

# PPHSN OUTBREAK SURVEILLANCE AND RESPONSE GUIDELINES

First Draft <sup>1</sup>for Comments by the PPHSN Coordinating Body

DRAFT

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<sup>1</sup> This copy is for initial comments by the PPHSN Coordinating Body. Some Annexes will need additional input and acronyms will be included in the first draft to be given to WHO as consultancy report. Slides are not included in this document.

## Table of Contents

Page

1.	Introduction	
2.	General Surveillance and Response in the Pacific	
2.1	What is PPHSN?	
2.2	What is PacNet?	
2.3	What is PacNet-Restricted	
2.4	What is LabNet	
2.5	What is EpiNet?	
2.6	What are the urgent notifiable diseases for the PPHSN?	
2.7	Technical options for Surveillance of Urgently Notifiable Conditions	
3.	Structures for Urgent Reporting and Action	
3.1	Heads of Health Services	
3.2	EpiNet Teams (national and peripheral)	
3.3	Regional Role	
4.	Laboratory Confirmation and Reporting	
5.	Preparedness for Reporting and Response	
5.1	Reporting to PacNet and the PPHSN	
5.2	Maintenance of surveillance following outbreak confirmation	
5.3	Levels of responsibilities	
5.4	Training and National Policy Guidelines	
5.5	Regional Stock Piles	
6.	Regional Collaboration	
7.	Cholera	
7.1	International Implication	
7.2	National Programme Implication	
7.3	Basic Facts	
7.4	Surveillance and Reporting	
7.4.1	Human Surveillance	
7.4.2	Environmental Surveillance	
7.4.3	Syndromic Diagnosis	
7.5	Case Definition	
7.6	Initial Investigation and Response	
7.6.1	Assessment of routine surveillance data	
7.6.2	Initial action and staff responsibilities	
7.6.3	Risk factor assessment (Outbreak description) and further action	
7.7	Diagnosis	
7.7.1	Laboratory diagnosis	
7.8	Intervention for containment of a cholera epidemic	
7.8.1	Standard treatment	
7.8.2	Immunization	
7.8.3	Travel and trade restrictions	
7.8.4	Sanitation and hygiene	
7.8.5	Community interventions	
7.9	Preparedness for Epidemic Response	
7.10	International coordination and support	
7.11	Other conditions	

## Table of Contents (Cont'd)

Page

8.	Typhoid	
8.1	International Implication	
8.2	Other National Programme Implications	
8.3	Basic facts	
8.4	Surveillance and reporting	
	8.4.1 Human surveillance	
	8.4.2 Environmental surveillance	
8.5	Case Definition	
8.6	Initial Investigations and Response	
	8.6.1 Assessment of Routine Surveillance Data	
	8.6.2 Initial Action and Staff Responsibilities	
	8.6.3 Risk Factor assessment and further action	
8.7	Laboratory Diagnosis	
8.8	Interventions for containment of a Typhoid Epidemic	
	8.9.1 Standard Treatment	
	8.9.2 Immunization	
	8.9.3 Travel and Trade Restrictions	
	8.9.4 Sanitation and Hygiene	
	8.9.5 Community Interventions	
8.9	Preparedness for Epidemic Response	
8.10	International coordination and support	
8.11	Other Considerations	
9.	Measles	
9.1	International Implications	
9.2	National Programme Implication	
9.3	Basic facts	
9.4	Surveillance and Reporting	
	9.4.1 Human Surveillance	
9.5	Case Definition	
9.6	Initial Investigation and Response	
	9.6.1 Assessment of Routine Surveillance Data	
	9.6.2 Initial Action and Staff Responsibility	
	9.6.3 Risk factor assessment and further action	
9.7	Diagnosis	
	9.7.1 Laboratory Diagnosis	
	9.7.2 Syndromic Diagnosis	
9.8	Intervention for Containment of a Measles Epidemic	
	9.8.1 Standard treatment	
	9.8.2 Vaccination	
	9.8.3 Travel and Trade Restrictions	
	9.8.4 Sanitation and Hygiene	
	9.8.5 Community Interventions	
9.9	Preparedness for Epidemic Response	
9.10	International Coordination and Support	
9.11	Others Considerations	

## Table of Contents (Cont'd)

Page

10.	Influenza	
10.1	International Implications	
10.2	National Programme Implications	
10.3	Basic Facts	
10.4	Surveillance and Reporting	
	12.4.1 Human Surveillance	
	12.4.2 Case Definition	
	12.4.3 Animal Surveillance	
10.5	Initial Investigation and Response	
	12.5.1 Assessment of Routine Surveillance Data	
	12.5.2 Initial Action and Staff Responsibility	
	12.5.3 Risk Factor Assessment and further Action	
10.6	Diagnosis	
	10.6.1 Laboratory Diagnosis	
	10.6.2 Syndromic Diagnosis	
10.7	Interventions for Containment of an Influenza Epidemic	
	10.7.1 Standard Treatment	
	10.7.2 Vaccination	
	10.7.3 Travel Restrictions	
	10.7.4 Sanitation and Hygiene	
	10.7.5 Community Intervention	
10.8	Preparedness for Epidemic Response	
10.9	International Coordination and Support	
10.10	Other Considerations	
11.	Leptospirosis	
11.1	International Implications	
11.2	National Programme Implications	
11.3	Basic Facts	
11.4	Surveillance and Reporting	
	11.4.1 Human Surveillance	
	11.4.2 Case Definition	
	11.4.3 Animal Surveillance	
11.5	Initial Investigation and Response	
	11.5.1 Assessment of Routine Surveillance Data	
	11.5.2 Initial Action and Staff Responsibility	
	11.5.3 Risk Factor Assessment and further Action	
11.6	Diagnosis	
	11.6.1 Laboratory Diagnosis	
	11.6.2 Syndromic Diagnosis	
11.7	Interventions for Containment of a Leptospirosis Epidemic	
	11.7.1 Standard Treatment	
	11.7.2 Vaccination	
	11.7.3 Travel Restrictions	
	11.7.4 Environmental and Animal Host Strategy	
	11.7.5 Community Intervention	
11.8	Preparations, Stock and Supplies	
11.9	International Coordination and Support	
11.10	Other Considerations	

## Table of Contents (Cont'd)

Page

- 12. Dengue
  - 12.1 International Implications
  - 12.2 National Programme Implication
  - 12.3 Basic facts
  - 12.4 Surveillance and Reporting
    - 12.4.1 Human Surveillance
    - 12.4.2 Case Definition
    - 12.4.3 Environmental Surveillance
  - 12.5 Initial Investigation and Response
    - 12.5.1 Assessment of Routine Surveillance Data
    - 12.5.2 Initial Action and Staff Responsibility
    - 12.5.3 Risk factor assessment and further action
  - 12.6 Diagnosis
    - 12.6.1 Laboratory Diagnosis
    - 12.6.2 Syndromic Diagnosis
  - 12.7 Intervention for Containment of a Dengue Epidemic
    - 12.7.1 Standard treatment
    - 12.7.2 Vaccination
    - 12.7.3 Travel Restrictions
    - 12.7.4 Environmental Strategy
    - 12.7.5 Community Interventions
  - 12.8 Preparedness for Epidemic Response
  - 12.9 International Coordination and Support
  - 12.10 Others Considerations

## 13. UNUSUALLY OCCURRING SERIOUS CONDITIONS

## ANNEXES

- ANNEX ...: SPECIFIC QUESTIONS IS SETTING UP AN URGENTLY NOTIFIABLE SYSTEM 1 ASSESSING THE LEVEL OF PREPAREDNESS OF THE EPINET TEAM
- ANNEX ...: DAILY TALLEY SHEET OUT PATIENTS DEPARTMENT
- ANNEX ...: SUSPECTED MEASLES -- LINE LIST
- ANNEX ...: DETAILED CASE MANAGEMENT GUIDELINES FOR CHOLERA
- ANNEX ...: OTHER COMMUNITY INTERVENTIONS FOR CHOLERA  
SAMPLES OF KEY EDUCATION MESSAGES,  
WATER CHLORINATION GUIDE AND KEY ELEMENTS FOR FOOD SAFETY
- ANNEX ...: PLAN LOGISTIC AND STAFF
- ANNEX ...: SUPPLIES NEEDED TO TREAT 100 CHOLERA PATIENTS
- ANNEX ...: CALCULATIONS FOR SUPPLIES OF EQUIPMENT FOR CONTAINMENT AND STOKING



## INTRODUCTION TO EPINET REPORTING AND RESPONDING SYSTEM

### 1. INTRODUCTION

The 1969 International Health Regulations endorsed by member countries of the World Health Organization (WHO) and updated and printed again in 1992 set the basis for global public health surveillance and response to diseases of serious global concern. Three diseases, yellow fever, plague and cholera have been classified as urgent internationally notifiable diseases. These are diseases that should be reported to WHO and a neighboring country in the interest of regional and global health. In the Pacific islands WHO and the Secretariat of the Pacific Community (SPC) had worked towards setting up a system that will allow countries to be able to respond quickly to any epidemic disease and at the same time be able to inform neighboring countries of any threat of the spread of the disease and to seek support and collaboration in the containment of epidemics.

The development of this manual is the culmination of the work that had been undertaken by the Pacific Public Health Surveillance Network (PPHSN), through the Pacific Public Health Surveillance Network Coordinating Body (PPHSN-CB), being undertaken in collaboration with member states of the World Health Organization (WHO) and the Secretariat of the Pacific Community (SPC). The manual is also a follow through from the commitment made by Ministers of Health of member states in the Madang Commitment towards healthy islands following the report of the PPHSN. The commitment of all member states called for a sustained and renewed commitment to communicable disease prevention and control given the continued threats of outbreak prone diseases and the endemic burden of many infectious disease already prevalent in the island countries of the region. Effective surveillance and response was seen as an essential intervention to control diseases of public health importance in the region. The World Health Organization in facilitating the development of this manual aims to bring all its global experience in surveillance and outbreak investigations to ensure that countries of the region are able to respond efficiently to outbreak prone diseases faced by the island countries of the region. It is also facilitating this in light of existing international health regulations, in the interest of protection of public health.

Workshops and meetings conducted jointly by WHO and SPC with participants National EpiNet team members from member countries decided on methodologies to carry out surveillance and monitoring of selected diseases of epidemic importance in the region. Using these methodologies, the six diseases were selected as epidemic prone diseases that required immediate reporting and response. These diseases include: (CTMILD)

- Cholera,
- Typhoid
- Measles,
- Influenza,
- Leptospirosis, and
- Dengue.

This manual spells out the consensus reached in each of the workshops on a regional and national approach to ensuring improved response to epidemics in the region. The manual focuses on improving the mechanism for response to the six focus diseases in the region. Acknowledging the existing systems of surveillance in countries, the manual provides a simple user-friendly guide to members of the EpiNet teams<sup>1</sup> or their equivalent surveillance and response mechanism to make the right decisions and provide guidance for their effective response to suspected epidemics of the six selected diseases at the country level. The manual provides information to the EpiNet team member

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<sup>1</sup> EpiNet Teams are synonymous with existing public health surveillance and response systems in PICTS

and intends to guide the national level responses in surveillance and monitoring of epidemic diseases. It spells out basic principles of surveillance but focuses on the practical steps that should be followed in the event of a report of a possible outbreak of one of the six diseases in a given country in the region.

The manual should also serve as resource documentation to other agencies such as the transport industry, pharmaceutical supply agencies and veterinary services in a country.

A special emphasis is placed on linking LabNet and EpiNet as it is essential that the national EpiNet teams are aware of the practical means of confirming an epidemic through sample collection, transportation and analysis. Major input from all countries in the region are to ensure that all suspected epidemics are reported to PacNet.

The guidelines should serve as a practical guide for response to epidemics linking with PacNet and LabNet to facilitate a comprehensive surveillance system for the region. The manual should also set the basis for development of comprehensive surveillance guidelines for each country and more detailed guidelines for the various laboratory services in the countries

It is hoped that the guidelines serve as an advocacy for all relevant agencies both within the countries and the region that should be made aware of any comprehensive response to any epidemic threat. Institutions like the veterinary services in all the countries, the local disaster management entities and the regional disaster management agencies including South Pacific Applied Geological Commission (SOPAC) and the Pacific Emergency Health Initiative (PEHI) would find these general guidelines useful to advocate for commitment of countries and the different regional entities to address epidemic diseases as an important part of development agenda in the countries and territories of the region.

## **2. GENERAL SURVEILLANCE AND RESPONSE IN THE PACIFIC**

One of the aims of the PPHSN is to provide tools and technical expertise to the Pacific Islands in order to improve their surveillance and response activities whenever needed. In reviewing the current surveillance capacity there are still improvements needed. These guidelines will therefore serve as guidance to improve surveillance and response in the region through the existing national disease surveillance and response mechanisms, which has been named in this manual as EpiNet teams in accordance with the regional structure of PPHSN.

In the early days of the development of PPHSN the PacSel methodology was developed as a tool for countries to select priority communicable diseases and health indicators for surveillance. It was developed and validated during the preparatory year before the PPHSN establishment. This methodology was taught during the first series of SPC sub-regional public health surveillance workshops. It was applied in some of the Pacific countries or territories. The same methodology had been used with consensus to select the six diseases for urgent notification in the region.

Other inputs included in-country technical assistance provided through the PPHSN to:

- Implement the hospital-based EPI active surveillance or on request,
- Review and upgrade of the communicable disease surveillance and health information systems,
- Control outbreaks of communicable diseases.

While there are good structures in place to build upon there is still a need to improve response to epidemic diseases in the region. In reviewing available documentation in Inform' Action<sup>2</sup> it is

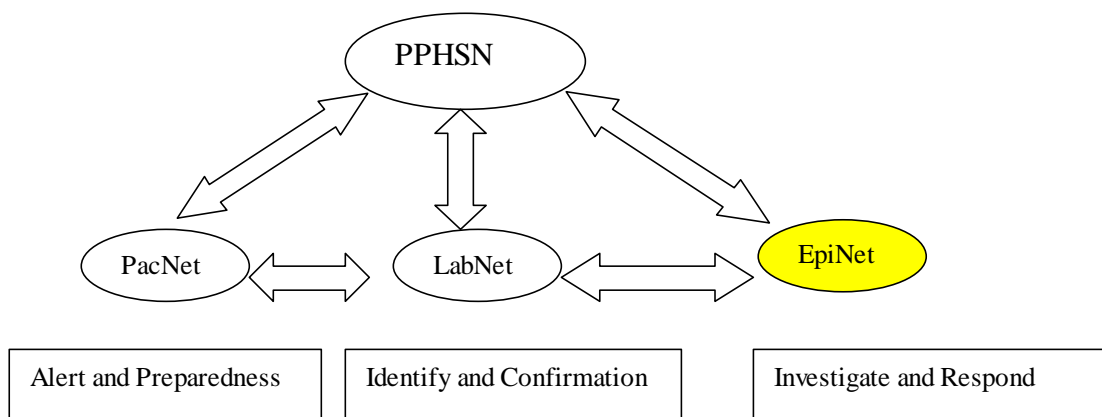
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<sup>2</sup> Review of all the "Inform' Action" The formal publication of PPHSN

interesting to note that only a few countries and territories had the capacity to adequately keep track of important epidemic diseases. Only a few countries have been able to respond efficiently to influenza and dengue epidemics more efficiently than most countries in the region. Exchange of information such as the documentation on the cholera outbreak in Pohnapei provided in Inform' Action<sup>3</sup> is an example of a country response that would serve as a model for action. Warning and guidance provided by Inform Action of August 2001 in reference to the Dengue outbreak affecting the Pacific is a classical example of a collective response to any epidemic threat. However, only eleven (11) of the twenty-two (22) members of PPHSN reported cases as was also noted in Inform' Action<sup>4</sup>. This illustrates the fact that there is still a lot more to be done in improving surveillance information for the six-selected diseases from all the members of the PPHSN through out the region. While there has been general improvement in the documentation of epidemics there is still a need for full participation by all members of the PPHSN in a timely manner. This will become increasingly important as we face new and re-emerging diseases in the region including those created by threats of bio-terrorism and other man-made disasters.

Since the establishment of the Pacific Public Health Surveillance Network (PPHSN) and the coordinating body, the network had worked towards establishing structures that enhanced full participation by all Pacific Island countries and territories. A network, which would cut across political boundaries and one that, would enable all countries and territories to respond efficiently to disease epidemics at both the national and the regional level. This was vital as the Pacific had a difficult geo-political setting to allow a coordinated response to epidemic diseases of importance to the region. PPHSN has since developed the concept of the three legs of surveillance in the Pacific: PacNet, EpiNet and LabNet.

Fig: 1. The Three Legs of PPHSN



## 2.1 What is PPHSN?

PPHSN stands for Pacific Public Health Surveillance Network (PPHSN) which is the Pacific epidemiological surveillance network dealing with disease surveillance, that involves, recording, reporting, confirmation and responding to diseases of public health importance in the Pacific region. Currently the network encompasses three networks of services, PacNet, LabNet and EpiNet.

<sup>3</sup> Inform' Action, July 2000

<sup>4</sup> Inform' Action, April 2000

The primary aim of the PPHSN is to improve public health surveillance in the Pacific in a sustainable way. The Pacific Island Meeting on Public Health Surveillance agreed that the original working group became the PPHSN Coordinating Body (CB), with SPC as focal point. Five strategies were endorsed to guide the development of the network:

- Harmonisation of health data needs (first focus of the working group) and development of adequate surveillance systems, including operational research
- Development of relevant computer applications
- Adaptation of field epidemiology and public health surveillance training programmes to local and regional needs
- Promoting the use of e-mail, and opening the Network to new partners, new services and other networks
- Publication of health information bulletins, technical studies, applied research findings, monographs, information on resources available in the network, etc.

The PPHSN-CB aims<sup>5</sup> to support the activities and functioning of the PPHSN by:

- Developing and implementing a dynamic action plan for the PPHSN (the action plan will address issues including, but not limited to, public health surveillance and response, relevant training, and operational research);
- Organizing, coordinating and integrating PPHSN activities (this will include, but not be limited to, liaising with other organizations, and securing adequate resources for PPHSN activities);
- Monitoring and evaluating PPHSN activities;
- Communicating the status of PPHSN activities to its membership and outside entities;
- Providing leadership in the identification and control of public health problems in the region;
- Advocating the development and use of evidence-based practices in public health surveillance and response; and
- Facilitating preparedness for dealing with new and emerging diseases in the region.

The major proposed roles and responsibilities<sup>6</sup> of the PPHSN-CB Focal Point are to support the functions of the PPHSN-CB by:

- Representing the PPHSN at conferences and meetings,
- Providing a Secretariat function for the PPHSN-CB,
- Organizing PPHSN-related meetings, and
- Transmitting the results of PPHSN-related meetings to the membership and other appropriate entities.

Other CB members might also undertake these roles from time to time.

In addition to these the PPHSN focal point will continue to be involved in training and facilitating communication between all members of the PPHSN.

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<sup>5</sup> Approved aims and responsibilities by the Coordinating Body of PPHSN

<sup>6</sup> Tailored from existing Focal point roles and responsibilities, highlighting core functions only

## 2.2 What is PacNet?

PacNet is one leg of the PPHSN that deals with reporting. PacNet serves as an early warning system for diseases of outbreak importance. All countries and territories have been encouraged to report any suspected disease of outbreak importance to PacNet through an electronic list server that is being currently managed by the Secretariat of the Pacific Community (SPC). This component of the network should enable countries and agencies to be informed of the occurrences of epidemic diseases in the region. PacNet is therefore the arm of the Pacific Public Health Network that deals with **preparedness, alert and reporting** of any unusual occurrences of diseases in the region.

## 2.3 What is PacNet Restricted?

To allow a not-yet verified information on outbreaks to be circulated as early as possible amongst the Pacific Island Departments or Ministries of Health and some key allied members of the PPHSN, a list called “PacNet-Restricted” has been set up. The aim of this restricted list is to ensure timely alert and ensure preparedness to outbreaks threatening the Pacific Islands, with a higher degree of confidentiality.

The list comprises of a sub-set of PacNet members, all having either (i) decision-making influence and responsibilities within the Pacific Islands countries and territories (PICTs) Core members of the Pacific Public Health Surveillance Network (PPHSN) or (ii) being among the 12 individuals members of the PPHSN-CB.

PacNet-Restricted is devoted to non-verified outbreak alert messages. It means that the information on PacNet-Restricted is not yet confirmed by a proper/specific diagnosis. This allows politically sensitive information to be disseminated with a degree of confidentiality and not compromise the need to be prepared to avoid large-scale morbidity or mortality due to epidemic diseases in the region. This will allow those who need to know to get prepared and respond accordingly.

## 2.4 What is LabNet?

LabNet is the second leg of the PPHSN that deals with the **confirmation** of any disease outbreak. LabNet is a network of all laboratories in the region and those laboratories that support laboratories in the region to make confirmatory diagnosis of diseases of epidemic importance in the region. Laboratory levels have been designated into Level 1, Level 2 and Level 3. This is to ensure that aspects of quality control, cost effectiveness, basic minimum standards, and storage and supplies are well coordinated. *(Although not yet fully defined a separate manual may be needed to spell out more clearly the functions of LabNet).* In short LabNet is the second arm of the PPHSN that deals with the **logistics** of specimen shipping and **confirmation** of a particular disease outbreak.

## 2.5 What is EpiNet?

EpiNet is the third leg of the PPHSN that mostly deals with **response** to outbreaks. EpiNet is the network that involves all the EpiNet teams in all countries and territories in the region on the surveillance and response aspect of the Pacific Public Health Surveillance system. This requires commitment from all members of PPHSN to make it work. This manual therefore attempts to spell out the guidelines to ensure EpiNet is functional and enables countries to respond effectively to epidemics in a collaborative Pacific spirit.

## 2.6 What are the urgent notifiable diseases for the PPHSN?

**The following conditions require IMMEDIATE NOTIFICATION AND ATTENTION BY THE EPINET TEAM/NETWORK:**

CHOLERA  
TYPHOID  
MEASLES  
INFLUENZA  
LEPTOSPIROSIS  
DENGUE  
AN UNUSUAL SERIOUS CONDITION

"IMMEDIATE" means e-mail radio, fax, or fastest means to DOH, EpiNet Team focal point and PacNet.

In respect to diversity of the distribution of other diseases of public health importance in the region, the list provided is not prescriptive of the diseases that require urgent notification in all countries and territories of the region. Countries and territories can therefore add other diseases of outbreak importance to their individual lists.

These definitions represent guidelines for reporting, and not definite diagnosis, as the aim of the system is to detect an epidemic of a selected disease as early as possible and respond immediately. Therefore the initial steps should ensure training and awareness on suspected signs and symptoms of the selected diseases. An additional category of "Unusual Serious Condition" has been added to the six selected diseases to enlarge the scope of surveillance to include any other fatal epidemic condition that can be detected through a syndromic diagnosis. This is important as there are new and emerging diseases including the threat of bio-terrorism, which the surveillance system in the region should be versatile enough to detect.

The following definitions of the selected diseases provide guidelines on the initial decision to report a suspected case. A detailed case description is given under each of the disease chapters in this manual.

### **SUSPECT conditions must be reported immediately.**

**Cholera:** Sudden onset of profuse, usually painless, watery diarrhea with rapid dehydration, or death due to diarrhea of a person 5 years or more.

**Typhoid:** Sustained fever of 38 degrees centigrade or more for 3 or more days

**Measles:** High fever with generalized (red) blotchy/macular rash, often with cough, runny nose, conjunctivitis, and malaise.

**Influenza:** Sudden onset of Fever, headache, muscle ache, cough and running nose (affecting many people at once)

**Leptospirosis:** Sudden onset of fever, myalgia, headache,<sup>7</sup> jaundice, conjunctival suffusion, signs of hemorrhage and kidney failure.

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<sup>7</sup> +/- Weil's Syndrome

**Dengue:** Fever for 2-7 days with two or more of the following manifestations; headache, retro-orbital pain, myalgia, arthralgia, rash, haemorrhagic manifestations and, leukopenia.

**Unusual Serious Conditions:** A cluster of serious illness or death, or an occurrence of an unusual illness or condition in a locality.

## 2.7 Technical Options for Surveillance of Urgent Notifiable Conditions

Depending on the prevalence of the disease in any given country the national EpiNet team should decide on the surveillance type, which should be utilized for each of the selected diseases for surveillance. A decision should be made as to whether **all facilities** report, whether a **laboratory based** reporting system be engaged, whether there is a need to design a **sentinel** surveillance system or whether a **hospital based** system is needed for a particular disease. It is important that this decision is made, as it would be most cost effective to design appropriate systems for each of the diseases dependant on the capacity and resource availability of each country or territory. In some instances a combination of either can be used to improve the sensitivity of detection of an epidemic.

## 3. STRUCTURES FOR URGENT REPORTING AND RESPONSE

### 3.1 Head of Health Services

As is the case in most countries the **Director of Health or his/her equivalent** in each country is normally responsible for administrative and financial aspects in a health response during a major natural disaster. The head of health is also the focal point of all sectors of government for health related matters and it is important that cross sector and international communications regarding the six selected diseases be facilitated through the head of health services in the country. It is therefore important that he/she plays a major role in setting up the EpiNet team and ensures that it has the necessary resources and political/bureaucratic support to ensure sustainability.

### 3.2 EpiNet TEAMS

<b>National Level</b>
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At the national level the **Director of Health** in each country/territory should maintain an EpiNet outbreak investigating team. The exact size and composition of the team would depend on the specific situation and would be at the discretion of the Director of Health. Team members in most countries have been designated. Five categories of health personnel should be included in the team membership. These include:

- Management Supervisor
- Field Investigations Supervisor
- Laboratory Personnel
- Clinician
- Data manager

The team should be made up of people that can be contacted quickly and are available immediately to respond to any outbreak. The team members would be called upon from their various field of expertise to contribute to the response. The team should be made up of people that can be called upon immediately to meet when the need arises. It should have well-defined terms of references and all members should be aware of their individual roles and responsibility in an event of an outbreak. Other sectors can be co-opted to the team depending on the nature and extent of the epidemic.

The National EpiNet team should ensure that adequate support is provided to peripheral teams where it is applicable.

### Peripheral Level

Most countries in the region are small and therefore there may not be a need to have peripheral level EpiNet teams. However in larger countries there will be a need to have peripheral level teams that would be responsible for the initial confirmation and response to any epidemic. The decision to set up peripheral level teams will need to be made at the country level depending on the size and structure of the health system in each country.

At the peripheral level the team should have good communications link with the national EpiNet focal point and should be made up of local:

Public Health Official  
Nursing Supervisor  
Physician/Pediatrician  
Laboratory Technician

Each peripheral level EpiNet team should focus on early detection and reporting and assist the national team in the implementation of intervention programmes to contain the epidemic.

In most cases the national team can play both the role of a peripheral team and that a national team.

### 3.3 Regional Role

All regional partners will collectively assist the Pacific Island Country or territory where the epidemic has occurred. The focal point of the PPHSN and the coordinating body will be responsible to carry out the necessary administrative support for outbreak response once a formal report and request has been sent to the focal point through official communications from a country or territory.

The focal point will be responsible for raising finances, upkeep of stocks and supplies and coordinating expert inputs from different countries in the region as and when required.

Quality assurance and monitoring of effectiveness of response should also be carried out by the regional focal point. Regional training on particular epidemic measures can also be facilitated and carried out jointly by the PPHSN.

## 4. LABORATORY CONFIRMATION AND REPORTING

As there are limited laboratory services in most of the countries and territories of the region it is important that PPHSN ensures a cost effective means of confirming outbreaks in linking up regional support for the laboratory confirmation of diagnosis. On this basis that a 3-tiered system of laboratory support has been set up i.e. LabNet. All countries of the region should have level 1 capability, while four locations were designated as level 2 laboratories, Guam Public Health Laboratory, Pasteur Institute, New Caledonia, Institute Malarde, Tahiti and Mataika House, Fiji. Depending on in-country capacity and communication and transport links with the designated Level 2 laboratories, they would assist in conducting initial confirmatory tests and provide support to transport samples to level 3 laboratories for confirmation. (The LabNet procedures and guidelines should spell out the category of each level of laboratory and the equipment requirements for each level of laboratory). Countries and territories each already have a mechanism to confirm diagnosis for other communicable diseases and have existing laboratory referral mechanisms. Most of the existing mechanism deals with clinical

samples, however the national EpiNet team is encouraged to ensure that the system also addresses the public health needs that may arise during an epidemic. The existing mechanism should therefore be used based on the practicality of the situation. Emphasis should be given to the urgent diagnostic confirmation of each of the six diseases of regional importance.

Level 1 Lab	National/ Local Level	Collection of specimens and basic tests to verify epidemic  Provision of support and supplies, Stockpiles of lab supplies, Carry out initial confirmatory tests & Prepare samples for shipment  Further confirmatory tests and feed back
Level 2 Lab	National/Local, Regional Levels	
Level 3 Lab	International Level WHO collaborating centers etc.	

## 5. PREPAREDNESS FOR REPORTING AND ACTION

The threat of epidemic diseases is a real one for the Pacific Island Countries and territories as are illustrated by the following figure illustrating the most recent outbreaks in the region. It is therefore important that all countries and territories develop appropriate plans and policies to respond to epidemic diseases in the region. Annex 1 of these guidelines provides the basic questions that a national EpiNet team should ask to set up monitor and evaluate a surveillance system for urgently notifiable conditions in the region.

*Inset Slide "Major Outbreaks in WPR"*

The National EpiNet teams should be aware of the prevalence of a urgently notifiable disease in any given locality and the **natural disaster** such flood which may influence the epidemic risk. In such as case the case the EpiNet team should work with relevant agencies to develop a plan to minimize the risk of outbreaks following a natural disaster.

### 5.1 Reporting to PacNet and the PPHSN

When reporting any outbreak to PacNet it is suggested that the out line of a report should follow the following:

- (a) Global description:
  - Total number of cases, causative agent (or suspected)
  - Period of time involved
  - Geographical distribution (islands, cities, villages, areas)
  - Number of fatal cases
  - Number of severe forms
  - Diagnostic methods, # of samples tested, laboratory involved

- Case definition used and clinical particularities, if any

(b) Trends:

- Weekly incidence
- Age breakdown
- Geographical spreading (where it started and progress over time)
- Description of prevailing Epidemiological pattern
- Note any recent epidemic history in relation to the global description

(c) Measures taken and/or considered

(d) Note down needs (if any):

- Resources needed to confirm, monitor and to control the epidemic
- Confirm the nature of the epidemic: request for reference laboratory assistance

## 5.2 Maintenance of Surveillance following outbreak Confirmation

Once an outbreak is confirmed the national EpiNet team must continue to make assessment of risk by monitoring the following indicators; Monitor the number of cases, deaths, and outbreak sites;

- Monitor the attack rate and case fatality rate at each outbreak site;
- Map the location of outbreaks;
- Graph the number of cases by week of onset;
- Graph the number of outbreak sites by week of onset (based on onset date of the first case; and
- Review patient characteristics for high-risk groups and potential sources of infection.

Regular visits to the outbreak site by the national or peripheral EpiNet team is imperative during an outbreak. If health facilities are not submitting reports, visits to these sites to determine if cases are occurring should be considered.

During staff training all staff should be made clearly aware of the methods of calculating the different rates for and how to keep proper track of the epidemic.

## 5.3 Level of Responsibility

**Local Health Care Provider** should be trained and be well informed of the six selected diseases in this manual and any other disease of importance to the locality and must immediately notify the person in charge of the nearest health facility or EpiNet team when an urgent notifiable disease or an outbreak is suspected. The specific details of urgent notifiable diseases protocols for surveillance, reporting and response will vary by country according to the capacity and needs of individual countries.

**Nearest Health Facility** responsible for the supervision of the peripheral health worker must **confirm** and report to the national EpiNet team that an urgent notifiable disease is suspected in the locality. The closest health facility **takes immediate clinical action**, gets a list of patients and instructs the peripheral health worker to update the list. Refer to the chapters on the specific diseases regarding initial medical treatment and admission of patient, etc. **Contact** the focal point for the nearest EpiNet Team, **immediately** after confirming the suspected case of the urgently notifiable disease. A copy of the same message should be communicated to the focal point for the national EpiNet team. The communication should contain the following information: **Age, sex, symptoms, date of onset of illness, locality, number of cases and deaths.** (A copy of the patient list might need to be sent as well)

**The EpiNet Team discusses** with the local health care provider, **decides and determines** immediately whether there is a need for further action. This may require an initial on-site visit together with the supervising health facility or available medical or local public health official. Whenever possible, a physician should examine the index case and confirm the diagnosis. The EpiNet team should then ensure laboratory samples are collected. The remaining chapters of this manual provide standard operating procedures for detection of epidemics and responding to each of the six selected diseases of epidemic importance to the region. It is always important to keep the public informed with accurate and factual information. Again the EpiNet team plays an important focal point role for information dissemination. Regular feed-back should be provided to the general public through the mass media in close collaboration with local and national health authorities. The EpiNet team must keep a log of all reports regardless of actions taken. If there are peripheral EpiNet teams it is imperative that there is an open communication line with the national EpiNet team focal point. The national EpiNet team should also keep 2 way communications with peripheral health workers at all times by providing regular feedbacks on reports.

**National EPINET Team** should ensure there is open communications with PPHSN and neighboring countries. There are adequate supplies in the country or are readily available and appropriate other resources are made available to act appropriately in case of any serious epidemic. In the event of a suspected epidemic of the selected diseases the team should immediately send e-mail messages to PacNet on the situation of the epidemic and request any specific support if required. Posting on PacNet and PacNet restricted will allow the coordinating body (WHO, SPC, UNICEF and Others) and other countries in the region to collaborate in the containment and forewarn countries in the region to take precautions to avoid introduction of particular infectious agent to a neighboring country. *(Yet to be clarified in upcoming meetings as this appears to be contrary to general feeling of the workshops)\*\* my comments" openly and responsibly attending to epidemics together will only reaffirm regional commitment to address issues of public health concern and therefore I believe countries should not feel afraid to share information when there is an epidemic. Responsible action will enhance confidence in our countries and regional agencies to respond collectively. I believe responsible reporting and action will enhance confidence in our system and therefore people will not feel afraid to visit our part of the world. If the global health regulations are translated into region specific regulations, it will go a long way to support this aspect of PPHSN)*

Members of the national team should plan and assist in the investigation and confirmation process so as to maintain surveillance at the national level and to avoid new outbreaks in neighboring countries. The National EpiNet team should also use this opportunity as experience to develop new policies to improve efficiency in detection and response to other epidemic diseases. It should also provide training opportunities for health workers in surveillance and response to epidemics, including case investigations and other operational aspects of epidemic containment.

The global public health regulations should be the basis of national response to epidemics. The national EpiNet teams should therefore play an important role in the implementation of the requirements of the global regulations at the sub-regional and national level.

Annex.. provides details of a sample message format for reporting of disease outbreaks.

## **5.2 Training and National Policy on Surveillance**

Training of staff at all levels to be aware of the diseases of public health importance is an important part of preparedness to respond to important epidemic diseases in any country. Health care providers at all levels should be conversant with the case definitions of the six selected diseases for urgent notification in the region. Staff should be aware of the basic recording and reporting system for the six diseases.

Being well prepared is the best way to guarantee a rapid and effective response to any disease of epidemic importance. At the national level appropriate policies need to be put in place to ensure that the following issues are addressed in order to facilitate a comprehensive response to any epidemic disease. The EpiNet team should ensure the following:

- (i) Ensure that the surveillance system can detect any condition of epidemic importance;
- (ii) Ensure the capability to get laboratory confirmation (sample collection, packaging, transportation and communication)
- (iii) Identify and address training needs
- (iv) Maintain a reserve stock of essential equipment and supplies
- (v) Has the capacity to organize an epidemic committee
- (vi) Plan logistics and staff responsibilities
- (vii) Ensure that financial support is available for preparation and response
- (viii) Plan for implementation of control measures
- (ix) Ensure that there is an appropriate policy environment for an emergency response plan
- (x) Evaluate epidemic preparedness
- (xi) Plan for prevention

Necessary stocks and supplies including, medications, IV fluids, vaccines, sample collection containers, transport mediums etc. need to be kept in stock in preparation for any out break. Annex ..... Provides details of stock supplies for the six selected diseases.

If the EpiNet team ensures these are carried out the country will be prepared for an epidemic and also be able to carry out interventions efficiently during an epidemic.

### **5.3 Regional Stocks Piles**

A standard list of stocks should be developed based on the epidemiological risk of a disease on epidemic importance in that country. Annex .. Has a standard list of supplies for each of the urgently notifiable conditions covered in this manual.

For the smaller island states the PPHSN focal point should ensure that existing networks are used to ensure a reliable source of supplies is available for epidemic repose.

In larger countries of the region local stockpiles should be arranged and kept in stock at all times. The national EpiNet teams should ensure that these supplies are not outdated or depleted so they are ready for utilization immediately upon request in an event of an out break.

## **6. REGIONAL COLLABORATION**

The World Health Organization currently collaborates with the following entities in the Asia Pacific region including the PPHSN. Regional and global collaboration should tie together all the different entities involved in surveillance as shown in the following diagram. The National EpiNet team members should be aware of these networks so as to seek additional advise and support should it arise depending on the geographical locality, or a political affinity of a country or territory.

***Insert slide “Inter-country Surveillance Network”***

Globalization and modern transport and communications technology has made it possible for island countries to develop a public health surveillance systems that should be efficient. All countries of the

region need collaboration if the system is to meaningfully assist the island countries to prevent morbidity and mortality resulting from epidemic diseases. There global health legislation currently in review should set the basis for the regional response. The work currently being done should set the basis for a Pacific Island Country specific regional health regulation, which should formalize all countries commitment to public health response to epidemic diseases in the region.

The PPHSN supported by its coordinating body has developed a regional **communication network** to serve as **information exchange** to facilitate action and **collaboration** in responding to epidemics. In order to sustain this mechanism the regional organizations can play an important part in supporting countries in the region **address epidemic diseases**, which do not respect political boundaries. PPHSN should therefore have a well-funded secretariat in a regional entity like SPC. A core funded Secretariat would facilitate meetings of the PPHSN, manage the list server for PPHSN, and will facilitate a mechanism for **cross country communication**, exchange of staff including, **staff training** and provide some **recurrent costs** to the entities which would have a sub-regional role like the Level two laboratories in selected countries. The Secretariat would also manage a regional **database** of the different **expertise** available in the region and who could be called upon for specific advice when required. Such arrangements would ensure sustainability of a regional network of surveillance and response to epidemic diseases. *This should have the role of administering the role of the PPHSN and the Coordinating body. It should look after financing for calling upon regional experts to investigate outbreaks, have fids for fellowships and attachments, keep central supplies for epidemic responses etc...*

## 7. CHOLERA

### 7.1 International Implication

Under the terms of the International Health Regulations of 1969, cholera is one of three diseases for which it is mandatory to notify the World Health Organization. National health authorities should report the first suspected case of cholera in their country to WHO as rapidly as possible. The national EpiNet teams should therefore play an active role in meeting the requirements of the international health regulations.

### 7.2 National Programme Implications

A strong programme for the control of Diarrhoeal diseases (CDD) is the best preparation for a cholera epidemic both in areas that have not yet been affected and in areas where cholera has been reported. The Healthy islands concept endorsed by the regional ministers of health should be the basis for overall improvement in water, sanitation and personal hygiene.

### 7.3 Basic Facts

- The infective organism, *vibrio Cholera*, usually enters through the drinking of water contaminated with faeces or vomitus of a patient, or faeces of a carrier. Food also may be contaminated with dirty water or by flies. Person to person contact can occur through faecal-oral contamination.
- Cholera is characterized by sudden onset of painless diarrhoea, in any age group, with very profuse watery stools. Diarrhea stools look like "rice-water", and have a "fishy smell". One or two diarrhoea stools may be followed by vomiting and muscle cramps.
- Severe dehydration and circulatory collapse may follow, and death may occur after only 10-12 hours (As little as 2 hours to as long as 30 hours). Fever is not a common symptom.

- The incubation period is from 12 hours to 5 days. Cholera is highly infectious, and highly fatal. Cholera can cause serious epidemics with high death rate within a few days.
- Most cholera infections are mild; patients may have no symptoms or only mild diarrhoea. In a minority of cases, however, there is rapid onset of severe watery diarrhoea and vomiting, resulting in the loss of large amounts of fluid and electrolytes from the body. Patients become thirsty, stop urinating, and quickly become weak and dehydrated. Patients with severe cholera often complain of cramps in the stomach, arms, or legs.
- All cases of cholera should be treated immediately. If treatment is delayed or inadequate, death from dehydration and circulatory collapse may follow very shortly.
- There are more than 60 serogroups of *Vibrio cholerae*, but only sero-group O1 and O139 causes cholera. *Vibrio cholerae* O1 occurs as two biotypes - classical and El Tor. Each biotype also occurs as two serotypes - Ogawa and Inaba. The El Tor biotype has caused almost all of the recent cholera outbreaks, although cases caused by the classical biotype still occur on the Indian subcontinent. The El Tor biotype also causes a higher proportion of asymptomatic infections than the classical biotype and survives longer in the environment. It can live in association with certain aquatic plants and animals, making water an important reservoir for infection.

### **Common sources of infection**

#### **# Drinking-water**

That has been contaminated at its source (e.g. by faecally contaminated surface water entering an incompletely sealed well) or during storage (e.g. by contact with hands soiled by faeces), and **ice** made from contaminated water.

#### **# Food contaminated during or after preparation**

e.g. milk, cooked rice, lentils, potatoes, beans, eggs, and chicken.

#### **# Seafood**

Particularly shellfish taken from contaminated water and eaten raw or insufficiently cooked.

#### **# Fruit and vegetables**

Grown at or near ground level and fertilized with night soil, irrigated with water containing human waste, or "freshened" with contaminated water, and then eaten raw.

Note that in small island atolls contaminated water supply would be an important source of infection as water tables are close to the surface and can be easily contaminated by pit latrines. This is illustrated by data released by the Pohnapei, Environmental Protection Agency indicating that only 42% of the 29 samples surveyed in May 1999 were free of faecal coliforms. Other important source of contamination in the Pacific includes lagoon water, stream water, sewer system effluent and shellfish and goatfish.

## **7.4 Surveillance and Reporting**

All attempts should be made not to create a new and separate system for cholera surveillance. Existing systems for Diarrhoeal disease surveillance should be used and strengthened to closely monitor cholera.

### **7.4.1 Human Surveillance**

People known to have traveled from a cholera endemic region of the world that have symptoms indicating cholera should provide stool samples for cholera. Otherwise epidemic response will depend on the detection and confirmation of a case of cholera.

#### **Surveillance In Areas Where Cholera Is Not Endemic**

In areas where cholera is not endemic, surveillance can be based on reporting of:

- Severe, dehydrating diarrhea affecting persons aged 5 years or more;
- Diarrhea, which causes severe dehydration, requiring IV therapy or causing death in older children and adults

Although this definition will miss some initial mild cases of cholera, public health personnel should not waste time investigating the many cases of mild diarrhea due to other causes, especially in the less than 5 age groups.

#### **Surveillance In Area Where Cholera Is Endemic, Or During An Epidemic**

During a cholera outbreak or in areas where cholera is endemic, a large proportion of the cases of acute, watery diarrhea in persons aged 5 years or more will be due to cholera. In this setting, the case definition should be broadened so that cholera surveillance includes the milder cholera cases as well. WHO protocols and guidelines should be referred to in broadening the case definitions if the need arise.

Following containment surveillance should continue for at least 10 days or the length of time equivalent to two incubation periods. Again existing surveillance systems should be used to keep track of the epidemic.

### **7.4.2 Environmental Surveillance**

Areas without a safe water supply and good sanitation are at risk for epidemic cholera. This includes municipal areas with inadequately chlorinated piped water, rural areas without access to tube or deep, protected wells, and areas where latrines or sewage systems are not commonly used. In many islands of the Pacific, cholera epidemics are often unpredictable. In a given locale, however, cholera epidemics tend to recur at roughly the same time of year. It is therefore important to know the history of past outbreaks in each country setting. In small island settings of small island atolls and overcrowding with poor hygiene it is important to improve overall overcrowding and water and sanitation facilities in keeping with the healthy island concept of the World Health Organization. With improved water and sanitation the risk of cholera and other enteric diseases transmission will be minimized significantly.

It is important that routine coliform surveillance of water supply is maintained as part of an overall water supply and sanitation programme. The EpiNet team should keep ongoing links with urban authorities and other agencies responsible for this. Environmental surveillance of shellfish and other possible environmental contaminants can also be considered for ongoing surveillance.

### 7.4.3 Syndromic Diagnosis

At the community level diagnosis must be made on the basis of the case definition of a suspected case of cholera. Any sudden onset of profuse, but usually painless, watery diarrhoea with rapid dehydration or death of an adult due to diarrhoea and dehydration should be considered as cholera unless proven otherwise. Communities should be encouraged to report such cases immediately.

### 7.5 Case Definition

**For Urgent Notification:** Sudden onset of profuse, but usually painless, watery diarrhoea with rapid dehydration or death of a person more than 5 years of age.

**Clinical Case Definition:** In most cases, infection with *Vibrio Cholera* is asymptomatic or causes mild diarrhea (asymptomatic carriers can transmit the infection). In 10 – 20 % of cases there is severe diarrhoea and vomiting leading to dehydration. In the absence of appropriate treatment, the case fatality rate can range from 20% to 30%; proper management can reduce the case fatality rate to 1%.

**Suspected Case:** In areas where cholera is not endemic, a case of cholera should be suspected when any person aged 5 years or more develops severe dehydration or dies from acute watery diarrhea. In areas where there is an epidemic of cholera or where cholera is endemic, a case of cholera should be suspected when any person aged 5 years or more develops acute watery diarrhea.

**Confirmed Case:** A confirmed case is any person with diarrhea who has *V. cholera* O1 or O139 isolated from their stool.

### 7.6 Initial Investigation and Response

Following on from and as part of the surveillance process to detect an outbreak of cholera the following guidelines spell out the issues to consider in the decision making process in the initial response to a cholera epidemic by the EpiNet teams.

#### Threshold for action and surveillance during an epidemic

Cholera is not endemic in all Pacific island countries and territories. Therefore in most circumstances a single case of suspected Cholera must prompt action immediately and be treated as an outbreak.

#### 7.6.1 Assessment of routine surveillance data

Minimum Data set required for recording and reporting of a cholera outbreak should include the following:

- Demographic: name, gender, age, place of residence (current: where you can find the person)
- Date of visit to the health facility
- History of travel the previous week (at least)
- Date of onset of symptoms
- Description of symptoms
- Date of report
- Date stool specimen taken

### 7.6.2 Initial action and staff responsibilities

Ensure there is a clear description of the epidemic by describing the “**Time**”, “**Place**” and “**Person**” when reporting. **Reporting** of any suspected cholera case, or any outbreak should be reported to the closest operational level. The person to be contacted should have been designated by the National EpiNet team. At the central/provincial/divisional level, the person would be a member of the EpiNet team and/or any other relevant health authority. The EpiNet team person contacted must inform the other team members. The EpiNet team should make sure all health facilities and relevant health professionals in the country are notified if a cholera case or outbreak is suspected. Immediate alert must be released through inter-state, regional and international networks (PIHOA, PACNET-restricted).

#### **Health facilities must report all suspected cases of cholera immediately to the local and national EpiNet teams.**

During an epidemic, daily reporting by health facilities should be maintained. Health facilities should send a report even if they had no cases. This “zero” case reporting allows the peripheral (where applicable) and the national EpiNet Team to distinguish areas, which do not have any cases from areas, which are not reporting. Cases should be reported by the most rapid and reliable means available. These can include email, telegram, telephone, fax, or courier. During epidemics, special, temporary methods of reporting, such as using police radios in remote areas, should be considered so that reports will arrive quickly. Information gathered by the district through informal channels, such as travelers, should be investigated by contacting health care providers in the area of the suspected epidemic.

Deaths often occur at community level unnoticed by the health system. Communities should therefore be informed to report any case of death resulting from diarrhoea to the local health facility.

### 7.6.3 Risk factor assessment (Outbreak Description) and further action

In case of a cholera outbreak the peripheral (where appropriate) and national EpiNet teams must continue to make assessment of risk by monitoring the following indicators:

- Monitor the number of cases, deaths, and outbreak sites;
- Monitor the attack rate and case fatality rate at each outbreak site;
- Map the location of outbreaks;
- Graph the number of cases by day of onset;
- Graph the number of outbreak sites by day of onset (based on onset date of the first case); and
- Review patient characteristics for high-risk groups and potential sources of infection.

Regular visits to the outbreak site by the national or peripheral EpiNet team is imperative during an outbreak. If health facilities are not submitting reports, visits to these sites to determine if cases are occurring should be considered.

During staff training all relevant staff should be made clearly aware of the methods of calculating the different rates for and how to keep proper track of the epidemic.

## 7.7 *Diagnosis*

### 7.7.1. Laboratory Diagnosis

As laboratory services can be overloaded in an outbreak situation, it is recommended that initial 5-10 patients or so be confirmed for *vibrio cholera*, the laboratory should do confirmatory tests for 1 in every 5 cases of diarrhoea. If antibiotic therapy is part of the strategy to contain the epidemic it is imperative that antibiotic sensitivity tests be carried out in the beginning and be monitored throughout the epidemic. At the end of an epidemic it is important to collect samples from all diarrhoea cases for 10 days or the length of time equivalent to two incubation periods. This is to ensure that there are no more new infections occurring in the locality.

The only way to confirm the presence of *V. cholerae* is through laboratory identification. Stool samples are sent to confirm the identity of the causative organism and to test its sensitivity to antibiotics. Several organisms, including some serogroups of *V. cholerae*, can produce an acute, dehydrating diarrhoeal illness, which is clinically indistinguishable from cholera. These organisms can occasionally cause a number of illnesses within a community, but only *V. cholerae* O1 and O139 are capable of causing widespread epidemic disease.

All level 2 laboratories categorized by PPHSN should be able to confirm the diagnosis of cholera. Recommended capacities for laboratory capacities are:

- All local and national L1 laboratories should have available (on-site or easily accessible) the minimal capacity for collecting rectal swabs and transporting them to an L2 laboratory.
- L2 laboratories should have capacity for, at minimum, isolation, identification, and serogrouping of *V. cholerae* O1.
- L2 laboratories should ensure that necessary laboratory supplies are maintained in stock during non-outbreak periods.
- Antimicrobial resistance monitoring should be available at L3 laboratories and if possible, at L2 laboratories.
- L3 laboratories should maintain a collection of strains for subtyping and capacity for further laboratory investigations.

Depending on the capacity of the national referral health facility some level 1 laboratories in the region can also confirm *V. Cholera*. The following describes the methods of collection and sending of specimens to the level two laboratories (where appropriate) for the confirmation of *v. cholera* O1 and O139. Detailed technical procedures can be obtained from the WHO laboratory specific guidelines.

Key steps to be followed when collecting and sending samples include:

- Collect stool samples before patient is given antibiotics,
- Introduce a clean cotton-tipped swab into the rectum ensuring that the swab is moist with faecal stain or collect specimen from a freshly passed liquid stool,
- If the specimen will reach the nearest laboratory within 2 hours, place it in a screw cap bottle tighten it well and transport. If the specimen will take 2 hours or more to get to the nearest laboratory then put it into a tube containing Cary-Blair transport medium and send. Alkaline peptone water (APW) may also be used if the transport time will not exceed 24 hours. At the laboratory the specimen should be transferred to a fresh APW,
- Where transport medium is not available, soak strips of blotting paper with liquid stool and send them to the laboratory in carefully sealed plastic bags to prevent drying,
- If possible transport specimens in refrigerated boxes or in an environment with minimum temperatures, and
- Laboratory confirmation done and feedback provided in the quickest way possible and provide feedback.

## **7.8 Interventions for containment of a Cholera epidemic**

In the event of a cholera outbreak the goal of the national EpiNet team should be to:

- To, reduce Deaths through good patient management, mobilize staff and supplies and increase access to care, and
- To prevent new cases through intensive public education, environmental sanitation campaigns and ensures safe water.

The EpiNet team should ensure that there is logistic support to provide easily accessible care and support services to people affected by the outbreak. Particular emphasis should be placed on regular supplies of IV fluids, which can take a lot of effort to transport and maintain stocks at the required level.

### **7.8.1 Standard Treatment**

The goal of treatment is to rehydrate patients and replace electrolytes lost in stool and vomitus. 80% - 90% of cholera patients can be rehydrated with oral rehydration therapy alone. Severely dehydrated patients require rapid fluid replacement with intravenous fluids. Give ORS during and after IV therapy as soon as the patient can drink. Ringer's Lactate is the preferred intravenous solution because it contains an electrolyte composition appropriate for treating cholera patients. For the severely dehydrated patient, antibiotics can reduce the volume and duration of diarrhea, and shorten the period of infectivity. Young coconut water is also a safe source of rehydration fluid and can be used in cases where there is no ORS or interchange with ORS where ORS is available. Some guidance on case management is given in Annex .....of these guidelines. More detailed treatment guidelines can be sought form the reference list provided as an annex to these guidelines.

### **7.8.2 Immunization**

Vaccination and chemoprophylaxis is not recommended. Use of vaccines to control cholera epidemics is ineffective and not recommended. However current vaccination policies are being reviewed by WHO. If in doubt contact the PPHSN for additional advice.

### **7.8.3 Travel and Trade Restrictions**

Travel restrictions to neighboring islands should not be introduced in the acute phase of cholera outbreak. However, restrictions may be useful in small islands with limited resources to deal with a cholera epidemic and where food and water supply are susceptible to contamination. The overall concept of healthy islands must be promoted in these setting.

Passengers should not carry non-commercial food out of cholera-infected areas, as these can lead to a point source outbreak.

National and international trade should not be restricted during a cholera outbreak and control procedures should be in line with WHO guidelines and procedures. If in doubt contact the PPHSN for advice.

### **7.8.4 Sanitation and Hygiene**

Sanitation and dis-infection efforts to encourage building and use of latrines should be intensified during an epidemic. Health facilities should practice careful disinfection procedures when disposing of human waste or contaminated materials. Waste from cholera patients should be separated from other kinds of waste. Safe disposal of cholera waste can be accomplished by incineration or burial.

Before burying the waste, it should be mixed with a disinfectant, such as cresol, or mixed with acid to lower the pH of the waste to 4.5 or lower. Clothing, bedding, and mattresses can be disinfected by drying them thoroughly in the sun. Clothing can also be disinfected by stirring them in boiling water for 5 minutes.

### **7.8.5 Community interventions**

The EpiNet team should be the focal point to disseminate information to the public. It is important that the public is kept updated on the status of the epidemic at all times. Media relations by the focal point should be maintained at all times. There is likely to be widespread public concern and media attention. Therefore, efforts to inform the community about the outbreak must begin as early as possible and continue throughout the epidemic. The public should be told when and where to seek medical attention and how to prevent the spread of the disease. This information should be combined with health education messages whenever possible. Health authorities in neighboring islands, provinces, districts, and cities should be informed about epidemic activity so that health education efforts and heightened surveillance can begin. Health care personnel within the area should be kept informed of the extent of the epidemic, changes in reporting procedures, appropriate patient management and outbreak control.

Education messages should focus on three basic messages:

- Cooking food,
- Boiling or chlorination of water, and
- Personal hygiene (washing hands).

#### **“COOK IT”, “BOIL IT”, “PEAL IT” OR “LEAVE IT”**

As a number of epidemics in the region have been associated with feasts and big public gathering it is important to discourage public gatherings and feasts during an epidemic.

Annex ..... Provides samples of education messages, a guide to chlorination of water and some principals of food safety.

## **7.5 Preparedness for Epidemic Response**

In addition to creating a right policy environment for response to epidemics and integrating emergency responses with all agencies of government it is important that staff capacity is enhanced to respond effectively to a cholera epidemic<sup>8</sup>.

For the containment of cholera in locations where outbreaks are very likely it is imperative that a stockpile of supplies be kept for at least 100 patients. In the case of the Pacific islands it would be important that the Secretariat of PPHSN ensures a supply of 2-3 sets are kept at two or three designated sites in the Pacific. Suggested supplies are provided in Annex ..... of this guidelines. At the local level it is imperative to get these supplies to the location of the epidemic as soon as practical.

In larger countries of the region the EpiNet team can calculate the amount of supplies needed by predict how many people might become ill, based on possible attack rates. When estimating initial supply needs for large populations, the attack rate of 0.2% recommended by WHO might be used. For rural populations of 5,000 or less, a higher attack rate of 2% might be considered. During a

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<sup>8</sup> Additional information on options for response in PICTS can be obtained form the report of Informal Meeting of WHO South Pacific Office on Cholera Fiji, March 2001.

prolonged epidemic, estimates of attack rates from the outbreak sites can be used. These estimates should provide enough supplies to meet initial treatment needs and allow time for additional supplies to be requested and delivered, if needed.

The attack rate can be used to estimate the supplies for a cholera epidemic in a specific locality. After working out the attack rate the EPINET team or focal point in the locality should be able to calculate the supplies required for the epidemic. Annex .... Provides examples of how to calculate supplies for the treatment of cases and estimation of supplies to keep in stock in case of an epidemic.

When an outbreak is first suspected, health facilities in the area should do an inventory of the cholera treatment and control supplies on hand, and submit it to the nearest health care supervising center. The center should summarize the inventories, calculate the amount of supplies that might be needed, and send a report or request to the national, regional level or other designated level.

The following levels of responsibility are essential for preparedness at the national, regional and laboratory levels:

**National preparedness** plans should be in place in all countries, and include the following:

- List of responsible people (names and contact information for key people to involve in an Outbreak Response Team).
- Inventory of resources (supplies which may be tapped, sources of back-up supplies and support).
- Health facility assessment (list of inpatient and outpatient facilities, number of beds or typical number of patients seen per day).
- Adoption of guidelines and protocols for surveillance and response.
- Description of mechanisms for securing financial and other support at national level (e.g. by declaring a national disaster)
- Regional preparedness

**Regional preparedness** should include the following:

- List of regional experts (name, c.v., contact information, areas of expertise/ specific skills, availability for inter country consultation either by phone/ e-mail, or through on-site support as part of a field response team).
- List of regional organizations which may be involved in outbreak response or support (e.g. WHO, SPC, Red Cross, SOPAC).
- Definition of tasks and responsibilities of regional agencies and organizations.
- Emergency stocks established and maintained: items, location, and person responsible for maintenance, contact information and description of procedures to follow to draw on these resources.
- Description of procedures for seeking international support.
- Regional stocks should include:
  - Cholera kits (Box 8: *WHO Guidelines for Cholera Control*)
  - Laboratory supplies (e.g. rectal swabs, Cary-Blair transport media, TCBS media, O1 anti-serum, etc).
  - Water treatment and testing supplies (consider, e.g., emergency chlorine generating devices, chlorine diffusers, CDC “safe water system”, water test kits, portable membrane filtration such as DelAgua, presence/absence tests such as H<sub>2</sub>S paper strip tests, chlorine and pH test kits, water disinfection supplies, and reagents and replacement parts.
  - Reference materials and guidelines.

- Description of procedures for requesting supplies from regional stocks.

**Laboratory preparedness** should include the following:

- List of laboratories and contact information, including capabilities for testing specimens and for resistance monitoring (for L2 and L3 laboratories and, where capacity exists, L1 laboratories).
- Maintenance of laboratory stocks (items, location, person responsible) at national level (L1 laboratories) and regional level (L2 laboratories).
- Protocols for collection, shipping, and testing of specimens from cases of suspected cholera (refer to WHO guidelines for microbiology techniques, and for international packing and shipping requirements).
- Assurances of quality control.

In addition to national, regional and laboratory preparedness it is important that environment and sanitation is part of the preparatory process. The implementation of the Healthy Island concept in keeping with existing WHO Guidelines<sup>9</sup> for control of Cholera should include:

- Investigate, summarize, and promote low cost sanitation options appropriate to island settings
- Investigate social, cultural or traditional barriers to acceptance of safe sanitation and hygiene practices
- Identify hazardous practices and promote successful strategies
- Increase emphasis on hand washing and use of soap
- If safe water available: single use poured or running water is preferred
- If safe water is not available: 3 buckets method may be preferred

### **7.10 International coordination and support**

During an outbreak, assistance from other ministries or donor agencies may be needed to provide technical support in outbreak containment. This may include on-site training and supervision by clinicians and epidemiologists experienced in cholera epidemics and collaboration with national disaster and emergency organizations. However in the PPHSN structure countries would be encouraged to participate by assisting each other through a database of island experts who would be designated to carry out part of this work. Such assistance may include support for more advanced epidemiological studies to identify cholera transmission routes so that control efforts can be better targeted. Or assistance may be needed to provide additional emergency treatment supplies, medical personnel, sanitarians, and health educators.

If any one of the following factors are present in a country or area the EpiNet team must consider asking for additional support:

- Staff that are inexperienced or untrained in epidemic cholera control;
- Local resources that are inadequate to meet projected needs;
- A case fatality rate greater than 5%;
- Outbreaks in several health facility catchment areas or in several districts;
- Attack rates that are greater than: 2% in populations less than 10,000; 0.2% in populations 10,000 - 100,000; 0.02% in populations of 100,000.

When communicating with donors or more central personnel, present data on the following points in order to help them objectively evaluate the outbreak. The information below will help them compare the technical and resource needs with the supplies that are available:

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<sup>9</sup> WHO Guidelines for Cholera Control Chapter 3

- (i) The magnitude of the epidemic (number of cases, deaths, and overall attack rate)
- (ii) The geographic extent (number and location of sites (focal versus diffuse)
- (iii) The severity (the case fatality rate)
- (iv) The tempo (graph of cases and outbreak sites by week of onset - is the situation worsening or improving?)
- (v) Site-specific data - include information about problematic outbreak sites, such as:
  - Unusually high attack rates
  - Unusually high case fatality rates
  - Difficulty with access

The request should also contain the projected needs for personnel and supplies provide details of control activities undertaken and planned and an inventory of materials and staff currently available.

Such a request should be sent to PacNet restricted simultaneously so countries in the region are informed of the outbreak and support can also be obtained through the EpiNet and the LabNet network from within the region.

### **7.11 Other Considerations**

Specific research needs may arise, as would be the case if there was an unusual case reported or the epidemic appears to be worsening despite standard procedures. Research should also be employed to improve national policy development and improve management of epidemic s in future. Setting for research could be determined by:

- Unusually high attack rates
- Unusually high case fatality rates, and
- Difficulty with access.

Should a particular need arise, specific case control studies methodologies could be employed to explore further the difficulties caused by the epidemic.

## **8. TYPHOID**

### **8.1 International Implication**

Typhoid is not a reportable disease under the terms of the International Health Regulations of 1969. It is however an important health problem in most countries of the region.

### **8.2 Other National Programme Implications**

As for cholera, a strong programme for the control of Diarrhoeal diseases (CDD) is the best preparation for a typhoid epidemic both in areas that have not yet been affected and in areas where typhoid has been reported. The Healthy islands concept endorsed by the regional ministers of health should be the basis for overall improvement in water, sanitation and personal hygiene. Surveillance and control activities should be linked with food safety and control authorities in a country.

### **8.3 Basic Facts**

- Typhoid fever is caused by *Salmonella typhi*, usually enters the body through drinking water contaminated by faeces and urine of infected humans. Food also may be contaminated with dirty water or by flies. Person to person contact can occur through faecal-oral contamination.
- Chronic carriers are most common in the older age group and can be a reservoir of infection unless detected and treated. Treatment of carrier is a significant intervention in typhoid control.

- Typhoid fever may vary from mild illness with low-grade fever and malaise to a severe picture of sustained fever, diarrhoea or constipation, malaise, anorexia and severe headache. Intestinal ulceration can produce intestinal hemorrhage and perforation.
- The incubation period ranges from 3 days to 1 month (dependent on the infective dose).
- Isolation of the organism is from stool, urine or blood of patients or asymptomatic chronic carriers.
- Early isolation and proper treatment of typhoid cases and treatment of carrier states are important factors in preventing morbidity and mortality due to typhoid.

### **Common sources of infection**

**# As for Cholera and other diarrhoeal diseases however, infected Food handlers (or carriers) can be particular sources of infection for typhoid.**

## **8.4 Surveillance and Reporting**

Overall surveillance focuses on clinical, laboratory and environmental based data the environmental component should focus on detection of chronic carriers, routine testing of food handlers, on spot checks of food premises and water and sanitation facilities.

Simple minimum data analysis should be carried out at the peripheral level. However, majority of data analysis should be done at the central level depending on the structure of health service. It is essential that all health care providers are made aware of the public health importance of notifiable diseases and that they are trained to do basic analysis and interpretation of data at the local for transmission to the local and national EpiNet team.

### **8.4.1 Human Surveillance**

People known to have lived in a typhoid endemic country or area and who have symptoms indicating typhoid should be hospitalized for typhoid investigations and treatment.

Food handlers are a particular group of people that should be focused upon in case of a food borne outbreak involving a food consumption outlets. This is particularly important as there is an increase in the frequency of chronic carriers in the Pacific Islands.

### **Surveillance In Areas Where Typhoid Is Not Endemic (Routine Reporting)**

**Surveillance for typhoid in a non endemic setting should not differ from where it is endemic or in a case of an epidemic as all cases of typhoid are serious and should be treated immediately. All health facilities should report a suspected a laboratory confirmed case of typhoid to the EpiNet team.**

In a non-endemic situation a single case of typhoid must be reported immediately to the EpiNet team for follow-up investigations and action.

Minimum data set required for routine reporting in all health institutions that are provided to the national EpiNet focal point should include:

- Personal details - name, sex, age, date of birth (DOB) and date reported,
- Location details – Village, district, settlement etc..

- Contact details including telephone number where appropriate
- Details of where the case has been diagnosed
- Laboratory diagnosis, and
- Status of the case.

### **Surveillance In Area Where Typhoid Is Endemic, Or During An Epidemic (Urgent Notification)**

In a situation where typhoid is endemic an unexpected increase in the number of routinely reported cases should be treated as an epidemic. Special investigations may be required to determine the common source of infection and therefore more detailed investigations would be required to determine the main source of the infection.

In a confirmed or suspected case the following minimum data set is required:

- Classification of the case – Suspected, Probable, confirmed or potential or confirmed carrier,
- Laboratory results indicating confirmation or not
- Name of the clinic where diagnosis was made
- Places visited in the past month, and
- Vaccination status of the patient (only in places where vaccination is carried out, otherwise not relevant)

In order to increase the sensitivity for the detection of an outbreak in an endemic situation, the EpiNet team should seek advise from PPHSN and consider broadening the case definition and advise/train the local health staff accordingly.

#### **8.4.2 Environmental Surveillance**

In line with the Healthy islands concept, keeping a check on water supply and sanitation and monitoring hygiene practices in food preparation facilities should be maintained at all times dependent on resource availability.

Ongoing collaboration with urban authorities where appropriate in maintaining good quality water and inspection of food outlets is an important aspect of environmental surveillance for typhoid.

#### **8.5 Case Definition**

**For Urgent Notification:** A single patient with fever at least 38°C for > 3 days + gastro-intestinal disturbance (diarrhoea, constipation) and / or have contact with known carriers in a non-endemic situation and an increase in the number of normally occurring cases in any given locality.

**Clinical Case Definition:** Typhoid fever may vary from a mild illness with low-grade fever and malaise to a severe picture of sustained fever, diarrhoea or constipation, malaise, anorexia, severe headache. Intestinal ulceration can produce intestinal haemorrhage or perforations. Incubation period is from 3days to 1 month. The case fatality rate may reach 10% if not treated promptly but if treatment is given promptly case fatality rate can be less then 1%.

**Suspected Case:** A patient with fever at least 38°C for > 3 days + gastro-intestinal disturbance (diarrhoea, constipation) and / or have had contact with a known carrier.

**Confirmed Case:** A suspected case with laboratory confirmed tests (blood culture, stool and/or urine tests positive) (Symptoms + laboratory confirmation)

**Carrier:** A confirmed case where the *S. typhi* organisms persisting in the stools or urine for more than 1 year after onset of the disease, with the absence of any clinical signs.

## 8.6 Initial Investigations and Response

Following on from and as part of the overall surveillance system to detect an outbreak of typhoid the following guidelines spell out the issues to consider in the decision making process in the initial response to a typhoid epidemic by the EpiNet teams.

### Threshold for Action

Action for epidemic notification and response must be taken when:

- (i) There is an unusual increase in the number of suspected and/or confirmed typhoid cases in a endemic situation, and
- (ii) When there is a single suspected or confirmed case reported in a non-endemic setting.

### 8.6.1 Assessment of Routine Surveillance Data

In assessing routine surveillance data three mechanisms for data collection should be considered. Surveillance as per the case definition, hospital admissions and laboratory confirmations, looking out for;

- (i) Number of conditions reported
- (ii) Number of samples of blood culture and stools confirmed for typhoid in a laboratory,
- (iii) Number of gastro-intestinal conditions with fever.

Minimum data set should be the same as for cholera with particular attention to food consumption and blood culture confirmation.

### 8.6.2 Initial Action and Staff Responsibility

General reporting procedures for a suspected or confirmed outbreak of typhoid should follow the procedures set out in the general guidelines. If needed a special task force may be needed to handle the situation but otherwise the EpiNet team should remain the focal point for containment and monitoring activities. Information must be provided with clarity from the epidemic site to the EpiNet teams and feedback provided to the field in an efficient and timely manner.

Initial response activities should include:

- Staff in-service training may be required to update staff on treatment and control measures for typhoid,
- Accurate information should be provided to the general public through the mass media and relevant community based organizations,
- An epidemiological investigation must be conducted to try to identify source of infection,
- A locally specific action plan for containment should be developed in collaboration with all relevant entities in the affected areas including sectors apart from health i.e. town authorities, water resource bureaus etc..

**Staff training** should include treatment protocols, care when handling wastes including introduction of any existing disinfection protocols, occupational health, education of patients and guardians upon discharge from hospital and education of family members and contacts of patients.

**Information education and communication** should focus on the importance of hand washing, targeted information to food handlers, information on disposal of human waste, chlorination or disinfection of drinking water, personal hygiene and directives on what to do if one suspects illness (including signs and symptoms of typhoid).

**Epidemiological investigations** to locate the source of infection and ways of transmission should focus on interviews focusing on time, place and person of typhoid infection. Based on assumption samples may be collected from relevant potential sources as part of the epidemiological investigations.

An ideal **plan of action** should address the best options for control depending on the source of infection. It should contain well-defined roles and responsibilities of individuals taking part in treatment and control measures. It should focus on identifying chronic carriers, provide ongoing education programmes both to health workers and the general public and support behaviour change supporting personal hygiene and environmental control activities.

**During an epidemic**, weekly updates must be provided to the national EpiNet team for assessment feedback and assistance. As for cholera and other urgently notifiable disease the most effective and timely means of communication should be used to communicate information to the national EpiNet team.

Health education must be first used in order to improve sanitation and hygiene practices, focusing on food handling and to decrease the incidence of the cases. Investigation and treatment of healthy carriers should follow.

In case of **natural disasters** such as cyclones and typhoons causing floods in an endemic setting special preparedness and surveillance mechanisms needs to be maintained by the national EpiNet teams.

**Outbreak Monitoring, at the end of an outbreak** should be conducted by:

Blood and stool cultures being conducted on all suspected cases of typhoid. Depend on the total number of cases all clinical and suspected cases should be tested for confirmation. Continue testing for all suspected cases should be carried out for up to two months following a decline in the number of cases.

### 8.6.3 Risk factor assessment and further action

In case of a typhoid outbreak the peripheral (where appropriate) and national EpiNet teams must continue to make assessment of risk by monitoring the following indicators; Monitor the number of cases, deaths, and outbreak sites:

- Carry out source investigation including environmental sampling and potential carrier investigations.
- Monitor the attack rate and case fatality rate at each outbreak site;
- Map the location of outbreaks;
- Graph the number of cases by day of onset;
- Graph the number of outbreak sites by week of onset (based on onset date of the first case; and
- Review patient characteristics for high-risk groups and potential sources of infection.

Regular visits to the outbreak site by the national or peripheral EpiNet team is imperative during an outbreak. If health facilities are not submitting reports, visits to these sites to determine if cases are occurring should be considered.

During staff training all staff should be made clearly aware of the methods of calculating the different rates and indicators used for monitoring and how to keep proper track of the epidemic.

## 8.7 Laboratory Diagnosis

Diagnosis of the *s. typhi* and confirmation of an outbreak depends on good laboratory capacity in each country. A clinical suspicion should lead to laboratory confirmation of the organism and followed up by environmental investigations with additional laboratory investigations on environmental samples.

Blood culture is the recommended gold standard for confirmatory diagnosis of *S. Typhi*. All countries in the region should have a capacity to do blood and stool cultures. In larger countries the capacity to carry out blood culture should be decentralized as far as possible. Stool and urine cultures can also be done.

Level 1 laboratories should also be able to carry out biochemistry and serological tests for further identification of the infective agent. It is recommended that the following anti-sera be made available at level 1 laboratories – poly O, poly H, 9 Vi, and d.

Other tests are available such as the Widal test, which has low specificity and sensitivity, not recommended as a confirmatory test. New rapid serological tests are currently being tried. Vi antibody test and Polymerase Chain Reaction (PCR) tests are also available in more sophisticated laboratories for confirmation.<sup>10</sup>

Antibiotic sensitivity tests should also be done wherever possible. It is recommended that isolates from the first case (few cases) should have a sensitivity test conducted to know the likely sensitivity to antibiotics to be used for chemotherapy and for the purposes of determining interventions.

Two sets of blood culture should be collected within 24 hours by the attending physician together with a stool sample and sent to the laboratory for laboratory confirmation. Blood must be collected before administration of any antibiotics.

Where shipment is required blood culture bottles are required at the location of blood collection and shipment of blood culture bottles should be carried out using fastest means of transport. When shipping infectious specimens the International Airlines and Transportation Associations (IATA) Regulations<sup>11</sup> should be followed. This means that the EpiNet team should be familiar with the air transport system and be in close communications with the local air transport system to ensure samples are treated with care on shipment. (*Details in LabNet protocols*)

## 8.8 Interventions for Containment of a Typhoid Epidemic

As for cholera the goal of the national EpiNet team should be to:

- Reduce mortality through good patient management, mobilize staff and supplies and increased access to care,
- Find the source of infection including carriers and treat the cause of the epidemic, thus interrupt transmission, and

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<sup>10</sup> See LabNet protocols

<sup>11</sup> International Airlines and Transportation Association Regulations

- Prevent new cases through intensive public education, environmental sanitation campaigns and ensure safe water.

### **8.8.1 Standard Treatment**

Treatment must be instituted as soon as possible after the collection of necessary samples for confirmation if there is a strong suspicion of typhoid. First line drugs for typhoid are: chloramphenicol, trimetoprim/sulfamethoxalone and Ampicilline. First line drugs are recommended for use in the pacific as these drugs are easily available and least expensive. However in a situation where there have been reports of multi-drug resistance second line drugs should be considered. Second line drugs include the fluoroquinolones (Ciprofloxacin and Ofloxacin), and third generation of Cephalosporines (Ceftriaxone – IV and Cefixime – oral). Fluoroquinolones are recommended as a first choice where there is multi-drug resistance to typhoid. Fluoroquinolones are not recommended for children. See annex ... for details of drug dosages.

### **8.8.2 Vaccination**

Mass vaccination is not recommended by WHO however the EpiNet teams should consider the following factors before making any decisions on a wide scale vaccination programme:

- Age specific incidence,
- Particular high risk populations,
- Sensitivity pattern of S. Typhi, and
- Cost benefit analysis of the intervention.

Focus must be placed on the healthy islands concept and on improving water supply and sanitation in all the countries of the region.

Only two vaccination types are recommended by WHO:

- (i) The Vi polysaccharide vaccine, intramuscularly single dose initially with booster every 2-3 years. Stores at 2-8 degrees centigrade.
- (ii) Oral live attenuate (Ty21a) initial dose 3-4 doses 2 days apart booster at 2-3 years administered orally. Also stores at 2-8 degrees centigrade. (Details are provided in annex....)

### **8.8.3 Travel and Trade Restrictions**

Travel or trade restrictions are not recommended. If in doubt, contact PPHSN for advice.

### **8.8.4 Sanitation and Hygiene**

General principals of ensuring clean water and proper sanitation facilities should apply as in the management of any Diarrhoeal disease outbreak. Emphasis on the healthy islands concept should be maintained.

### **8.8.5 Community Interventions**

As in any outbreak the EpiNet team should be the focal point to disseminate information to the public. It is important that the public is kept updated on the status of the epidemic at all times. Media relations by the focal point should be maintained at all times. There is likely to be widespread public concern and media attention. Therefore, efforts to inform the community about the outbreak must begin as early as possible and continue throughout the epidemic. The public should be told when and where to seek medical attention and how to prevent the spread of the disease. This information should be combined with health education messages whenever possible. Health authorities in

neighboring islands, provinces, districts, and cities should be informed about epidemic activity so that health education efforts and heightened surveillance can begin. Health care personnel within the area should be kept informed of the extent of the epidemic, changes in reporting procedures, appropriate patient management and outbreak control.

As for Cholera education messages should focus on three basic messages:

- Cooking food,
- Boiling or chlorination of water, and
- Personal hygiene (washing hands).

#### **“COOK IT”, “BOIL IT”, “PEEL IT” OR “LEAVE IT”**

In addition special messages should be developed for food handlers in all settings on the importance of food and personal hygiene.

### **8.9 Preparedness for Epidemic Response**

As for a cholera epidemic response, in addition to creating a right policy environment for response to epidemics and integrating emergency responses with all agencies of government it is important that staff capacity is enhanced to respond effectively to a typhoid epidemic.

It is important to ensure that a stockpile of drugs and equipments required to detect, confirm and treat the initial cases of typhoid is made available at all times. Stock of drugs and supplies should be kept close to an area of particular risk of an outbreak. *This would be an important function of the PPHSN focal point in ensuring necessary stocks and supplies are kept in the central locality with reliable communications with most of the countries in the region.* See annex ... for the suggested list of supplies for a typhoid outbreak.

As for cholera the attack rate can be used to estimate the supplies for a typhoid epidemic in a specific locality. After working out the attack rate the EpiNet team or focal point in the locality should be able to calculate the supplies required for the epidemic.

When an outbreak is first suspected, health facilities in the area should do an inventory of the typhoid treatment and control supplies on hand, and submit it to the nearest health care supervising center. The center should summarize the inventories, calculate the amount of supplies that might be needed, and send a report or request to the national, regional level or other designated level.

### **8.10 International coordination and support**

As described in the containment of a cholera outbreak, during an outbreak, assistance from more central Ministry levels or donor agencies may be needed to provide technical support in outbreak containment. This may include on-site training and supervision by clinicians, epidemiologists, and laboratory specialists experienced in typhoid epidemics management. Countries and territories are encouraged to participate by assisting each other through a database of island experts who would be designated to carry out part of this work. Such assistance may include support for more advanced epidemiological studies to identify typhoid transmission so that control efforts can be better targeted. Or assistance may be needed to provide additional emergency treatment supplies, medical personnel, sanitarians, and health educators.

As for cholera, if any of the following factors are present in a country or area the EpiNet team must consider asking for additional support:

- Staff that are inexperienced or untrained in typhoid epidemic control;
- Local resources that are inadequate to meet projected needs;
- A high case fatality rate, and

- Outbreaks in several health facility catchments areas or in several districts.

When communicating with donors or more central personnel, present data on the following points in order to help them objectively evaluate the outbreak. The information below will help them compare the technical and resource needs with the supplies that are available:

- (i) The magnitude of the epidemic (number of cases, deaths, and overall attack rate)
- (ii) The geographic extent (number and location of sites (focal versus diffuse)
- (iii) The severity (the case fatality rate)
- (iv) The tempo (graph of cases and outbreak sites by week of onset - is the situation worsening or improving?)
- (v) Site-specific data - include information about problematic outbreak sites, such as:
  - Unusually high attack rates
  - Unusually high case fatality rates
  - Difficulty with access

The request should also contain the projected needed for personnel and supplies provide details of control activities undertaken and planned and an inventory of materials and staff currently available.

Such a request should be sent to EpiNet simultaneously so countries in the region are informed of the outbreak and support can also be obtained through the EpiNet and the LabNet network from within the region.

### 8.11 Other Considerations

Specific research needs may arise as would be the case if there was an unusual case reported or the epidemic appears to be worsening despite standard procedures. Research tools should be employed to improve national policy development and improve management of epidemic s in future. Setting for research could be determined by:

- Unusually high attack rates
- Unusually high case fatality rates, and
- Difficulty with access.

Should a particular need arise, specific case control studies methodologies could be employed to explore and further intervention causes of the epidemic.

## 9. MEASLES

Before deciding on the type of interventions to take in measles outbreak containment the national EpiNet team must first of all decide what phase strategy to use in its national response to a Measles epidemic. There are three phases of measles interventions depending on the prevalence of measles and immunization coverage:

- Control phase,
- Outbreak prevention phase, and
- Elimination phase.

**Control phase** – Focuses on vaccination to increase coverage and provision of quality care to affected patients by focusing on reduction in incidence and mortality.

**Outbreak Prevention phase** – Focuses on early detection of cases and epidemics with main objectives to maintain low incidence and prevent outbreaks.

**Elimination phase** – maintain immunization coverage investigate single case of measles with the main goal of interrupting transmission on the measles virus.

In the Pacific region, the phase of elimination, which is to maintain a high immunization coverage and to investigate and respond to a single case of measles. This is well in keeping with the purpose of these guidelines, which is to focus on early detection of cases and epidemics with an objective of maintaining low incidence and to prevent outbreaks.

### 9.1 International Implications

Though there are no specific international measures recommended for measles outbreak, measles is the number one cause of vaccine preventable deaths in the world. Measles accounts for 875,000 deaths a year, over 50% of estimated 1.6 million deaths due to vaccine preventable diseases. The current global target is to reduce mortality by 50% by 2005.

### 9.2 National Programme Implications

Indigenous measles transmission has been interrupted in the Pacific and therefore programmes in every country and territory should focus on ensuring 95% coverage of first and second dose of measles immunization and supplementary mass campaigns every 4 – 5 years. Improvement and integration of measles into overall immunization programmes is the key to maintaining coverage and vigilance against the measles virus.

Note that there is integrated reporting with polio and neonatal tetanus at the health facility and therefore community based health providers should be aware of these procedures.

### 9.3 Basic Facts

- Measles is an acute, highly communicable viral disease with prodromal fever, conjunctivitis, coriza, cough and small spots with white or bluish white centers on an erythematous base on the buccal mucosa (**Koplik Spots**),
- Prior to immunization programmes, Measles caused high case fatality rates in the islands of the Pacific since it was first introduced into the islands,
- Humans are the only reservoir of infection,
- Mode of transmission is airborne through droplet spread with direct contact with nasal or throat secretions of infected individuals. Less common by contact with articles soiled by nasal or throat secretions of infected individuals. Measles is one of the most highly communicable infectious diseases,
- Incubation period is 10 days but can range from 7 – 18 days from onset of fever.
- Period of communicability is about 4 days before the appearance of the rash and four days after the appearance of the rash.
- Every person that has not been infected in the past or not vaccinated is susceptible to the disease.
- Vaccination induces 94-98% active immunity and a second dose increases the immunity level up to 99%. This makes measles vaccine a very effective tool for interruption of transmission if there is high immunization coverage in any community.
- Provision of Vitamin A supplementation to measles cases has been proven to protect against blindness caused by measles and reduce all cause mortality by 23%.

### Common sources of infection

# **Highly infectious communicable disease and is passed from person to person.**

**Humans are the only reservoir of infection. Measles is targeted for global elimination by the World Health Organization**

## 9.4 Surveillance and Reporting

Measles surveillance focuses only on human surveillance, as the virus has no other reservoir or vector in the environment.

Simple minimum data analysis should be carried out at the peripheral level. These would include, unique identifier (name, age, sex locality), symptoms, date of onset, and rationale for measles diagnosis. More detailed analysis should be done at the central level with the provision of feedback to the peripheral level.

### 9.4.1 Human Surveillance

Objective of surveillance should be to:

- (i) Identify population at risk of Measles,
- (ii) Understand the changing epidemiology of measles, and
- (iii) To predict an occurrence of an outbreak.

The intervals between measles outbreaks and the number of susceptible cases are key indicators for prediction of outbreaks. If more than one birth cohort of unprotected children has accumulated over the years an outbreak is usually imminent. The accumulation of susceptible cases can be estimated by monitoring:

- (a) The number of non-protected births using the annual immunization coverage reached for each yearly birth cohort and an estimated vaccination efficacy, and
- (b) The changes in measles epidemiology, particularly age specific attack rates obtained from surveillance data which will reflect the age group where most susceptible cases have accumulated.

**Minimum data set** required for basic surveillance information include; name, age, place/location, vaccination status, gender, nutritional status, date of onset of rash, travel history for the past 14 days and indication of possible source of infection. Information should also contain whether the case has been confirmed by laboratory test or not.

Surveillance should include:

- Primary community based surveillance and continuation with the hospital based surveillance system integrated with Acute Flaccid Paralysis (AFP) surveillance,
- Surveillance of acute fever and rash (*once the protocols have been tested*),
- Active case-based surveillance with Laboratory confirmation,
- Expansion of surveillance to private health clinics and other hospitals, and
- Use of existing networks such as PacNet for warnings from neighboring countries.

## 9.5 Case Definition

**Urgent notification** is required if there is a case of high fever with generalized red blotchy rash, with cough, runny nose, conjunctivitis, and malaise (usually in a child).

**Clinical Case Definition:** Usually a child with a high fever, malaise, cough, and runny nose. Within 3 to 4 days a characteristic red blotchy rash appears, often on the face, then becoming generalized and lasting 4-7 days. Red watery eyes, runny nose, and chesty cough are commonly present. **Koplik's spots** on the lining of the mouth may or may not occur just before or after onset of the skin rash.

**Suspected Case:** Any person who is suspected to have measles by a clinician, which is anyone with fever and rash plus one of the following or more; cough, coriza (running nose) and conjunctivitis (red eye).

**Confirmed Case:** A suspected case with laboratory confirmed tests, by confirming measles specific IgM or rise in paired IgG titers and an epidemiological link with a confirmed case.

## 9.6 Initial Investigations and Response

Once a suspected case is reported the EpiNet team must confirm that there is an actual case of measles and begin the process of investigation, and determine whether it is a localized case or one which might require national wide outbreak response.

### 9.6.1 Assessment of Routine Surveillance Data

Local level public health and clinical authorities should make an initial analysis of the data immediately rather than sending the data to the national level. The local level authorities should make an assessment of the immunization coverage, and the actual number of cases reported. All suspected and laboratory confirmed cases should be included with indicators mentioned under the surveillance section. At the central level once the report is received should make a detailed analysis and support the peripheral authorities in ensuring the basic requirements are met to ensure confirmation, make available necessary resources to respond to the epidemic.

### Threshold for Action

Depending on the national situation action for epidemic response is taken once a threshold is reached, depending on assessment by the EpiNet team.

### 9.6.2 Initial Action and Staff Responsibility

General reporting procedures for a suspected or confirmed outbreak of measles should follow the procedures set out in the general guidelines. The EpiNet team should be the focal point for containment activities. It should develop an **action plan** that sets out details of a national response to the measles outbreak.

Initial response activities should include:

- Where possible isolate cases to prevent nosocolial transmission,
- Staff in-service training may be required to update staff on treatment and control measures for typhoid,

- Accurate information should be provided to the general public through the mass media and other relevant community based organizations,
- Prompt action should be taken to vaccinate populations at risk in neighboring islands or provinces,
- A locally specific action plan for containment should be developed in collaboration with all relevant entities (particularly schools) in the area.

The plan should spell out the individuals responsible for the implementation of each activities of the plan.

**Staff training** should include treatment protocols, for secondary infections, vitamin A administration, vaccination procedures and cold chain requirements.

**Information education and communication** should focus on early vaccination for children or adults who have not had measles and who have not been vaccinated against measles. Information should also focus on avoidance of infection through nosocomial transmission.

**Epidemiological investigations** to locate the source of infection should focus on interviews focusing on time, place and person of persons infected including age distribution and vaccination status of those affected. Immediate assessment should be made to determine the susceptible groups in any adjacent localities so could be defined for an immediate mass vaccination campaign.

**During an epidemic**, weekly updates must be provided to the national EpiNet team for assessment feedback and assistance. As with other urgently notifiable disease the most effective and timely means of communication should be used to communicate information to the national EpiNet team and feedback from the national EpiNet teams.

**Outbreak Monitoring and determination of the end of an outbreak** should be conducted by confirming laboratory tests in the beginning followed up by periodic tests during the epidemic and followed by random tests on suspected cases for a period of one month after the last confirmed case of measles.

### 9.6.3 Risk factor assessment and further action

As for assessment of other infectious disease outbreaks the EpiNet team should a spot map and keep track of the epidemic by monitoring the following indicators; Monitor the number of cases, deaths, and outbreak sites:

- Monitor the attack rate and case fatality rate at each outbreak site;
- Map the location of outbreaks;
- Graph the number of cases by day of onset;
- Graph the number of outbreak sites by week of onset (based on onset date of the first case; and
- Review patient characteristics for high-risk groups.

Supervisory visits to the outbreak site by the national or peripheral EpiNet team is imperative during an outbreak. If health facilities are not submitting reports, visits to these sites to determine if cases are occurring should be considered.

## 9.7 Diagnosis

Diagnosis of measles is dependent on good clinical judgment and confirmatory serological test. Quality of testing will depend on the collection and transportation of sample for testing and the conduct of the test.

### 9.7.1 Laboratory Diagnosis

The role of the laboratory is to confirm clinical diagnosis, identify and type wild virus strains, and determine sero-prevalence of population and forecast outbreaks. Main laboratory tests carried out for measles diagnosis and their objectives include:

- IgM ELISA – for measles serological diagnosis,
- Viral Culture – for reference and to define new genotypes and the determination of circulating measles virus genotypes throughout the world, and
- PCR – to confirm diagnosis and the genotype.

Measles is diagnosed serologically by detection of measles specific IgM, and by demonstrating significant rises in IgG between paired acute and convalescent sera.

Samples of blood should be collected in the following instances:

- An isolated case of suspected measles,
- First 10-20 suspected cases of measles in case of an outbreak,
- Unusual cases, or cases in a new geographical area or subpopulation occurring during an outbreak, and
- Occasional samples from cases at the end of an outbreak.

#### Collection of blood Sample:

Three (3) mls of blood should be taken at the first contact opportunity from a suspected case of measles. Noting that the IgM antibodies are best detected from the 4<sup>th</sup> day after the onset of the rash, peaking at about 1-2 weeks after the onset of the measles rash.

Whole blood should be kept at room temperature until clot retracts, separate into a sterile vial within 24 hours and then store at 4 degrees centigrade. If shipping is required the serum should be frozen or at least refrigerated at 0-8 degrees centigrade.

#### Shipping:

Specimens should be shipped by air as soon as possible. Place specimen in a zip lock bag, labeled with at least;

- Patient's name and medical record number, and
- Hospital and country. Place a form for each specimen in a separate zip lock bag with at least;
- Patient's name, date of birth, and medical record number,
- Date of onset of rash,
- Date of collection of sample,
- Date of last measles vaccination, and
- Name of hospital and country.

Specimens and forms should be shipped in approved cold boxes with ice packs. Before shipment of specimens, make sure that the laboratory is capable and is willing to perform such tests. (details to be developed by LabNet protocol)

Fax a pre-alert message to the laboratory follow up with a telephone call giving the airway bill number, flight number, and arrival time at the destination. Current practice would be to notify WHO Suva on fax 679 300 462 and telephone 679 304 600. This would be also an opportunity to place a message on LabNet. However if there is to be a Secretariat this would be one of the functions of the Secretariat to be able to provide support to laboratory specimens and monitor support through the PacNet.

### 9.7.2 Syndromic Diagnosis

Increases in the number of rash and fever cases would be a good indication of measles outbreaks in the community and so community health workers and the general population should be made aware of fever and rash as a possible case of measles. Communities could also be encouraged to report to health facilities in case of a fever associated with a rash as a possible case of measles.

## 9.8 Interventions for Containment of a Measles Epidemic

Like all diseases of epidemic importance the overall goal should be to:

- To, reduce morbidity and mortality through good patient management, mobilize staff and supplies and increase access to care, and
- To prevent occurrence of new cases.

### 9.8.1 Standard Treatment

Management of a child with measles is divided into two:

1. Treatment for uncomplicated cases
  - Giving vitamin A,
  - Provide advise to mother to treat symptoms at home and to return if symptoms of infection or dehydration due to diarrhoea become worse,
  - Provision of nutritional support including breast feeding,
  - Advise on controlling fever, and
  - Immunization of close contacts if identified within 72 hours.
2. Treatment for complicated cases
  - Giving two doses of vitamin A
  - Cleaning eye lesions and applying 1% tetracycline eye ointment 3 times per day for 7 days,
  - Clean ear discharge and apply antibiotics,
  - Refer suspected encephalitis cases to the hospital,
  - Treat for diarrhea and malnutrition, and
  - Treat for pneumonia.

#### Vitamin A Dosages

Age	Immediately on Diagnosis	Next Day
< 6 months	50,000 IU	50,000 IU
6 – 11 Months	100,000 IU	100,000 IU
12 Months or more	200,000IU	200,000IU

### **9.8.2 Vaccination**

Routine immunization is the most cost effective means of preventing morbidity and mortality resulting from measles. In an event of an outbreak immunization of contacts should take place 72 hours following a detection of a primary case. Otherwise supplementary immunization campaigns in areas that are defined to be at risk can be very effective means of averting a severity of an epidemic.

Standardized schedules for measles vaccination needs to be approved.

Live Edmonson B? Schwartz & Attenuvax? or MMR? And the schedules not indicated in t any of the workshops.

### **9.8.3 Travel and Trade Restrictions**

Some restrictions in population movement or isolation may be needed in localized areas but widespread restrictions are not recommended.

### **9.8.4 Sanitation and Hygiene**

Not applicable.

### **9.8.5 Community Interventions**

Public education to enable early community based suspicion of measles and cooperation in measles outbreak containment should be the focus of information education and communication to the general public.

Key education messages should include:

- Signs and symptoms of measles,
- Measles can be prevented by vaccination,
- Provide guidance on symptomatic case management at home for uncomplicated cases of measles, and
- Provide guidance on the signs of severe cases of measles for guidance on hospital referrals.

## **9.9 Preparedness for Epidemic Response**

As for epidemic response to all urgently notifiable diseases the EpiNet team should ensure that there is an epidemic response plan in place with well-defined roles and responsibilities of individuals involved in the interventions. The team should ensure there are adequate supplies of Vitamin A, sample-collecting equipment, and drugs required to treat complications. Staff should also be reminded of vaccination requirements and standard care procedures for complications of measles.

When an outbreak is first suspected, health facilities in the area should do an inventory of the measles treatment and control supplies on hand, and submit it to the nearest health care supervising center. The center should summarize the inventories, calculate the amount of supplies that might be needed, and send a report or request to the national, regional level or other designated level.

## **9.10 International Coordination and Support**

The PPHSN has been set up so countries and territories together with regional support agencies are able to collaborate in a timely manner to contain any disease of epidemic importance. There are a number of agencies in the region that can assist in the containment of an epidemic. Communications with PacNet restricted and then with PacNet would set the basis for an immediate and timely response.

Support from international agencies and neighboring countries may include:

- Additional supplies of vaccines and medications,
- Technical support in staff training, and
- Assistance from other experts in the region.

In addition, if any one of the following factors is present in a country or area the EpiNet team must consider asking for additional support:

- Staff that are inexperienced or untrained in measles epidemic control;
- Local resources that are inadequate to meet projected needs; and
- If there is an unusually high case fatality rate.

When communicating with donors or more central personnel, present data on the following points in order to help them objectively evaluate the outbreak. The information below will help them compare the technical and resource needs with the supplies that are available:

- (i) The magnitude of the epidemic (number of cases, deaths, and overall attack rate)
- (ii) The geographic extent (number and location of sites (focal versus diffuse)
- (iii) The severity (the case fatality rate)
- (iv) The tempo (graph of cases and outbreak sites by week of onset -- is the situation worsening or improving?)
- (v) Site-specific data - include information about problematic outbreak sites, such as:
  - Unusually high attack rates
  - Unusually high case fatality rates
  - Difficulty with access

The request should also contain the projected needed for personnel and supplies provide details of control activities undertaken and planned and an inventory of materials and staff currently available.

Such a request should be sent to EpiNet simultaneously so countries in the region are informed of the outbreak and support can also be obtained through the EpiNet and the LabNet network from within the region.

*This section might need to be placed in the general section as it applies to all diseases.*

## **9.11 Other Considerations**

Accelerated measles control that requires mass vaccination should comply with strict injection safety procedures. It is important to note that at least 3 out of 4 children in developing countries develop one or more complications of measles. These often lead to high case fatality rates. Complications may include pneumonia, diarrhoea and croup. Long-term complications include blindness, brain damage, and deafness.

It is important to facilitate further investigations and research if there is a high number of complications and long-term complications of measles. And if there is;

- Unusually high attack rates, and
- Unusually high case fatality rates

Research might also be carried out to improve national policy development and improve management of epidemics in future.

## **10. INFLUENZA**

Influenza has caused significant worldwide pandemics and is an important disease to monitor globally. At the regional level only a few countries have specific guidelines and policies in place to respond effectively to influenza including the capacity to make a diagnosis.

### **10.1 International Implications**

There is already a network of global institutions keeping a track of the influenza as the virus was known to have caused significant mortality in earlier pandemics. Major pandemics included; Spanish (1918 – 1919) – led to 20 – 40 million deaths, Asian (1957) – led to approximately 1 million deaths, and Hong Kong (1968 – 1969) – led to approximately 1 million deaths. Because of the pandemic importance of influenza, it is important that notification reaches PPHSN and WHO through PacNet as soon as possible following suspicion of an outbreak or

### **10.2 National Programme Implications**

Acute respiratory infection is a major cause of morbidity and mortality among infants in most Pacific Island Countries. While there are not specific programmes to address acute respiratory infections the concept of the management of the sick child being facilitated by UNICEF would be an important programme aspect to consider in influenza surveillance in most countries of the region.

Care and support programmes for the elderly should also be considered as collaborating agents in the surveillance of influenza in any country of the region.

### **10.3 Basic Facts**

- Influenza or flu outbreaks can present as a pandemics, epidemics, localized outbreaks and as sporadic cases,
  - In the temperate regions epidemics tend to occur during winter and early spring seasons. Every influenza season is unique.
  - About 10% – 20 % of population is affected during each influenza season (rates differ between age groups each season)
  - About 1% of those affected require hospitalization due to complications or severity of infection and among the hospitalized as many as 8% may die.
  - On average 20,000 Americans die from complications of influenza each year.
  - Three types of influenza viruses are responsible for human infection: Influenza A, Influenza B and Influenza C viruses.
- 
- Humans are the primary source of human infections; however mammalian reservoir such as pigs and birds are likely sources of new human strains,
  - Incubation period is 1 – 3 days,
  - Period of communicability is between 3 – 5 days from clinical onset in adults and up to 7 days in young children.
  - Global WHO collaborating centers for influenza global surveillance are in London, Tokyo, Atlanta and Melbourne.

### **10.4 Surveillance and Reporting**

Surveillance and early reporting of influenza is essential for the early detection and evaluation of new variants or subtypes of influenza viruses. The early detection and characterization of these viruses allows for timely annual updates of vaccine that can prevent deaths and alleviate illness in vulnerable

groups of the population. It will also enable the national EpiNet team to exclude other diseases of epidemic importance that cause similar symptoms in a given population. Therefore the main purpose of influenza surveillance would be to:

- Secure vaccine strains, for the development of appropriate vaccines,
- Identify potential pandemic strains,
- Assess the impact of influenza on communities and groups,
- Predict hospital admissions, and prepare for management of cases,
- Monitor vaccine breakdown,
- Provide accurate information to the public as to the cause of the epidemic, and
- To exclude other epidemic agents.

#### 10.4.1 Human Surveillance

Routine weekly cases based aggregated data reports should be regularly sent to the national EpiNet team focal point as has been done in most countries in the region. This should include information on:

- Suspected clinical cases,
- Laboratory confirmed cases,
- Virus isolates (types and subtypes) through laboratory confirmation,
- Suspected or confirmed cases by sentinel sites such as general practitioners and health institutions.

An unusual increase in mortality among young children and the elderly (50+) could be an important indicator for influenza outbreak. Other proxy data that could be used include:

- Absenteeism from school, and
- Absenteeism from the work place.

Minimum data set required would be:

- Geographical locality,
- Incidence of influenza, and
- Age distribution. *Workshop recommended*
- Date of birth,
- Symptoms,
- Date of onset of symptoms,
- Specimen collection,
- Vaccination history, and
- Geographical locality.

At the national level aggregated data should include:

- Total number of cases,
- Total number of Deaths,
- Circulating virus types and sub-types (where there are facilities),
- Total number vaccinated by age group.

Monthly routine reporting through the existing systems of reporting should be strengthened and continued as this is important to confirm an absence of an influenza epidemic (“0” Reporting)
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### 10.4.2 Case Definition

**Clinical Case Description:** Fever (often higher in children), cough, sore throat, runny or stuffy nose, headache, muscle ache, and often fatigue. More severe complications can follow such as pneumonia affecting mostly young children and the elderly.

**Clinical Case definition:** A person with sudden onset of fever of  $>38^{\circ}\text{C}$  and cough or sore throat in the absence of other diagnosis.

**Suspected Case:** A case that meets the clinical definition.

**Confirmed Case:** A case that meets clinical case definition and is laboratory-confirmed.

### 10.4.3 Animal Surveillance

Due to the importance of animal reservoir it is important that the EpiNet team keeps a close communication with Agriculture and Live Stock departments in case of high mortality among birds or pigs in these sector.

## 10.5 Initial Investigations and Response

Once a suspected epidemic is reported the EpiNet team must confirm that there is an actual influenza epidemic and take the necessary steps as would be described in the national influenza plan of action.

### 10.5.1 Assessment of Routine Surveillance Data

The national EpiNet team should regularly review existing statistics from hospital data and other sources routinely collected data to determine any trends in influenza like illness (ILI) in the community. This is important as such assessment would be a very good indication of an absence of an influenza epidemic.

In making analysis past historical data and seasonal variations are important background information for the EpiNet team.

#### Threshold for Action

As different countries would have different systems of surveillance in place for influenza the threshold for action needs to be decided upon by the national EpiNet team.

### 10.5.2 Initial Action and Staff Responsibility

General reporting procedures for a confirmed influenza outbreak should follow the procedures set out in the general guidelines. The EpiNet team should be the focal point for initiatives to minimize the impact of an outbreak of influenza. It should develop an **action plan** that sets out details of a national response to an influenza outbreak.

In general outbreak control measures are limited due to the nature of the spread of the influenza virus.

In an epidemic situation the most cost effective intervention is to carry out immunization against the circulating variant of the virus.

As no island countries in the region have influenza pandemic plans it is important that EpiNet teams develop plans in line with the principles of PPHSN and other global surveillance networks.

**Staff training** would depend on the interventions decided upon by the national EpiNet team. If vaccination is to be a primary intervention then this should be the main focus of training. If otherwise antiretroviral or symptomatic treatment of influenza cases is decided upon as the major interventions strategy then training should focus on this. Otherwise ongoing training and in-service training of health workers should emphasize the importance of influenza as an urgently notifiable disease in the pacific islands and one that can have devastating affect on a country.

**Information education and communication** should focus on early vaccination and early warning signs of the complications of influenza so people can seek treatment quickly. Specific messages should be tailored for the elderly and very young children.

**Immediate Epidemiological investigations** in an influenza outbreak is not useful in most circumstances due to the nature of the disease. However, matters such as high case fatality rates despite vaccination interventions might need epidemiological investigations.

**During an epidemic**, weekly updates must be provided to the national EpiNet team for assessment feedback and assistance. As with other urgently notifiable disease the most effective and timely means of communication should be used to communicate information to and from the national EpiNet team.

**Outbreak Monitoring at the end of an outbreak** should focus on reviewing interventions applied by the EpiNet team so the future measures could be improved. Some of the areas to review would include:

- Review of death certificates,
- Review hospital admissions for influenza like illnesses,
- Conduct retrospective studies on vaccine efficacy (where applicable),
- Conduct validation studies of influenza illness reporting,
- Conduct retrospective studies on the validation of protective action taken by the EpiNet team and validate any important recommendations.

### 10.5.3 Risk factor assessment and further action

Preparedness for an influenza epidemic is an important feature in the prevention of morbidity and mortality. Investigating unusual cases and unusually high case fatality rates would determine any other risks associated with the epidemic.

## 10.6 Diagnosis

Syndromic diagnosis and determination and confirmation of the epidemic are the important aspects of diagnosis in influenza outbreak determination. At the regional level investigations of outbreaks should be monitored at the sentinel network level through LabNet.

### 10.6.1 Laboratory Diagnosis

Testing for influenza virus is done to determine cause of epidemic (or to exclude influenza as a possible cause of the epidemic) not to diagnose individual cases. In a case where there are appropriate clinical symptoms reported a rapid test to identify or exclude influenza is necessary. This would be done for the first 4-5 reported cases at the local level along side other tests required on other epidemic notifiable conditions.

The local EpiNet team should decide on a suitable rapid test to use in consultation with a local scientist depending on the costs and other logistic support.

Where ever possible level 2 laboratories should be trained, equipped and resourced to do confirmatory analysis of influenza and to give feedback on the results.

If samples are confirmed as positive for influenza then a sample (preferably a cell culture isolate) could be shipped in a batch to the WHO collaborating center in Melbourne for sub-typing and analysis.

### **Collection of Sample:**

A nasal swab or aspirate is required for diagnosis of influenza. Two swabs are required if both a direct examination and cultivation is required. In most instances only a single swab would be required for direct examination. Pharyngeal swabs can also be used if nasal sampling is difficult. However, pharyngeal swabs are less productive for virus isolation.

### **Shipping:**

Logistic issues are a major one in influenza surveillance and individual countries should work out the most practical way to meet the overall surveillance objectives for influenza. In general if level 2 laboratory does not have test facilities the samples could be shipped to level 3 or the WHO reference laboratory in Melbourne depending on existing arrangements with other laboratories in the region.

The sample should be accompanied by request form containing minimum personal and epidemiological data that should be simple for a general practitioner (GP) to complete.

Refer to laboratory protocols for details of collection and shipment techniques.

## **10.6.2 Syndromic Diagnosis**

Syndromic diagnosis and surveillance is the most preferred way to detect an influenza outbreak. This should be done at all levels of the health system including particular institutions such as pediatric wards, outpatient clinics including private clinics, employment agencies and schools. Unusual increases in flue like illnesses (FLI) leading to drop in school attendance and people taking time off work are good indicators of a flue outbreaks that would require further investigations.

## **10.7 Interventions for Containment of an Influenza Epidemic**

Influenza containment relies heavily on active global viral surveillance and the timely production of appropriate vaccine. The prevention of mortality will also depend on the capacity to treat complications of influenza.

### **10.7.1 Standard Treatment**

Major complication of influenza is pneumonia. If treated with sensitive antibiotics the case fatality due to complications of pneumonia can be markedly reduced.

Antiviral drugs are very expensive and are of limited value to use as control measure. EpiNet teams should decide the use of antiviral drugs based on in country capacity. However it is recommended that antiviral drugs should not be prioritized before a vaccination programme.

### **10.7.2 Vaccination**

The current WHO recommendations for vaccinations should be used as the guidelines for vaccinations. The national EpiNet teams should decide on the groups most at risk and develop appropriate strategies to vaccinate these groups in an event of an outbreak of influenza. Health workers should also be considered as persons who are in a particular group at risk and decision made by the national EpiNet team accordingly.

### **10.7.3 Travel Restrictions**

Influenza is a highly contagious disease and travel restrictions are not recommended, as interventions such as this would not be effective.

### **10.7.4 Sanitation and Hygiene**

Not applicable.

### **10.7.5 Community Interventions**

Sharing accurate factual information within PPHSN and the public at large in each country will avoid panic and provide confidence in the health system. After confirmation of the epidemic and exclusion of other potential urgently notifiable diseases the public and the media should be kept informed of the situation.

Key education messages should include:

- Signs and symptoms of influenza,
- If vaccination is available provide information on how to get vaccinated,
- Provide guidance on symptomatic case management at home for uncomplicated cases of influenza, and
- Provide guidance on the signs of major complications of influenza i.e. pneumonia and to seek appropriate treatment.

## **10.7 Preparedness for Epidemic Response**

To ensure preparedness and comprehensive response to an influenza epidemic every country's EpiNet team should develop a comprehensive influenza action plan. The plan should spell out clearly what to do in two scenarios:

1. In an epidemic situation, and
2. A pandemic situation.

The plan should spell out the different levels of responsibility of individuals who are to take part in the response including a committee and its terms of references.

## **10.9 International Coordination and Support**

Influenza requires close regional and global cooperation and coordination. At the global level FlueNet gathers information on global trends of influenza. The following figure illustrates the number of global centers responsible for global surveillance of influenza. Melbourne and Tokyo are the closest WHO collaborating centers in our region which the national EpiNet team should have working with/through the PPHSN.

***Insert slide “How the WHO system works”***

Early notification of influenza or other notifiable conditions to PacNet and PPHSN will enable countries in the region and other relevant agencies to be prepared to support and share resources where appropriate.

Factors for the national EpiNet team to consider in seeking additional support have been described in the other sections.

### **10.11 Other Considerations**

As described under other conditions the national EpiNet team should monitor the epidemic and decide on other interventions as required.

## **11. LEPTOSPIROSIS**

### **11.1 International Implications**

There are non-specific international implications of Leptospirosis. It is however a widespread disease in the Pacific Islands.

### **11.3 National Programme Implications**

Leptospirosis appears to be a widely unrecognized problem in most Pacific Islands countries and territories. However it is increasingly being diagnosed is noted to be widely prevalent among the domestic and agricultural live stock populations in 9 Of the 22 island countries where surveys were conducted by the SPC’s regional animal health services. Health authorities are therefore encouraged to work closely with the agriculture and livestock authorities in all the countries of the region.

### **11.3 Basic Facts**

- Leptospirosis often known as Weil disease is caused by a spirochaetales a motile spiral shaped bacteria
- Leptospirosis is a major infectious livestock disease of public health importance in Pacific Island Countries and territories
- There are over 200 serovars identified in the world and 18 have been identified in the Pacific islands
- The disease occurs worldwide and the reservoir is wild and domestic animals. In the Pacific it has be found in pigs, cattle, goats and dogs.
- It is transmitted through abrasades skin and mucosal membranes when in contact with water, moist soil or vegetation contaminated with urine of infected animals.
- Incubation period is 10 days with a range of 4-19 days.
- Direct transmission from person to person is rare but the organism may be passed in the urine for up to 1 month and has been noted for up to 11 months. It can therefore be passed into the environment for up to 11 months.
- Treatment is effective with early antibiotic therapy.
- Floods and natural disasters that cause excess water are important determinants for the transmission of Leptospirosis

## 11.4 Surveillance and Reporting

Leptospirosis has become an important disease of public health importance recently because diagnostic facilities have become available and that it can be differentiated from other conditions with similar symptoms. The following figure illustrates where major outbreaks have been reported in the Pacific and parts of Asia. Increased surveillance is therefore important in the containment of epidemics in the region.

*Insert slide “Impacts of Leptospirosis in Asia Pacific Region”*

### 11.4.1 Human Surveillance

In most instances the etiologic surveillance system does not work well because it is dependent on dependant on physician awareness and his/her capacity to include Leptospirosis as a differential diagnosis and also the capacity of the local laboratory to conduct appropriate test for Leptospirosis. Leptospirosis, dengue and malaria have similar symptoms and therefore surveillance of Leptospirosis should be built into existing surveillance systems for the surveillance of malaria and dengue. Routine weekly cases based aggregated data reports should be regularly sent to the national EpiNet team focal point. Analysis of data should be done at the most peripheral level of the health system in order that epidemic detection is done early.

Minimum set of information to be collected should include:

- (a) Demographic data - Name, Age, Sex, Ethnicity, Place of Residence and Occupation,
- (b) Risk Factors – Contact with water or moist environment, occupation, outdoor recreational pursuits, recent travel history, history of contact with animals, domestic or wild animas in the surrounding, description of type of contact with immediate surrounding.
- (c) Clinical details should include – Symptomatology, Hospitalization, duration of hospitalization, death, and details of complications

Each country and territory is encouraged to use the existing system of reporting as far as possible and develop appropriate cards and forms and other existing administrative structures to collect surveillance data and respond efficiently to any Leptospirosis outbreak.

All clinically suspected and laboratory confirmed cases must be reported. For this to take place it is important that the clinical and laboratory surveillance systems must be linked.

It is recommended that all laboratories should report presumptive diagnosis based on a rapid test (latex agglutination or dipstick), while awaiting confirmatory tests (microscopic agglutination test - MAT).

As a feedback serovar identification should be reported back to the national EpiNet team and the clinician requesting the test.

### 11.4.2 Case Definition

To ensure standardization of reporting the following case definitions should be used for Leptospirosis outbreak monitoring.

**Clinical Case Description:** The usual presentation of Leptospirosis is an acute febrile illness with headache, myalgia, and prostration associated with any of the following symptoms:

- Conjunctival suffusion

- Meningeal irritation
- Anuria or oliguria and or proteinuria
- Jaundice
- Haemorrhages (from intestine and lungs)
- Cardiac arrhythmia or failure
- Skin rash (particularly pre-tibial)

**Case Classification:**

**Suspected Case** – Is a case compatible with the above clinical case description.

**Confirmed Case** – A suspected case that is confirmed in a competent laboratory.

### 11.4.3 Animal and Environmental Surveillance

The national EpiNet team should work closely with the national veterinary services in determining the circulating serovars and the animal host so well targeted interventions can be developed.

Countries should be encouraged to conduct surveys in collaboration with agricultures and livestock departments to know the different prevalence of Leptospirosis among mammalian hosts in each country.

Where rodents such as rats a major reservoir refuse disposal should be monitored as breeding of rats will increase the risk of Leptospirosis in a locality.

## 11.5 Initial Investigations and Response

Once a suspected epidemic of Leptospirosis is reported the EpiNet team must share report to EpiNet restricted and confirm that there is an actual dengue epidemic. Once confirmed a report should be sent to PacNet for information sharing with the PPHSN.

### 11.5.1 Assessment of Routine Surveillance Data

The national EpiNet team should regularly review existing statistics from clinics and hospital data and other sources of routinely collected data to determine any suspicions of a possible Leptospirosis outbreak.

Leptospirosis aggregated data should include;

- (i) Number of cases by age,
- (ii) Number of confirmed cases,
- (iii) Number of cases by clinical presentations
- (iv) Number of hospitalization and deaths
- (v) History of possible exposure and geographical locality

Regular exchange of information with the veterinary or department of agriculture and livestock is important in assessment of surveillance of Leptospirosis. It is also recommended that the EpiNet team considers co-opting a member of the national animal health authority onto the EpiNet team in an event of a Leptospirosis outbreak.

### Threshold for Action

A single case of suspected/probable or confirmed case of Leptospirosis should prompt epidemic containment measures. In some countries this may not be practical the disease is already prevalent. If this is the case the national EpiNet team should set the national threshold for action.

### 11.5.2 Initial Action and Staff Responsibility

Once a case has been confirmed immediate action should focus on, the individual case management and investigating the possible source of infection with particular attention given to health promotion for the general public.

If there is already a Leptospirosis **implementation plan** in place then this should be activated and the relevant agencies involved in the containment efforts. If there is no plan in place then relevant authorities should be contacted to mount a comprehensive intervention plan for dengue containment. It is imperative that the local animal health authorities be involved in the development of these plans and are ready to be called upon in an event of an outbreak.

A major problem in the lack of diagnosis of Leptospirosis in the past has been the lack of **staff training**. Countries in the region are therefore requested to ensure health staff is trained in the recognitions of the common signs of Leptospirosis and the mode of transmission. In the case of an epidemic staff could be called again for in-service training in treatment and patient care. Public health staff should be trained in assessment of environmental risk in regard to mammalian breeding sites and links with local animal health authorities.

**Information education and communication** should focus on informing the public on the fact that there is a Leptospirosis epidemic, the way Leptospirosis is spread and how it can be avoided. Messages must focus on avoidance of contact with infected water, improve personal hygiene by keeping skin abrasions and cuts well covered and out of contact with potentially infected materials including water and mud. Basic signs and symptoms of dengue may also be included with the general education messages to encourage early self-referral for treatment.

**Immediate Epidemiological investigations** should focus on the source of infection and potential spread of the epidemic to determine the mammalian vector and other environmental factors.

**During an epidemic**, weekly updates must be provided to the national EpiNet team for assessment feedback and assistance. As with other urgently notifiable disease the most effective and timely means of communication should be used to communicate information to and from the national EpiNet team.

**Outbreak Monitoring at the end of an outbreak** should focus on reviewing interventions applied by the EpiNet team so the future measures could be improved and to ensure that dengue risk has been eliminated. Review of weekly reports of cases and their characteristics and other factors, which should include;

- Review of death certificates,
- Review hospital admissions for Leptospirosis,
- Conduct validation studies of Leptospirosis reporting,
- Review of entomological data on mammalian reservoirs and the different serovars in a country.
- Conduct retrospective studies on the validation of protective action taken by the EpiNet team and validate any important recommendations.

### 11.5.3 Risk factor assessment and further action

Main risk factor assessment would be conducted in collaboration with the local animal health authorities to determine the organism, vector, human, and the environmental relationship to determine the best intervention for containment of the current epidemic and to avoid future epidemics.

Further investigations would also be required if there appears to be a failure of any interventions and any other unusual increases in the number of cases or increases in the number of fatalities despite standard interventions and treatment.

## 11.6 Diagnosis

Suspicion of Leptospirosis, with a good history profile of suspected cases, including knowledge of the mammalian reservoir in the community and laboratory confirmation of Leptospirosis is the important aspects of confirming a Leptospirosis outbreak.

### 11.6.1 Laboratory Diagnosis

It is recommended that 2 samples of blood are required for laboratory confirmation. One should be taken during the acute phase of the disease and the other during the convalescent phase. Any rapid test should not be done 4-5 days prior to illness. In **an endemic situation** rapid test should be conducted at Level 1, IgM microplate assay at Level 2 and MAT at Level 3. In a **non-endemic situation** only levels 2 and 3 tests should be encouraged.

Steps to follow:

- (i) Step 1 (in an endemic situation) – Rapid Test
  - Latex agglutination assay
  - Dipstick IgM assay
- (ii) Step 2: Micro plate IgM assay – During this step samples should be sent for MAT
- (iii) Step 3: Microscopic Agglutination Test and Isolation.

Depending on the resources and capacity of each country all these steps need not be followed. The national EpiNet team should decide on the most appropriate cost-effective steps to follow.

### Collection of Sample:

Request forms and labels for the samples should be well designed based on existing experiences. Countries and territories are encouraged to seek assistance from others who have already developed requesting and reporting forms for Leptospirosis.

### Shipping:

As logistics for transportation of samples is important samples should be batched depending on the regularity of flights. Until such time a local confirmatory laboratory capacity is built Pacific island countries and territories should use existing laboratory support arrangements to send samples for Leptospirosis confirmation.

### 11.6.2 Syndromic Diagnosis

It is easy to confuse Leptospirosis with Dengue fever or Malaria. Early confirmation with laboratory tests is encouraged in Leptospirosis.

## 11.7 Interventions for Containment of leptospirosis

Main interventions should be to detect and provide early treatment to patient to avoid deaths from complications of Leptospirosis.

### 11.7.1 Standard Treatment

Treatment focuses on avoiding mortality due to the complications of Leptospirosis. Severe complications includes **Weil's disease** which involves hemorrhage from the lungs, skin and mucosal membranes. internal bleeding and low blood. Treatment with doxycycline and benzyl penicillin is effective. Prompt diagnosis and early treatment of cases is essential in avoiding complications and deaths due to Leptospirosis.

### **11.7.2 Vaccination**

There is no human vaccine against Leptospirosis.

### **11.7.3 Travel Restrictions**

Travel restrictions are not recommended.

### **11.7.4 Environmental and Animal Host Strategy**

Rodent control should be advocated where rats are a major reservoir for Leptospirosis. In some instances vaccinations of livestock to control certain serovars has been useful. Close collaboration with local animal health authorities is essential in determining appropriate other animal host measures are important.

### **11.7.5 Community Interventions**

Public education campaigns should play a major role in containing an outbreak of Leptospirosis. Once the major animal reservoir in the area are known it would be important to target public education campaign that would minimize contact between humans and possible infective agents in the environments. If the environment is flood prone then taking necessary measures on avoiding voiding in potentially infective water should be encouraged. It is important to give out early warning during natural disasters that includes floods.

Other public education messages should include early signs and signs of Leptospirosis so people would seek early treatment to avoid the complications and death from Leptospirosis. Other key education messages should include:

- How Leptospirosis is transmitted,
- How it can be prevented, and
- Provide information of getting rid of rodent breeding sites.

## **11.8 Preparations and Stock and Supplies**

In endemic areas it is important that test kits are made available for clinical diagnosis together with other medical supplies. In non-endemic sites it may be useful to have access to a supply agency that can provide test kits on short notice. Once again working together with the local animal health officials should assist in working out the necessary requirements for a comprehensive response to a Leptospirosis outbreak.

Having a plan developed and documented in preparation for the containment of an epidemic spelling out the roles and responsibilities of individuals who would be taking part in an event of an outbreak, including a list of supplies and equipment is an important step for preparedness to contain a Leptospirosis outbreak.

## **11.9 International Collaboration**

Collaboration between the World Health Organization and the Secretariat of the Pacific Community is an important aspect of regional cooperation in addressing animal health diseases in general.

Leptospirosis is particularly important as the Regional Animal Health Programme of SPC has already a good database of the prevalence of Leptospirosis in the general animal population including the different serovars and their provenance among the different animal populations in the different island countries of the region. Further collaborative regional strategies should be developed in collaboration with other animal health authorities in countries like Australia and New Zealand.

### **11.10 Other Considerations**

Leptospirosis is a difficult disease to diagnose and has just become common because of the increase in the diagnostic capacity of laboratories and clinicians in the region. Due to the prevalence of the organism in the region more emphasis should be placed on training clinical and public health officials in countries to be aware of the disease.

## **12 DENGUE**

### **12.1 International Implications**

Main factors responsible for the spread of dengue fever in the region is related to the movement of people in the region coming in contact with infected vectors that include *Aedes Aegypti*, *Aedes albapictus* and *Aedes polynesiensis*. Improved international collaboration in epidemic reporting and response will assist in the prevention and containment of epidemics in the region.

### **12.2 National Programme Implications**

As Dengue is a vector borne disease which is transmitted depending on man vector relationship and the environment, any national programme intervention that deals with mosquito vector, movement of people and changes in the environment should be involved in any dengue fever control and prevention initiatives.

### **12.3 Basic Facts**

- Dengue is caused by four serotypes of flavoviruses; Serotypes 1, 2, 3 and 4.
- In the Pacific, dengue is transmitted by *Aedes Aegypti*, *Aedes albapictus* and *Aedes polynesiensis*.
- Dengue clinically presents in four main ways; sub-clinical infection, mild fever, dengue haemorrhagic fever (DHF) and Dengue Shock Syndrome (DSS).
- Incubation period is from 3-14 days
- There is no direct person to person transmission but is passed from person to person and transmission takes place by mosquito feeding on an infected person with viremia and passing it to others.
- The reservoir of infection is the human mosquito cycle particularly human relationship with the three main *Aedes* vectors in the region.
- There is no cross immunity between the 4 serotypes of the dengue virus.
- Minimizing the vector population and minimizing man vector contact is the best prevention for dengue prevention.

### **12.4 Surveillance and Reporting**

Since 1970 the Pacific islands have experienced a number of epidemics which include:

- (i) Type 2 outbreak, 1971 – 72,
- (ii) Type 1 outbreak, 1975 – 1978,
- (iii) Type 4 outbreak, 1979 – 1980

(iv) More recently in 1998 a dengue 2 outbreak.

These outbreaks indicate that there is a need to improve surveillance and reporting of dengue in the Pacific. Early warning by early reporting to the PPHSN is the key to early interventions to contain major epidemics of dengue in the region.

The main objective of surveillance should therefore be to suspect, detect and confirm and report followed by action to prevent further transmission and care for those who are already infected.

Two types of surveillance are recommended:

1. **In areas where no dengue transmission has been detected but where any of the three vector mosquitoes occur** – Surveillance of suspected cases with investigation of clusters of suspected cases for dengue,
2. **Countries where disease is endemic with seasonal variations in transmission, and areas where epidemic dengue occurs** – Routine weekly/monthly reporting of aggregated data of suspected probable and confirmed cases from all health facilities should be maintained.

#### 12.4.1 Human Surveillance

Leptospirosis, dengue and malaria have similar symptoms and therefore surveillance of dengue should be built into existing surveillance systems for the surveillance of the three diseases. Routine weekly cases based aggregated data reports should be regularly sent to the national EpiNet team focal point. Analysis of data should be done at the most peripheral level of the health system in order that epidemic detection is done early.

Basic minimum data set should include:

- (i) Unique Identifier (name, age, sex, locality)
- (ii) Symptoms,
- (iii) Date of onset,
- (iv) History of travel in the past 2 weeks,
- (v) Indicate whether hospitalized or not,
- (vi) Describe outcome of illness,
- (vii) Indicate any members of the family with suspected, probable or confirmed cases of dengue.

#### 12.4.2 Case Definition

To ensure standardization of reporting the following case definitions should be used for dengue fever outbreak monitoring.

**Clinical Case Description:** Acute febrile illness for 2 days or more duration with 2 or more of the following manifestations: headache, retro-orbital pain, myalgia, arthralgia, rash, haemorrhagic manifestations, leucopenia. Infants and persons under 15 years of age may have a non-specific febrile illness with a maculopapular rash. Older patient may have a mild febrile syndrome or the classical incapacitating disease.

#### **Case Classification:**

**Suspected Case** – Is a case compatible with the above clinical case description.

**Probable Case** – A case compatible with the clinical description with one or more of the following:

- Supportive serology (reciprocal haemagglutination-inhibition antibody titre more than or equal to 1280, comparable IgG EIA titre or positive IgM antibody test in late acute or convalescent-phase serum specimen)
- Occurrence at same location and time as other confirmed cases of dengue fever.

**Confirmed Case** – A case compatible with the clinical description with laboratory confirmation.

**\* Details also provided in Inform Action August 2001**

As for other urgently notifiable conditions monthly routine reporting through the existing systems of reporting should be strengthened and continued as this is important to confirm an absence of a dengue epidemic ("0" Reporting).

### **12.4.3 Environmental Surveillance**

This would include surveillance on the three main vectors in the region, *Aedes Aegypti*, *Aedes albapictus* and *Aedes polynesiensis*. Depending on the factors that are in each country including seasonal receptivity the EpiNet team might wish to decide to carry out and set up an entomological surveillance network. This would include two options:

1. Carrying out monthly larval surveillance in all localities, or
2. Develop a sentinel larval surveillance system with appropriate laboratory support in the different localities.

The EpiNet team should also have close collaboration with the national disaster and emergency organizations to advocate for potential dengue outbreaks following natural disasters.

## **12.5 Initial Investigations and Response**

Once a suspected epidemic is reported the EpiNet team must share report to EpiNet restricted and confirm that there is an actual dengue epidemic. Once confirmed, a report should be sent to PacNet for information sharing with the PPHSN.

### **12.5.1 Assessment of Routine Surveillance Data**

The national EpiNet team should regularly review existing statistics from clinics and hospital data and other sources of routinely collected data to determine any suspicions of a possible dengue outbreak.

The dengue aggregated data should include:

- (vi) Number of cases by age,
- (vii) Number of confirmed cases,
- (viii) Number of DHF/DSS by age, and
- (ix) Number of hospitalization and deaths due to dengue.

Data from entomological indices should also be monitored so appropriate urban or national authorities can be informed of possible build up of vector populations in the locality so vector control activities can be carried out.

### **Threshold for Action**

A single case of suspected/probable or confirmed case of dengue who has had not history of recent travel should prompt epidemic containment measures.

### **12.5.2 Initial Action and Staff Responsibility**

Once a case has been confirmed immediate action should focus on, field investigations, commencement of vector control activities and health promotion to the general public.

If there is already a dengue outbreak **implementation plan** in place then this should be activated and the relevant agencies involved in the containment efforts notified to commence activities. If there is no plan in place then relevant authorities should be contacted to mount a comprehensive intervention plan for dengue containment.

**Staff training** may be required if there is no local capacity to deal with the epidemic. Otherwise in-service training for environmental health officials in vector identification, and laboratory personnel and refresher training may be required for improving laboratory diagnosis and case management.

**Information education and communication** should focus on informing the public on the fact that there is a dengue epidemic, the way dengue is spread and how it can be avoided. Messages must focus on elimination of mosquito breeding sites, signs and symptoms of dengue and symptomatic treatment of mild dengue. Early warning signs of the severe forms of dengue should also be included in the messages including instructions to seek appropriate treatment.

**Immediate Epidemiological investigations** should focus on the confirmation of a case and the potential spread of the epidemic by assessing vector indices and other environmental factors.

**During an epidemic**, weekly updates must be provided to the national EpiNet team for assessment feedback and assistance. As with other urgently notifiable disease the most effective and timely means of communication should be used to communicate information to and from the national EpiNet team.

**Outbreak Monitoring at the end of an outbreak** should focus on reviewing interventions applied by the EpiNet team so the future measures could be improved and to ensure that dengue risk has been eliminated. Review of weekly reports of cases and their characteristics and other factors, which should include;

- Review of death certificates,
- Review hospital admissions for dengue,
- Conduct validation studies of dengue reporting,
- Review of entomological data on aedes mosquito breeding and feeding habits,
- Conduct retrospective studies on the validation of protective action taken by the EpiNet team and validate any important recommendations.

### 12.5.3 Risk factor assessment and further action

Once again preparedness for an epidemic of dengue is an important feature in the prevention of morbidity and mortality. Additional risk factor assessment should be maintained which includes, major changes in sero-type and the rates of DHF and DSS. Major trends in epidemic diseases or re-emergence of dengue should be assessed regularly.

Further investigations would also be required if there appears to be a failure of any interventions and any other unusual increases in the number of cases or increases in the number of fatalities despite standard interventions and treatment.

## 12.6 Diagnosis

Suspicion of dengue, with a good history profile of suspected cases and laboratory confirmation of dengue are the important aspects of confirming a dengue outbreak.

### **12.6.1 Laboratory Diagnosis**

Laboratory diagnosis is usually confirmatory, however good clinical assessment and history taking could make an accurate diagnosis of dengue. Clinical diagnoses are well described in Inform Action No. 9 of August 2001.

For virus isolation it is recommended that blood be collected early in the course of the disease, within 1-4 days of onset of symptoms. Otherwise thereafter serology techniques are used for dengue diagnosis. Laboratory diagnosis is by two methods, viral detection and serology. Viral detection is done by:

- Cell culture,
- Rib nucleic acid detection by RT-PCR, and
- In-situ RT-PCR on cell and tissues.

Serology can be done at the laboratory or the field level. In the laboratory two principals are used:

- Dengue specific IgM and IgG detection by MAC-ELISA, and
- Demonstration of rise in titre of serum dengue IgM antibodies.

Field test kits are now available for transportation using filter paper. However these need to be tested and made available for peripheral level utilization.

#### **Collection of Sample:**

The ideal situation is to have capacity for dengue diagnosis at all level 1 laboratories. Rapid strip or card tests should be kept at this level for initial screening diagnosis.

If initial tests are positive all samples should be sent to level 2 laboratories for confirmation. Depending on the situation some level 1 laboratories may be able to confirm diagnosis. All designated level 2 laboratories should provide support to level 1 laboratories when required.

#### **Shipping:**

Good logistic coordination, and communication is required between level 1, level 2 and level 3 laboratories to ensure smooth collation and transportation of samples for analysis.

Persons responsible for the packaging and transportation of samples should be aware of the IATA regulations on transportation of biological samples.

The sample should be accompanied by request form containing minimum personal and epidemiological data that should be simple for the requesting physician or nurse to complete.

Refer to laboratory protocols for details of collection and shipment techniques.

### **12.6.2 Syndromic Diagnosis**

Dengue syndromic diagnosis can be made using the clinical case description parameters as described in Inform Action No.9 of August 2001.

## **12.7 Interventions for Containment of a Measles Epidemic**

Preparedness and early warning on vector population and elimination of vectors is an important determinant for containment of a dengue epidemic. Individual case management decreasing case

fatality and does not contribute significantly to the containment of the epidemic. Interventions should therefore focus on vector control and public education.

### **12.7.1 Standard Treatment**

Treatment focuses on avoiding mortality due to internal bleeding and low blood. Treatment does not prevent transmission of dengue and therefore it is important that vector mosquitoes do not bite the patient. **Keep patient away from mosquito bites.** See treatment guidelines Inform Action Vol. 9, August 2001.

### **12.7.2 Vaccination**

There is no vaccine against dengue

### **12.7.3 Travel Restrictions**

Travel restrictions are not recommended. Transport industries such as sea travel, and air travel industries should be informed to take extra precautions in preventing infected mosquito form entering a neighboring country. At the same time early warning through the PPHSN will ensure precautions to e taken by intending travelers to avoid vector human contact.

### **12.7.4 Environmental Strategy**

Elimination of mosquito vector breeding sites is an important intervention to contain a dengue epidemic. All government and private sector agencies should be kept informed of the extent of the epidemic and encouraged to take part in the prevention breeding sites for mosquitoes.

### **12.7.5 Community Interventions**

Public education campaigns are a major strategy to contain any dengue epidemic. Community participation in alleviating mosquito breeding sites Sharing accurate factual information within PPHSN and the public at large in each country will avoid panic and provide confidence in the health system. After confirmation of the epidemic and exclusion of other potential urgently notifiable diseases the public and the media should be kept informed of the dengue situation.

Key education messages should include:

- How dengue is transmitted,
- How it can be prevented,
- Provide information of getting rid of mosquito breeding sites,
- Signs and symptoms of dengue, and
- Provide guidance on the signs of major complications of measles i.e. fever and bleeding.

## **12.8 Preparedness and Stocks and Supplies**

Dengue fever is an important urgently notifiable preventable vector borne disease. Including it has a urgent notifiable disease in all countries of the region and prepared ness to respond by ensuring replenish able standard stock of supplies and equipment is an important indication of preparedness to contain a dengue epidemic in any country of the region.

Countries which have had recent outbreaks and who are more prone to epidemics are encouraged to develop and maintain an operational plan to respond to any dengue outbreak. Plans should spell out the different levels of responsibility of individuals who are to take part in the response including a committee and its terms of references.

## **12.9 International Coordination and Support**

Reporting to PacNet restricted and PacNet on suspicion and confirmation of an epidemic will facilitate a timely regional support to a dengue epidemic. It is therefore important that reports be made to the PPHSN as soon as practical to mount a timely, collective comprehensive response.

## **12.10 Other Considerations**

As DHF and DSS are uncommon clinical presentations in the Pacific it is important to monitor these worst forms of outcomes of dengue infection. It is recommended that a hospital based enhanced system be set up to monitor these two syndromes during an epidemic. Classification of reporting for dengue should include these two clinical forms of dengue. It is recommended that zero reporting of these clinical forms should be maintained and that any case should prompt immediate reporting to PPHSN through PacNet restricted or PacNet.

## **13 Unusually Occurring Serious Condition**

The potential for natural disaster and biological warfare and other conditions of epidemic importance will become increasingly important in the Pacific islands as there is increasing communications and travel between the islands of the Pacific and the neighboring continents.

The national EpiNet teams are encouraged to define their own mechanisms for reporting, providing nationally tailored definition of a serious unusually occurring condition. Teams should work closely with the national disaster and emergency organizations and appropriate collaborating agencies in developing protocols and plans for response to unexpected outbreaks not categorized under the diseases classified in these guidelines.

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## ANNEX

### **SPECIFIC QUESTIONS IS SETTING UP AN URGENTLY NOTIFIABLE SURVEILLANCE SYSTEM AND ASSESSING THE LEVEL OF PREPAREDNESS OF THE EPINET TEAM**

The EpiNet team will be well prepared if the team can answer, “ yes” to all the questions (there is some purposeful duplication in the questions). Although the components are numbered, there is not an exact order in which they should be considered – the order would depend on the situation in each country or locality. Each EpiNet team may be at a different state of readiness with respect to any given component. The preparedness components should be reviewed and acted upon *before* an epidemic, so that the EpiNet team is ready to respond, *during* an epidemic and that the response will be effective, so that the area will be better prepared for the future. To ensure that the surveillance system can detect any epidemic the following questions must be asked:

- (i) Can health workers recognize cases of all urgently notifiable conditions in a country?
- (ii) Do health workers know the surveillance case-definitions for all the urgently notifiable conditions?
- (iii) Do they know how to report suspected cases by the most rapid and reliable means?
- (iv) Do they know what to report?

In Areas Where a notifiable disease Is Endemic:

- (i) Are routine reports complete, sent regularly, and on time?
- (ii) Are reports regularly analyzed for increases in cases that met the case definition?

Investigation Team

- (i) Have possible members of an Investigation Team been identified?
- (ii) Have they been trained or briefed on their duties?
- (iii) Has funding for an investigation been provided for?
- (iv) Have the necessary supplies and resources been provided for?

#### **Mechanism to Collect and transport specimen to a Laboratory**

The national EpiNet team must also ensure that there is capacity to get laboratory confirmation of all urgently notifiable diseases. All necessary specimen collection kits should be readily available to local personnel so that specimens can be collected from the initial cases and before antibiotics are given. This facilitates the rapid confirmation of the epidemic causing agent. To do this properly the EpiNet team must ask the following questions:

- (i) Are personnel trained in collection of specimens from patients?
- (ii) Are the supplies needed for collection and transport of specimens available?
- (iii) Have appropriate supplies and equipment been distributed to health facilities?
- (iv) Have any funds needed for laboratory costs been allocated?

#### **Maintain A Reserve Stock Of Essential Equipment And Supplies**

It is essential that at the national level the EpiNet focal point ensure that adequate stocks and supplies are available to avert serious morbidity and mortality due to any of the urgently notifiable conditions. Therefore the following questions need to be asked to ensure that the national EpiNet team is confident that essential supplies are available.

- (i) Is there a reserve stock of the treatment supplies needed for all urgently notifiable conditions?
- (ii) If so, are the supplies being rotated with usual supplies?
- (iii) Is there a stock of specimen collection kits?

- (iv) Has funding been found for the reserve stock?

### **Emergency Plan for an Epidemic of Urgently Notifiable Condition**

An important role of the national EpiNet focal point and the team is to ensure that policy guidelines are in place to respond to any epidemic.

- (i) Is there an Emergency Response Plan for responding to any of the urgently notifiable diseases?
- (ii) Are all members of the EpiNet and other relevant individuals and agencies aware of the plan?

### **Evaluation of Epidemic Preparedness**

The National EpiNet team should regularly assess the different local EpiNet teams and peripheral health personnel for their epidemic preparedness:

- (i) *Before* an epidemic (to be sure the local EpiNet team is ready),
- (ii) Periodically *during* an epidemic (to be sure that the response is effective), and
- (iii) *After* an epidemic (to be sure the local EpiNet team will be better prepared in the future).

Systematically review the questions in this section. Decide whether there are other indicators of preparedness that you want to add. When you can answer, “ yes” to all the questions, the peripheral EpiNet teams will be ready to respond to any epidemic of urgent notifiable condition.

To ensure that there is sustained response, the national EpiNet team asks the following questions on a regular basis, before and after any epidemic or during a review process.

- (i) Has the preparedness of the district or peripheral level been evaluated?
- (ii) If so, were the results of the evaluation acted on?
- (iii) Are regular, periodic evaluations scheduled?

Each urgent notifiable disease will have particular and specific questions, which needs to be asked to address a particular disease problem with a particular intervention. This needs to be decided and developed by the national EpiNet team.

**DAILY TALLEY SHEET OUT PATIENTS DEPARTMENT**

NAME OF HEALTH INSTITUTION: .....

DATE: .....

URGENT NOTIFIABLE CONDITIONS	TALLEY
CHOLERA	
TYPHOID	
MEASLES	
INFLUENZA	
LEPTOSPIROSIS	
DENGUE	
TOTAL OPD ATTENDANCE	



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## DETAILED CASE MANAGEMENT GUIDELINES FOR CHOLERA

### Assessment of Dehydration

When suspected cholera patients first appear at a health facility, assess the level of dehydration immediately. Severely dehydrated patients may die within hours of illness onset, if not promptly rehydrated. Monitor the patient's hydration status frequently until their diarrhea has ended as sudden, large fluid losses can occur.

### Rehydration Therapy

Most cholera patients can be treated using oral rehydration therapy alone. Oral rehydration salt (ORS) can often rehydrate patients adequately even when they vomit, because most patients absorb enough ORS solution, despite vomiting, to achieve rehydration. The ORS packets produced for WHO contain the correct balance of electrolytes needed to replace those lost in the cholera patient's stool. Patients with signs of severe dehydration require rapid fluid replacement with intravenous fluids initially to prevent shock, kidney failure, or death. Even these patients, however, should start oral therapy as soon as they are able to drink.

Ringer's Lactate is the preferred intravenous fluid. Normal saline or half normal saline with 5% glucose can also be used when Ringer's is not available. These solutions are less effective than Ringer's as they do not correct electrolyte imbalances. When these solutions are used, give ORS solution at the same time to help replace missing electrolytes. Plain glucose solutions are not effective in re-hydrating cholera patients and should not be used. When IV fluids are not available and the patient is too weak to drink effectively, ORS solution can be given by naso-gastric tube.

### Chemotherapy

An effective antibiotic can reduce the volume of diarrhoea in patients with severe cholera and shorten the period during which *Vibrio cholera* 01 is excreted and shorten the period of diarrhoea, shortening the time for hospitalization. Commence antibiotics after the patient has been re-hydrated and vomiting has stopped.

### Antibiotics used to treat Cholera

Antibiotic	Children	Adults
Doxycycline <i>single dose stat</i>		300 mg
Tetracycline <i>4 times per day for 3 days</i>	12.5 mg/Kg	500 mg
Trimethoprim -sulfamethoxazole (TMP-SMX) <i>twice a day for 3 days</i>	TMP 5mg/kg and SMX 25mg/kg	TMP 160 mg and SMX 800 mg
Forazolidone <i>4 times per day for 3 days</i>	1.25 mg/kg	100 mg

Chemoprophylaxis is not recommended in most instances. Mass chemoprophylaxis of communities has failed to limit cholera epidemics in the past and may have led to the emergence of antibiotic resistant strains. The risk of cholera transmission from a patient to family members varies by locale. Selective chemoprophylaxis of family members may be considered if epidemiologic investigations indicate that family member attack rates are high (> 20%). Frequent use of antibiotics in a population will increase the risk of antibiotic-resistant organisms. However, chemoprophylaxis may be useful when a cholera outbreak occurs in a closed population, such as a prison.

**ANNEX**

**OTHER COMMUNITY INTERVENTIONS FOR CHOLERA:  
SAMPLES OF KEY EDUCATION MESSAGES,  
WATER CHLORINATION GUIDE AND KEY ELEMENTS FOR FOOD SAFETY**

**SAMPLES OF EDUCATION MESSAGES**

ARE YOU PROTECTED FROM CHOLERA? DO YOU PREPARE FOOD SAFELY?

Cooking kills cholera germs

- Thoroughly cook all meats, fish and vegetables.
- Eat them while they are hot.

Washing protects from cholera

- Wash your hands before preparing or serving food.
- Wash your dishes and utensils with soap and water.
- Wash your cutting board especially well with soap and water.

Peeling protects from cholera

- Eat only fruits that have been freshly peeled, such as oranges and bananas.

KEEP IT CLEAN: COOK IT, PEEL IT OR LEAVE IT!

ARE YOU PROTECTED FROM CHOLERA? IS YOUR DRINKING WATER BOILED OR TREATED?

Even if it looks clean, water can contain cholera germs. Water for drinking can be made safe in two ways:

- Boil it to kill cholera germs: bring water to a rolling boil, and keep it boiling for one minute.
- Chlorine kills cholera germs; use three drops of chlorine solution for each liter of water, mix well, and leave it for half an hour before drinking.

To make the chlorine solution: mix 3 level tablespoons (33 grams) of bleaching powder in one liter of water.

DRINK ONLY SAFE WATER

This amount is for a bleaching powder that contains 30% concentration by weight of available chlorine. If the bleaching powder available in the market is different, adapt the amount needed to prepare the chlorine solution.

ARE YOU PROTECTED FROM CHOLERA? IS YOUR DRINKING WATER STORED SAFELY?

Clean water can become contaminated again if it is not stored safely. Store drinking water in a clean container with a small opening or a cover. Use it within 24 hours. Keep the water out of the reach of children and animals. Pour water from the container - do not dip a cup into the container.

KEEP IT CLEAN: STORE DRINKING WATER SAFELY



## ARE YOU PROTECTED FROM CHOLERA? DO YOU WASH YOUR HANDS?

The germs that cause cholera are invisible. They can be carried on your hands without you knowing it. Always wash your hands:

- After you use the toilet or latrine, or clean up your children;
- Before you prepare or serve food;
- Before you eat and before you feed your children.

This is the best way to wash your hands:

- Always use soap or ash.
- Use plenty of clean water.
- Wash all parts of your hands - front, back, between the fingers, under the nails.

## KEEP IT CLEAN: WASH YOUR HANDS

## ARE YOU PROTECTED FROM CHOLERA? DO YOU USE A TOILET OR LATRINE?

Cholera germs live in feces. Even a person who is healthy might have the germs in the feces.

- Always use a toilet or latrine. If you don't have one, build one.
- Keep the toilet or latrine clean.
- Dispose of babies' feces in the toilet or latrine (or bury them).
- Wash your hands with soap (or ash) and clean water after using the toilet or latrine.

## KEEP IT CLEAN: USE A TOILET OR LATRINE

## ARE YOU PREPARED FOR CHOLERA? WHAT SHOULD YOU DO IF YOU GET CHOLERA?

Cholera can be treated. The biggest danger of cholera is the loss of water from the body. Don't panic, but act quickly.

- Drink ORS mixed with safe water (boiled or treated).
- Go immediately to the health center. Continue drinking as you go.

Now, before you or your family gets cholera - find out where you can get ORS, and how to mix it.

## CHLORINATION OF WATER

Water can be made safe by chlorination. The following is a guide to chlorination of water. Stock Solution Of Chlorine (1% Concentration By Weight). Add To 1 Liter Of Water: 15 g of calcium hypochlorite (70%) or 33 g of bleaching powder or chlorinated lime (30%) or 250 ml of sodium hypochlorite (5%) or 110 ml of sodium hypochlorite 10%) Store the stock solution in a cool place in a closed container that does not admit light. To be effective, new stock solutions must be made monthly. Combine the stock solution with household water. Add water to the stock solution to assure proper mixing. Add 1 liter of water to 3 drops of stock solution, or Add 10 liters of water to 6 ml of stock. Let the chlorinated water stand for 30 minutes before using. Water that is cloudy should be filtered before chlorinating.

## IMPORTANT ASPECTS OF FOOD SAFETY

Food safety is important and therefore it is important in an event of any Diarrhoeal disease outbreak. The following basic principals must apply to food safety in the community:

- Food must be cooked thoroughly,
- Eat cooked foods immediately.

- Store cooked foods carefully
- Reheat cooked foods thoroughly
- Avoid contact between raw and cooked foods.
- Wash hands repeatedly between food preparations.
- Keep all kitchen surfaces clean.
- Use safe water especially while preparing food for infants
- Canned, dried and acidic foods should be safe.

## **PLAN LOGISTICS AND STAFF RESPONSIBILITIES AND TRAINING NEEDS OF LOCAL STAFF**

The major responses to an epidemic of cholera - patient care, public education and implementation of control measures - require extraordinary efforts by health personnel. The number of very sick patients may overwhelm health services, if there is not a plan or if resources are not available. To avoid confusion and panic, local health officials should plan how to make the best use of staff and of available resources *before* an epidemic occurs. Annex 6 lists suggested responsibilities of health facility and district level staff. Review them before an epidemic and consider who among your staff would be responsible for each task. Notify those people and arrange for any necessary training or briefing. The EPINET team must clearly work out the responsibilities of each staff in the locality of the epidemic using the following guides:

- Have the responsibilities for district personnel been decided?
- Is there a plan for re-assigning staff during an epidemic?
- Has funding been identified for extra staff costs during an epidemic?
- Is there a plan for setting up Temporary Treatment Centers?
- Have logistics needs during an epidemic been identified?
- Has funding for extra costs related to logistics been identified?

To ensure that there is adequate financial and resource support to containment of the epidemic the local EPINET team should answer the following questions:

- Have the costs related to preparation for an epidemic been identified?
- Have the costs for investigation of suspected epidemics been identified?
- Have the costs related to the response to an epidemic been identified?
- Has a source of funding or support been found for each expense?

### **Plan For Implementation Of Control Measures**

To ensure there are adequate control measures in place the local EPINET team should consider the following questions.

- Have potential members of Mobile Control Team been identified?
- If so, have they been trained?
- Has a source of supplies for the team(s) been identified?
- Has transport for the team(s) been identified?
- Have possible Temporary Treatment Center sites been identified?
- Are there plans for providing safe water in affected areas?
- Are there plans for ensuring safe disposal of excreta?
- Are health education materials ready?
- Has funding for control measures been identified?

### **Responding To An Epidemic Of Cholera**

A locality with a Cholera Emergency Response Plan can respond quickly and effectively to a suspected or confirmed epidemic. Planning an emergency response means that you have a procedure guide or “road map” to follow during an epidemic. It also means you have adequate resources and have identified sources of support. The EPINET team should be involved in making

the plan, and if a crisis committee exists, it should be involved. An Emergency Response Plan should specify:

- *What* should be done,
- *When* it should be done,
- *Who* should do it, and
- What *resources* are needed?

Activities to be Done When the First Report of Suspected Cholera is Received (the order in which each activity is done may vary and will depend on how well prepared the affected area is):

- 1) Report the suspected cases to the designated authorities;
- 2) Convene the epidemic committee;
- 3) Identify (or review) responsibilities of staff;
- 4) Send investigation team to the field;
- 5) Inventory essential supplies;
- 6) Inform health facilities to be alert for cases (inform the public when you are more certain it is cholera, usually after the investigation).

Activities to be Done When A Cholera Epidemic is Confirmed, or Strongly Suspected

- 1) Inform neighboring districts or areas;
- 2) Regularly obtain health facility reports, summarize them, and forward them to the designated level;
- 3) Conduct training, if needed;
- 4) Obtain supplies;
- 5) Set up Temporary Treatment Centers, if needed;
- 6) Implement other control measures;
- 7) Monitor and evaluate control measures; and
- 8) Inform and educate the public.

Assign a person to monitor and document control activities, costs and results throughout the epidemic. This will be useful if the strategy needs to be changed during the epidemic and will help you improve EPINET team epidemic preparedness in the future.

### **Identify And Address Training Needs**

One of the responsibilities of a district health officer is to make sure that district health personnel have the knowledge and skills to detect and to respond to epidemics of cholera. In order to *detect* an epidemic, clinical staff should know how to recognize and report possible cases of cholera. If they cannot, they should be trained as soon as possible. However, the district health team may decide to delay training on certain response activities until an epidemic threatens. In that case, district health officers should make a detailed training plan in advance, and plan to use the plan when an epidemic is suspected.

### **Decide Who Needs to be Trained, What They Need to Learn, and When to Conduct Training**

The responsibilities of personnel involved in the detection, confirmation, and control of epidemic cholera should be determined prior to an epidemic. Assess the training needs of the district's personnel, based on those responsibilities.

The table on the next page lists suggested topics - if needed, modify it according to the responsibilities assigned in your own district. Staff should receive initial training and periodic refresher courses during non-epidemic periods and should be trained in the starred (\*) topics *before* an epidemic. Decide whether you will train them in the other topics before an epidemic, or will conduct rapid training when an epidemic occurs.

## TOPICS FOR TRAINING DISTRICT AND HEALTH FACILITY STAFF

Training Target Group	Target group Topic
Health Facility Personnel	<ul style="list-style-type: none"> <li>* Basic epidemiology of cholera</li> <li>* How to recognize cholera</li> <li>* Cholera case definitions</li> <li>* How to report suspected cholera</li> <li>* Case management</li> <li>* Collection of specimens</li> <li>. Collection of data on patients and record keeping</li> <li>. Reporting during epidemics</li> <li>. Taking inventory of treatment and control supplies</li> <li>. Community control measures</li> <li>. Health education of patients and public</li> </ul>
National or Referral level Personnel	<ul style="list-style-type: none"> <li>. Epidemiology of cholera</li> <li>. Surveillance for cholera</li> <li>. How to report suspected cholera</li> <li>. Field investigation, including data collection and analysis</li> <li>. Specimen collection and laboratory confirmation</li> <li>. Case management</li> <li>. Reporting and analysis of data during an epidemic</li> <li>. Taking inventory, estimating and ordering supplies</li> <li>. Implementing control measures</li> <li>. Health education of the public</li> </ul>

When making the training plan, consider the educational level of personnel, the resources available and the amount of time and travel involved. If possible, adapt standard curricula to the needs of the locality. Consult the communicable diseases Programme to coordinate training and for training materials. Training should include plenty of practice of the skills that health workers would be expected to do. Plan for regular supervisory and follow-up activities to ensure that trainees are practicing what they learned, to correct mistakes, and to get feedback from trainees. In addition to formal courses and workshops, supervisors may teach health workers during regular supervisory visits. During an outbreak, simplified on-the-job training may be needed to rapidly bring health workers up-to-date.

### IDENTIFY AND ADDRESS TRAINING NEEDS

- . What % of district's health workers is up-to-date on case management of diarrhea?
- . What % of district's health workers are up-to-date on items starred in the Table above?
- . Is there a plan to train health workers in advance of an epidemic?
- . Is there a plan to quickly train health workers at the time of an epidemic?
- . Are health workers being trained according to the plan(s)?
- . Is funding available (or planned) for training activities?

## SUPPLIES NEEDED TO TREAT 100 CHOLERA PATIENTS

### Re-hydration Supplies 1

- 650 packets oral re-hydration salts (1 liter each)
- 120 bags Ringer's lactate solution, 2 1 liter, with giving sets-
- 10 scalp-vein sets
- 3 nasogastric tubes (adult)
- 3 nasogastric tubes (child)

### Antibiotics For adults:

- 60 capsules doxycycline, 100 mg (3 capsules per severely dehydrated patient) or
- 480 capsules tetracycline, 250 mg (24 capsules per severely dehydrated patient)

### For children:

- 300 tablets trimethoprim-sulfamethoxazole, TMP 20 mg + SMX 100 mg (15 tablets per severely dehydrated patient)

### Other Treatment Supplies

- 2 large water dispensers with tap (marked at 5- and 10-liter levels) for making ORS solution in bulk
- 20 bottles (1 liter) for ORS (e.g. empty IV bottles)
- 20 bottles (0.5 liter) for ORS
- 40 tumblers, 200 ml
- 20 teaspoons
- 5 kg cotton wool
- 3 reels adhesive tape

- 
1. The supplies listed above are sufficient for intravenous fluid followed by ORS for 20 severely dehydrated patients, and for ORS alone for 80 patients.
  2. If Ringer's lactate is unavailable, normal saline can be substituted.

**ANNEX...**

**CALCULATIONS FOR SUPPLIES OF EQUIPMENT FOR CONTAINMENT AND STOCKING**

- Step 1):** If the attack rate is 0.2% multiply the population of catchments area by 0.002. The result is the number of people who might become ill with cholera. i.e. Multiply by 0.002 if you are using the attack rate of 0.2%, Multiply by 0.02 if you are using the attack rate of 2%, Use the attack rate from the outbreak site, if you know it.
- Step 2)** Divide the result of Step 1 (the number of people who might become ill) by 100.
- Step 3)** Multiply each item on the supply list by the result of Step 2. This gives the amount of each item needed.

**EXAMPLE 1**

In a district of 75,000 populations, the EPINET team decided to use the attack rate of 0.2% to calculate the amount of supplies needed:

- Step 1):** They multiplied the population of catchment area by 0.002.  $75,000 \times 0.002 = 150$
- Step 2):** Next, they divided the result of Step 1 (the number of people who might become ill) by 100.  $150 / 100 = 1.5$
- Step 3):** Then, they multiplied each item on the supply list by the result of Step 2. The list gives 650 packets of ORS.  **$1.5 \times 650 = 975$ . THEY ORDERED 975 PACKETS OF ORS.**

**EXAMPLE 2**

A remote health clinic, with a catchment population of 4,000 persons, has decided to maintain a reserve stock of cholera treatment materials. They use 2% as the attack rate.

- Step 1)** They multiplied the population of catchment area by 0.02.  $4,000 \times 0.02 = 80$
- Step 2)** Then, they divided the result of Step 1 by 100.  $80 / 100 = 0.8$
- Step 3)** Finally, they multiplied each item on the supply list by the result of Step 2.

The list gives 650 packets of ORS.  **$0.8 \times 650 = 520$ . THEY ORDERED 520 PACKETS OF ORS.**