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Health Laboratory Facilities in Emergency and Disaster Situations

Warren Johns
Auckland
New Zealand

Waren Sanborn
Solana Beach, California. USA

Corinne Lacroix
Médecins sans Frontières
Paris, France

Mohamed El-Nageh*
World Health Organization
Eastern Mediterranean Region
Alexandria, Egypt

Claus Heuk*
World Health Organization
Geneva, Switzerland

Alfred Reich
Manheim, Germany

Paul Shears
The University of Liverpool
Liverpool, United Kingdom

Patricia Corcorant
World Health Organization
Geneva, Switzerland

*Editors

World Health Organization
Regional Office for the Eastern Mediterranean
Alexandria, Egypt
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FOREWORD

Unfortunately, emergencies and disasters are widespread all over the world and many people suffer from famine, pain, injury, and infections Therefore, there is a need for basic care and further support for emergency planning by national and international organizations

The World Association of Societies of Pathology (WASP) appreciates very much the publication of these very important guidelines by the Eastern Mediterranean Regional Office of the World Health Organization. According to these guidelines, the appropriate national organizations should plan, introduce and establish basic administrative and organizational structures to be able to respond immediately and adequately to an emergency or a disaster

The WASP supports all activities which promote the realization of a national contingency plan by local or international specialists in the field of laboratory medicine. These guidelines are an important contribution towards fulfilling the essential requirements of coping with emergencies and disasters. We strongly recommend that all relevant national organizations follow these guidelines.

Prof. Dr. med. H. Reinauer
Vice-President
World Association of Societies of Pathology
(Anatomic and Clinical)

PREFACE

Many countries are vulnerable to disasters and emergency situations and a number of countries in the Eastern Mediterranean Region have suffered from such situations in recent years. The Eastern Mediterranean Regional Office of the World Health Organization has identified the need for guidelines on health laboratory services and problems associated with disasters and emergency situations that fall within the scope of these services.

This publication is intended to provide information on the provision of basic laboratory services in emergency situations. It is aimed at all health professionals, including physicians, nurses, laboratory technicians and other paramedical staff.

The guidelines are also intended to assist international agencies, national authorities and other bodies involved in emergency and disaster relief in drawing up contingency plans for the provision of emergency laboratory services. These plans should enable those involved to respond rapidly and specifically to the needs of the situation. It should be emphasized, however, that the guidelines describe laboratory services that are intended for emergency situations and therefore may not necessarily represent what would be recommended for health laboratory services functioning under normal circumstances. Nevertheless, under any conditions, principles of quality assurance must always be applied and laboratory safety respected.

Throughout the text it has been assumed that the laboratory staff involved are technically competent and well trained in good laboratory practice and quality assurance. For this reason, with a few exceptions, no technical details are given.

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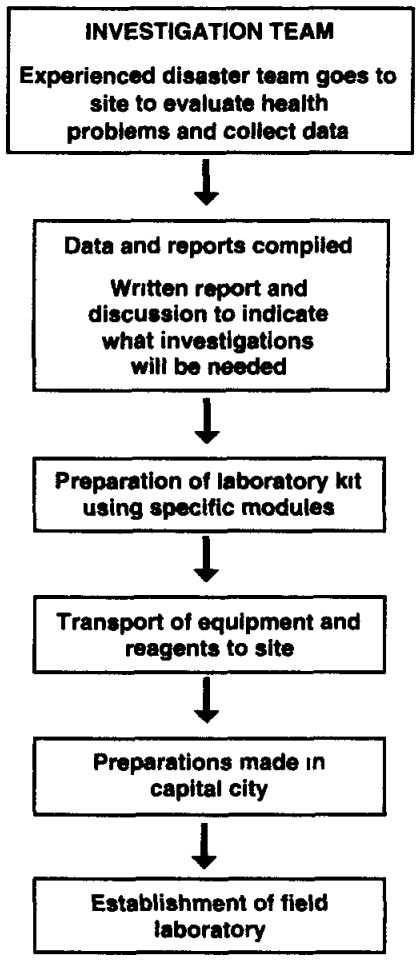

Recommended steps in establishing a laboratory in an emergency

INTRODUCTION

For the purposes of this publication the following definitions of 'emergency' and 'disaster' are those used in the document *WHO Action in Emergencies and Disasters* [1].

emergency
sudden occurrence demanding immediate action that may be due to epidemic, technological catastrophe, strife, or natural and man-made causes;

disaster
any occurrence that causes damage, ecological disruption, loss of human life, or deterioration of health and health services on a scale sufficient to warrant an extraordinary response from outside the affected community or area.

Emergencies and disasters demand prompt and adequate response, and the provision and monitoring of relief will be required until normal services can be resumed. To meet these demands, contingency plans and preparedness are of fundamental importance. In order to be able to respond quickly and adequately to an emergency or a disaster, every country should formulate a national contingency plan and establish mechanisms for emergency preparedness and response in the health sector. The national plan should be based on coordinated multisectoral emergency activities and all aspects, including the plan for emergency health services, should fit into the established administrative structure. The provision of disaster relief may require the support of health laboratory services. Therefore a national programme of emergency health services should include provision for an emergency health laboratory service.

When formulating a national plan for timely and appropriate response to emergencies and disasters a presumptive assessment of needs should be made. The assessment of needs depends upon many factors, some of which relate to the type of disaster (e.g. earthquake, destructive wind, flooding, epidemic, war, famine, refugees) and others which relate to local conditions (e.g. national economic situation; geographic conditions; state of transport and communication; availability of health facilities in the country as a whole and specifically in the affected area; number of people affected; availability of water, food, sanitation facilities, shelter and electricity). Those responsible for a national programme of emergency health services should have readily available a list of external health relief agencies to be contacted should external support be needed (see Annex 1 for a list of agencies providing health relief).

In emergency situations and disasters, basic medical care is essential to limit morbidity and mortality due to infectious diseases and other medical conditions, such as trauma. Morbidity and mortality may result from an increase in the prevalence of existing endemic diseases, such as measles and infantile gastroenteritis, or from epidemic diseases, such as cholera and typhus. Disease surveillance is an essential component of disaster assessment and is also important for monitoring the effectiveness of relief interventions. Some diseases, such as measles, have a

typical clinical picture which permits diagnosis without laboratory investigations. However, many infectious diseases require laboratory facilities to make or confirm diagnosis, or to enable valid epidemiological data to be collected.

Emergency laboratory facilities operating in response to disaster face many constraints, including remoteness of location, lack of reagents, limited equipment and power supplies, and insufficient numbers of trained staff. Experience gained from disasters and famine relief areas over the last two decades has provided useful and important information on the optimal use of laboratory services with limited resources.

The primary objectives of laboratory services in emergency situations are the prevention or control of infectious diseases and the management of conditions such as anaemia and trauma.

The pages containing descriptions of contents of modules have been printed on separate pages for easy reproduction and inclusion with individual modules in warehouses and in the field.

CHAPTER 1

DISEASES AND MEDICAL CONDITIONS COMMONLY ASSOCIATED WITH DISASTERS

Different health problems are associated with different types of disaster. **Box 1.1** lists various types of disaster. A list of the diseases and medical problems that may be encountered in disasters is shown in **Table 1.1**. Not all of these problems will occur in every disaster. For example some are dependent upon geography; e g a flood or tidal wave in a tropical area may create the conditions for an outbreak of malaria, but this is unlikely to happen in temperate climates. Other problems, such as outbreaks of dysentery and gastroenteritis, can occur anywhere.

The conditions listed in **Table 1.1** are frequently interrelated but may occur independently. Disasters which result in homelessness and population displacement may contribute to the spread of infectious diseases The risk factors for potential outbreaks of disease should be assessed early on by a team of experienced health professionals and risk factors for infectious diseases must be taken into consideration when contingency plans for disasters are drawn up

BOX 1.1 **Types of disasters**

Natural

- **epidemic**
- **earthquakes**
- **volcanic eruption**
- **flood**
- **cyclone**
- **drought**

Man-made

- **war, including chemical and bacteriological warfare**
- **environmental pollution including chemical and nuclear accidents and sewage pollution**

Natural or man-made disasters may result in the following:

- **population displacement and formation of camps for displaced people or refugees**
- **famine**
- **drought**

by national authorities. The relationship between the diseases that may be encountered and their modes of transmission are outlined in **Table 1.2.** Modes of transmission include inhalation, injection, induced trauma, and vectors.

TABLE 1.1 **Diseases and medical conditions encountered in disaster situations**

Disease/medical condition	Population displace-ment	Epidemic	Earthquake /volcanic eruption	Flood/ tidal wave	Drought	War	Environmental pollution
Aids/HIV	1	0	0	0	0	1	0
Anaemia	2	0	0	0	1	0	1
Anthrax	1	1	0	1	0	0	1
Cholera	2	2	0	2	1	1	1
Dehydration	1	0	1	0	1	1	0
Dengue*	1	1	0	1	0	0	0
Diphtheria	1	1	0	0	0	0	0
Dysentery/ gastroenteritis	2	2	0	2	1	1	1
Enteric fevers	2	2	0	1	1	1	1
Haemorrhagic fever*	1	1	0	1	0	1	0
HepatitisA	1	1	2	2	1	1	1*
Intoxication	0	1	0	0	0	0	2
Leptospirosis	1	1	0	1	0	1	2
Leishmaniasis	1	1	0	0	1		
Malaria	2	2	0	1	1	1	0
Malnutrition	2	0	0	0	1	1	0
Measles	2	1	1	1	2	1	0
Meningitis	1	2	0	0	0	1	0
Plague*	2	1	0	0	0	1	0
Poliomyelitis	1	1	0	1	0	0	1
Protozoan dysentery	1	1	0	1	1	1	1
Relapsing fever*	2	2	0	0	0	1	0
Streptococcal disease	0	1	2	0	0	0	0
Tetanus	1	0	2	1	0	2	0
Trauma	1	0	2	2	0	2	0
Tuberculosis	1	1	0	0	0	0	0
Typhus*	1	1	0	0	1	1	0
Viral encephalitis	1	0	0	1	0	0	0
Whooping cough	1	0					

0 = Rare problem
1 = Potential problem (depends on area)
2 = Likely problem (depends on area)
* Particularly in endemic areas

TABLE 1.2 **Modes of transmission of diseases encountered in disasters**

Disease	MODE OF TRANSMISSION						
	Food contamination	Water/ sanitation	Aerosol droplet	Vector	Sexual contact	Blood/ needles	Trauma/ burns
AIDS/HIV					X	X	
Anthrax	X	X	X				
Bacterial dysentery/ gastroenteritis	X	X					
Cholera	X	X					
Dengue				X			
Diphtheria			X				
Enteric fevers	X	X					
Hepatitis A	X	X					
Intestinal helminths and protozoa	X	X					
Leishmaniasis				X			
Leptospirosis	X	X					
Malaria				X			
Measles			X				
Meningitis			X				
Plague			X	X			
Pneumonia			X				
Poliomyelitis		X					
Protozoan dysentery		X					
Relapsing fever				X			
Streptococcal disease			X				X
Tetanus							X
Trench fever				X			
Tuberculosis			X				
Typhus				X			
Viral encephalitis				X			
Haemorrhagic fever[1]	X	X	X	X		X	X
Whooping cough			X				

[1] The mode of transmission is usually a vector, but other modes occur depending on the particular virus involved

CHAPTER 2

SITUATION ANALYSIS

2.1 Planning and assessment of needs

Poor water and sanitation, crowding and inadequate shelter are known to be risk factors common to most disasters and therefore likely to lead to outbreaks of communicable diseases which will require diagnostic laboratory services. Anticipation of these factors should enable the early establishment of essential laboratory facilities.

Preliminary assessment of the overall health situation and needs should be made by an experienced health team, using check lists and other means of collecting data. When medical services are required, an experienced laboratory technician should be part of the operational team. Where risk factors are not apparent or the situation is more complex, for example where trauma is involved, such data may be used to determine laboratory needs

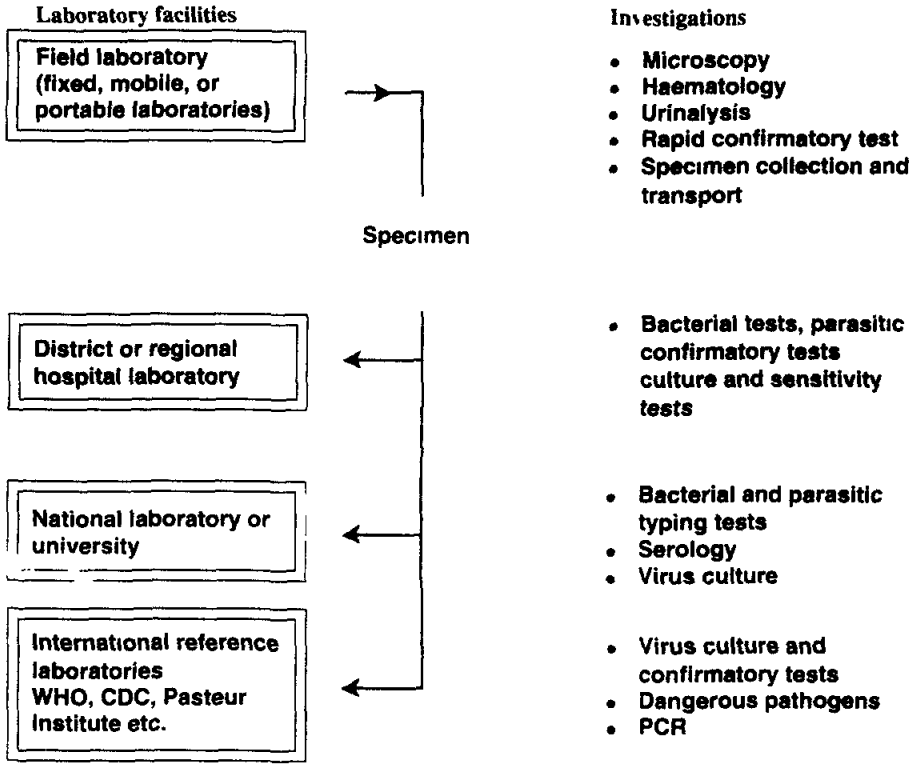

Figure 2.1 Laboratory referral/support hierarchy

During the early stages of a disaster, laboratory services are more useful for identifying the major health problems than for diagnosing individual patients. This information, when combined with the available data on prevalent causes of morbidity and mortality (such as measles, diarrhoea and dysentery, respiratory infections and malaria), can provide a useful basis for planning and evaluation of control measure efficiency Laboratory results, together with data on disease prevalence enable ongoing surveillance to determine changes in disease patterns and to give early warning of epidemics During epidemiological investigations, laboratory services can provide a definitive confirmation of a suspected disease.

For a population dispersed over a large area or several locations, one laboratory may serve all or part of the affected population In such situations it is more appropriate to collect and transport samples to a central field laboratory than to set up a laboratory in each location.

The field laboratory will not always be able to undertake all the necessary investigations such as the proper testing for viral infections or the culture of mycobacteria. Therefore, it is important that the laboratory be part of a laboratory network as illustrated in **Figure 2.1.**

Support to district and regional laboratories in the form of materials, equipment, or personnel may be an important component of disaster response. National and international reference laboratories should be involved in supporting field laboratories (a list of international reference laboratories is given in Annex 2).

2.2 Assessment of existing services

2.2.1 General

Central and local laboratory services, where they exist, should be assessed by the laboratory technician during the first visit of the assessment and/or operational team(s). Capabilities should be recorded. Strengths and weakness of available health laboratory services should be reported.

2.2.2 Supplies

The laboratory technician should also visit a number of local suppliers of laboratory equipment, chemicals and reagents. A telephone call is not sufficient A personal visit enables the technician to check:

- availability of equipment and supplies;
- storerooms for stock levels;
- the possibilities for local purchase of basic items such as microscope slides, methanol, Field's stain and Giemsa's stain, together with their prices.

2.2.3 Reference laboratories

The laboratory technician should also visit local reference laboratories and check the following:

- standard of work, professional capability and willingness of laboratory staff to test referred samples;
- availability and quality of media and other consumables such as Cary-Blair, Amies transport medium, alkaline peptone water, TCBS medium, and Group O1 polyvalent antiserum;
- expiration dates of materials;
- source of supplies.

2.2.4 Blood transfusion services

Finally the technician should visit the local blood transfusion services to check the following:

- adequacy of blood stocks;
- contingency plans for provision of extra blood supplies from other centres and other countries;
- stocks of in-date grouping antisera;
- availability and routine use of HIV and HBV testing kits;
- cold chain equipment and vehicles for blood transport.

2.2.5 Logistics of sample referral and transport of blood

The laboratory team should check the following:

- state of all transportation (road, rail, river, sea and air);
- timetables for buses, trains, ships, river ferries and aircraft flights;
- other agencies, e.g. United Nations or Red Cross/Red Crescent, to determine if specimens can be sent on chartered aircraft.

2.2.6 Contacts with existing laboratory services and suppliers

The team should also register the following:

- names, addresses and telephone numbers (work and private) of contact persons and store-room key holders;
- opening hours of services;
- availability and call-up signs of high frequency radio, for base office of UN, Red Cross/Red Crescent, Médecins sans Frontières, and other organizations;
- fax and telex numbers of services, including the above organizations.

2.3 Selection of laboratory staff

Staff for emergency laboratories may be locally trained or expatriate. Criteria for selection should include the following:

a) *Essential*

- internationally or nationally recognized qualification in medical laboratory technology. The laboratory technologist must be familiar with:
  - microscopical techniques for the identification of parasites and bacteria;
  - basic haematological investigations;
  - water testing for thermotolerant (faecal) coliforms;
  - blood grouping, crossmatching, and HIV, HBV, and syphilis testing, using rapid or simple tests;
  - use of other rapid or simple diagnostic tests;
- flexible approach to tasks and problems encountered in field and emergency laboratories;
- willingness to work long, unsocial hours;
- ability to work and take decisions without direct supervision.

b) *Desirable*

- experience in logistics and purchase of equipment;
- experience in general laboratory management;
- experience of working overseas (if expatriate);
- working knowledge of language of the country (if expatriate), whenever possible. The employment of bilingual local staff or an interpreter may also help.