WHO/CDS/BVI/95.4
DISTR: LIMITED
English only

Report of an Interregional Meeting on Prevention and Control of Plague

New Delhi, India
13-16 March 1995

WORLD HEALTH ORGANIZATION
BACTERIAL, VIRAL DISEASES AND IMMUNOLOGY

TABLE OF CONTENTS

ANNEXES

1. EXECUTIVE SUMMARY

The outbreak of plague in India in 1994 was of global concern. WHO convened an Interregional Meeting in the WHO Regional Office for South-East Asia, New Delhi, from 13 to 16 March 1995 to review the lessons learned from the outbreak and to make recommendations for the prevention and control of plague and other infectious diseases with epidemic potential.

With improved hygiene and living standards, the availability of effective drugs for treatment and prophylaxis and the large-scale application of insecticides, the world-wide incidence of plague decreased steadily during the 20th century with a remarkable decline in the mid-1950s, although no real decrease was apparent world-wide during the last two decades. During the period from 1954 to 1993, 36 countries notified 67 344 cases and 6 095 deaths to WHO under the International Health Regulations, with case fatality rates ranging from 14.4% in Africa to 5.4% in the Americas.

The 1994 outbreak of plague in India started in Mamla village in the Beed district of Maharashtra State. In this village, rat-fall was reported on 5 August 1994 followed by reports of flea nuisance. On 26 August 1994, 33 patients with lymphadenitis were reported. From September until October 1994, suspected bubonic cases were reported from other villages of Beed district and other districts of Maharashtra State. A total of 596 presumptive cases (i.e. with positive serology) of bubonic plague were reported. The last case of bubonic plague occurred in Beed District on 2 October 1994.

An outbreak of acute respiratory illness characterized by fever, cough, hemoptysis and pneumonic infiltration seen in radiographs occurred in Surat, Gujarat State, in September-October 1994. The infection occurred with greatest frequency in young adults. It did not respond to treatment with penicillin, but responded well to tetracycline. The case fatality was high during the early stage of the outbreak. Based on the clinical picture and the occurrence of plague in the bordering state of Maharashtra, the diagnosis of suspected pneumonic plague was made. A total of 146 presumptive (seropositive) cases and 54 deaths considered as due to plague occurred place during the period 19 September to 22 October 1994. The independent international team established by WHO concluded that clinical, epidemiological and serological findings pointed to *Y. pestis* as the likely causative agent of the Surat outbreak. Subsequently, the National Technical Advisory Committee on Plague established that *Y. pestis* was the causative agent in three Surat patients with pneumonia by isolation and characterization of the organism.

Experience gained during this outbreak demonstrated that epidemic preparedness has to be a concern of health authorities at all levels of the health system, beginning with the community and extending to the global level. It should include laboratory support to ensure rapid and accurate confirmation, or at least preliminary confirmation, of clinical diagnoses. While epidemic preparedness can often appropriately be focused at local (district) level, it will need to be encompassed within a broader framework of integrated disease prevention and control strategies at regional (state) and national levels.

Recognition of a suspected epidemic posing an acute public health threat should be followed by the immediate formation of a multi-disciplinary Action Group to review the findings and decide on further actions to be taken, including clinical, epidemiological

and microbiological investigations.

For a number of diseases, insect vectors and animal reservoirs play a critical role. In epidemic-prone areas, surveillance services are required to monitor vector frequency, susceptibility to insecticides and rates of infection. They should also determine the distribution and infection rates of reservoir hosts and their susceptibility to control measures.

Building partnerships with the media and others involved in public relations is an integral part of the responsibility of health authorities. These partnerships must be fostered on a routine and continuing basis and appropriate channels of communication used to provide timely and accurate information in simple language.

Rapid action to contain diseases with serious epidemic potential, and to publicize such action, will often be critical in countering rumours and maintaining public confidence. This is also important to ensure that other countries do not impose inappropriate restrictions with respect to international travel and commerce.

Surveillance for new, emerging and re-emerging diseases must be a component of general disease surveillance within the health infrastructure. Reporting systems need to be improved and streamlined and surveillance data rapidly analysed to provide the essential information needed for decision-making. Guidelines for surveillance and control activities should be prepared in simple language for peripheral staff who have a key role in early detection and containment of diseases of concern.

The capacity to make a presumptive diagnosis must exist on all levels of health services, from national down to the district level. Confirmatory diagnosis should be the primary responsibility of the national reference laboratory.

Involvement of NGOs and other voluntary organizations, with their roles clearly defined, may contribute substantially to the containment of an outbreak.

The International Health Regulations (IHR) define a sound framework for national and international action and provide a model for all communicable diseases with rapid epidemic potential. Guidelines on application of the IHR at country level should be circulated by WHO.

2. INTRODUCTION

Plague is a disease of great antiquity, recorded in the ancient writings of India as well as in the Bible. Three great pandemics have swept across the world claiming many millions of lives and causing untold misery. The last pandemic, which began in the late 19th century, claimed about 13 million deaths in India alone. A remarkable decline in the number of cases and deaths due to plague was observed in the 20th century including in India, where no cases had been reported since 1967.

However, in 1994, plague suddenly re-emerged in India. Bubonic cases in Beed district of Maharashtra State and Surat City preceded an outbreak of pneumonic cases in Surat City in Gujarat State. The outbreak in Surat created local panic and international concern, leading to the imposition of travel and trade restrictions by a number of other countries. Effective measures taken by India brought the Surat outbreak rapidly under control and the disease did not spread to other countries.

An Interregional Meeting was convened in the WHO Regional Office for South-East Asia, New Delhi, from 13 to 16 March 1995 to review the lessons learned from this outbreak of plague and to make recommendations for the prevention and control of plague and other infectious diseases with epidemic potential.

The meeting was opened by Dr Hiroshi Nakajima, Director-General of WHO and was attended by staff from WHO Headquarters, WHO Regional Offices of the African, South-East Asian and Western Pacific Regions and scientists from India, Russian Federation, Thailand, Tanzania, United Kingdom and United States of America. The objectives, agenda, and list of participants are annexed. Professor V. Ramalingaswami accepted to Chair the meeting.

3. OPENING SESSION

Dr Nakajima, in his inaugural address, recalled that the control of plague had been one of WHO's earliest priorities. WHO expert committees met in 1949, 1952, 1958, 1969 and consultations were also held in Geneva (1979) and New Delhi (1989) where the need for effective plague surveillance was repeatedly emphasized. Emergency preparedness and response, including response to epidemics, require a well-coordinated plan of action and pooling of resources and efforts. Priorities must be clearly understood by all; relevance and timeliness are first among these priorities. The Director-General highlighted the need for increased coordination both at national and international levels. WHO should help countries prepare for and take effective action.

Dr Uton Muchtar Rafei, Regional Director, WHO/SEARO, noted that the lessons learned from the last epidemic of plague in India will enable countries to be better prepared to control future outbreaks of plague and other infectious diseases. The importance of epidemiological surveillance for the early recognition of outbreaks and carrying out of effective control measures, particularly for those diseases with epidemic potential, both at national and international levels, was stressed.

Dr Ralph H. Henderson, Assistant Director-General, WHO, reviewed the background and the objectives of the meeting. The outbreak of plague in India resulted not only in the loss of life and social disruption for thousands of people but also in substantial economic losses from trade and tourism. While there were many technical lessons to be learned from the outbreak of plague, he suggested that the meeting as a whole should also focus on more generic issues which would apply to any disease with epidemic potential.

Dr Mukherjee, Director General of Health Services, India, presented the steps taken by the Government of India to bring this outbreak under control.

4. REVIEW OF PLAGUE WORLD-WIDE

With improved hygiene and living standards, the availability of effective drugs for treatment and prophylaxis and the large-scale application of insecticides, the incidence of plague decreased steadily during the 20th century. Vector control measures brought plague under control in India in the 1950s. The 1994 outbreaks of bubonic plague in Beed district, Maharashtra and of pneumonic plague in Surat, Gujarat, were the first human cases reported in India since 1967.

During the period from 1954 to 1993, 36 countries notified 67 344 cases and 6 095 deaths to WHO under the International Health Regulations. The highest number of cases, 6 004, was reported in 1967 and the lowest, 200 cases, in 1981. The largest proportion of reported cases (66.8%) was notified by countries in Asia, followed by Africa and the Americas. The case fatality rates were relatively high in Africa (14.4%) and low in the Americas (5.4%). Despite the remarkable decline in the incidence of plague in the world in the mid-1950s, there appears to have been no real decrease world-wide in the last two decades.

The distribution of human plague throughout the world corresponds to the geographical distribution of its natural foci in wild rodents, which persist at present in North and South America, Africa and Asia, and to some extent in south-eastern Europe. Sporadic cases of human plague may occur in natural foci. Epidemics may develop if the ecology and environment are disturbed by earthquake or floods when wild rodents leave their normal habitats and come in contact with domestic rodents and hence result in human infections. Large outbreaks of plague have occurred during the past decade in Peru, Madagascar, Tanzania, Viet Nam and most recently in Zimbabwe and India. Recrudescence of enzootic plague has almost always been related to epizootics of the disease among rodents.

The meeting identified the following important issues:

1. Given that occurrence of plague epidemics is closely associated with the presence of natural foci, there is a need to investigate the presence of hitherto unknown natural foci particularly in Africa, Asia and South America.

2. Experience from a number of countries suggests that areas affected by plague are expanding over time. Therefore, surveillance for plague must be strengthened in countries where natural foci exist.

3. The existing reported data underestimate the true incidence of plague world-wide. There is a need to strengthen surveillance and reporting practices.

4. Plague case fatality rates vary in different regions. Improvements in case management and availability of effective treatment for plague can assist in reducing case fatality, particularly in Africa and Asia.

5. PLAGUE IN INDIA

Plague is estimated to have caused some 12.5 million deaths in India between 1886 and 1950. Plague was then successfully controlled and between 1967 and 1993 no human cases were reported in India. The recent cases highlight the threat posed by the new, emerging and re-emerging infectious diseases, most of which have epidemic potential.

The National Institute of Communicable Diseases (NICD), New Delhi, acts as the national centre for surveillance and control of plague and played an important role in the investigation of the cases in 1994. Since 1980, NICD has instituted serological surveillance of rats for evidence of plague in addition to pathological examinations. In the period 1983-1988, 133 668 rodent sera were examined and none was found positive for *Y. pestis*. However, in 1989, three (*Tatera indica*) samples were found to be positive; in 1990 four; in 1991 fifty; in 1992 one hundred and thirty five; in 1993 twenty-one and in 1994 (up to September) seventy-three. During the last three years, sero-positivity was found in three common species of rodents: *Tatera indica, Rattus rattus* and *Bandicoota bengalensis*.

In Mamla village in the Beed district of Maharashtra State, rat-fall was reported on 5 August 1994, followed by reports of flea nuisance. On 26 August 1994, 33 patients with lymphadenitis were reported. From September until October 1994, suspected bubonic cases were reported from other villages of Beed district and other districts of Maharashtra State. A total of 3 701 clinically suspected cases (including 596 presumptive cases i.e. with positive serology) of bubonic plague (without any deaths) were reported. The last case of bubonic plague occurred in Beed District on 2 October 1994. The patient was isolated, cured and discharged on 7 October 1994. The examination of serum samples from recovered patients (also from dogs and rodents from Beed district) showed high titres (1:128 and 1:1024) of antibody to *Y. pestis*.

An outbreak of acute respiratory illness characterized by fever, cough, hemoptysis and pneumonic infiltration seen in radiographs, occurred in Surat, Gujarat State, in September-October 1994. This infection occurred with greatest frequency in young adults. It did not respond to treatment with penicillin, but responded well to tetracycline. The case fatality was high during the early stage of the outbreak. Based on the above clinical picture and the plague outbreak in the bordering state of Maharashtra, the diagnosis of suspected pneumonic plague was made. A total of 1 088 clinically suspected, 146 presumptive (seropositive) cases and 54 deaths due to plague took place during the period 19 September to 22 October 1994. Seroreactivity to F1 antigen of *Y. pestis* transmission was found among the affected patients. The independent international team established by WHO concluded that clinical, epidemiological and serological findings pointed to *Y. pestis* as the likely causative agent of the Surat outbreak. Subsequently, the National Technical Advisory Committee on Plague established that *Y. pestis* was the causative agent by isolation and characterization of the organism in three Surat patients with pneumonia. Vigorous control efforts undertaken by the Government of India and State Government resulted in there being no transmission of pulmonary plague outside of Surat. The last case of presumptive pneumonic plague in Surat city occurred on 11 October 1994. The

patient was isolated, cured and discharged on 15 October 1994. No case of plague has occurred after this date in any part of the country and no evidence was found to suggest transmission of *Y. pestis* in any major urban population other than in the city of Surat.

Surveillance capabilities were adequate to detect suspected cases of human plague. Case containment, case treatment, contact tracing, and the administration of prophylactic antibiotics to populations at risk were timely and comprehensive.

TABLE 1. A SUMMARY OF OBSERVATIONS[1] RELATED TO PLAGUE IN INDIA

Observation	Surat	Beed District
Rat falls	NR	R
Flea nuisance	NR	R
Positive cultures of *Y. pestis* from		
(a) Fleas	ND	pending
(b) Rats	ND	R
Antibody to *Y. pestis* in		
(a) Dogs	R	R
(b) Rats	ND	R
Bubonic Plague cases	R	R
Pneumonic Plague cases	R	NR
Positive cultures of *Y. pestis* from presumptive plague patients	R	ND
Four-fold rise of titre of antibody to *Y. pestis* in presumptive plague patients	R	R
Histopathological evidence of plague infection in patients	R	NR
Detection of PLA gene of *Y. pestis* by polymerase chain reaction in the extracted DNA from		
(a) autopsy materials	R	ND
(b) pure cultures	R	ND

ND - Not Done R - Reported NR - Not Reported

[1] *NICD, WHO International Team and National Advisory Committee on Plague.*

Experience gained during the outbreak indicates the need for strengthening of surveillance, systematic epidemiological studies, improvement of laboratory services and better interaction with media and the press.

The following specific problems were identified:

- Laboratory capabilities insufficient to quickly confirm cases and the broad working case definition used for surveillance sacrificed specificity for sensitivity. In consequence, the number of clinically suspected cases rapidly rose to high levels, many times the number later found to be seropositive. Throughout the outbreak, diagnosis chiefly depended on procedures that are used to support a diagnosis of suspected plague (Gram stain, Wayson stain of clinical materials) and on serological procedures that support presumptive (probable) plague (a single serum specimen tested in passive hemagglutination assay).

- Although Mamla village had reported flea nuisance on 5 August 1994, concrete steps were taken only from 26 August onwards when bubonic plague cases started to appear.

- The interaction between the media and medical fraternity in some instances gave rise to confusion and misleading reports. Under the prevailing social and political circumstances, it is difficult to envisage how the initial public panic and its coverage by national and international media could have been prevented. The broad case definition used initially resulted in the number of suspected cases rapidly rising into the thousands. With the expansion of laboratory support facilities, a more specific case definition was evolved and only presumptive cases were reported. Problems with the understanding of data that were disseminated contributed in part to the application of travel and trade restrictions in excess of what was warranted by the actual events. In some countries, an additional factor was inadequate capacity to screen incoming airline passengers and to place them in isolation or under surveillance as appropriate.

- During the outbreak, the etiological agent *Y. pestis* was not isolated in pure culture.

- NICD had maintained surveillance of the rodent population in states neighbouring Maharashtra State. Since 1989, increasing frequency of seropositivity to *Y. pestis* had been detected but the public health implications of the findings were not fully exploited.

- Lack of precise operational case definitions hindered diagnosis and appropriate reporting.

6. HISTORICAL OVERVIEW OF COMMUNICABLE DISEASES AND PERSPECTIVES ON NEW, EMERGING AND RE-EMERGING DISEASES

Communicable diseases were responsible for 44% of deaths in developing countries in 1990 and they are expected to continue to dominate well into the 21st century. Some of the disease problems which countries like India are facing are common communicable

diseases including malaria, Kala-Azar, Japanese encephalitis, hepatitis E, cholera 0139, Kyasanur forest disease and filariasis. In Thailand, melioidosis, with a case-fatality of about 40%, has become aggravated by the increasing prevalence of HIV infection. Given the severe resource constraints, increased allocations for the prevention and control of such diseases should be seen as an essential component of more general actions to foster sustainable national development. The adverse consequences of epidemics, not only on public health but also on trade and tourism, make the investment in control, including the investment in relevant research capacities, highly cost-effective.

Considerable progress in strengthening WHO's response to communicable diseases was reported from African, Eastern Mediterranean and Western Pacific Regions, although many challenges remain. A growing problem is that of natural and man-made disasters, requiring more vigorous WHO response to epidemics and antibiotic resistance as is frequently encountered in refugee settings and was observed in Rwanda. SEARO plans to organize a consultative meeting with Member States later in 1995 to improve recognition of, and response to, new and re-emerging infectious diseases. The Regional Office proposes to strengthen national and regional surveillance, information dissemination, research applied to basic public health issues and laboratory support through promotion of standard, rapid and simple laboratory techniques. It also proposes to encourage surveillance of antimicrobial resistance and development of standard case definitions for various diseases for use by countries. In order to reach targets and maintain high quality programme standards, it will be necessary to mobilize additional resources while making maximal use of those already available. Programmes for the prevention and control of communicable diseases should continue to be integrated into the basic health infrastructure and primary health care.

7. RESPONSE TO EPIDEMICS

7.1 Epidemic Prevention and Preparedness

Environmental conditions pertaining to the breeding of rodents, fleas and mosquitoes and to the availability of safe water and sanitation play a dominant role in the origin of many epidemics, including those caused by cholera, malaria and plague. In rural areas, primary prevention depends heavily on community action. In rapidly growing urban areas ("magnets for microbes" according to one author), prevention also depends on adequate investments by municipal, state and national authorities in safe water supply, sanitation and housing. In all areas, ill-planned development projects can also create the potential for epidemics. All of these factors underline the importance of inter-sectoral collaboration in the prevention of epidemics.

Epidemic preparedness has to be a concern of health authorities at all levels of the health system, beginning with the community in the country and extending to the global level. For each infectious disease which poses an epidemic threat at national or subnational level, guidelines for response have to be established which encompass case definitions, case management and containment, and, where vectors are involved, the use of pesticides and other vector-control procedures. These guidelines have to be kept current and made familiar to health staff in epidemic-prone areas.

Epidemic preparedness has to include the support services available from the laboratory so that rapid and accurate confirmation, or at least preliminary confirmation, of clinical diagnosis is available. The importance of laboratory diagnosis is heightened by clinical presentations of many diseases which have been rendered atypical because of antibiotic use, modified virulence or modified host factors. Efforts are needed to make such services available as close to the community level as possible. Routine quality assurance of laboratory methodologies has to be an element of epidemic preparedness. For diseases with epidemic potential, it is essential that adequate supplies of appropriate diagnostic reagents be made readily available so that laboratory testing can be carried out rapidly. Production of reagents for which there is no local commercial source needs to be assured on a national basis where appropriate, otherwise at regional or global level.

For a number of diseases, insect vectors and animal reservoirs play a critical role. In epidemic-prone areas, surveillance services are required to monitor vector frequency, susceptibility to insecticides and rates of infection, and to determine the distribution and infection rates in reservoir hosts and their susceptibility to control measures. The centre or centres responsible for monitoring have to ensure that the results are known to those in a position to take remedial action and that summary information on such monitoring and action is published at least at national level at regular intervals.

While epidemic preparedness for diseases with focal incidence can often appropriately be focused at local (district) level, it will need to be encompassed within a broader framework of integrated disease prevention and control strategies at regional (state) and national levels. While recognizing that a general shortage of resources severely constrains action in many cases, if the resources made available at national, sub-national and local levels are not sufficient for epidemic prevention and control, high costs in terms of loss of trade and tourism will be the likely result.

Epidemic preparedness requires on-going efforts in applied research to ensure that appropriate methods are developed and are widely available, particularly in relation to (a) diagnostic tests, which have to be rapid, accurate and relatively simple to perform and (b) treatment, including studies on antimicrobial sensitivity. The simple tools needed for rapid diagnosis and appropriate treatment will only be developed by the investment in science and scientists to meet the highest standards. Although the initial cost of developing these tools may be high, they will be of little front-line use unless they become available at affordable prices. Implementation requires effective communication and partnerships between public health professionals and biomedical researchers.

Recognition of a suspected epidemic of a disease posing an acute public health threat or other untoward emergency event needs to trigger the immediate formation of a multidisciplinary Action Group to review the findings and decide on what further actions are required, including further clinical, epidemiological and microbiological investigations. Ideally, the Group needs to comprise an epidemiologist, a clinician, a microbiologist or laboratory specialist, and, when a serious epidemic appears probable, relevant civil authorities. In many rural areas, the Group, in practice, will consist of the district medical officer and immediate staff. When the Group concludes that a serious epidemic is probable, membership needs to be expanded to include relevant representatives from the community and from civil authorities, at times also including state and national

representatives. The Group needs to be small (usually less than 12 persons) to function effectively. Members of the Group have to be of sufficient seniority to take decisions on behalf of their organizations. The Group will define the policies with respect to case-definitions, treatment, preventive action and communications, including those with the media. It will decide when an outbreak is over and produce a final report drawing on the lessons learned.

Relationships with the media and the public are of critical importance to the prevention and control of epidemics and depend on good relationships which have been established on a routine basis. (See Chapter 8 for additional recommendations).

Specific recommendations on the prevention and control of plague are well summarized in the report of the 1989 WHO Consultation on Plague held in New Delhi and are contained in Annex 5.

7.2 Response at National and International Levels

Effective containment of the spread of epidemics depends most importantly on the prompt actions taken by the persons infected, their household contacts and the health workers with whom they have first contact. Persons seriously afflicted with an acute illness should be rapidly referred to a health worker, either by the persons themselves, by members of their household or by their neighbours. Such rapid referral can only be expected if the population of the locality concerned has confidence in the ability of the health care system to provide a supportive response, not only in the face of the rare occurrence of an epidemic disease, but also in the everyday workings of routine health care. If the illness is thought to relate to a communicable disease with acute epidemic potential, the worker, in addition to attending to the health care needs of the persons concerned, should alert the appropriate public health authorities immediately.

Once health workers learn of the potential threat of an epidemic, rapid action is required to make a working case-definition for the purposes of treatment and perhaps a more stringent case-definition or definitions for the purposes of identifying cases, contact-tracing, placing persons under isolation or surveillance, providing treatment and record cases in a line-listing. The nature of the case-definition or definitions must be adapted to the local circumstances, and will remain a matter of judgement; those making the judgement must be fully informed of the epidemiological and public relations consequences of the balance chosen between sensitivity and specificity.

Open and rapid flow of information within the health system and to the general public and media from the health system is required if the official health information is to be credible. Such credibility is difficult to establish in the face of an epidemic if confidence in the routine health information system is lacking. The greater the concern at local level about the potential for a serious epidemic, the greater the need for open and rapid communication with others, including relevant civil authorities, private practitioners and the media.

Rapid action to contain diseases with serious epidemic potential, and to publicize such action, will often be critical in countering rumours and maintaining public

confidence. This will also be important to ensure that other countries do not impose inappropriate restrictions with respect to international travel and commerce.

Response from the local level is of vital importance both for outbreak containment and the routine surveillance for new, emerging and re-emerging diseases. Emergency preparedness at the local level depends heavily on the training of the staff. Early recognition of unusual occurrences of groups of illnesses similar in clinical picture would facilitate quick response.

The capacity for presumptive laboratory diagnosis must exist on all levels of health services from national down to the district level. Confirmatory diagnosis should be the primary responsibility of the national reference laboratory. This laboratory, in addition to training of staff for laboratory services, should help in development of peripheral laboratory services, thus helping to avoid overloading the national laboratory during outbreaks as occurred during the plague outbreak in India. The national laboratory also has to ensure the proficiency of peripheral laboratories through periodic visits and a quality assurance programme. A close network of laboratories in the country and collaboration with the WHO reference laboratories would facilitate the early diagnosis of new, emerging and re-emerging diseases.

Surveillance for new, emerging and re-emerging diseases needs to be a component of general disease surveillance within the health infrastructure. Areas undergoing rapid ecological changes, either man-made (irrigation, industries, etc.) or natural (earthquakes, etc.), should receive priority attention for surveillance. Health staff at various levels lose awareness of a problem that does not occur for several years, as exemplified by the plague outbreak in India. Effective surveillance including sero-surveillance of rodent and animal populations in previously endemic areas will be helpful in early detection of plague and other zoonotic diseases.

Timely analysis is essential if surveillance data are to be used effectively for action. Reporting systems need to be improved and streamlined. Emphasis should be given to providing essential, minimum information for maximum utilization. The type of information to be transmitted to various levels of health services should be clearly defined so as to facilitate quick response and avoid overloading.

Guidelines for surveillance and control activities need to be prepared in simple language for peripheral staff who have a key role in early containment of outbreaks. Detailed guidelines for higher echelons of technical staff should be widely available and familiar to the staff concerned.

The state level needs to update the mapping of high risk areas and have contingency plans for epidemic prevention and control developed in collaboration with districts and primary health centres/health posts.

In the interest of speed, health personnel at different levels must have access to some financial resources for prompt containment of an outbreak.

Involvement of NGOs and other voluntary organizations, with their roles clearly

defined, can be highly beneficial in the containment of an outbreak.

WHO should periodically update the information available on the subject of new, emerging and re-emerging diseases and provide information to countries, including provision of advanced warning to countries threatened with such diseases. WHO should review the relevance of International Health Regulations in the light of advances made in the treatment of diseases and the impact of extensive international travel.

8. PUBLIC INFORMATION AND PUBLIC RELATIONS DURING EPIDEMICS

Building partnerships with the media and others involved in public relations is an integral part of the responsibility of health authorities. Media and public relations must be fostered on a routine and continuing basis and appropriate channels of communication used to provide timely and accurate information in simple language. During crises, an appropriate spokesperson must be identified who can ensure that conflicting information is not provided. In crises involving international health concerns, close liaison is needed between the national spokesperson, the WHO Representative and, in many circumstances, the Regional Office concerned. Regularly scheduled press conferences, even on a daily or more frequent basis, may be required.

9. SURVEILLANCE OF COMMUNICABLE DISEASES

"The ravaging epidemic of AIDS has shocked the world ... . We will face similar catastrophes again ... . We have too many illusions that we can ... govern the remaining vital kingdoms, the microbes, that remain our competitors of last resort for domain of the planet."[1]

The global problem of infectious diseases as a leading cause of death is increasingly being acknowledged. New, emerging and re-emerging infectious diseases are a special threat in both developing and industrialized countries. This threat has many causes, including rapid and often uncontrolled urbanization, increased speed and volume of international travel, population moves to uninhabited areas, microbial adaptation (including development of antibiotic resistance) and deterioration of public health infrastructures. Early detection and rapid implementation of effective control measures are the best defenses. Epidemiological services with special emphasis on surveillance need to be developed both nationally and internationally to serve as early warning systems and effective rapid response mechanisms.

Effective surveillance is essential for early action to prevent and control epidemics. For surveillance systems to be effective the following principles need to be respected:

- the data requested are <u>needed</u> for action
- these data are <u>used</u> for action

---

[1] Lederberg J. JAMA 1988; 260: 684-5

- the use of the data justifies the work involved in its collection
- the use of the data is understood by those responsible for collection
- simple data analysis is done at the level of collection for action at that level
- rapid analysis and feedback of the data from the centre to the field is assured

A landmark report entitled '*Emerging Infections: Microbial Threats to Health in the United States*' was issued in 1992 by an Institute of Medicine (IOM) Committee. This report highlighted the complacency concerning infectious diseases which had developed over the past 25 years in the United States and other industrialized countries because of the availability of antibiotics and vaccines to combat most major infectious diseases. It emphasized the threats posed by microbial agents, identified the factors that contribute to disease emergence and re-emergence and stressed the need to heighten vigilance and strengthen response capability. The relevance of the report was highlighted by outbreaks in the United States of America of *E. coli* 0157:H7, Cryptosporidia, Hantavirus, vancomycin resistant enterococci and penicillin-resistant pneumococci within 6 months of its publication.

Based on the recommendations of this report, the Centers for Disease Control and Prevention (CDC) developed a strategy addressing emerging infections[2] containing four goals: strengthening surveillance and response capability, addressing applied research priorities, improving prevention and control strategies, and strengthening the public health infrastructure at the local, state and federal levels. Implementation of the strategy requires effective partnerships with other federal, state and local public health agencies, academic institutions, industry, WHO and other international organizations and agencies.

Experiences to date suggest that the world will continue to confront national and international outbreaks, including those of new syndromes caused by long recognized microbial agents, and increasing problems posed by antimicrobial drug resistant organisms. Responding to these threats will require strengthened surveillance and formation of multidisciplinary response teams at the local, national and international levels with expertise in epidemiology, laboratory science, behavioural science and disease control.

There are many definitions of surveillance. The definition published in Last's *Dictionary of Epidemiology* emphasizes the characteristics of practicability and timeliness to enable prompt action, defining surveillance as "ongoing scrutiny, generally using methods distinguished by their practicability, uniformity and frequently their rapidity, rather than by complete accuracy. Its main purpose is to detect changes in trend or distribution in order to initiate investigative or control measures".

---

[2] Centers for Disease Control and Prevention, Atlanta, Georgia. *Addressing Emerging Infectious Disease Threats: A Prevention Strategy for the United States.* US Department of Health and Human Services, Public Health Services, 1994.

The specific objectives of surveillance at the national level are: the early detection of outbreaks to enable rapid investigation and control; the monitoring of trends to assess the need for intervention or modification of existing preventive programmes; the evaluation of preventive measures; the provision of information for service planning and resource allocation; the collection of data on rare and newly recognized diseases for research purposes.

Surveillance systems may be classified as addressing five broad categories of data: morbidity and mortality; outbreak investigations; circulation and prevalence of infectious agents in man, animals and the environment; biological changes in agents such as changing antigenicity in influenza virus and antibiotic resistance in bacteria; and factors affecting susceptibility such as prevalence of antibodies to vaccine preventable diseases.

Several broad principles underlie each of these systems:

- Surveillance is a continuous process.
- Surveillance is based on relatively simple and uniform methods of data collection.
- Surveillance should provide early warning pointers to changes in disease epidemiology rather than all the answers to the how and why of such changes.

The key elements of surveillance are the systematic collection of pertinent data, the transformation of data into information, the evaluation of that information and its prompt dissemination to those who need to know.

Many sources of data may be used in the surveillance of morbidity and mortality. For instance, the most valuable sources in England and Wales are statutory notifications of infectious diseases by clinicians, voluntary reports from microbiology laboratories and voluntary reports from general medical practitioners working at the primary care level in sentinel practices.

In general it is appropriate to apply agreed case definitions for surveillance purposes, but statutory notification of certain infectious diseases is required in England and Wales whenever the disease is suspected by a clinician. The system is operated in this way to provide maximal sensitivity to allow early detection of clustering or single cases where control measures are required. The definition of a confirmed case will normally include both clinical and laboratory based components. Ideally a case definition should be developed as part of a strategy for the control and prevention of the specific communicable disease.

The development of effective international surveillance will depend on several prerequisites:

- The existence of political and financial support.
- Agreement on standardized definitions and methods.
- The collection of data from each collaborating country on a prospective basis.
- A coordinating centre for each surveillance system to undertake collection and analysis.
- A rapid alert mechanism.

Europe-wide surveillance of AIDS and HIV infection with the above characteristics is now well-established. In the last few years several other international systems have been developed in the European Region which meet these requirements. Examples include Salmnet for the surveillance of human salmonellosis (involving 13 countries) and EWGLI for the surveillance of travel-associated Legionnaires' disease (involving 23 countries). Both these systems are meeting their key objectives of the early detection of common source international outbreaks, leading to prompt collaborative investigations including exchanges of strains.

The European Commission, under the provisions of the Maastricht Treaty, is committed to promoting and strengthening European surveillance based on a well-defined strategy. It is essential that linkages be established with surveillance networks elsewhere in Europe and in other Regions. The World Health Organization is being encouraged to take a leading role in facilitating this process, particularly in terms of forming bridges between its vertical programmes and horizontal programmes such as those developing in Europe.

The present surveillance system in India, especially with regard to many epidemic diseases, is weak. The surveillance systems for certain diseases, including the EPI target diseases, cholera, Japanese encephalitis and malaria, are more satisfactory. Most of the notifications are based on clinical diagnosis, with considerable under-reporting of cases. The general practitioners are not part of the reporting system, and there are few or no links with the clinicians. The National Institute of Communicable Diseases was established in 1964 to function as a centre of excellence and as a national focal point for surveillance. It remains constrained in its functions by limitations in resources.

10. REVIEW OF APPLICATION OF PROVISIONS OF THE INTERNATIONAL HEALTH REGULATIONS

The International Health Regulations (IHR) were adopted by the Twenty-second World Health Assembly on 25 July 1969 and were further amended in 1973 and 1981. In accordance with Article 22 of the Constitution, they are binding for all Member States of WHO except if a Member State submits a reservation within a fixed time period. The purpose of these regulations is to ensure maximum security against the international

spread of diseases with a minimum of interference of world traffic by preventing infection from spreading from a country where it exists and containing it upon arrival. Plague is one of the three diseases -besides cholera and yellow fever - which are reportable under the International Health Regulations (IHR). Countries where an outbreak occurs are obliged to notify cases with as much epidemiological information as possible and to inform of preventive measures taken.

Many countries and organizations do not adequately adhere to the IHR for various reasons, including lack of familiarity with them and inadequate laboratory facilities to confirm diagnosis. The variable degree of compliance with the regulations in different countries contributes not only to the underestimation of the incidence of these three diseases world-wide but also to the imposition of unnecessary restrictions beyond the provisions of the IHR. Developments in mass media communication and the increasing volume and rapidity of international travel increase the pressure on national governments and WHO to report accurately and rapidly on disease outbreaks and on response measures taken which present new challenges to the implementation of the regulations.

The International Health Regulations (IHR) define a sound framework for national and international notifications and provide a model for all communicable diseases with rapid epidemic potential. Guidelines on application of the IHR at country level should be circulated by WHO.

A close collaboration should be established with the International Civil Aviation Organization (ICAO) for effective implementation of IHR at airports and for international passengers.

11. CONCLUSIONS

There is increasing concern about the global prevalence of infectious diseases as a leading cause of death. The recent outbreak of plague in India highlights the threat posed by the new, emerging and re-emerging infectious diseases, most of which have epidemic potential.

Experience to date suggests that the world will continue to be exposed to national and international outbreaks, new infectious disease syndromes and increasing problems posed by anti-microbial drug resistant organisms.

The best defence is prevention, early detection of these diseases and rapid implementation of effective control measures. Effective surveillance is essential for early action to prevent and control epidemics. For this purpose, strengthened surveillance systems and rapid response mechanisms are essential. These require expertise in epidemiology, laboratory science, behavioural science and disease control, and could operate at local, national and international levels. Action at the local level is vital both for outbreak containment and for routine surveillance.

Epidemic preparedness has to include laboratory support services for accurate and rapid confirmation of clinically diagnosed cases. The importance of laboratory diagnosis is heightened by clinical presentations rendered atypical because of antibiotic use,

modified virulence or modified host factors. It is essential that adequate supplies of appropriate diagnostic reagents are ensured so that laboratory testing can be carried out rapidly.

Effective surveillance is essential for a number of diseases where insect vectors and animal reservoirs are critical elements.

Open and rapid flow of information within the health system and to the public and media is an integral part of the response mechanism and is needed to counter rumours, maintain public confidence and assure other countries with respect to international travel, trade and commerce.

12. RECOMMENDATIONS

1. National authorities should periodically review their own capability and capacity with respect to (i) the prevention and control of communicable diseases with epidemic potential, and (ii) emergency preparedness and response in case of such outbreaks. Plans of action and allocation of resources for meeting such an eventuality must be worked out in advance. The use of a check list in such a national review is recommended. Questions that may be included in the check list are given in Annex 6.

2. In order to ensure that assessment of epidemic preparedness is carried out periodically and is satisfactory, national authorities should consider designating one focus, perhaps an office within the Ministry of Health or a national institution, with this responsibility. The annual reports of such assessment should be reviewed at high (ministerial) level.

3. Recognition of a suspected epidemic or other untoward event should trigger the immediate formation of a multidisciplinary Action Group to review the findings and decide on what further actions are required, including further clinical epidemiological and microbiological investigations. The Group should define the policies with respect to case-definitions, treatment, preventive action and communications, including those with the media. It should decide when an outbreak is over and produce a final report drawing on the lessons learned.

4. Epidemic preparedness should be a concern of health authorities at all levels of the health system, beginning with the community and extending to the global level. For each infectious disease which poses a significant epidemic threat at national and subnational level, guidelines for response should be established.

5. At regional and global levels, WHO should undertake similar reviews of epidemic preparedness within the Organization itself. An inventory of existing capacities as well as of additional resource needs should be developed and support sought from national and international levels to meet them.

6. WHO should also review its existing Collaborating Centres and assess potential new Centres to build an effective global network with capacities to recognize, report and respond to outbreaks of infectious diseases.

6.1 The ability of these Collaborating Centres to communicate rapidly with each other and with WHO Regional Offices and Headquarters should be assured in support of their advisory, training and reference functions.

6.2 WHO should maintain an up-to-date panel of experts, both from Collaborating Centres and elsewhere, on diseases with epidemic potential who could be on-call to help countries at short notice either through consultation or visit. This information should be readily available to WHO Regional and country offices.

6.3 The Collaborating Centres should assist the countries in producing reagents for laboratory diagnosis. For small countries, where it may not be cost-effective to produce reagents, WHO should ensure their availability at the most convenient Collaborating Centre.

7. A large unmet need for training exists, related to routine surveillance, epidemic preparedness, laboratory diagnosis and response. WHO should promote teaching of epidemiology in medical and allied health worker schools and appropriate training guidelines and materials. Such teaching should emphasize the importance of disease surveillance, preparedness and response to outbreaks of communicable diseases. Periodic newsletter and health bulletins should be used as part of a strategy for continuing education.

8. Many national authorities are not sufficiently familiar with the International Health Regulations. WHO should collaborate with national authorities by issuing a short guide highlighting the most critical aspects of the Regulations.

8.1 The International Health Regulations provide a helpful framework with respect to the national and international action in relation to other diseases. WHO should promote that framework as a general model, particularly with respect to new and emerging infectious diseases.

8.2 WHO should also liaise with the International Civil Aviation Organization (ICAO) and other relevant organizations to ensure that International Airports, in particular, conform to the International Health Regulations.

9. WHO should encourage and assist countries to initiate applied research on new, emerging and re-emerging infectious diseases.

10. WHO should continue to convene periodic meetings on the prevention and control of new, emerging and re-emerging infectious diseases at Regional and Interregional level in order to promote the implementation of the actions which have been recommended and to assess the need for additional actions.

WORLD HEALTH ORGANIZATION

ORGANISATION MONDIALE DE LA SANTE

ANNEX 1

INTERREGIONAL MEETING ON PREVENTION AND CONTROL OF PLAGUE

New Delhi, 13-16 March 1995

OBJECTIVES

The specific objectives of the meeting were:

(1) To review the recent outbreak of plague in India.

(2) To assess the lessons learned from the plague experience in India in particular with respect to public health policies and related technical, economic, political and legal aspects.

(3) To heighten awareness of the potential risks of plague in other countries.

(4) To identify strategies for strengthening epidemic preparedness and response in both Member States and WHO.

(5) To recommend measures for strengthening the surveillance of and response to new, emerging and re-emerging communicable diseases.

(6) To consider whether there is a need to revise any of the provisions of the International Health Regulations.

WORLD HEALTH ORGANIZATION

ORGANISATION MONDIALE DE LA SANTE

ANNEX 2

INTERREGIONAL MEETING ON PREVENTION AND CONTROL OF PLAGUE

New Delhi, 13-16 March 1995

AGENDA

1. Opening Session
2. Review of Plague World-wide
3. Plague Outbreak in India in 1994
4. Recommendations for Remedial Action for Different Levels
5. Review of the Application of the International Health Regulations.
6. Public Information and Public Relations During Outbreak
7. Surveillance of Communicable Diseases
8. Communicable Diseases with Epidemic Potential and Recommendations on WHO Responsibilities
9. Review and Discussion on Conclusions and Recommendations of the Meeting
10. Adoption of the Report

WORLD HEALTH ORGANIZATION

ORGANISATION MONDIALE DE LA SANTE

ANNEX 3

INTERREGIONAL MEETING ON PREVENTION AND CONTROL OF PLAGUE

New Delhi, 13-16 March 1995

PROGRAMME*

Monday, 13 March 1995

0900-1030	**Opening Session** *(Agenda Item 1)*	Professor V. Ramalingaswami Chairman, National Advisory Committee on Plague, India
	Opening of the Meeting	Dr Hiroshi Nakajima Director-General, WHO
	Opening Remarks	Dr Uton Muchtar Rafei Regional Director, WHO/SEARO and Dr A.K. Mukherjee Director-General of Health Services Government of India
	Background and Objectives of the Meeting	Dr Ralph H. Henderson Assistant Director-General, WHO
1045-1230	**Review of Plague World-wide** *(Agenda Item 2)*	Dr Ralph H. Henderson Assistant Director-General, WHO and Dr L.J. Martinez Programme Manager, BVI/HQ

**Chairman of the Meeting: Professor V. Ramalingaswami*

Monday 13 March 1995

1400-1630	**Plague Outbreak in India in 1994** *(Agenda Item 3)*	
	Plague in India	Dr K.K. Datta Director, NICD, Delhi
	Plague in Maharashtra	Dr S.R. Salunke Director of Health Services, Maharashtra
	Plague in Surat	Dr J.C. Gandhi Deputy Director of Health, Gujarat and Dr D.N. Shah, Medical Superintendent, New Civil Hospital, Surat
	Action taken by the Government of India	Ms Shailaja Chandra, Joint Secretary, Ministry of Health & Family Welfare, India
	Action taken by the WHO Representative to India	Dr N.K. Shah WHO Representative to India
	Action taken by WHO/SEARO	Dr Samlee Plianbangchang, Director, Prevention and Control of Diseases, SEARO
	Action taken by WHO/HQ	Dr Ralph H. Henderson Assistant Director-General, WHO
	Report of the International Team of Experts	
	• Epidemiological and Laboratory Findings	Dr David T. Dennis, Chief, Bacterial Zoonoses Branch, Centres for Diseases Control and Prevention, Fort Collins, USA
	• Clinical Findings	Dr V.V. Maleev, Deputy Director, Central Research Institute of Epidemiology, Moscow
	Preliminary Findings of the National Committee of India	Prof. V. Ramalingaswami, Chairman, National Advisory Committee on Plague, India

Tuesday, 14 March 1995

0900-1230 **Panel discussions: Recommendations for Remedial Action for Different Levels** (*Agenda Item 4*)

Moderator
Dr Ralph H. Henderson
Assistant Director-General, WHO

Representatives taking part in this Panel:

Dr J.C. Gandhi, Deputy Director of Health, Gujarat
Dr D.N. Shah, Medical Superintendent, New Civil Hospital, Surat
Dr S.R. Salunke, Director of Health Services, Maharashtra

Dr S. Sehgal, Director (Micro.), National Reference Laboratory, NICD, Delhi

Ms Shailaja Chandra, Joint Secretary, Ministry of Health & Family Welfare, Government of India

WHO: AFRO, EMRO, SEARO, WPRO, HQ

1400-1515 **Panel discussions: Review of the application of the International Health Regulations** (*Agenda Item 5*)

Moderator
Mr T.S.R. Topping
Deputy Legal Counsel/HQ

Introduction — Dr J.-C. Alary, ESS/HQ

Representatives taking part in this Panel:

Ms Shailaja Chandra, Joint Secretary, Ministry of Health & Family Welfare, Government of India

WHO: AFRO, EMRO, SEARO, WPRO, HQ

1545-1645 **Panel discussions: Public Information and Public Relations During Outbreak** (*Agenda Item 6*)

Moderator
Dr M.Z.Husain,
DPM/SEARO

Representatives taking part in this Panel:

Dr N.K. Shah, WHO Representative to India
Mrs Indira Mansingh, Deputy Principal Information Officer, Govt. of India
Mr Praful Bidwai, Journalist

WHO: AFRO, EMRO, SEARO, WPRO, HQ

Wednesday, 15 March 1995

0900-1230	**Surveillance of Communicable Diseases** *(Agenda Item 7)*	
	Emerging Diseases: Need for Surveillance	Dr J.M. Hughes CDC, Atlanta, USA
	National and International Surveillance	Dr C. Bartlett CD Surveillance Centre, London
	Surveillance in India	Dr K.K. Datta Director, NICD, Delhi
1400-1645	**Panel discussions: Communicable Diseases with Epidemic Potential and Recommendations on WHO Responsibilities** *(Agenda Item 8)*	**Moderator** Dr J.M. Hughes CDC, Atlanta, USA

Representatives taking part in this Panel:

Dr Uton Muchtar Rafei, Regional Director, WHO/SEARO
Prof. V. Ramalingaswami, Chairman, National Advisory Committee on Plague, India
Prof. Natth Bhamarapravati, Professor & President Emeritus Mahidol University, Bangkok, Thailand

Thursday, 16 March 1995

1000-1230	**Review and Discussion on Conclusions and Recommendations** *(Agenda Item 9)*
1400-1515	**Adoption of the Report** *(Agenda Item 10)*

WORLD HEALTH ORGANIZATION

ORGANISATION MONDIALE DE LA SANTE

ANNEX 4

INTERREGIONAL MEETING ON PREVENTION AND CONTROL OF PLAGUE

New Delhi, 13-16 March 1995

LIST OF ATTENDANTS

1. PARTICIPANTS

WHO/HQ

1. Dr Hiroshi Nakajima
   Director-General

2. Dr R.H. Henderson
   Assistant Director-General

3. Dr G. Torrigiani
   Director, Division of Communicable Diseases

4. Mr Thomas S.R. Topping
   Deputy Legal Counsel

5. Dr L.J. Martinez
   Programme Manager
   Bacterial, Viral Diseases and Immunology

6. Dr E.D. Tikhomirov
   Medical Officer
   Bacterial, Viral Diseases and Immunology

7. Dr J.-C. Alary
   Chief
   Epidemiological Surveillance and Statistical Services

8. Mr T. Prentice
   Information and Media Support

AFRO	9.	Dr Kadri Tankari Regional Adviser, Prevention and Control of Diseases
EMRO	10.	Dr M.H. Wahdan Director, Integrated Control of Diseases
WPRO	11.	Dr Seppo Suomela Medical Officer Control of Diarrhoeal Diseases
SEARO	12.	Dr Uton Muchtar Rafei Regional Director
	13.	Dr M.Z. Husain Director, Programme Management
	14.	Mr G. Koulischer Director, Administration & Finance
	15.	Dr N.K. Shah WHO Representative to India
	16.	Dr Samlee Plianbangchang Director, Prevention and Control of Diseases
	17.	Dr Z. Jadamba Director, Health Protection and Promotion
	18.	Dr Than Sein Director Planning, Coordination & Information
	19.	Dr George Fernando Director, Health System Infrastructure
	20.	Dr S.P. Tripathy Director, Research & Family Health
	21.	Dr A.G. Andjaparidze Regional Adviser on Communicable Diseases
	22.	Dr K.B. Sharma Acting Regional Adviser, Health Laboratory Services
	23.	Dr J.P. Narain Team Leader, Global Programme on AIDS

24. Dr Saroj Jha
Acting Regional Adviser, Health Education

25. Mr J. Tuli
Information Officer

26. Dr Ranjan De Sylva
Acting Medical Officer (Epidemiology)

27. Dr S. Pattanayak
WHO Short-term Consultant

2. *RESOURCE PERSONS*

28. Professor V. Ramalingaswami
Chairman, National Advisory Committee on Plague
New Delhi, India

29. Ms Shailaja Chandra
Joint Secretary
Ministry of Health & Family Welfare, Government of India
New Delhi, India

30. Dr K.K. Datta
Director
National Institute of Communicable Diseases
22 Shamnath Marg, Delhi, India

31. Dr S. Sehgal
Director (Microbiology) and Head of the Division of Zoonoses
National Institute of Communicable Diseases
22 Shamnath Marg, Delhi, India

32. Mrs Indira Mansingh
Deputy Principal Information Officer
Government of India, Shastri Bhawan, New Delhi, India

33. Dr J.C. Gandhi
Deputy Director of Health
Commissariat of Health, Medical Services & Medical Education
Block No.5, Dr Jivaraj Mehta Bhawan
Gandhinagar, Gujarat, India

34. Dr D.N. Shah
Medical Superintendent
New Civil Hospital
Surat, Gujarat, India

35. Dr S.R. Salunke
Director of Health Services, St. George Hospital
Government Dental College Building, P. D'Mello Road
Bombay, India

36. Dr C. Bartlett
Director, Communicable Diseases Surveillance Centre
Public Health Laboratory Service
London, UK

37. Dr David T. Dennis
Chief, Bacterial Zoonoses Branch
Centers for Diseases Control and Prevention
Fort Collins, Colorado, USA

38. Dr J.M. Hughes
Director, National Center for Infectious Diseases
Centers for Disease Control & Prevention
Atlanta, Georgia, USA

39. Dr V.V. Maleev
Deputy Director
Central Research Institute of Epidemiology
Moscow, Russian Federation

40. Dr B.S. Kilonzo
Faculty of Veterinary Medicine Rodent
Research Project, Sokoine University of Agriculture
Morogoro, United Republic of Tanzania

41. Professor Natth Bhamarapravati
Professor & President Emeritus
Mahidol University
Bangkok, Thailand

3. SUPPORT STAFF

42. Mr V.K. Malhotra, Administrative Assistant, PCD/SEARO
43. Mr V.K. Thakur, Senior Administrative Secretary, CDA/SEARO
44. Mr E. Rangarajan, Secretary, PCD/SEARO

WORLD HEALTH ORGANIZATION

ORGANISATION MONDIALE DE LA SANTE

ANNEX 5

INTERREGIONAL MEETING ON PREVENTION AND CONTROL OF PLAGUE

New Delhi, 13-16 March 1995

WHO CONSULTATION ON PLAGUE
(New Delhi, India, 11 to 15 September 1989)

CONCLUSIONS AND RECOMMENDATIONS

1. Epidemiological surveillance

It is felt that the international surveillance of plague is still not entirely satisfactory. Many outbreaks of plague go unreported for a variety of reasons and it was recommended that epidemiological surveillance be improved and timely notification be made of zoonotic and human outbreaks and that the exchange of information on all aspects of the epidemiology, prevention and control of plague be improved.

The countries should be encouraged to develop an effective, early warning system for the predictive surveillance and control of plague, supported by timely and accurate laboratory diagnosis of both human and animal specimens.

2. Community participation in surveillance and control

Every effort should be made by national and regional laboratories to enlist the participation of the community in the surveillance of plague and in its control by measures appropriate for use by the community itself with special emphasis on environmental measures that would reduce rodent densities and hence man-vector contact.

Continuous awareness should be created amongst the medical and veterinary personnel regarding the utility and availability of the plague laboratory in the diagnosis and surveillance of plague, and the epidemiological investigation of outbreaks.

3. Chemotherapy

Early institution of specific chemotherapy in appropriate dosage is essential to reduce the morbidity and mortality especially so in pneumonic plague. Tetracycline, streptomycin and chloramphenicol have been widely used. These drugs should be used in dosage as recommended by WHO. Since many new antibiotics are now available, studies should be undertaken to assess their efficacy. The contacts or family members of a plague case should be placed under medical surveillance or treated with prophylactic doses of antibiotics or sulfa according to the situation and degree of actual or potential exposure.

4. Vaccination

Both live and inactivated vaccines against plague are available. Observations on the result of their use in the field indicate that they appear to have reduced morbidity and mortality to some extent in outbreaks of bubonic but not pneumonic plague. The immunity which they provide is, however, of short duration and a revaccination is necessary to maintain the level of immunity. Adverse side effects following revaccination are common. In the light of the restraints, vaccination is recommended only for high risk groups such as laboratory personnel working on plague or field workers in endemic areas. Vaccination should be used only for the prevention of plague and should not be used as a means of control during outbreaks.

5. Strengthening of laboratories

Fully staffed and properly equipped laboratories should form an integral and essential part of plague surveillance and control. The number of such laboratories in a country should be according to the endemic/epizootic area and/or magnitude of the problem. These laboratories should be capable of undertaking bacteriological and serological studies and should function under the guidance and supervision of a national laboratory which should perform activities pertaining to detection and confirmation of Y. pestis, relevant studies on mammology, entomology, immunology, studies on vaccines, vector susceptibility to insecticides, maintenance and characterization of Y. pestis strains, study of its sensitivity to newer antibiotics, use of animal models for isolation and characterization of local strains and establishing liaison with regional/WHO collaborating centers.

6. Training of laboratory staff

Regional laboratories should be set up which will act as regional reference centers to support national laboratories to train manpower, to develop educational material and to maintain nd characterize strains. These laboratories should be encouraged and strengthened to produce diagnostic reagents for use in countries and their regions.

Training courses should be organized in collaborating centers on laboratory techniques in plague for scientists from different countries who should, in turn, act as trainers for laboratory workers in their respective countries.

7. Supply of reagents

Until indigenous production of reagents commences, the WHO collaborating centers should continue to supply the test kits.

8. Evaluation of test kits

Multicentric studies should be undertaken to evaluate the test kits currently being produced. The protocol for such study should be prepared by a country currently not involved in production.

9. Training and cooperation

There is a great need to train plague workers at all levels from paramedical personnel and community health workers through physicians, epidemiologists, microbiologists, ecologists and entomologists. A programme of continuing education is necessary to ensure that personnel keep abreast of new developments. For example, advantage should be taken of the WHO supported MSC courses in medical entomology and vector control to provide professionals with additional training in the epidemiology and control of rodent-borne diseases.

Training can be carried out in existing centers or laboratories. As suggested by the group, a more productive approach might be to train trainers at existing centers who could then train others in dispersed locations.

There is an urgent and continuing need for the development and support of regional laboratories to assist national laboratories in establishing surveillance and control programmes, organize training courses and seminars, and to maintain liaison with reference laboratories. Such regional laboratories in cooperation with WHO collaborating centers and inc lose liaison with national reference centers should play a key role in developing and improving national and international early warning surveillance systems, establishing standards for responses and actions.

10. Cost-effective measures

In many areas of the world rodent species which are reservoirs of plague as well as other diseases of public health importance may also be major agricultural pests, causing serious crop losses, while in urban areas, towns and villages, commensal species can cause huge losses in stored foodstuff.

As has been stated elsewhere in the report, in plague endemic areas rodent control measures should be carried out only after flea populations have been reduced through dustings. Afterwards, efforts should be made to keep rodent populations at the lowest possible levels. Whenever possible, particularly in urban areas, this should be done by denying food and harbourage to rodents through improved sanitation. Where such an approach is not deemed feasible, rodent control can be achieved through careful and assiduous use of rodenticide baits. Studies should be encouraged in each country to determine what are the most acceptable local baits and toxicants available for use in the control of each important species.

11. Study of other rodent-borne diseases

Plague remains a threat in many countries with established natural foci of the disease. However, with the suppression and reduction in the number of human cases in a country, there may be some pressure to disband centers where responsibility is restricted only to the study and control of plague. It would therefore seem prudent for centers with a reduced work load concerned with plague, to use their expertise to begin studies of other important rodent-borne diseases. Among these should be such diseases of virtually global distribution such as leptospirosis, murine typhus, haemorrhagic fever with renal syndrome (HFRS), etc. The expertise of the plague laboratories in studies of rodent and ectoparasite-borne diseases represents a valuable resource for the countries.

12. Research

Regional laboratories should be supported and encouraged to undertake both basic and applied research on better elucidation of plague epidemiology, ecology and control, the basic molecular biology of the plague organisms, and the development of rapid and accurate field tests for the identification of plague in humans, animals and flea vectors, such as DNA probes, ELISA antigen and/or antibody capture methods.

13. Updating of the Plague Manual

The existing WHO Manual on Plague should be updated to incorporate newer tests and methodologies in laboratory aspects of plague, for new developments in vector and reservoir control and additional epidemiological information, including an updated plague distribution map.

14. International cooperation and assistance

The international agencies and WHO collaborating centers should provide assistance and coordination for the development of manpower in the field of bacteriology, entomology, mammology, epidemiology and clinical aspects; for the supply of reagents and test kits; for strengthening of existing centers, national control activities and dissemination of technical information as well as results of research undertaken in different parts of the world. To develop and strengthen national plague activities, consultants may be provided by international agencies to countries who may require them. The research workers from various countries should meet periodically to review the advances made and assess their utility for the control of plague.

WORLD HEALTH ORGANIZATION

ORGANISATION MONDIALE DE LA SANTE

ANNEX 6

INTERREGIONAL MEETING ON PREVENTION AND CONTROL OF PLAGUE

New Delhi, 13-16 March 1995

QUESTIONS TO BE INCLUDED IN THE CHECK LIST FOR REVIEW OF NATIONAL EPIDEMIC EMERGENCY PREPAREDNESS

- Are actions being taken by communities and municipal authorities or other local bodies to prevent epidemics by ensuring health environments free or with low levels of domestic pests and vectors and with adequate water supply and sanitation?

- Does an effective surveillance system exist for diseases with major epidemic potential? Do adequate mechanisms exist to permit the rapid recognition and response to epidemics of new diseases or to epidemics of unknown cause?

- Does the surveillance system include an adequate network of national and subnational laboratory facilities with the capacity to perform the relevant tests and whose performance is regularly assessed through a quality-assurance programme?

- Is epidemic preparedness satisfactory at local, state and national level? Do standing orders exist for epidemic response for each disease with significant epidemic potential emphasizing areas known to be at high risk? Are there general epidemic/disaster response plans at each level which identify the persons responsible for initial assessment and response (Action Groups)? Do members of

the Groups command sufficient authority and resources to permit rapid and effective action? Is inter-sectoral coordination ensured?

- Are adequate resources devoted to teaching medical and allied health workers about surveillance, epidemic preparedness and response? Are there satisfactory links between medical schools and schools of public health? Are there satisfactory links between the public health authorities, academic institutions and practising physicians and other practitioners?

- Is there sufficient support for applied research to ensure continued improvement in the application, especially at local level, of appropriate preventive, diagnostic and research measures?

- Are adequate staff and resources devoted to building and maintaining close partnerships with the media and with others relevant to public relations? Do special routines, such as the establishment of a 24-hour 'operations room' during emergencies exist?

- For re-emerging diseases not covered under International Health Regulations - like Kala-azar and malaria, particularly resistant *P. falciparum*, has the country developed a mechanism to coordinate with neighbouring countries for prevention of spread of these diseases?

- Has the country developed a mechanism to involve NGOs/Volunteers in containment of oubtreaks of new, emerging and re-emerging infectious diseases?