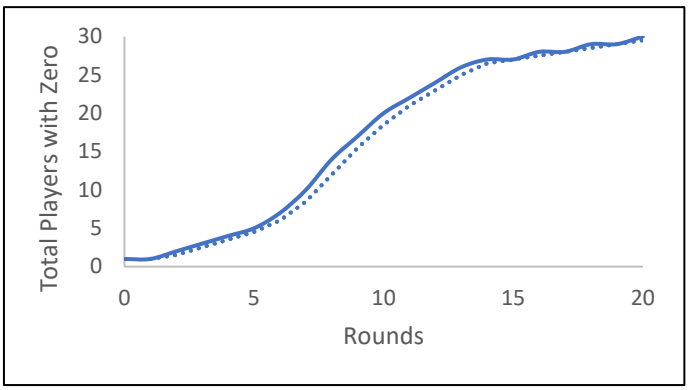


Figure 3: Graph showing total players with zero over time.

Use the graph to help participants understand the progress of the "infection" and its implications.

- How is this graph different from the team prediction graphs? How is it similar? By evaluating their earlier predictions, participants reflect on their thinking.
- What does the graph tell us? What happened to the number of participants "infected" with zero during the game? At first, only one student was infected, but the infection eventually spread to everyone in the class in a general pattern called "S-shaped growth."
- Why does the line have an S shape? How does this relate to what was happening during the game?
- What was happening in Region A in the graph? Why is the line flatter? This is the initial spread. Very few people had the infection, so it spread very slowly at first.
- What was happening in Region B? Why is the line steeper? Growth was increasing. As more and more people were infected and interacted with others, the disease spread at an increasing rate.
- What happened at Region C? Does the curve change its shape? At this point, the curve changes its direction, like an "S."
- What was happening in Region D? Now, growth is decreasing. When most people already had the illness, fewer healthy people were infected, so the disease spread more slowly. The number of infected people was still increasing but at a slower rate.
- What was happening in Region E? Why is the line flat? There was no further growth. Everyone was infected.

2. Group activity on interdisciplinary approaches to zoonotic disease. Prior to the class, participants are expected to read the article below:

   - Daszak, P., Zambrana-Torrelio, C., Bogich, T.L., et.al. *Proc Natl Acad Sci U S A*. 2013 Feb 26; 110 Suppl 1:3681-8. doi: 10.1073/pnas.1201243109. Interdisciplinary approaches to understanding disease emergence: the past, present, and future drivers of Nipah virus emergence. Article are available for free online at PubMed Central: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3586606/.

   The article will thoroughly introduce the fundamentals of infectious disease and One Health.

   Divide participants into small groups and have them discuss the following questions that relate to the assigned paper on the Nipah virus:

   - What is a reservoir of disease?
   - What is the Nipah virus, and where did it first emerge?
   - What are the pathological manifestations of the Nipah virus in humans and animals?
   - What is meant by drivers of emerging infectious diseases?
   - How did the Nipah virus emerge from animal populations and infect humans?
   - How does climate change relate to disease emergence?
   - What strategies can help us predict future disease emergence?
   - Describe how a One Health approach is important for understanding disease emergence.

Resources

1. Morse SS, Mazet JAK, Woolhouse M, et al. Prediction and prevention of the next pandemic zoonosis. *Lancet*.2012;380(9857): 1956-1965. doi: 10.1016/S0140-6736(12)61684-5.
2. Weiss RA, McMichael AJ. Social and environmental risk factors in the emergence of infectious diseases.Nat Med. 2004 Dec; 10(12 Suppl):S70-6.
3. SEAOHUN One Health Course Module (https://seaohunonehealth.wordpress.com/)
4. Field Epidemiology Training Program Development Handbook, Department of Health and Human Services, US Centers for Disease Control and Prevention (https://www.cdc.gov/globalhealth/healthprotection/fetp/index.htm)
5. Daszak, P., Zambrana-Torrelio, C., Bogich, T.L., et.al. *Proc Natl Acad Sci U S A*. 2013 Feb 26; 110 Suppl 1:3681-8. doi: 10.1073/pnas.1201243109. Interdisciplinary approaches to understanding disease emergence: the past, present, and future drivers of Nipah virus emergence.
6. Murray, K.A., and P. Daszak. Human ecology in pathogenic landscapes: two hypotheses on how land use change drives viral emergence. *CurrOpinVirol*. Feb 2013; 3(1): 79–83.
7. The Infection Game: The Shape of Change and The Shape of Change: Stocks and Flows. The Creative Learning Exchange Acton, Massachusetts (http://www.clexchange.org/)

MODULE FOUR

ZOONOTIC DISEASE CONTROL AND PREVENTION

Rafdzah Ahmad Zaki

Introduction

Disease control measures are implemented to break the chain of disease transmission, while preventive measures are meant to prevent diseases from recurring. A disease control and prevention program can range from a simple mitigation plan to a progressive control or eradication measure for an infectious disease. The ultimate goal of an infectious disease control and prevention program includes reduction of disease prevalence till it is no longer a threat to humans, animals and environmental health, cease/ elimination of pathogen from the host (both in humans and animals) and complete removal/ eradication of pathogen from any reservoirs. However, it is not possible to eradicate/eliminate those pathogens in the reservoir, but we can minimize the impacts or reduce the exposure between the host and the reservoir. So, our zoonotic disease control and prevention target should be to eradicate/eliminate the pathogens from susceptible hosts. This module will provide participants with an overview of how infections spread, ways to prevent the spread of infections, and the importance of interrelationships between the host, the etiological agent, and the environment. This module's infectious disease control and prevention approach will focus on applying the "epidemiological triad" and "chain of infection" from a One Health perspective.

Training Outcomes

By the end of this session, participants will be able to:

1. Recognize the principles of control and prevention of infectious diseases.
2. Apply knowledge on the transmission and chain of infection modes in disease control and prevention.
3. Apply the One Health approach in disease control and prevention planning.

Training Plan

Topic	Method	Material	Duration
Control and Prevention in Zoonotic Diseases.	Short lecture, interactive quiz	Slides, Kahoot quiz	30 minutes
Transmission and Chain of Infection in Disease Control and Prevention.	Short lecture, discussion	Slides	30 minutes
One Health Approach in Disease Control and Prevention.	Group discussion and presentation	Reading material on diseases	30 minutes

Training Guide

Topic 1: Understand the principles of control and prevention in zoonotic diseases (Human Health and Animal Health)

Activity: Interactive lecture and quiz (15 minutes)

The trainer gives a short presentation on the key terms and concepts of control and prevention in infectious diseases. Recap on the transmission mode and general approach in preventing and controlling zoonotic diseases. Conduct interactive quizzes (e.g. Kahoot) related to this topic.

Topic 2: Application of knowledge on modes of transmission and chain of infection in disease control and prevention (Human Health and Animal Health)

Activity: Interactive lecture and quiz (15 minutes)

The trainer gives a short presentation on the mode of transmission, the concept of the chain of infection, and the concepts of control and prevention of infectious diseases. Discuss how disease control and prevention can be applied using the concept of chain of infection.

Topic 3: Apply the One Health approach in planning for disease control and prevention (How Human Health and Animal Health programmes could be coordinated efficiently and effectively)

Activity: Group discussion and short presentation (30 minutes)

Divide participants into four groups and have them discuss different zoonotic diseases, such as SARS, MERS-CoV, Rabies, Nipah virus, and COVID-19. Allow 10 minutes for discussion.

Each group is given 5 minutes for a short presentation on:

- What is the reservoir of disease?
- How does the disease emerge from animal populations and infect humans?
- Describe how a One Health approach is important for understanding disease emergence.
- Discuss the One Health approach in the implementation of disease control and prevention.

Supporting Materials

1. Guidelines for Animal Disease Control, World Organisation for Animal Health (OIE) 2014.
    - This guideline helps to identify priorities, objectives, and the desired goal of disease control programmes. It also presents steps for establishing a disease control programme.
    - Table 1 below lists proposed factors to be considered in defining the goal of disease control programmes. An assessment of these factors should guide strategic planning and programme implementation.

Biological factors

- Species affected
- Zoonotic potential
- Genetic stability and diversity of the agent
- Distribution and density of susceptible species
- Wildlife reservoir
- Modes of transmission (e.g. vector transmission)
- Transmissibility
- The current extent of the disease
- Survival in the environment
- Carrier state

Control measures

- Movement control
- Stamping-out, slaughter or pre-emptive slaughter
- Import or export restrictions
- Zoning or compartmentalisation
- Herd accreditation
- Isolation and quarantine
- Cleaning and disinfection
- Vector and reservoir control
- Treatment of products and by-products
- Vaccination and other medical measures

Availability of technical tools

- Diagnostic tests
- Vaccines
- Treatment
- Disinfectants and insecticides
- Disposal facilities
- Trained personnel

Socioeconomic considerations

- Cost and benefits of intervention
- Availability of resources
- Structure of livestock production systems
- Public health implications
- Logistics and ease of implementation,
- Stakeholder engagement
- Environmental impact
- Political will
- Incentives and Compensation
- Acceptance of the public (e.g. animal welfare implications, culling of animals, destruction of food)
- Safe commodities for trade.
- Governance and institutional arrangements
- Distribution of roles and responsibilities
- Budget and financial resources planning

Table 1: Factors to consider in setting achievable goals for a disease control program.

(Source: Adopted from OIE- Guideline for Animal Disease Control, May 2014)

2. One Health Manual: On Handling Zoonotic Disease Outbreaks in Malaysia.

- Chapter 5 of this manual provides detailed information on implementing control measures for zoonotic diseases.
- Figure 4.1 below summarizes the different control measures that can be implemented to break the chain of transmission at different points.

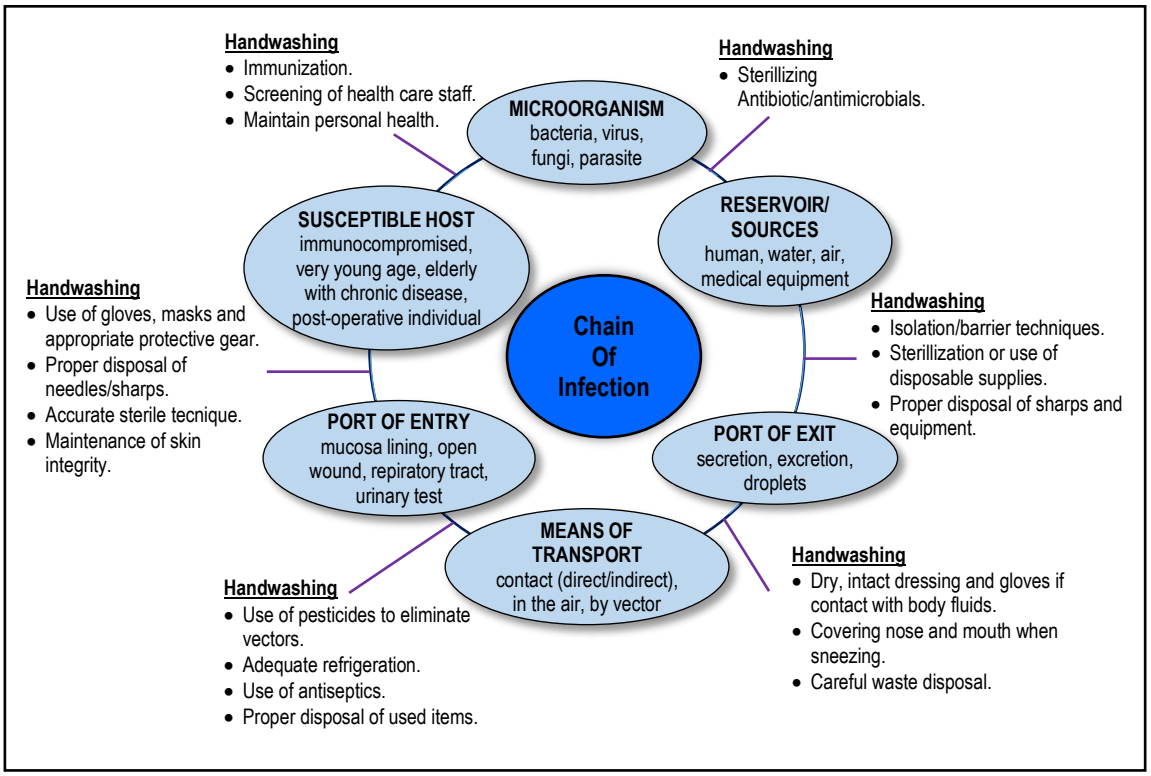


Figure 4: The chain of transmission of infectious diseases and ways of breaking it.

(Source: One Health Manual: On Handling Zoonotic Disease Outbreaks in Malaysia, pg:91)

Resources

1. SEAOHUN One Health Course Module (https://seaohunonehealth.wordpress.com/)
2. Centers for Disease Control and Prevention (CDC) website (https://www.cdc.gov)
3. World Health Organization (WHO) (2005). Communicable Disease Control in Emergencies: A Field Manual.
4. Guidelines for Animal Disease Control, World Organisation for Animal Health (OIE) 2014.

MODULE FIVE

ECOSYSTEM AND HEALTH

Rozita Hod, Hidayatulfathi Othman, Azimatun Noor Aizuddin, Rohaida Ismail

Introduction

Ecosystem health is defined as "the state or condition of an ecosystem in which its dynamic attributes are expressed within the normal ranges of activity relative to its ecological state of development" (van Andel and Aronson, 2006), while ecosystem integrity is "the state or condition of an ecosystem that displays the biodiversity characteristic of the reference, such as species composition and community structure, and is fully capable of sustaining normal ecosystem functioning" (SER, 2002).

Encyclopedia of Biodiversity (Second Edition), 2013

Global approaches to health, such as One Health or Eco Health paradigms, postulate that the epidemiological dynamics and stakeholders' actions that determine the health of animal and human populations are interconnected ecologically, socioeconomically, and politically. One Health and Eco Health are conceptual movements, scientific areas, and political endeavours. One Health and Eco Health are convergent in their vision and goals to reposition animal and public health within their broader context. Both are motivated by the belief that health concerns must be addressed at the human-animal interface within their broader natural and social environments (i.e. socio-ecosystem approach). Both aim to mitigate the risks threatening ecosystems and public health, including animal health. Both deal with the complexity of diseases and health.

Human health ultimately depends upon ecosystem products and services (such as the availability of freshwater, food and fuel sources), which are requisite for good human health and productive livelihoods. Significant direct human health impacts can occur if ecosystem services are no longer adequate to meet social needs. Indirectly, changes in ecosystem services affect livelihoods, income, local migration and, on occasion, may even cause political conflict. Any impacts on economic and physical security, freedom, choice and social relations have wide-ranging effects on well-being and health, as well as the availability and access to health services and medicines.

The training session will provide participants with an overview of the concepts of ecosystem and health. This module aims to equip participants with the importance of ecosystems and health interrelationships. Trainees will be able to apply the One Health approach to maintain and sustain ecosystem health.

Training Outcomes

By the end of this session, participants will be able to:

1. Recognize the principles of the ecosystem.
2. Describe the relationship between ecosystem and health.
3. Apply the One Health approach to maintain and sustain ecosystem health.

Training Plan

Topic	Method	Material	Duration
Principles of Ecosystem.	Interactive lecture	Slides	10 minutes
Relationship between Ecosystem and Health.	Interactive lecture, Group discussion	Slides, video	30 minutes
One Health Approach in Ecosystem Health.	Interactive lecture	Slides, photo voice	20 minutes

Training Guide

Topic 1: Understand the principles of ecosystem to describe the concept of ecosystem and health.

Activity: Interactive lecture (10 minutes)

The trainer gives a short presentation on the definitions, key terms and concepts of ecosystems and health. The lecture should include ecosystem diversity, their services, and their importance. The trainer should also discuss the impact of ecosystem changes in general. Example of case study:

- Air pollution and respiratory diseases.
- Water contamination and gastrointestinal diseases.

Topic 2: Discuss the inter-relationship between ecosystem and health.

Activity: Interactive lecture and group discussion (30 minutes)

The trainer gives a short presentation on the relationship between ecosystems and health. The lecture should include the impact of ecosystem changes on human health and also the impact of human behavior on ecosystem health. The trainer uses videos highlighting the impact of ecosystem changes on human health.

- Ecosystem Health, Ecosystem Services, and the Well-Being of Humans and the Rest of Nature - https://www.youtube.com/watch?v=zCr1OxfyCc4
- How the Environment Affects Our Health - https://www.youtube.com/watch?v=I7STZsY_-Ps

Trainees discuss in the group the inter-relationship between ecosystem and health using case studies. Example of case study:

- Urbanization leads to increased heat islands and respiratory issues.
- Deforestation contributes to the spread of zoonotic diseases.

Topic 3: Apply the One Health concept to maintain and sustain ecosystem health.

Activity: Interactive lecture and photo voice activity (20 minutes)

The trainer recaps the definition, key terms and concepts of One Health. Using a case scenario, the trainer invites discussion to answer the issues and questions. Using several pictures to spark conversation about the application of One Health in addressing and solving the issues.

Supporting Materials

1. Case scenario.

> For the past six months, many equatorial countries in and around the Pacific Ocean have been affected by the El Niño phenomenon. During this period, prolonged droughts triggered forest fires that developed into hot spots in these countries. Climate change also caused a massive invasion of fruit bats into one of the countries. Not long after, a group of workers from several pig farms in a famous fruit and pig farming village in the country showed symptoms of illness with progressive, low to high-grade fever, confusion, and loss of consciousness and eventually died. During this time, a strange disease that killed adult breeder pigs and caused severe cough in young grower pigs also emerged in the farms. A joint investigation conducted by human and animal health workers and findings from laboratory investigations revealed that the same pathogen infected the workers and animals. Since the outbreak was severe, the country was put on high alert, and a national crisis was declared. A Rapid Action Team (RAT) from the Veterinary Department was mobilized to immediately contain and control the pig farms' disease. All infected pigs were culled. Further investigations showed that the migrating fruit bats were the source of the disease caused by a virus. Several agencies were assigned to address the disease outbreak, and national and local authorities launched programs to inform and pacify the public about the outbreak.

Instruction:

Read the case scenario. Discuss in your group and answer the following questions:

a. Describe the El Niño phenomenon.
b. Describe the mode of transmission of Nipah Virus from animal to humans and vice versa.
c. Discuss the One Health concept in emerging zoonotic diseases.

2. Photo of deforestation.

Picture 1: Global biodiversity loss from tropical deforestation.

(Source: PNAS, 2019)

Instruction:

Discuss how deforestation could affect wildlife ecology.

Resources

1. Ecosystem goods and services for health (htpp://who.int/globalchange/ecosystems/en).
2. Ford, A.E.S., Graham, H., and White, P.C.L. 2015. Integrating Human and Ecosystem Health Through Ecosystem Services Frameworks. EcoHealth 12:660-671.
3. Harwell, M.A., Gentile, J.H., McKinney, L.D. et al. 2019. Conceptual Framework for Assessing Ecosystem Health. Integrated Environmental Assessment and Management 15: 544-564.
4. One Health Manual on Handling Zoonotic Disease Outbreaks in Malaysia. MyOHUN 2017.
5. Queenan et al. 2017. Roadmap to One Health Agenda 2030. CAB Reviews 2017: 1-17.
6. Roe, D. 2019. Biodiversity loss—more than an environmental emergency. The Lancet 3: e287-e289.
7. SEAOHUN One Health Course Module (https://seaohunonehealth.wordpress.com/).

MODULE SIX

LABORATORY INTELLIGENCE IN INFECTIOUS DISEASE MANAGEMENT

Razitasham Safii, Yap Wei Boon

Introduction

A rapid and reliable infectious disease diagnosis entails a close and collaborative partnership between physicians, veterinarians, relevant laboratory technologists and microbiologists who provide valuable information to the healthcare team for better disease management and surveillance. Introducing various diagnostic tests that are important for disease management and surveillance strengthens the roles and functions of diagnostic laboratory technologists and scientists in promoting human, animal and environmental health. Epidemiology and laboratory medicine are two closely interrelated disciplines.

This training module will provide participants with information on infectious disease diagnosis in human and animal health. The module hopes to consolidate interdepartmental collaboration between the human and animal health sectors and promote systems thinking when interpreting diagnostic findings by introducing diagnostic methods commonly used in these fields.

Training Outcomes

By the end of the session, participants will be able to:

1. Recognize the different diagnostic and typing methods, including molecular tests for diagnosing infectious diseases.
2. Describe the roles of diagnostic laboratories and their importance for human, animal and environmental health investigation.
3. Apply One Health systems thinking in interpreting diagnostic laboratory findings.

Training Plan

Topic	Method	Material	Duration
Methods for Infectious Disease Diagnostic.	Interactive lecture and discussion.	Slides, videos	30 minutes
Laboratory Diagnostic for Human, Animal, and Environmental Health Investigation.	Interactive lecture and discussion.	Slides, videos	30 minutes
One Health Systems Thinking in Laboratory Diagnostic.	Interactive lecture and discussion.	Slides, videos	30 minutes

Training Guide

1. Laboratory testing and its importance.

   Laboratory testing plays a crucial role in the diagnosis, management, and control of infectious diseases. By providing accurate and timely information, laboratory tests help identify pathogens, monitor the progression of diseases, and guide appropriate treatment and public health interventions.

Types of Laboratory Tests

a) Microbiological Tests:
   - Culture: Growing pathogens from clinical samples (e.g., blood, urine, sputum) to identify bacteria, fungi, and sometimes viruses.
   - Gram Stain: A rapid test that classifies bacteria into Gram-positive or Gram-negative, aiding in initial treatment decisions.

b) Molecular Tests:
   - Polymerase Chain Reaction (PCR): Amplifies DNA or RNA of pathogens for identification. Highly sensitive and specific, and it is used for detecting viruses like HIV, SARS-CoV-2 and bacteria like *Mycobacterium tuberculosis*.
   - Real-Time PCR (qPCR): Quantifies the amount of pathogen DNA/RNA, useful for monitoring viral load in infections like HIV and Hepatitis C.

c) Serological Tests:
   - ELISA (Enzyme-Linked Immunosorbent Assay): Detects antibodies or antigens in the blood, useful for diseases like HIV, Hepatitis B, and Lyme disease.
   - Rapid Diagnostic Tests (RDTs): Provide quick results for antibodies or antigens commonly used for malaria, dengue, and COVID-19.

d) Biochemical Tests:
   - Identify metabolic characteristics of bacteria, such as enzyme activities or sugar fermentation, helping in species identification.

e) Immunofluorescence:
   - Uses antibodies labeled with fluorescent dyes to detect pathogens directly in samples, useful for respiratory viruses and certain bacterial infections.

Importance of Laboratory Testing:

a) Accurate Diagnosis:
   - Precise identification of the causative pathogen ensures appropriate treatment.
   - Helps differentiate between bacterial, viral, fungal, and parasitic infections.

b) Guiding Treatment:
   - Antibiotic susceptibility testing determines the most effective antibiotics for bacterial infections.
   - Antiviral resistance testing guides therapy for infections like HIV and Hepatitis B/C.

c) Monitoring Disease Progression:
   - Quantitative tests (e.g., viral load tests) help monitor the effectiveness of treatment and disease progression.
   - Blood tests (e.g., complete blood count) monitor the body's response to infection.

d) Infection Control and Epidemiology:
   - Identifying the source and spread of infectious diseases in communities and healthcare settings.
   - Supports outbreak investigation and monitoring, helping implement control measures.

e) Public Health Surveillance:
   - Monitoring the prevalence and incidence of infectious diseases to inform public health strategies.
   - Early detection of emerging pathogens or outbreaks to prevent widespread transmission.

f) Vaccine Development and Efficacy:
   - Laboratory tests evaluate the immunogenicity and efficacy of vaccines.
   - Post-vaccination monitoring for vaccine-preventable diseases.

2. Laboratory Biosafety Level (BSL)

Each laboratory has its biosafety level based on prescribed procedures and levels of containments for the particular agents used. There are Four BSLs, i.e. BSL 1 to BSL 4, based on the risk assessment:

- **BSL 1** - Work involving well-characterized agents that are not known to consistently cause disease in healthy adult humans and are of minimal potential hazard to laboratory personnel and the environment (CDC,1997). All materials used for cell and/or bacteria cultures are decontaminated via autoclave. Laboratory personnel have specific training in the procedures conducted in the laboratory and are supervised by a scientist with general training in microbiology or related science.
- **BSL 2** - This level is similar to BSL 1 and is suitable for work involving agents of a moderate potential hazard to personnel and the environment. It includes various bacteria and viruses that cause only mild disease to humans or are difficult to contract via aerosol in a lab setting, such as *C. difficile*, most Chlamydiae, hepatitis A, B, and C, influenza A, Lyme disease, dengue fever, *Salmonella*, mumps, measles, HIV, and MRSA. This lab requires biological safety cabinets.
- **BSL 3** - This level applies to clinical, diagnostic, teaching, research, or production facilities where work is done with indigenous or exotic agents that may cause serious or potentially lethal disease after inhalation. It includes various bacteria, parasites and viruses that can cause severe to fatal diseases in humans but for which treatments exist, such as *Leishmania donovani*, *Mycobacterium tuberculosis*, *Bacillus anthracis*, *Chlamydophila psittaci*, West Nile virus, Venezuelan equine encephalitis virus, Eastern equine encephalitis virus, Hendra virus. This lab requires biological safety cabinets, specially designed hoods, or other physical containment devices or appropriate personal protective clothing and equipment. The laboratory has special engineering and design features.
- **BSL 4** - This level is required for work with dangerous and exotic agents that pose a high individual risk of aerosol-transmitted laboratory infections. These agents cause severe to fatal diseases in humans such as Bolivian and Argentine hemorrhagic fevers, Marburg virus, Ebola virus, Lassa fever, Crimean-Congo hemorrhagic fever, Smallpox, and other various hemorrhagic diseases. A Hazmat suit is necessary when dealing with biological hazards at this level.

<u>Laboratory category.</u>

Four categories of Public Health labs are based on their function and capabilities.

- Level 1 is a clinical lab,
- level 2 is a public health lab,
- level 3 is the public health typing lab,
- Level 4 is the CDC lab.

Whilst for Animal health labs, based on their function and capabilities, there are three levels:

- On-site lab for quick screening using rapid diagnostic tests such as pen-site kit and blood test (RWBT, Rose Bengal Test, milk ring test, egg counts, etc.).
- Zone Regional Laboratory for diagnosing and confirmatory tests includes samples from national surveillance programmes and field cases.
- Veterinary Research Institute is for advanced techniques of diagnosing and researching further emerging diseases from zone regional labs, reference cases, and research.

3. The roles of public health laboratory tests.

   a. The role of the lab in disease control and prevention.

      The clinical lab focuses on individual patient care. It accurately diagnoses ongoing, recent or past infections for appropriate case management.

      The public health labs are responsible for disease identification and outbreak investigation, reference services (additional, definitive testing on isolates and specimens), specialized testing, direct services, environmental testing, rapid testing, improvement of clinical laboratories throughout the state, applied research and support of disease surveillance and epidemiology investigations.

   b. Laboratories and disease surveillance.

      Detection of pathogens that have the potential to spread and can act as early warning signals, e.g., lab-based surveillance of HFMD and outbreak detection, such as the detection of avian influenza A, H5N1.

   c. Outbreak detection by the lab.
      - Identification of a cluster of infections with an unusual pathogen.
      - Carbapenem resistant enterobacteriaceae (CRE)

      Reference centres may capture outbreaks disseminated over a large area, e.g., lab-based influenza.

   d. Outbreak detection with lab help.

      Epidemiologist captures an increased incidence. Laboratory results will:
      - Confirm the diagnosis.
      - Allows for a more specific case definition.
      - Detects a new pathogen.
      - Provides additional details on the pathogen (e.g., phage type).

   e. Laboratory role during outbreaks.
      - Typing of the pathogen can link clusters when the epidemiological data is insufficient.
      - Antimicrobial susceptibility testing to guide treatment.
      - Environmental investigations.
      - Detection of carriers.
      - Laboratory confirmation of early cases on a subset of cases.
      - Identification of new pathogens.
      - Antimicrobial susceptibility testing to guide treatment.
      - Post-outbreak surveillance.

f. Monitoring endemic disease trends.
   - Confirm diagnosis when case definitions include laboratory criteria.
   - Monitor resistance patterns.
   - Monitor subtypes of a pathogen.

4. The roles of Animal Health laboratory tests.

a) Human public health laboratory diagnosis (Human Health).

- Describe the routine roles and functions of human public health laboratories and their roles and functions during disease outbreaks.
- Describe specific diagnostic test procedures employed during disease outbreaks and surveillance.

b) Veterinary laboratory diagnosis (Animal Health).

- Describe the roles and functions of veterinary public health laboratories on a regular basis and during disease outbreaks.
- Describe specific diagnostic test procedures employed during disease outbreaks and surveillance.

c) Apply One Health system thinking in interpreting diagnostic laboratory findings.

- Identify the links between diagnostic findings for human and animal health.
- Apply systems thinking in describing the relationship of diagnostic findings for human and animal health.

Supporting Materials

Handbooks

1. Makmal Kesihatan Awam Kebangsaan (MKAK) Test Handbook (https://mkak.moh.gov.my/ms/muat-turun-orange/penerbitan/mkak-test-handbook-2018.html)
2. Veterinary Research Institute (http://www.dvs.gov.my/dvs/resources/user_10/BORANG%20MAKVET/JENIS_UJIAN_MENGIKUT_PENYAKITKERJA.pdf)
3. Veterinary Research Institute (http://www.dvs.gov.my/dvs/resources/user_10/BORANG%20MAKVET/JENIS_UJIAN_MENGIKUT_SEKSYEN, PENYAKITKERJA.pdf)

Videos

1. The Public Health Lab: Infectious Disease Laboratory (https://youtu.be/qboNlbygsLU)
2. The Public Health Lab: Environmental Laboratory (https://youtu.be/dRssXlSlmkU)
3. CDC Laboratory Science: Mission Critical (https://youtu.be/ofb1GKPpzpI)

Resources

1. Department of Veterinary Services. 2011. Protokol Veterinar Malaysia (Selsema Burung (Avian Influenza)). Malaysia: Ministry of Agriculture.
2. Department of Veterinary Services. 2011. Protokol Veterinar Malaysia (Japanese Encephalitis). Malaysia: Ministry of Agriculture.
3. Makmal Kesihatan Awam Kebangsaan. 2018. The National Public Health Laboratory Test Handbook. Malaysia: Ministry of Health.
4. Miller, J. M., Binnicker, M. J., Campbell, S., Carroll, K. C., Chapin, K. C., Gilligan, P. H., Gonzalez, M. D., Jerris, R. C., Kehl, S. C., Patel, R., Pritt, B. S., Richter, S. S., Robinson-Dunn, B., Schwartzman, J. D., Snyder, J. W., Telford, S., Theel, E. S., Thomson Jr, R. B., Weinstein, M. P. and Yao, J. D. 2008. A Guide to Utilization of the Microbiology Laboratory for Diagnosis of Infectious Diseases: 2018 Update by the Infectious Diseases Society of America and the American Society for Microbiology. *Clin. Infect. Dis.* 2008: 67.

MODULE SEVEN

SURVEILLANCE

Azimatun Noor Aizuddin, Mohd Rohaizat Hassan, Razitasham Safii, Rozanah Asmah

Introduction

Surveillance is a perpetual and systematic collection, analysis and interpretation of data essential for planning, implementing, and evaluating public health and animal health practices. A sound surveillance system can serve as a warning system, and it is used to track the impacts of intervention measures, monitor the epidemiology of health issues, and implement public and animal health strategies. This training module will inform participants about surveillance systems for infectious diseases in public and animal health and how to link and use surveillance data to control and manage infectious diseases.

Training Outcomes

By the end of the session, participants will be able to:

1. Recognize public and animal health surveillance systems.
2. Perform descriptive analysis of surveillance data.
3. Identify key findings from surveillance data analysis and draw conclusions.
4. Recognize related laws and regulations on local, national and international surveillance systems.
5. Demonstrate systems thinking in surveillance activities in human, animal, and environmental health.

Training Plan

Topic	Method	Material	Duration
Fundamental of Public Health Surveillance in Human, Animal, and Environmental Health.	Interactive lecture	Slides	90 minutes
Identification and Application of Surveillance Systems.	Field visit	Field visit manual	60 minutes
Systems Thinking in Surveillance Activity.	Group work and presentation	Surveillance activity mapping chart	60 minutes

Training Guide

1. Explain the fundamentals of public health surveillance.

a. Definition of public health surveillance:

> "The on-going systematic collection of data, analysis, interpretation and dissemination of data regarding a health-related event for use in public health action to reduce morbidity and mortality and to improve health"

(Source: CDC Updated Guidelines for Evaluating Public Health Surveillance Systems, MMWR 2001;50 (No RR-13)

b. The use of disease surveillance (important of analysis in surveillance data).

- Quantitative estimates of the magnitude of a health problem
- Portrayal of the natural history of disease
- Detection of outbreaks
- Documentation of the distribution and spread of a health event
- Facilitating epidemiologic and laboratory research
- Testing of hypotheses
- Evaluation of control and prevention measures
- Monitoring of changes in infectious agents
- Detection of changes in health practice
- Planning

c. Types of Surveillance.

i. Event-Based Surveillance (EBS):

- Organized rapid capture of information about events that are potential risks to PH.
- Source of information: Ad-hoc reports through formal and informal channels and rumours.

Examples are:

- Community-based / rumours.
- Events related to the occurrence of disease in humans – clustered cases of a disease or syndromes – unusual disease patterns or unexpected deaths.
- Events related to potential exposure for humans – diseases and animal deaths – contaminated food products or water / environmental hazards.
- A complement to indicator-based surveillance for an early warning system.

ii. Indicator-Based Surveillance (IBS):

- Systemic collection and analysis of timely, reliable and appropriate data on priority diseases, syndromes, and conditions.
- Follows a predefined format and includes specific definitions.
- Data reporting and analysis occur regularly.
- Alert or epidemic thresholds are used to identify an outbreak.

Examples are:

- Passive and active
- Mandatory disease notification
- Sentinel
- Clinical-based/ Syndromic
- Lab base

2. Explain the fundamentals of animal health surveillance.

a. Definition of animal health surveillance:

In general, surveillance aims to demonstrate the absence of infection or infestation, determine the presence or distribution of infection or infestation, or detect exotic diseases or emerging diseases as early as possible.

Animal health surveillance is a tool for monitoring disease trends, facilitating the control of infection or infestation, providing data for use in risk analysis, for animal or public health purposes, substantiating the rationale for sanitary measures, and providing assurances to trading partners.

Wildlife may be included in a surveillance system because they can serve as reservoirs of infection or infestation and indicators of risk to humans and domestic animals. However, infection or infestation in wildlife does not necessarily mean it is present in domestic animals in the same country or zone or vice versa.

Surveillance of wildlife presents challenges that may differ significantly from those in the surveillance of domestic animals.

(Source: Chapter 1.4. Animal health surveillance of Animal terrestrial health code 2022)

b. The use of disease surveillance (important of analysis in surveillance data).

- Animals can become sentinel and act as an early warning system.
- Protecting animal health and welfare means protecting human health and welfare, especially for zoonotic diseases.
- Animals are the source of protein; protecting them will ensure food safety and security.
- Healthy animals will provide healthy human beings and food safety.

c. Types of Surveillance.

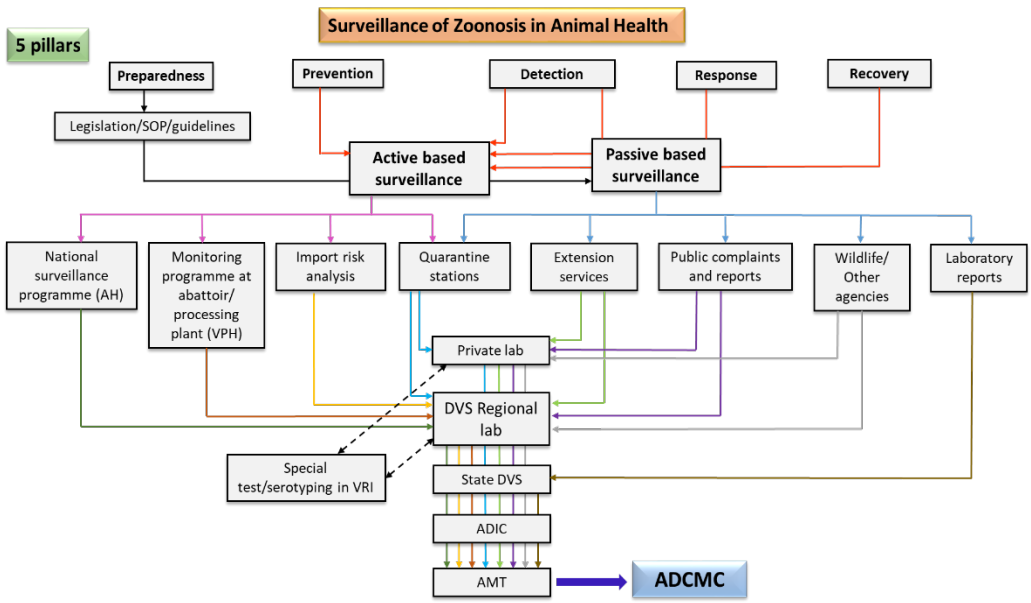
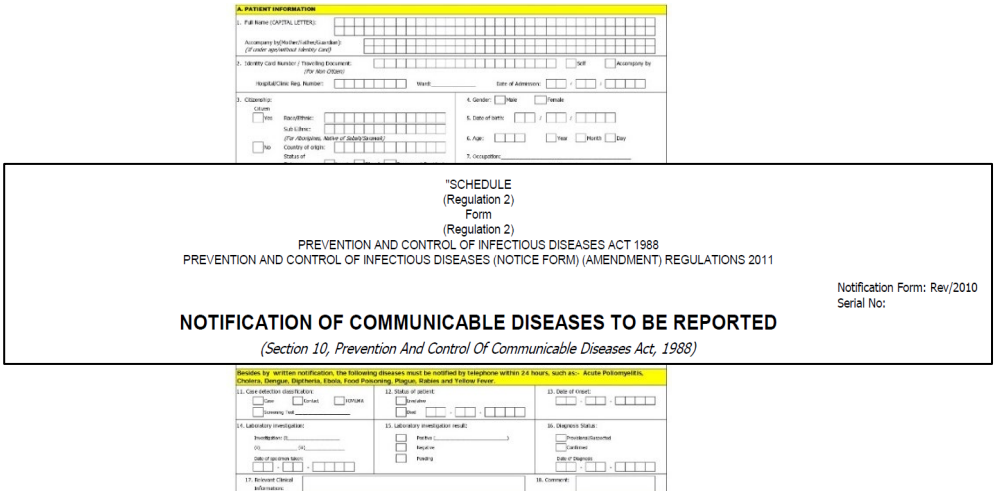


Figure 7.1

3. Applicability of surveillance tools: Notification form Rev/2010 (Appendix 2).



"SCHEDULE
(Regulation 2)
Form
(Regulation 2)
PREVENTION AND CONTROL OF INFECTIOUS DISEASES ACT 1988
PREVENTION AND CONTROL OF INFECTIOUS DISEASES (NOTICE FORM) (AMENDMENT) REGULATIONS 2011

Notification Form: Rev/2010
Serial No:

NOTIFICATION OF COMMUNICABLE DISEASES TO BE REPORTED

(Section 10, Prevention And Control Of Communicable Diseases Act, 1988)

Figure 7.2: The notification form.

(Source: MOH. 2012)

4. Identify and explain the application of surveillance systems and tools observed during field visits.
   a. Human public health: the agencies/ authorities involved, the authoritative levels, notification forms, registry, etc.
   b. Veterinary public health: the agencies/ authorities involved, the authoritative levels, notification forms, registry, etc.
   c. Environmental-related – agencies/ authorities involved, the authoritative levels, notification forms, registry, etc.

5. Introduction to various local and international surveillance guidelines and laws.

a. Local – Ministry of Health, Department of Veterinary Services, Department of Environment etc.

   Ministry of Health:

   i. The Prevention and Control of Infectious Disease Act 1988 mandates reporting or notifying of infectious diseases.

   "Every medical practitioner who treats or becomes aware of the existence of any infectious diseases in any premises shall, with the least practicable delay, give notice of the existence of the infectious disease to the nearest Medical Officer of Health in the form prescribed by regulations made under this Act".

   Section 10 (2), Prevention and Control of Infectious Disease Act, 1988

ii. Destruction of Disease-Bearing Insects Act 1975

This *Act* provides for the *destruction* of *disease-bearing insects*. Prohibition of creating conditions likely to propagate or harbour disease-bearing insects is also needed. (1) No person shall do or perform any act which may or is liable to create such conditions as may likely to propagate or harbour disease-bearing insects or permit or allow such conditions to arise or continue.

iii. Food Act 1983

It aims to protect the public against food-related hazards and fraud and to promote and motivate the preparation, handling, distribution, sale, and consumption of safe, high-quality food.

b. International – CDC, WHO, OIE etc.

i. International Health Regulations (2005)

The **International Health Regulations (IHR)** is a legally binding instrument of international law that aims for international collaboration "to prevent, protect against, control, and provide a public health response to the international spread of disease in ways that are commensurate with and restricted to public health risks and that avoid unnecessary interference with international traffic and trade". The IHR is the only international legal treaty empowering the World Health Organization (WHO) to act as the main global surveillance system.

ii. CDC

iii. WHO

iv. WOAH

Supporting Materials

1. Field visit checklist.

a. Participants are divided into smaller groups based on the number of selected field visit locations. Examples of field visit locations:

- Human health – Crisis Preparedness and Control Centre (CPRC) at the State health office, District health offices, international entry points, etc.
- Veterinary health – Veterinary offices, laboratories, animal farms, abattoirs, etc.
- Environmental health – Forestry Department, Wildlife Department, landfills and dumping sites, local councils, etc.

b. Group instruction during a visit.

- Identify and observe surveillance activities.
- Understand laws and regulations related to the department's surveillance activity.
- Identify key findings which can apply system thinking.

c. Group presentation of the visit findings

Picture 7.3: Field visit to Kuantan port.

2. Surveillance activity mapping chart.

Surveillance activity	**Department/Agency**		
	Human	Animal	Environment

Instructions:

- Participants are divided into five groups, irrespective of their professions.
- Each group discusses and writes down the department's surveillance activity using the provided chart.
- Each group discusses how the surveillance activities of a department can be linked to the other departments/agencies (systems thinking).

3. Reflection questions.
   a. What surveillance activities are implemented in your department?
   b. What action has been taken from your activities?
   c. How can your surveillance activities be linked to others?

Resources

1. Ministry of Malaysia, 2016 Case Definition 3rd Ed.
2. Arahan prosedur tetap veterinary Malaysia: Pengurusan index penyakit haiwan; 2010. No. dokumentasi APTVN (a) (b): 2/2010. Jabatan Perkhidmatan Veterinar, Kementerian Pertanian dan Industri Asas Tani, Malaysia.
3. CDC website – Updated Guidelines for evaluating public health surveillance systems: http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5013a1.htm

MODULE EIGHT

OUTBREAK INVESTIGATION

Mariam Mohamad, Razitasham Safii

Introduction

Disease outbreaks happen unexpectedly and may occur on various scales. One Health Workforce needs to be equipped with knowledge and skills to investigate and handle outbreaks. There are many guidelines for managing outbreak investigation, and this module will adapt the One Health approach to handling zoonotic disease outbreaks. Any further details on handling zoonotic disease outbreaks can be derived from the "One Health Manual on Handling Zoonotic Disease Outbreak in Malaysia", published by MyOHUN in 2017.

Training Outcomes

At the end of the session, participants will be able to:

1. Identify the disease transmission dynamic using the One Health approach in the initiation of an outbreak.
2. Identify One Health competencies needed to manage outbreaks.
3. Identify issues and challenges related to One Health in outbreaks.
4. Plan an outbreak investigation using the One Health approach.
5. Propose control and preventive measures using the One Health approach.

Training Plan

Topic	Method	Material	Duration
Diseases Transmission using One Health Approach.	Group work, Brainstorming, Experiential learning	Trailer "Outbreak"	10 minutes
One Health Competencies in Outbreaks.	Group work, Brainstorming, Experiential learning	Trailer "Outbreak"	10 minutes
Issue and Challenges Related to One Health in Outbreaks.	Group work, Brainstorming, Experiential learning	Trailer "Outbreak"	10 minutes
Outbreak Investigation (Human and Animal Health)	Interactive lecture, group work, brainstorming, affinity mapping	Slide, scenario, newspaper cutting, pictures, sticky notes	10 minutes
Outbreak Control and Preventive Measures (Human and Animal Health)	Interactive lecture, group work, brainstorming, experiential learning, affinity mapping	Slides, scenario, newspaper cutting, newspaper	10 minutes
Reflection			10 minutes

Training Guide

1. Identify the dynamic of disease transmission using the One Health approach.
   a. Describe Human-animal-environment interface.
   b. Define: enzootic, epizootic, spillover effect.
   c. Describe the natural history of disease in humans and animals.

2. Definition of a disease outbreak/epidemic/pandemic (and other relevant terminologies).
   a. What type of disease outbreak needs a One Health approach? Zoonotic, food-borne disease of animal origin?
   b. Outbreak is an occurrence of a disease greater than expected at a particular time and place. It may include any kind of disease (Communicable, injury, Non-Communicable Disease).
   c. Definition for a level of disease.
      - **Sporadic** refers to a disease that occurs infrequently and irregularly.
      - **Endemic** refers to the constant presence and/or usual prevalence of a disease or infectious agent in a population within a geographic area.
      - **Hyperendemic** refers to persistent, high levels of disease occurrence.
      - **Epidemic** refers to an increase, often sudden, in the number of cases of a disease above what is normally expected in that population in that area.
      - **Outbreak** carries the same definition as an epidemic but is often used for a more limited geographic area.
      - **Cluster** refers to an aggregation of cases grouped in place and time, suspected to be greater than expected, even though the expected number may not be known.
      - **Pandemic** refers to an epidemic that has spread over several countries or continents and usually affects a large number of people.

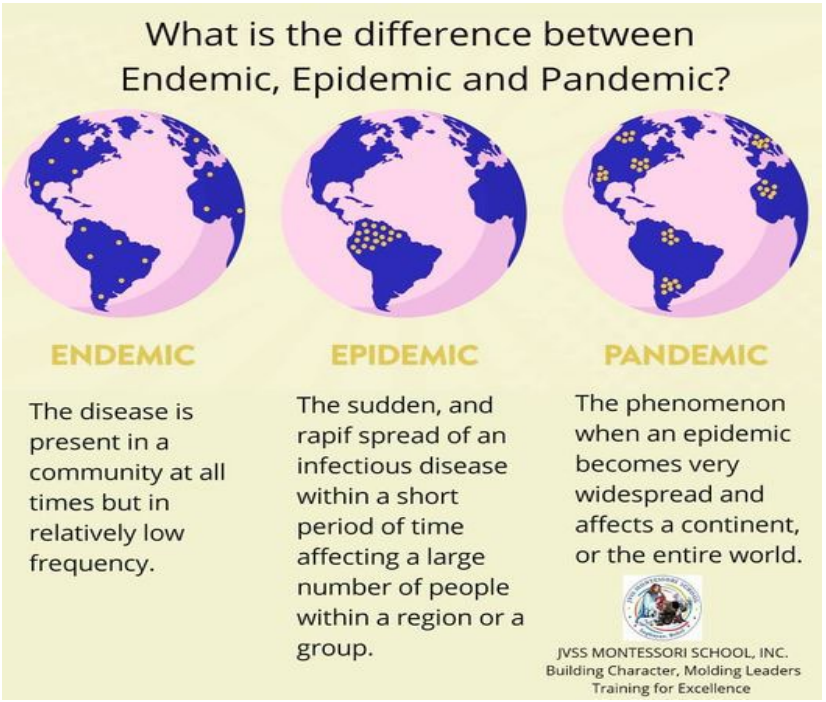
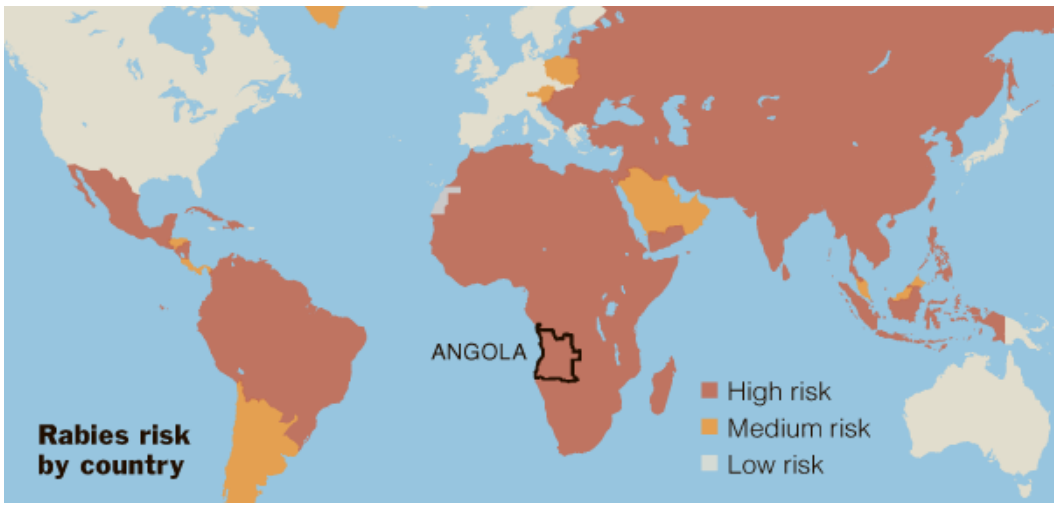


Figure 8.1: Differences between endemic, epidemic and pandemic.

3. Detection of an outbreak.

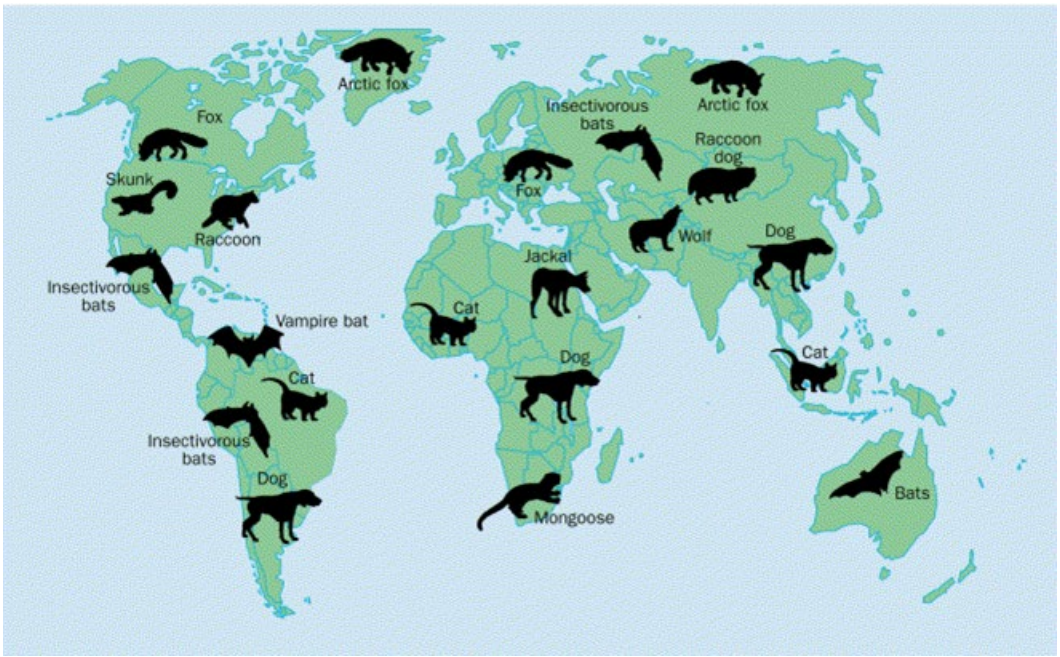
   Outbreaks can be detected through the following:

   - Public health and animal health surveillance
   - Informal reports of outbreaks
   - Formal reports of outbreaks



Map 1: Public health surveillance of countries with Rabies.

(Source: The New York Times By Donald G. McNeil Jr. March 16, 2009)



Map 2: The map above gives a general idea of which animals can transmit rabies to people in each continent, but overall, more than 99% of human rabies cases are caused by a dog bite.

(Source: http://www.infectionlandscapes.org/2013/05/rabies.html)

Figure 8.2: Condensed summary of the epidemiology principles for outbreak response summarising scientific progress made in the recent past (above in green) and future possibilities (above in blue). PCR = polymerase chain reactions; PPE = personal protective equipment; RDT = rapid diagnostic test (should be sensitive, specific, heat-stable, cheap, simple to use, electricity-free and disposable). Note: the nine outbreak steps have been condensed to seven for space.

(Source: Outbreak science: recent progress in the detection and response to outbreaks of infectious diseases. Clin Med (Lond). 2019;19(2):140-144. doi:10.7861/clinmedicine.19-2-140)

4. How does an outbreak occur?

   An outbreak is a sudden rise in the number of disease cases. It may occur in a community or geographical area or affect several countries. It may last for a few days, weeks, or even several years.

   Some outbreaks are expected each year, such as influenza. Sometimes, a single case of an infectious disease may be considered an outbreak. This may be true if the disease is rare (e.g., food-borne botulism) or has serious public health implications (e.g., bioterrorism agents such as anthrax).

How does a zoonotic disease outbreak happen?

Diseases that naturally transmit between people and vertebrates are called zoonoses. These diseases are further classified as epidemic zoonoses, are sporadic, endemic zoonoses that occur in many places, and emerging and re-emerging zoonoses that appear in a new population or re-emerge rapidly in incidence or geographical range.

The approach taken to countermeasure these zoonotic outbreaks is through One Health Workforce. Because of this, the World Health Organization (WHO) emphasizes the need for coordinated responses among public health, animal health, and environmental health to new infectious agents to prevent epidemics.

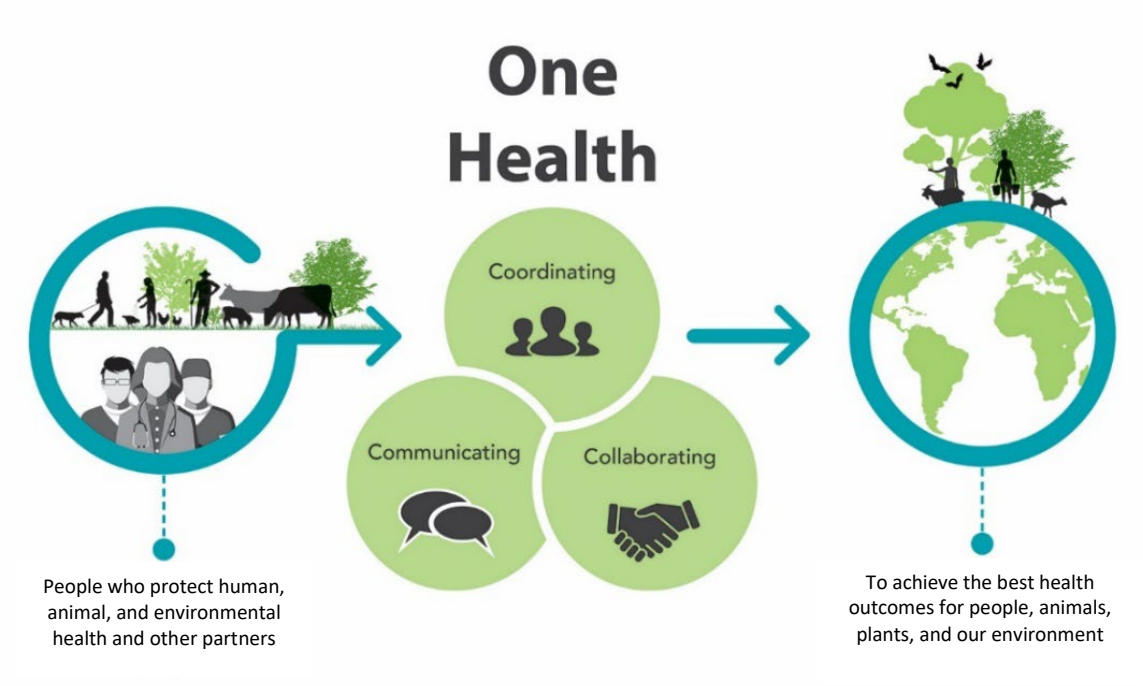


Figure 8.3: The foundation of One Health.

(Source: Centres for Disease Control and Prevention. National Center for Emerging and Zoonotic Infectious Disease - https://www.cdc.gov/one-health/about/index.html)

Zoonotic disease emergence is a complex process. A series of external factors, or drivers, allow a select pathogen to expand and adapt to a new niche. The drivers are mostly ecological, political, economic, and social forces operating at local, national, regional, and global levels. The human-animal-environment interface can explain these drivers.

Its emergence often occurs in stages, with an initial series of spillover events, followed by repeated small outbreaks in people, and then pathogen adaptation for human-to-human transmission. Each stage might have a different driver and, therefore, a different control measure. Zoonotic pathogens can spread to humans through any contact point with domestic, agricultural or wild animals.

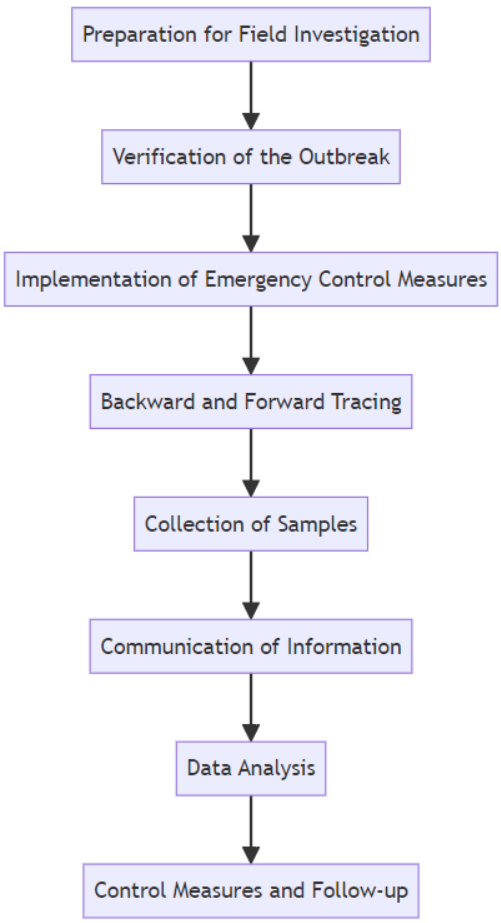
5. Outbreak Investigation

Animal Health

An outbreak investigation systematically identifies infection sources to control and prevent future cases. It highlights intervention successes and failures and detects changes in the agent, environment, or events. Keeping records, even of unconfirmed outbreaks, shows the surveillance system's effectiveness. In zoonosis, these investigations should be coordinated with public health authorities.

The main steps of the zoonotic outbreak investigation, as shown in Figure 8.4, include:

a. Preparation for field investigation.
b. Verification of the outbreak (coordination with public health competent authorities in case of zoonosis).
c. Confirmation of the report triggering the investigation.
d. Confirmation of diagnosis.
e. Epidemiological follow-up and tracing.
f. Data collection and analysis, including the animals involved and the spatial and temporal distribution.
g. Implementation of control and preventive measures.
h. Documentation and reporting.



(Source: Animal Disease Information Centre, 2011, Department of Veterinary Services)

Human Public Health

Steps in the outbreak investigation.

1. Confirm the existence of an outbreak.

   Establishing outbreaks of zoonotic diseases from the surveillance system.

   - National surveillance mechanism - both for human health and animal health. (*Please refer to the National Strategic Plan for Zoonotic Disease Investigation manual*)
   - Early warning response.
   - Joint investigation (*Please refer to One Health Manual on Handling Zoonotic Disease Outbreaks in Malaysia, MyOHUN 2017 and National Strategic Plan for Zoonotic Disease Investigation manual*).
   - The hospital was also called to verify if they received a surge in the number of patients and their main presenting symptoms.

2. Verify diagnosis of zoonotic diseases.
   - Ensure the disease has been accurately diagnosed.
   - Rule out laboratory errors/changes in laboratory practice/changes in diagnostic/changes in reporting procedure.

3. Developing an operational case definition.

   Case definition for both human and animal.

   - Human case definition: include clinical presentation, time, place and person. Should not include history of exposure.
   - Animal case definition: include clinical presentation (fever, lethargy, respiratory distress, gastrointestinal symptoms etc.), time, place, laboratory tests, and contact history of exposure. Also include species-specific as well as changes in behavior.

4. Case detection through active and passive case findings.

   A rapid response team will be deployed to the village for active and passive case detection.

   i. Active case findings were conducted during field investigation by interviewing the contacts to get further details on exposure and clinical complaints. A case is defined when it fulfils the criteria per the case definition.

   ii. Passive case detection was performed through clinic attendance or hospital admission for those who fulfilled the case definition.

   iii. Develop human exposure classification.

      - Possible exposure – a person who had close contact (direct or indirect) with reservoir animals in an endemic area.
      - Probable exposure – possible exposure plus an animal displaying clinical signs consistent with the disease under investigation at the time of the exposure or within the incubation period following exposure in the endemic area.
      - Exposed – probable exposure with laboratory-confirm diseased animal and/or positive tested environmental sampling (water and soil).

5. Data management.
   i. Line listing will be done according to the demographic data, risk factors and symptoms.
   ii. Perform descriptive epidemiology.
      - Descriptive epidemiology of the outbreak will include time, place and person (TPP).
      - A distribution table will be developed according to symptoms.
      - Measure: Attack rate, case fatality rate, food-specific attack rate, etc.
      - An epidemic curve and spot map will be developed.

6. Developing a hypothesis.

   Hypotheses should be developed guided by descriptive information.

   In generating hypotheses, we must consider the cause of the disease, the mode of transmission, the incubation period, and the infectious period. (Relate host, agent and environmental factors to the occurrence of an outbreak.)

   Example of One Health hypotheses.

   Case Example:

   > On July 27, 2015, a rabies outbreak was declared in Perlis. The first dog bite case was reported in a village near southern Thailand's border.

   - Human health – The rabies outbreak is due to dog bites with a possible source of rabid dogs.
   - Animal health – rabies outbreak amongst dogs with a possible source of infection from a neighbouring country.
   - Final One Health hypothesis, in this case, is 'an outbreak of rabies in Perlis is due to rabid dog bites with a possible source of infection from a neighbouring country'.

7. Evaluate Hypotheses.

   Evaluation of the hypothesis will be conducted once lab results are available. The lab results include:
   - Environmental sampling (soil, water)
   - Animal sampling (livestock carcasses and sick animals)
   - Clinical sampling (PCR or cultures)
   - Conduct epidemiological studies to evaluate hypotheses.
   - Case-control.
   - Retrospective cohort study.

8. Implement control measures
   - Communicate - press release, outbreak report (preliminary and final report): Group presentation/role play.

6. One Health competency in managing zoonotic disease outbreaks (*Please refer to National Strategic Plan for Zoonotic Disease Investigation manual-diagram of joint investigation and One Health Manual on Handling Zoonotic Disease Outbreaks in Malaysia, MyOHUN 2017*).

   One Health is a cross-sectoral, holistic approach to reducing disease risk and building resilience. The collaboration involves all levels, from preparedness plans to outbreak investigations, control, and preventive measures. Both core and technical competencies are required in managing disease outbreaks.

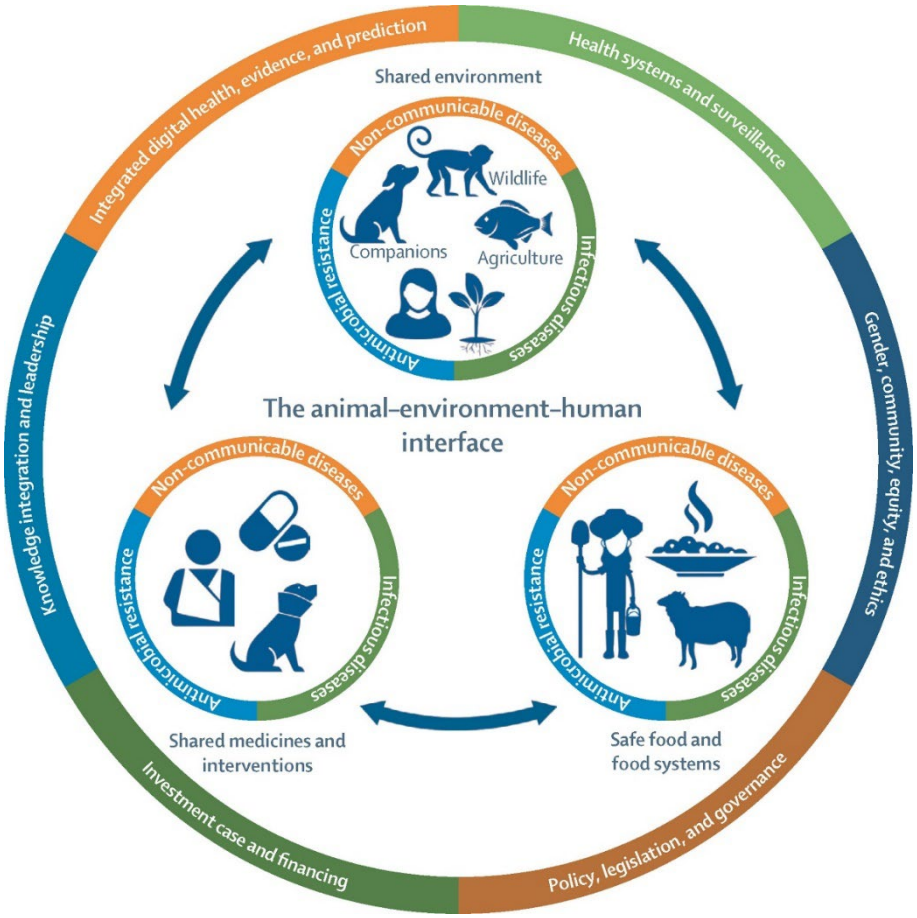


Figure 8.5: Approach of *The Lancet* One Health Commission.

(Source: Reconnecting for our future: The Lancet One Health Commission, The Lancet, Volume 395 Issue 10235, Pages 1469-1471, May 2020)

Supporting Materials

Activity 1 (Picture appreciation – 3 minutes)

Task: Observe the picture and discuss how the Nipah outbreak could have happened in the pig farm.

Picture 3: Nipah outbreak in Malaysia and Singapore.

(Source: Nipah Virus (NiV) basics concerns and prevention by Dr.T.V.Rao MD)

Activity 2 (Video: Outbreak (1995) official trailer (Dustin Hoffman, Morgan Freeman Sci-Fi movie HD)

Task: Group work

1. Identify the One Health competencies involved in managing disease outbreaks.
2. Identify the One Health Workforce involved in managing disease outbreaks.

Activity 3 (Problem-Based Learning - 30 minutes)

Task: Discuss using problem-based triggers in a group of 5-8 persons.

Aim:

1. Construction of case definition.
2. Case Investigation/Line listing – descriptive epidemiology (TPP).
3. Environmental investigation/sampling.
4. Generate a hypothesis and propose an epidemiological study.

TRIGGER 1: THE FEAST

Ahmad, a 14-year-old boy, fell sick 12 hours after attending a wedding reception at Nilam village with his father, Mr. Salleh. The guests were served various dishes, including briyani rice with spicy beef, spicy tomato chicken, lentil curry, salad, and pickles. Ahmad enjoyed several helpings of the chicken dish. The following morning, he came down with fever, nausea, and diarrhea and was given a home remedy consisting of boiled guava shoots and strong black tea. It was learnt that several of Mr. Salleh's relatives who attended the same wedding reception fell ill and presented similar symptoms.

Task 1:

- Construct and describe the case definition.
- Suggest method of case findings.

TRIGGER 2: THE HEADLINES

After three days, Ahmad's symptoms had not improved, and he was admitted to a local hospital. Mr. Salleh became more worried after hearing that many guests at the wedding reception had similar symptoms. A local newspaper reported the death of four people and hospitalization of 223 others for diarrhoea, fever, and abdominal cramps after consuming chicken meat served at the same wedding reception in Nilam village.

Ahmad's blood results: The Widal agglutination test was negative. Non-typhoidal Salmonella was isolated from blood and faecal cultures. The isolate was found to be an extended-spectrum β-lactamase (ESBL) producer.

Task 2:

- Describe the descriptive epidemiology (by time, place, and person).
- Propose a field visit, environmental investigation, and sampling you want to conduct.
- Suggest/write your hypothesis for this outbreak.
- Propose an epidemiological study that you could conduct for this outbreak.

Activity 4 (Preliminary Outbreak Report & Press Release - 15 minutes)

Task: Group Work

- Prepare and present a preliminary outbreak report or press release and to whom it should be submitted.

Resources

1. One Health Manual on Handling Zoonotic Disease Outbreaks in Malaysia. MyOHUN 2017.
2. A problem-based learning (PBL) Approach One Health cases. MyOHUN 2017.
3. Outbreak Toolkit available at https://outbreaktools.ca/.
4. https://rr-asia.woah.org/wp-content/uploads/2020/02/manual_outbreak-investigation.pdf

MODULE NINE

RISK ASSESSMENT

Saraswathi Bina Rai

Introduction

Rapid Risk Assessments are carried out in the early stages of potential public health concern incidents. It is used to identify evidence-based control measures and assess the feasibility of control measures in place. A rapid risk assessment aims to improve preparedness, especially in recurrent outbreaks. This module provides participants with a basic understanding of the importance of risk analysis and the concepts of risk assessment. It provides an overview of multiple methodologies available for risk assessment. The participants will be trained to identify and report unusual public health events and to carry out basic risk assessments.

Training Outcomes

By the end of the session, participants will be able to:

1. Describe the concepts and importance of risk assessment.
2. Identify an unusual public health event to be reported to the authorities in the subscribed format.
3. Perform a basic risk assessment according to One Health competencies.

Training Plan

Topic	Method	Material	Duration
Concepts and the Importance of Risk Assessment.	Lecture	Slides, photos, triggers	30 minutes
Unusual Public Health Event to be Reported to the Authorities.	Group work, group presentation	Scenarios	40 minutes
One Health Competencies in Risk Assessment.	Group work, group presentation	Scenarios	110 minutes

Training Guide

What is Risk in Public Health?

Risk is the probability or likelihood that an adverse health outcome will occur following an exposure to a hazard and the possible consequences associated with this.

Risk Analysis.

1. Describes how risks are dealt with within a society.
2. Three components:
   a. Risk assessment - is there a problem? How adverse is the problem?
   b. Risk management - how can the risk be reduced?
   c. Risk communications - communications of risk to managers, stakeholders, public officials and the public.

Five simple steps for risk assessment.

1. Look for the hazard.
2. Decide who might be harmed and how.
3. Evaluate/ estimate the risk and decide whether existing precautions are adequate or more actions should be taken.
4. Record findings.
5. Review your assessment and revise it if necessary.

Why do a Risk Assessment?

1. Provide guidance for risk management.
   - Appropriate use of resources
   - Provides options to consider managing and control.
   - Prioritize activities.
2. Provide information for risk communication.
3. Assess economic, political, and health consequences.

Uses of Risk Assessment.

1. Epidemic potential.
2. Assessment of workplace hazards.

Rapid Risk Assessment of Acute Public Health Events.

- Reduces or prevents disease in affected populations and reduces negative social and economic consequences.
- Benefits include defensible decision-making.
- Implementation of appropriate and timely control measures.
- More effective operational communication.
- More effective risk communication.
- Improved preparedness.

To Assess and Notify a Public Health Event.

What events need to be notified?

1. Public health events that have the potential to endanger lives.
2. Need to know:
   - Which events need to be detected?
   - How do we detect a public health event?
   - Whose job is it to notify a public health event?

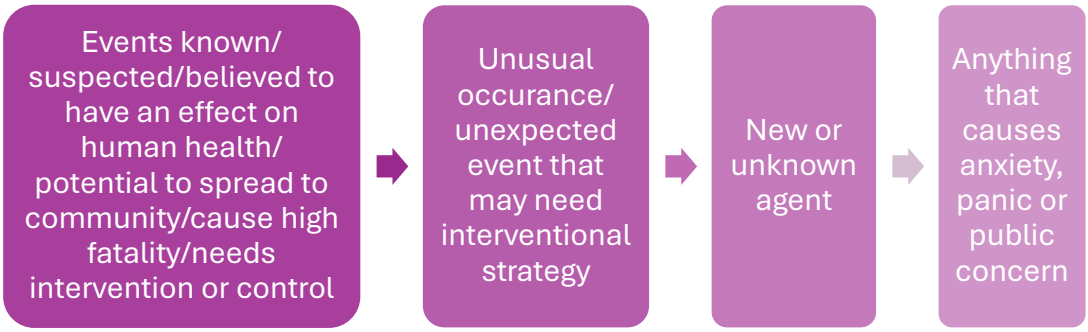


Figure 9.1: Type of events to be notified.

Activity.

Participants will be divided into groups (5 to 8) and given scenarios.

Scenario:

> The person in charge of a communicable disease operation room received a notification from the medical officer of Hospital A on 31st March 2020.
>
> One case of a male trainee from a Police Training Centre died, and 12 others were admitted to the medical ward for respiratory distress. They had gone into the fringes of the jungle in another state for a survival course. According to the supervisor who brought them to the hospital, other trainees in the training centre were extremely worried and were on their way to the nearby health centre.
>
> Within half an hour, a message was received in the WhatsApp group of the same operation room. The message was from one of the staff members stating that he had to take emergency leave as his child was down with a fever. A week earlier, his family was on vacation in a neighbouring state. The wife said that the sick child found two dead ducks near the river where they picnicked.

Information required for notifying a Public Health event.

- Date and time.
- What do you want to report?
- What happened (describe) and why?
- Describe symptoms and onset if related to the event.
- When did the event occur?
- Persons affected/ people exposed/ family members involved.
- Calculate the attack rate.
- If admitted - number admitted/outpatients/discharged/death.
- Is any further assistance needed?
- Evacuation centre activated/ how many?
- Any other information?
- Details of person reporting with signature and time of reporting.

Components of Disaster Risk.

- Hazard
- Vulnerability
- Exposure

Steps in Risk Assessment of Public Health Events.

1. Assembling the risk assessment team.
2. Formulating the risk questions.
   a. Focuses on who is likely to be affected, the likely exposure to the hazard, when, why, and how a population might be adversely affected by exposure to the hazard.
3. Undertaking the risk assessment.
   a. Hazard assessment - hazards could be biological, chemical, physical, zoonotic, or complex emergencies like tsunamis, floods, etc.
   b. Exposure assessment - the number of people who will be exposed and the number of exposed people who are likely to be susceptible.
   c. Context assessment - evaluation of the environment in which the event is taking place, e.g., the physical environment, water source, the health of the population, and infrastructure.
4. Risk characterization.
   a. Consider the use of the risk matrix.
5. Once the hazard, exposure and context assessments are carried out, a level of risk is assigned, i.e. extremely low, low, moderate, or high. Document the level of confidence in the risk assessment.

Level of Confidence in Risk Assessment.

This will depend on the reliability, completeness, and quality of the information used and the underlying assumptions made regarding the hazard, exposure, and context.

Quality of Evidence	**Confidence**
Mostly 'unsatisfactory'	Unsatisfactory (little poor-quality evidence, uncertainty/conflicting views amongst experts, no experience with previous similar incidents)
Most 'satisfactory'	Satisfactory (adequate quality evidence, including consistent results published only in grey literature; reliable source(s); assumptions made on analogy; and agreement between experts or opinion of two trusted experts)
Mostly 'good'	Good (good quality evidence, multiple reliable sources, verified, expert opinion concurs, experience of previous similar incidents)

Figure 9.2: Applying level of confidence.

(Source: ECDC 2019)

Group Work (110 minutes)

The scenario will be based on the field visits. Each group will present their findings.

Format for reporting.

- What is the main issue in this assessment?
- What level of expertise is needed in this report?
- The main findings of your assessment.
- What are the risk questions that you would like to ask?
- Hazard assessment, exposure assessment, and context assessment.
- What is the risk characterization?
- State the level of confidence in this risk assessment.
- In your opinion, to whom should this report be forwarded?
- In your opinion, when should a reassessment (if any) be done?

Guided Learning Materials (Trainers prepare teaching materials and resources).

1. Risk assessment and management.
   a. PowerPoint slides on the subject.
2. Format to notify a public health event.
   a. Required format.
   b. Scenarios to practise public health event notification and reporting.
3. Template to carry out a basic risk assessment.

Overview of Risk Assessment.

Component (Definition)	**Key Output**	**Examples of risk questions**
Hazard Assessment The hazards causing the event and the associated adverse health effects must be identified.	Viral factors	• Is there a higher proportion of infection compared with previous months/years? • Any situation that would lead to an increased severity of the disease?
	Clinical factors	• Is this virus associated with a severe infection?
Exposure Assessment The evaluation of the exposure of individuals and populations to likely hazards.	Epidemiology of infection	• Is there evidence of a severe season or bout of infection, considering the mode of spread?
	Susceptibility	• Who is the susceptible population?
	Population immunity	• Consider the population immunity, if any.
	Vaccine effectiveness	• Is there a vaccine? If so, its effectiveness?
	Transmission	• Is there an unusual viral activity?

Context Assessment The evaluation of the environment in which the event is taking place.	Socio-economic	• Would the current socio-economic situation result in the widespread of the disease? • Are the vulnerable and displaced persons more affected?
	Programmatic	• Is the health system strong enough to handle this virus/situation? • Is public perception affecting the reporting?

Resources

1. Rapid Risk Assessment of Public Health Event: WHO module.
2. Operational Guidance on Rapid Risk Assessment Methodology: ECDC.
3. World Health Organization 2012. Rapid Risk assessment of acute public health events (https://www.who.int/csr/resources/publications/HSE_GAR_ARO_2012_1/en/)

MODULE TEN

DATA MANAGEMENT AND ANALYSIS

Helmy Hazmi, Jeffery Stephen, Mohd Rohaizat Hassan

Introduction

Data management is important in disease surveillance activities and outbreak management. This module will provide participants with an overview of fundamental data management in disease surveillance and outbreaks. The purpose is to provide the participants with the knowledge and basis to handle data and perform basic data analysis using basic data management software. The participants will be trained to identify the appropriate data to be collected, conduct data analysis, and interpret and report the findings.

Training Outcomes

By the end of the session, participants will be able to:

1. Identify data to be collected in a surveillance and outbreak scenario.
2. Perform data entry using selected software, e.g. MS Excel or Epi Info.
3. Perform and interpret descriptive data analysis by time, place and person.
    - Trend analysis related to surveillance activity.
    - Warning threshold and action line of a surveillance activity.
    - An epidemiological curve in an outbreak.

Training Plan

Topic	Method	Material	Duration
Variables Identification.	Group work	Investigation/ notification form	10 minutes
Data Entry and Creating Line-listing.	Group work	Investigation/ notification form MS Excel	30 minutes
Surveillance Data and Trend Analysis.	Group work	MS Excel	20 minutes
Threshold and Action Line in Surveillance Data.	Interactive lecture	Slides/videos	15 minutes
Descriptive Analysis.	Group work	MS Excel	15 minutes
Creating Epidemiological Curve.	Group work	MS Excel	30 minutes
Group Report.	Group presentation	Slides/Coggle	60 minutes

Training Guide

Activity	Duration	Description
Interactive Lecture: a. Variables identification. b. What data to collect? c. How will the data be collected?	10 minutes	Introduction to: Types of variables. • Explain numerical variables. • Explain categorical variables. Data collection methods and tools • Common data sources – questionnaires, experiments, registry, etc. • Data collection methods – questionnaires, proformas, qualitative, blood readings, lung function test, etc • Data collection tools – questionnaires, checklist, narrative, rapid blood test, software. *focus on data for outbreak and surveillance data.
Hands-on group work: Data entry and creating line listings.	30 minutes	Introduction to Excel. • Data entry – show the use of columns and rows. • Data cleaning – show how to remove duplicate data.
Hands-on group work: Surveillance data and trend analysis.	20 minutes	Surveillance data and trend analysis. • Explain the different types of epidemiological curves. • Data setting for trend analysis. • Practice hands-on – drawing epidemic curves, moving mean, moving median.
Hands-on group work: Deciding on the threshold and action line in surveillance data.	15 minutes	Deciding on the threshold and action line in surveillance data and Epidemiological curve.
Hands-on group work: Descriptive analysis.	15 minutes	Descriptive analysis. • Show pivot table • Developing a chart and chart pivoting • Hands-on using provided data – based on time, place, and person
Hands-on group work: Creating epidemiological curve.	30 minutes	Plotting the epidemiological curve using the data.
Group report.	60 minutes	Preparing group report presentation from the above exercise and present (3-4 PowerPoint slides)

Supporting Material

Toolkit for Training (Only provide one example for each event/tool):

1. Powerpoint slides (Based on MyOHUN training modules).
2. Provide a trainer note for each material.
3. Simple & Simplified dataset - Prepared by the trainer.
4. Personal laptop with Microsoft Office® and internet connection.

Trainer notes:

1. Towards the end of the session, participants should be able to learn and understand the following:
   a. Types of variables
   b. Data collection methods, tools, and data sources
   c. Data entry and cleaning using Microsoft Excel ®
   d. Data analysis - surveillance data and trend analysis
   e. Epidemiology curve, outbreak threshold and action line in disease control and outbreak management
   f. Descriptive analysis (pivot table, chart, and chart pivoting- hands-on using provided data – based on time, place, and person.
2. Trainees should be divided into small groups (maximum of 8 per group)
3. The interactive lecture should be conducted as 2 ways of communication with QA within the session itself.
4. For hands-on training, 1 facilitator should optimally cover 2-3 groups for a more effective session.

Resources

1. Excel Easy - Data Analysis. https://www.excel-easy.com/data-analysis.html
2. Richard C Dicker. The CDC Field Epidemiology Manual - Analysing and Interpreting Data. https://www.cdc.gov/eis/field-epi-manual/chapters/analyze-Interpret-Data.html
3. Introduction to Coggle. https://www.youtube.com/watch?v=iL40u0uNYa8

MODULE ELEVEN

RISK COMMUNICATION

Nor Azwany Yaacob, Rosalia Saimon, Yap Wei Boon

Introduction

Risk communication has been identified as one of the core competencies of One Health in infectious disease management. Risk communication aims to enable people at risk to make informed decisions to reduce the impact of a threat, such as a disease outbreak, and to take appropriate protective and preventive actions. During public health events such as outbreaks, time is short, and risk communication tasks such as identifying public communication focal points and stakeholders and developing and implementing communication structures are critical. Effective risk communication saves lives, reduces illness, and helps countries and communities maintain social, economic, and political stability during emergencies. This module will provide participants with the knowledge and skills to communicate effectively in response to public health events.

Training Outcomes

Upon completion of this module, participants will be able to:

1. Understand the concepts of effective risk communication in multi-sectoral coordination.
2. Identify key messages and supporting information in risk communication.
3. Apply effective communication skills using the One Health approach in managing infectious diseases.

Training Plan

Topic	Method	Material	Duration
Concepts of effective risk communication	Interactive lecture	Slides, videos	30 minutes
Key messages and supporting information in risk communication	Group discussion	Videos, cases	30 minutes
Communicating risk to: 1. Public 2. Politician 3. Press (journalists) 4. Rumour surveillance messages 5. Social media (viral messages)	Group discussion and presentation	Slides, cases and scenarios	90 minutes

Training Guide

1. Understand the principle of effective risk communication in multi-sectoral coordination.
   a. Effective risk communication should promote the following outcomes:
      - Public awareness in relation to human, animal, and environmental health and their interconnection.
      - Accurate information organization and delivery when dealing with issues/activities of significant public concerns.
      - Better understanding of right-to-know laws relating to exposure to risk agents.
      - Restore public confidence and trust in risk management authorities.
      - Address public demands for the right to participate as part of all risk assessment and management phases.
      - Increase awareness in authorities and industries that risk controversies may dampen their organizational goals.
      - Generate awareness that certain parties cannot manipulate the public response to risk to achieve personal or particular agendas.

   b. Principles.
      - Share responsibilities.
      - Establish expertise in risk communication.
      - Know your audience.
      - Involve scientific experts.
      - Be a credible source.
      - Transparency.
      - Empathy and sincerity.
      - Put risk in perspective.

   c. Parties involved.
      - Individuals.
      - Groups.
      - Institutions/stakeholders.

2. Identify key messages and supporting information in risk communication.
   a. Key messages include all information that the audience wants to hear, understand, and remember. Key messages must;
      - Prioritize, define, and organize information.
      - Ensure consistency, continuity, and accuracy in information sharing.
      - Assess and evaluate outcomes of actions.
      - Strategize plans when speaking with media and stakeholders to avoid unnecessary panic in the public.

b. Trainers can do an exercise on developing key messages using the following steps.
   - Step 1: Brainstorming to develop key messages with internal stakeholders.
   - Step 2: Refine key messages.
   - Step 3: Test, finalize, and routinely update key messages.

3. Apply communication skills and tools using the One Health approach.

   Assign groups with simulated audiences to test the key messages. Each group is allocated 10 to 15 minutes to present their findings. After the presentation, facilitators are given 5-10 minutes to raise their views and comments on the group's findings.

   Simulated audiences:
   - Public.
   - Politician.
   - Press (journalists).
   - Rumour surveillance messages.
   - Social media.

Supporting Materials

1. Building Blocks of Risk Communication.

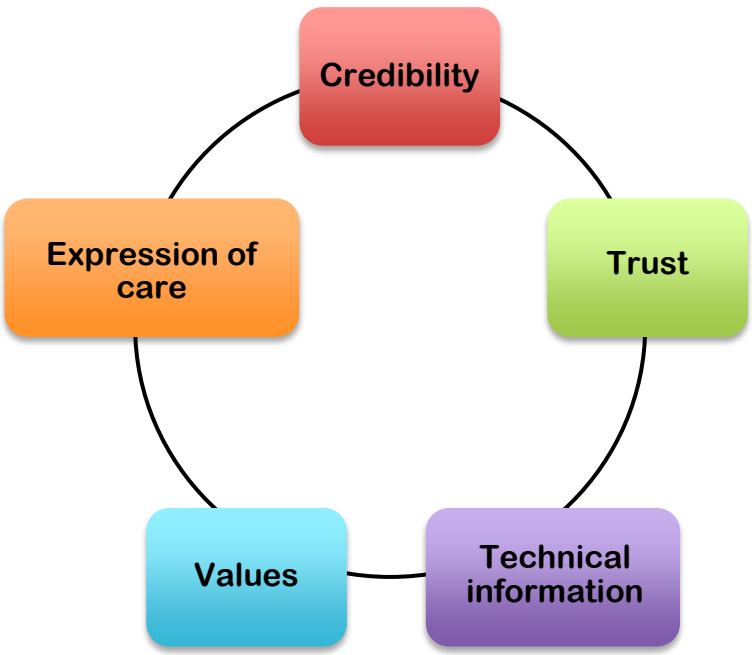


Figure 11.1: Building blocks of risk communication.

Technical information: Information should be evidence-based when possible but adapted to the languages and contexts of the target public or audience. This is generally known as translational communication. Credible communicators (e.g. public health specialists, scientists, opinion leaders, authorities) can produce changes in opinions.

Values: People's values and beliefs reflect how they perceive information from the experts or officials.

Expression of care: When information is delivered, people need to know that their welfare is taken care of and respected.

Credibility: Influenced by individual and organizational reputation. It could depend on the communicator's expertise and/or skills. It can be lost if people feel the communicator is lying or withholding information.

Trust: It is either strengthened or weakened every time officials and experts speak or make announcements. It is linked to the other four building blocks.

2. Importance of risk communication in One Health mechanisms (human and animal health events e.g. zoonotic outbreak management: joint investigation).
   - Enhances engagement with affected populations.
   - Public seeking health advice behaviour has shifted to public online sources and social networks.
   - Handles citizenship/mass journalism, especially on social media.
   - Prevents the rise of unfounded opinion by providing well-sourced and referenced information.
   - Bring together multiple professions in communication, social sciences, and systems-strengthening techniques.

3. Components of risk communication.
   - The individual sending the message - The sender must present the message clearly and with enough detail so that the receiver shares meaning with the sender.
   - The context for the message involves nonverbal communication such as gestures, body language, facial expressions, tone of voice and emotions.
   - The person receiving the message - The receiver must listen carefully and intently, ask questions for clarity, and paraphrase to ascertain that the receiver shares meaning with the sender.
   - The chosen delivery method - The delivery method must suit the communication needs of both the sender and the receiver. This includes verbal communication, instant messages (IM), email, letters, signs, posters, videos, screenshots, telephones, notes, forms, written documents, and more.
   - The content of the message. The content of the message should be clearly presented and described in enough detail to obtain understanding from the receiver.

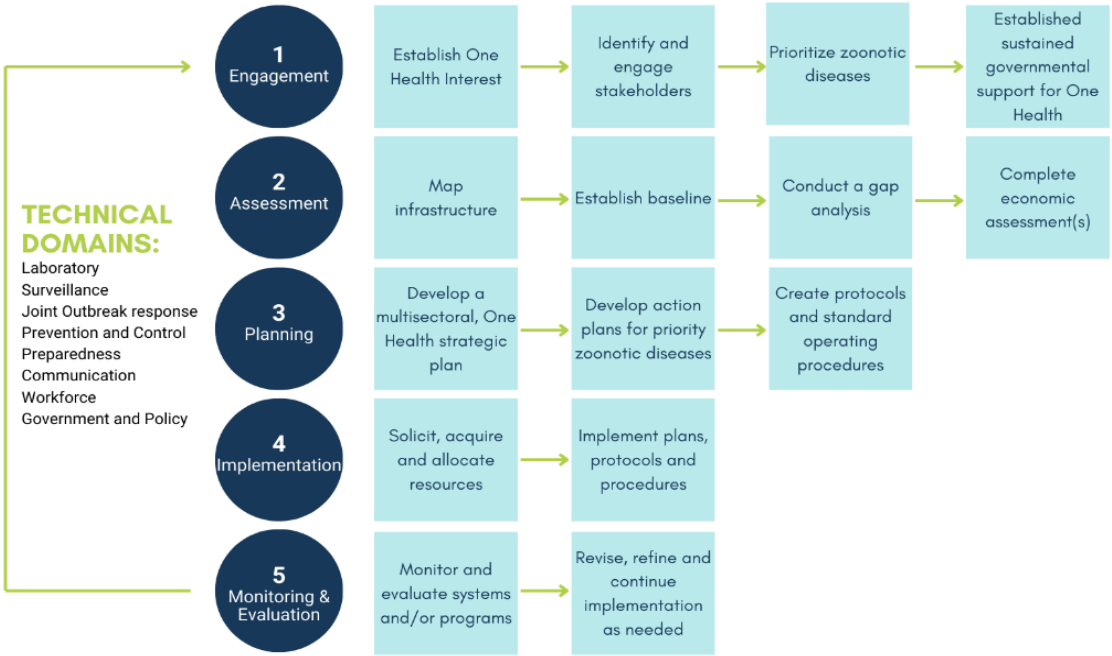


Figure 11.2: Generalized One Health Framework visualization. Dark teal circles indicate stepwise headings. Light blue boxes indicate activities under these headings that pertain to building a One Health system or zoonotic disease-specific program. Technical domains pertain to all steps within the GOHF and often comprise essential elements of a successful One Health system or zoonotic disease-specific program to be addressed.

(Source: Scientific Reports | (2022) 12:8588 | https://doi.org/10.1038/s41598-022-12619-1www.nature.com/scientificreports A generalizable one health framework for the control of zoonotic diseases)

4. Risk perceptions.

   Risk perception is important in health and risk communication because it determines which hazards people care about and how they deal with them. Layman normally evaluates risks according to subjective perceptions, intuitive judgments, and inferences from media coverage and limited information. Experts base their risk perceptions more on research findings and statistical evidence.

5. Audience mapping.

   At a minimum, an audience map should:

   - Include groups from inside and outside the crisis.
   - Separately assess awareness and support.
   - Express awareness and support in quantitative terms (Rating your audiences according to a numeric scale (a 1-5 scale tends to work best) quickly establishes an order of magnitude for awareness and support and makes a lot of information readily digestible).
   - Involve a manageable number of knowledgeable people in the mapping process.

6. Key components of risk communication strategies:
   - WHO needs to know the information?
   - WHY do they need to know the information?
   - WHAT information do they need?
   - WHEN do they need to know it?
   - HOW will it be delivered?

7. Risk communication strategy worksheet.

   This worksheet guides communicators in strategizing effective risk communication. The strategy includes describing the relevant issue/problem, identifying key messages, identifying the affected population, determining information delivery methods, identifying information resources, and determining the appropriate time to deliver the information.

Communication Strategy Worksheet		
Description of issue/problem:		
Key messages:		
Audience	Communication	Resource & Time

8. Guiding practices in risk communication.
   - Risk and crisis communication is an ongoing process.
   - Conduct pre-event planning and preparedness activities.
   - Proactive in public communication.
   - Listen to the public's concerns and understand the audience.
   - Demonstrate honesty, candour, and openness.
   - Communicate with compassion, concern, and empathy.
   - Accept uncertainty and ambiguity.
   - Give people meaningful actions to do.
   - Collaborate and coordinate with credible sources.
   - Meet the needs of the media and remain accessible.
   - Leading agency is based on the type of disease (eg, Animal health agency -Avian Influenza H5N1, Brucellosis and Rabies and, for Human health agency – JE, *P. knowlesi* and Leptospirosis)

Articles

1. Effective Health Risk Communication About Pandemic Influenza for Vulnerable Populations.
2. Theoretical Perspectives on Public Communication Preparedness for Terrorist Attacks.
3. Crisis and Emergency Risk Communication in a Pandemic: A Model for Building Capacity and Resilience of Minority Communities.
4. The Application of the Haddon Matrix to Public Health Readiness and Response Planning.
5. Healthcare worker competencies for disaster training.
6. Incorporating Bioterrorism Training into Dental Education: Report of ADA-ADE Terrorism and Mass Casualty Curriculum Development Workshop.

Videos

- https://www.youtube.com/watch?v=3lHGshTDMCw
- https://www.youtube.com/watch?v=cm0b3mknhAE
- https://www.youtube.com/watch?v=tJIe6sT1ar8&list=PLvrp9iOILTQaTqRqxNtxO8eKoQtX5ysxQ
- https://www.youtube.com/watch?v=nTZejYQeGCw

Resources

1. Barnett, D. J., Balicer, R. D., Blodgett, D., Fews, A. L., Parker, C. L. and Links, J. M. 2005. The Application of the Haddon Matrix to Public Health Readiness and Response Planning. *Environ. Health Perspect.* 113(5): 561-566.
2. Chmar, J. E., Ranney, R. R., Guay, A. H., Haden, N. K. and Valachovic, R. W. 2004. Incorporating Bioterrorism Training into Dental Education: Report of ADA-ADEA Terrorism and Mass Casualty Curriculum Development Workshop. *J. Dent. Edu.* 68(11): 1196-1199.
3. Hsu, E. B., Thomas, T. L., Bass, E. B., Whyne, D., Kelen, G. D. and Green, G. B. 2006. Healthcare worker competencies for disaster training. *BMC Med. Edu.* 6: 19 doi:10.1186/1472-6920-6-19.
4. Quinn, S. C. 2008. Crisis and Emergency Risk Communication in a Pandemic: A Model for Building Capacity and Resilience of Minority Communities. *Health Promotion Practice* 9(4): 18S-25S.
5. Vaughan, E., and Tinker, T. 2009. Effective Health Risk Communication About Pandemic Influenza for Vulnerable Populations. *American J. Public Health* 99(supp.2): S324-S334.
6. Wray, R. J., Kreuter, M. W., Jacobsen, H., Clements, B. and Evans, R. G. 2004. Theoretical Perspectives on Public Communication Preparedness for Terrorist Attacks. *Fam Community Health* 27(3): 232–241.

MODULE TWELVE

SPECIAL ISSUE:
PREVENTION OF OCCUPATIONAL ACQUIRED ZOONOTIC DISEASES AMONG ONE HEALTH WORKFORCE

Hanizah Mohd Yusoff

Introduction

This module provides participants with an overview of possible health issues faced by the One Health workforce in the prevention and control of zoonotic diseases. This module aims to equip participants with knowledge and skills on safeguarding the health of One Health Workforces (OHWs) potentially exposed to biological agents during their work.

Training Outcomes

At the end of the session, participants will be able to:

1. Describe the basic concept of occupational safety and health risk assessment and management.
2. Assess the risk of occupational-acquired zoonotic diseases among One Health workers.
3. Describe the risk management plan for occupational-acquired zoonotic diseases among OWHs.

Training Plan

Topic	Method	Material	Duration
Occupational Safety and Health Risk Assessment and Management.	Interactive lecture	Slides	15 minutes
Risk Assessment of Occupational-Acquired Zoonotic Diseases.	Interactive lecture, Group work and discussion	Slides, Scenario	60 minutes
Risk Management Plan of Occupational-Acquired Zoonotic Diseases.	Interactive lecture, Group work and discussion	Slides, Scenario	30 minutes

Training Guide

1. Basic concept of occupational safety and health risk assessment and management. Explain the:
   - Importance of recognizing zoonotic diseases as occupational diseases.
   - Examples of high-risk workers according to the zoonotic diseases.
   - Local legislation that emphasizes the management of biological risks among workers.
   - Hazardous tasks that expose OHWs to zoonotic diseases when managing disease outbreaks.

2. Risk assessment of occupational-acquired zoonotic diseases among OHWs. Explain the:
   - Principles of occupational health risk assessment.
   - Biological hazard identification.
   - Biological hazard exposure assessment.
   - Biological hazard risk characterization.

3. Risk management plan of occupational-acquired zoonotic diseases among OHWs. Explain the:
   - Hierarchy of control measures for occupational health risk.
   - The concept of 'as low as reasonably practicable' in occupational health risk management.

Supporting Materials

For Group Activities

1. To impart skills in assessing occupational health risks for biological hazard exposures in zoonotic disease outbreak management.

   Scenario:

   > An outbreak of rabies among dogs in Serian has been reported by the Department of Veterinary, Sarawak. Two children from the area had been admitted to the hospital with the diagnosis of rabies. The Department of Veterinary decided to pool resources in a concerted effort to mobilise and contain the spread of the disease with vaccination and removal of stray dogs and cats.

   Discuss:

   - The tasks of OHWs in the management of the zoonotic disease.
   - The biological hazards in the outbreak.
   - The possible exposure to the biological hazards among OHWs involved in the outbreak management.
   - The risk of OHWs acquiring the zoonotic disease based on the risk characterization.

The table below can be used to classify a biological agent in hazard identification.

Information box: Hazard group definitions when classifying a biological agent should be assigned to one of the following groups according to its risk of infection to humans.	
Group 1	Unlikely to cause human disease.
Group 2	Can cause a human disease and may be a hazard to employees; it is unlikely to spread to the community, and there is usually effective prophylaxis or treatment available.
Group 3	Can cause a severe human disease and may be a serious hazard to employees; it may spread to the community, but there is usually effective prophylaxis or treatment available.
Group 4	Can cause severe human disease and is a serious hazard to employees; it is likely to spread to the community, and there is usually no effective prophylaxis or treatment available.

The table below shows the principle of characterizing and prioritizing a risk.

Likelihood of Exposure	Hazard Classification			
	Minor	Moderate	Major	Extreme
Rare	Low	Low	Medium	Medium
Unlikely	Low	Medium	Medium	Medium
Moderate	Medium	Medium	Medium	High
Likely	Medium	Medium	High	High
Very likely	Medium	Medium	High	High

2. To impart the skills in planning for risk prevention and control of occupational-acquired zoonotic diseases among OHWs during outbreak management.

   The scenario is based on the risk characterization concluded during the earlier group activity. Discuss:

   - The possible control measures to be implemented in the scenario.
   - Prioritization of the control measures that make the risk management plan doable and practical.

   The hierarchy of control measures below can be used for the discussion:

   a) Elimination
   b) Substitution
   c) Isolation
   d) Engineering control
   e) Administrative control
   f) Personal Protective Equipment

Resources

1. The Advisory Committee on Dangerous Pathogens. 2013. The Approved List of Biological agents. Health & Safety Executive.
2. Occupational Safety & Health Act 1994
3. Sadhra SS &Rampal KG.1999. Occupational Health Risk Assessment and Management. London: Blackwell Science.

APPENDICES

Appendix 1: Areas and domains in public and animal health epidemiology.

Category	Area	Domain
Specific to the profession	Public health	1. Public health science
		2. Public health policy
	Animal Health	• Veterinarian • Veterinary epidemiologist
	Applied epidemiology	3. Risk assessment
		4. Public health and animal health surveillance
		5. Outbreak investigation
		6. Epidemiological studies
		7. Infectious diseases
		8. Laboratory issues
		9. Public health guidance
Common to other professions	Biostatistics	10. Probability
		11. Inferential statistics
		12. Sampling
	Applied informatics	13. Internet
		14. Statistical and other data analysis
		15. Editing and presentations
	Communication	16. Risk communication
		17. Written communication
		18. Oral communication
		19. Use of new technologies
	Management	20. Planning and use of resources
		21. Team building and negotiation
	Capacity development	22. Mentorship
		23. Training
	Ethic	24. Protection of individuals
		25. Confidentiality
		26. Conflicts of interest

(Source: ECDC TECHNICAL DOCUMENT. Second revised edition. 2010. List of core competencies for field epidemiologists in the public health administrations of the European Union, grouped by categories and domains)

Appendix 2: Notification form in Malaysia / Notification Form Rev/2010.

*SCHEDULE
(Regulation 2)
Form
(Regulation 2)
PREVENTION AND CONTROL OF INFECTIOUS DISEASES ACT 1988
PREVENTION AND CONTROL OF INFECTIOUS DISEASES (NOTICE FORM) (AMENDMENT) REGULATIONS 2011

Notification Form: Rev/2010
Serial No:

NOTIFICATION OF COMMUNICABLE DISEASES TO BE REPORTED

(Section 10, Prevention And Control Of Communicable Diseases Act, 1988)

A. PATIENT INFORMATION

1. Full Name (CAPITAL LETTER):

Accompany by(Mother/Father/Guardian):
(If under age/without Identity Card)

2. Identity Card Number / Travelling Document:
(For Non Citizen)
☐ Self ☐ Accompany by

Hospital/Clinic Reg. Number: Ward:_____ Date of Admission: / /

3. Citizenship:
Citizen
☐ Yes Race/Ethnic:
Sub Ethnic:
(For Aborigines, Native of Sabah/Sarawak)
☐ No Country of origin:
Status of Entry: ☐ Legal ☐ Illegal ☐ Permanent Resident

4. Gender: ☐ Male ☐ Female

5. Date of birth: / /

6. Age: ☐ Year ☐ Month ☐ Day

7. Occupation:_____
(If unemployed, please state self reference)

8. Telephone No.: ☐ Resident ☐ H.phone ☐ Office -
(Contact purposes)

9. Current Address:

10. Address of Employer/School/College/University:

B. DISEASE DIAGNOSIS

1. Poliomyelitis
2. Viral Hepatitis A
3. Viral Hepatitis B
4. Viral Hepatitis C
5. Viral Hepatitis *(Others)*
6. AIDS
7. Chancroid
8. Cholera
9. Dengue Fever
10. Dengue Haemorrhagic Fever
11. Diphtheria
12. Dysentery
13. Ebola
14. Food Poisoning
15. Gonorrhoea
16. Hand, Food and Mouth Disease
17. Human Immunodeficiency Virus Infection
18. Influenza
19. Leprosy *(Multibacillary)*
20. Leprosy *(Paucibacillary)*
21. Leptospirosis
22. Malaria - *Vivax*
23. Malaria - *Falciparum*
24. Malaria - *Malariae*
25. Malaria - *Others*
26. Measles
27. Plague
28. Rabies
29. Relapsing Fever
30. Syphilis - *Congenital*
31. Syphilis - Acquired
32. Tetanus Neonatorum
33. Tetanus *(Others)*
34. Typhus - *Scrub*
35. Tuberculosis - *PTB Smear Positive*
36. Tuberculosis - *PTB Smear Negative*
37. Tuberculosis - *Extra Pulmonary*
38. Typhoid - *Salmonella typhi*
39. Typhoid - *Paratyphoid*
40. Viral Encephalitis - *Japanese*
41. Viral Encephalitis - *Nipah*
42. Viral Encephalitis - *(Others)*
43. Whooping Cough / Pertussis
44. Yellow Fever
45. Others: *please specify:* _____

Besides by written notification, the following diseases must be notified by telephone within 24 hours, such as:- Acute Poliomyelitis, Cholera, Dengue, Diptheria, Ebola, Food Poisoning, Plague, Rabies and Yellow Fever.

11. Case detection classification:
☐ Case ☐ Contact ☐ FOMEMA
☐ Screening Test _____

12. Status of patient:
☐ Live/alive
☐ Died - -

13. Date of Onset: - -

14. Laboratory investigation:
Investigation: (i)_____
(ii)_____ (iii)_____
Date of specimen taken: - -

15. Laboratory investigation result:
☐ Positive (_____)
☐ Negative
☐ Pending

16. Diagnosis Status:
☐ Provisional/Suspected
☐ Confirmed
Date of Diagnosis - -

17. Relevant Clinical Information:

18. Comment:

C. NOTIFIER

19. Name of Medical Practitioner:

20. Name and address of Hospital/Clinic:

21. Date of Notification: - -

Signature of Medical Practitioner

Appendix 3: Veterinary diagnostic service in Malaysia. (Please obtain all relevant forms/documents related to reporting and sample submission).

1. Veterinary Research Institute (VRI) – Reference Laboratory.
   a) Accredited by FAO, OIE and ASEAN as a Regional Reference Laboratory for Highly Pathogenic Avian Influenza Disease (HPAI) and Newcastle Disease (ND) in 2008.
   b) The function of VRI includes:
      - Conduct research on animal health and disease control issues in Malaysia;
      - Provides quality animal disease diagnostic services;
      - Carry out epidemiological disease investigation and assist the department in specific disease prevention and control activities;
      - It serves as a national/regional reference centre for other laboratories in the country;
      - Provides advisory and consultancy services on animal health and laboratory testing;
      - Produce biological products; vaccines, test kits, antigens, antisera and conjugates for the department and industry;
      - Provide training on diagnostic techniques for animal diseases.

   c) Diagnostic services in VRI can be categorized into:
      - Diagnostic cases.
      - Disease control (National disease monitoring, surveillance).
      - Quality control (milk, meat, animal-based products).
      - Reference cases (Salmonella serotyping, AI and others).
      - Animal movement.
      - Research cases.

2. Regional Veterinary Laboratory (MVK)
   a) Borneo
      - Makmal Diagnosa Veterinar, Kuching, Sarawak
      - Makmal Diagnosa Veterinar, Kota Kinabalu, Sabah

   b) Peninsular Malaysia
      - MVK Bukit Tengah, Pulau Pinang
      - MVK Wilayah Tengah, Salak Tinggi, Selangor
      - MVK Johor Baharu, Johor
      - MVK Kuantan, Pahang
      - MVK Kota Baharu, Kelantan

Appendix 4: Common epidemiological terms in handling zoonotic disease.

Agent	A factor, such as a microorganism, chemical substance or radiation, is essential for the occurrence of the disease.
Carrier	A person or animal without apparent disease who is capable of transmitting the agent to others.
Contact	A person or animal that has been associated with an infected person or animal or contaminated environment that provides an opportunity to acquire the infection
Contamination	The presence of a disease agent on a body surface, in clothes, bedding, toys or other inanimate articles or substances, including water and food.
Herd immunity	The resistance of a community to a disease.
Host	Humans or animals that harbour the infectious agent and able to transmit the disease.
Susceptible host	A person or animal not possessing sufficient resistance against a particular pathogenic agent to prevent contracting infection or disease when exposed to the agent.
Reservoir	An animal that harbours the infectious agent can multiply itself, with or without any clinical sign.
Immunogenicity	The ability to produce specific immunity.
Index case	The first case in a family or other defined groups to come to the investigator's attention.
Primary case	The individual who introduces the disease into the group under study.
Suspect case	• A person's history and symptoms suggest that he or she may have developed the disease. • A suspect in the animal is an animal with clinical signs and a history of contact with the infected herd.
Infection	When an infectious agent has entered and established itself in a host.
Infectivity	The ability of an agent to invade and multiply in a host.
Pathogenicity	The ability of an agent of infection to produce disease.
Zoonotic disease	An infection or infectious disease transmissible under natural conditions from vertebrate animals to humans

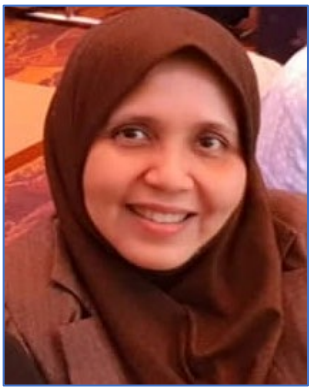
BIOGRAPHY OF EDITORS

Dr. Razitasham Safii is a Professor in the Department of Community Medicine and Public Health, Faculty of Medicine and Health Sciences at the Universiti Malaysia Sarawak (UNIMAS). She attained her MBBS from Universiti Malaya (UM) in 1991, her Master's degree in Community Health (Family Health) in 2003 from Universiti Kebangsaan Malaysia (UKM) and her Epidemic Intelligent Program (EIP) from the Ministry of Health, Malaysia in 2016. She started her earlier career as a medical officer in several health facilities in Sarawak. After completing her Master's program, she was appointed Assistant Director in the Primary Care Unit in the Sarawak Health Department and Senior Principal Director in the Communicable Disease Unit in 2009 before joining UNIMAS in June 2013 as a medical lecturer. Her field of interest is infectious disease epidemiology, which focuses on emerging, re-emerging, neglected tropical, and zoonotic diseases. She has been the One Health Field Epidemiology Training – Introductory Course project leader since 2017. She is a member of the Epidemic Intelligent Program (Malaysia), the Academy of Medicine Malaysia, the Malaysian Public Health Physicians' Association, the Malaysian Society of Environmental Epidemiology (MySEE) and the Protem Committee of the Malaysia Association of Epidemiology (MAE).

Dr. Saraswathi Bina Rai is a Public Health Medicine Specialist and Associate Professor at the Faculty of Medicine at AIMST University, Malaysia. She has served 31 years in public health, starting her career as a school health doctor in Kota Setar, Kedah, in 1986, and finally retired as the Head of the Epidemiology Unit in Penang in 2017. She has served in various capacities at Kedah and Penang's state and districts. Her field of interest is Field Epidemiology, zoonosis, outbreak management and emerging re-emerging diseases. She is a Global Outbreak and Response Network (GOARN) trained and an EIP (Epidemic Intelligence Program) Malaysia graduate. She was deployed to the Philippines in 2014 as a Surveillance Officer for two months under the World Health Organization (WHO). She has numerous publications in her name and has made numerous paper presentations on epidemiology worldwide. Dr. Bina Rai is an Academy of Medicine Malaysia member and currently the Honorary Secretary of the Malaysian Medical Association, Penang branch. She is also a life member of the Malaysian Public Health Society.

Dr. Rosalia Saimon is a senior lecturer in the Faculty of Medicine and Health Sciences at Universiti Malaysia Sarawak (UNIMAS). She attained her PhD in Social and Preventive Medicine from Universiti Malaya (UM). She underwent two years of post-doctoral training in prevention science at Penn State University, USA. Her project with Penn State was to develop a leisure education module for adolescents, My-TimeWise. Her research focuses on health prevention to address adolescent health issues such as substance abuse, internet addiction, physical inactivity, teenage pregnancy and mental health. Adopting a gamification technique in her research, she and her graduate student developed and tested a mobile phone game, "Rabies Hunter," to promote preventive behavior against rabies infection among children. Dr. Rosalia is an active reviewer for Preventive Medicine Report, Cogent Medicine, Asia Pacific Journal of Public Health, Malaysian Journal of Health Promotion and the Malaysian Journal of Health Sciences.

Dr. Mohd Rohaizat is an Associate Professor and Head of the Department of Community Health, Faculty of Medicine, Universiti Kebangsaan Malaysia (UKM). He attained his MD from Universiti Sains Malaysia (USM) in 1998, a Master's degree in Community Medicine (Epidemiology & Statistics) in 2009 from UKM and a PhD in Medical Science from Niigata University, Japan. He started his earlier career as a medical officer at Kuala Lumpur Hospital and later as an Assistant Director in the Medical Development Division at the Ministry of Health Malaysia before joining the Faculty of Medicine, UKM, in May 2004 as a medical lecturer. His field of interest is infectious disease epidemiology, focusing on emerging and re-emerging diseases, neglected tropical diseases, and vector-borne and zoonotic diseases. Dr Mohd Rohaizat has 75 publications, which include 52 indexed articles in Web of Science and Scopus. Apart from teaching and supervising undergraduate and postgraduate students, he has been appointed the Head of the Department of Community Health since May 2020. He is the editor of the Borneo Epidemiology Journal (BEJ) and the Global Journal of Public Health Medicine (GJPHM). He is a member of the Academy of Medicine Malaysia, a Life Member of The Malaysian Public Health Physicians' Association, a Life Member of the Malaysian Society of Environmental Epidemiology, a Member of the Malaysian Association of Parasitology and Tropical Medicine and Protem Chairman of the Malaysia Association of Epidemiology (MAE).



Dr. Rozita Hod is an Associate Professor and Public Health Physician affiliated with the Department of Community Health, Faculty of Medicine, Universiti Kebangsaan Malaysia (UKM). She obtained her medical degree from UKM in 1993. She served in the Ministry of Health (MOH) for 15 years before joining UKM in 2008. Her last post in MOH was as Principle Assistant Director in the Environmental Health Unit in the Disease Control Division. She is the Coordinator for the Master of Public Health (MPH) Program at UKM and sits on the Public Health Conjoint Board Malaysia. Her research interests are environmental health, especially climate change and its impacts on health. She leads various research projects funded by the Ministry of Higher Education. She was appointed a member of the Working Group on Climate Change and Water by the President of the Academy of Science Malaysia (2019 to present). She is a life member of the College of Public Health, Academy of Medicine, Malaysia. She served eight years as Secretary for the Malaysian Society of Environmental Epidemiology (MySEE) from 2012 till 2020. She is also the Malaysian representative for EcoHealth Network, which comprises 15 countries in the Asia region.

Dr. Azimatun Noor Bt Aizuddin is a trained Medical Doctor from Universiti Sains Malaysia (USM). She has a Master in Public Health (Hospital and Health Management) from Universiti Kebangsaan Malaysia (UKM) and a PhD in Public Health from UKM and United Nations University-International Institute for Global Health (UNU-IIGH). She started as a medical officer at Selayang Hospital and later as Senior Assistant Director in the Public Health Division, Ministry of Health, Malaysia, before joining UKM as a medical lecturer. As an associate professor, her main interests are health financing, health economics, and public health. Aside from being a Senior Lecturer at the Department of Community Health, she is also a Public Health Specialist and is currently the head of the International Training Centre for Casemix and Clinical Coding, UKM. Dr. Azimatun Noor is the editor of the International Journal of Public Health Research (IJPHR) and a reviewer of a few journals locally and internationally. She is a member of the Technical Advisory Committee for Health Technologies Economic Evaluation (TACHTEE) and Technical Advisory Committee for Casemix, Ministry of Health, Malaysia, Honorary Secretary of the Health Economics Association Malaysia (MAHEA), Life Member of the Malaysian Public Health Physicians Association, Malaysian Pharmacoeconomics and Outcome Research Group (MySPOR) and members of Malaysia One Health Network University (MyOHUN).

Dr. Rafdzah Ahmad Zaki is an Associate Professor and Public Health Medicine Specialist at the Department of Social & Preventive Medicine, Universiti Malaya (UM). She received a Bachelor of Medicine and Surgery degree from the University of Liverpool and worked in the clinical area for a few years in the UK. She obtained her Master of Public Health (MPH) in 2008 and her Doctor of Public Health (DrPH) in 2013 from UM. She received training in evidence-based medicine from the University of Oxford and formal exposure to clinical epidemiology at the University Medical Centre in Utrecht, Netherlands. She is interested in infectious disease and disease modelling and attended training on Infectious Disease Modelling at the Imperial College, London. In 2016, she received an observership award from the European Society in Clinical Microbiology and Infectious Diseases (ESCMID) for attachment at the European Centre for Disease and Control (ECDC), Stockholm, Sweden. She has led an international collaboration project funded by the Swedish Research Link grant to establish an early warning system for dengue in Malaysia in collaboration with Umea University, Sweden. She also received a Newton Fund Institutional Linkage grant for big data research on dengue in collaboration with the University of Nottingham, UK. She heads the Centre for Epidemiology and Evidence-based Practice at UM.

Dr. Yap Wei Boon is a senior lecturer in the Biomedical Science Programme and Head of the Postgraduate Program by Coursework, Faculty of Health Sciences (FSK), Universiti Kebangsaan Malaysia (UKM). He attained his BSc. (Hons) degree from Universiti Putra Malaysia (UPM) in 2007 and a PhD in Genetic Engineering and Molecular Biology (particularly in the field of Molecular Virology) in 2011 from UPM. He was appointed a post-doctoral fellow at Jefferey Cheah School of Medicine and Health Science, Monash University Sunway, from January 2012 to June 2012. He then joined the Biomedical Science Programme, FSK, UKM, as a senior lecturer in June 2012 till present. His field of interest is Molecular Virology and Immunopathogenesis of Viruses, particularly in emerging and re-emerging viral diseases and zoonotic virus infections. Dr. Yap has published 29 articles, including 18 in WOS/SSCOPUS-indexed journals. He has also secured several research grants from UKM, the Malaysia Ministry of Science, Technology and Innovation (MOSTI), and the Malaysia Ministry of Higher Education (MoHE). Dr. Yap is a member of the Malaysian Society for Microbiology and the American Society for Microbiology. He is also the Deputy Editor-in-Chief and an editorial board member of Journal Sains Kesihatan Malaysia (JSKM) (Malaysian Journal of Health Sciences), UKM.

Dr. Hanizah Mohd Yusoff is a Public Health Physician and an Associate Professor at the Department of Community Health, Faculty of Medicine, Universiti Kebangsaan Malaysia. She has served in public health for 25 years, starting at the district level as the medical and health officer in the Hulu Langat district of Selangor. She was appointed the Principle Assistant Director in Disease Control Division, Ministry of Health where she led the Occupational Health Services Unit and Dengue Prevention and Control Unit. She was the Head of the Occupational Safety, Health and Environment Division at UKM Kuala Lumpur Campus from 2016 to 2019. She was on the technical committee for several national policies, such as the National Policies and Procedures on Infection Control: Chapter OSH (2017). She has also contributed to developing national guidelines, including the Recommendation on Influenza Pandemic Preparedness for Industries in Malaysia (2006). She was a council member of the Malaysian Society of Public Health Physicians (2004-2010) and the Academy of Occupational & Environmental Medicine Malaysia (2015-2017). She was awarded Fellow of the Academy of Occupational & Environmental Medicine Malaysia in 2013. She is now the Vice President of the Malaysian Occupational Health Practitioners Association.

Dr. Nor Azwany binti Yaacob is an Associate Professor in the Department of Community Medicine, School of Medical Sciences, Universiti Sains Malaysia (USM). She attained her MD in 1993 and her Master in Community Medicine (Epidemiology & Statistics) in 2003 from USM. She started her medical career as a medical officer at Hospital USM and later joined the academia as a medical lecturer. She has been the Personal and Professional Development Program chairperson since 2008. This administrative responsibility brought her interest in medical ethics and professionalism, and later focused on public health ethics. She is also one of the pioneers in the human research ethics committee for USM and contributed to the committee's accreditation by the WHO FERCAP. Besides her research interest in chronic diseases, her medical statistics expertise was in questionnaire development, translation, and validation. Dr. Nor Azwany has published research articles on the prevention, control of chronic and infectious diseases, and research related to medical professionalism and validation studies. She teaches and supervises undergraduate medical students and postgraduate Master and Doctorate candidates in Public Health.

Dr. Mariam Mohamad has been a public health medicine specialist for almost 18 years and teaches epidemiology and public health in the Faculty of Medicine, Universiti Teknologi MARA (UiTM). Prior to being a lecturer, she was with the Ministry of Health, serving in the National Public Health Laboratory and Disease Control Division as an epidemiologist overseeing national surveillance and control of infectious diseases. She also managed outbreaks of national and international concerns such as SARS and AH1N1 and gave technical advice to control localized outbreaks. She has published over 40 journal articles, proceedings, reports, and modules and presented papers at national and international conferences. She has been appointed as reviewer, internal/external examiner for MPH and DrPH programs and editorial member of MJPHM. She is a life member of the Malaysian Public Health Physicians' Association, which she is currently an executive council member and has served as the Deputy Secretary since 2014. The Association awarded her the Fellow of Public Health Medicine Malaysia (FPHMM) in July 2018.

Dr. Rozanah Asmah bt. Abd. Samad. Dip. In Science (UiTM), DVM (UPM), PhD (Hokkaido). An experienced and professional retired veterinarian, now a freelance consultant in her company, RAAS Consultant Management. She worked with the Department of Veterinary Services (DVS) for over 25 years. She pursued her postgraduate study (PhD) at Hokkaido University, Japan, specializing in the epidemiology of avian influenza viruses. During her service in DVS, she successfully handled major emerging disease outbreaks in the country, such as Nipah Encephalitis, Highly Pathogenic Avian Influenza H5N1, Rabies, and Equine encephalitis, besides many other animal diseases of economic importance. She led various units and sections in the department. She was appointed as head of a delegation for the Fact Findings Mission to evaluate the effectiveness and the needs of ASEAN and Mongolia countries of the Third Country Training Programme (TCTP) during the tenancy in the department. Those opportunities have furnished her with tremendous knowledge and experience to lead and share her knowledge with colleagues and subordinates effectively and efficiently. She is still actively involved in many mediums of One Health and the veterinary field of health.

ISBN 978-629-96566-6-1