

Emerging infectious diseases: Memorandum from a WHO meeting*

A meeting of international experts exchanged information on recent activities dealing with new, emerging and re-emerging diseases, discussed ways of responding to this problem and to other communicable disease threats, and reviewed WHO's activities and role in this area. This Memorandum summarizes the various presentations and concludes with the recommendations and specific tasks for action at every level.

Introduction

Considerable attention has recently been directed to the topic of emerging infections, especially in national and international discussions, through the book, *Emerging infections, microbial threats to health in the United States*, which was published in 1992 by the Institute of Medicine, U.S. National Academy of Science. Several factors have influenced the emergence and re-emergence of infectious diseases, such as societal events, changes in the environment and in health care practices, new processing and packaging procedures in food production, and the curtailment or reduction of public health prevention programmes. Numerous specific examples confirm the importance of new or re-emerging microbes which do not respect international borders, so that an infection acquired in one corner of the globe may lead to an epidemic in a distant country, far removed from the original site of infection. Clearly a global approach,

spearheaded by the World Health Organization, is needed to address the problem.

Background

Prior to the 1970s, WHO's efforts were focused primarily on the communicable diseases; a number of action-oriented programmes led to some remarkable successes in disease control, particularly the global eradication of smallpox in 1977. Subsequently, interest in communicable diseases waned, partly because of changes in health care priorities, diminished resources, and the need to focus the limited available manpower and funds on the HIV/AIDS epidemic. The erosion of the infrastructure surrounding communicable diseases — owing to the overall diminution of programmes, deterioration of surveillance efforts, and loss of technical expertise in traditional infectious diseases — has directly affected the global capacity to recognize and respond to the new, emerging and re-emerging diseases. For example, a recent survey of WHO Collaborating Centres for Arboviruses and Haemorrhagic Fevers found that while most of them had sufficient reagents to identify local virus diseases, few had the reagents needed to recognize common diseases not traditionally endemic in their area. Thus, if these key reference centres do not have the resources to identify common pathogens, it will be impossible for them to recognize truly "new" diseases. This deterioration of laboratory capacity has been accompanied by an equally dramatic loss in the capacity of developed and developing countries to maintain surveillance activities for communicable diseases, and respond to outbreak situations. In addition, the experts in communicable diseases, trained before the 1970s, who retired or are nearing retirement, have frequently not been replaced, or their positions have been transferred to support other special programmes. We must therefore concentrate first on rebuilding our foundations in communicable diseases, if we are to have the capability of meeting the new challenges of emerging

* This Memorandum is based on the report (document CDS/BVI/94.2) of a WHO meeting on Emerging Infectious Diseases, which was held in Geneva, Switzerland, on 25–26 April 1994. The participants were: Dr K. Banerjee, Pune, India; Dr R. Berkelman, Atlanta, GA, USA; Dr S. Berkley, New York, NY, USA; Dr N. Bhamarapavati, Nakhon Pathom, Thailand; Dr T. Chillaud, Paris, France; Dr R. D'Amelio, Rome, Italy; Dr P. Harrison, Washington, DC, USA; Dr J. Hughes, Atlanta, GA, USA; Dr J. La Montagne, Bethesda, MD, USA; Dr J. Lederberg, New York, NY, USA (Chairman); Dr J. Losos, Ottawa, Canada; Dr W. Lyerly, Washington, DC, USA; Dr Y. Moritsugu, Tokyo, Japan; Dr S. Morse, New York, NY, USA; Dr F. Nkrumah, Accra, Ghana; Dr T. O'Brien, Boston, MA, USA; Dr R. Shope, New Haven, CT, USA; Dr R. Steffen, Zurich, Switzerland; and Dr P. Tukei, Nairobi, Kenya. WHO Secretariat: Dr R.H. Henderson, Dr P. Eriki (WHO Regional Office for Africa), Ms K. Esteves, Dr J. Le Duc (Secretary), Dr L.J. Martinez, Dr F.-X. Meslin, Dr Y. Motarjemi, Dr F. Pinheiro (WHO Regional Office for the Americas / Pan American Sanitary Bureau), Dr E.D. Tikhomirov, Dr G. Torrigiani, and Dr M.H. Wahdan (WHO Regional Office for the Eastern Mediterranean). Requests for reprints should be sent to Division of Communicable Diseases, World Health Organization, 1211 Geneva 27, Switzerland. A French translation of this Memorandum will appear in a later issue of the *Bulletin*.

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and re-emerging diseases. In response to the above-mentioned publication, *Emerging infections*, the U.S. and Canadian governments recently started specific programmes to address this emerging problem which, because of its global nature, would benefit from the active involvement of the World Health Organization.

Objectives

The objectives of the meeting were:

- To enable the international experts to exchange information on recent activities and initiatives that deal with emerging diseases, and on such related topics as the ability of international, regional and national institutions to address all communicable diseases, including the newly emerging and re-emerging disease problems.
- To discuss specific ways whereby WHO may assist Member nations in their efforts to recognize and respond to emerging diseases and other communicable disease threats.
- To establish a coordinated international effort, with the support of these experts, to deal with this problem.
- To review WHO's activities in this area, to offer proposals for future interventions, and to seek wide support for these efforts.
- To solicit the active involvement of the WHO Regional Offices, both for problem definition and for implementation of proposed activities.

Summary of presentations

Problem definition. Dr Joshua Lederberg, referring to the publication, *Emerging infections*, which he co-authored, noted that while the book was targeted to the United States, 70–80% of issues were of global concern. He contrasted the public perception of risks due to, for example, asbestos or radiation with that of infectious diseases, and noted that the latter had clearly not received comparable public attention, even though the health consequences were equal or even greater. The growing scientific basis of the newly emerging diseases, which we are now beginning to understand, was an important development.

WHO. Dr R.H. Henderson summarized some past accomplishments by WHO in addressing emerging diseases, such as the ongoing global surveillance of influenza with, every year, a recommendation on the composition of influenza vaccine. WHO is the focal point for surveillance of yellow fever, plague and cholera under the International Health Regulations, and promptly disseminates information on reported cases through the *Weekly epidemiological record*.

The existing networks of WHO Collaborating Centres represented an important resource for effectively addressing the emerging diseases, for which several technical skills are needed. Since most diseases falling into this category will be communicable diseases, the focus for these activities within WHO could be the Division of Communicable Diseases, especially in exercising programme leadership and coordinating activities throughout the Organization, as well as in pursuing its own specific initiatives in the field.

USA. Dr Ruth Berkelman noted that the number one killer of men aged 25 to 44 years old in the United States today was HIV and AIDS, which just over a decade ago was unknown to medicine. There was thus a very real threat posed by the emerging diseases. She mentioned the four primary goals and objectives outlined in the recently released report, *Addressing emerging infectious disease threats: a prevention strategy for the United States*,^a which are (1) surveillance: detect, rapidly investigate, and monitor emerging pathogens, the diseases they cause, and the factors influencing their re-emergence; (2) applied research: integrating laboratory science and epidemiology to optimize public health practice; (3) prevention and control: efforts to enhance communication of public health information about emerging diseases and ensure prompt implementation of prevention strategies; and (4) infrastructure: strengthening local, state, and federal public health providers to support surveillance and implement prevention and control programmes. Specific objectives were listed under each goal. An activity to be addressed under this programme is the establishment of a global consortium of closely linked epidemiology/biomedical research programme/centres to promote the detection, monitoring and investigation of emerging infections, with the suggestion that the consortium could operate under the direction of an international steering committee. Existing WHO networks of Collaborating Centres were specifically mentioned in this context. She also commented on the need to coordinate efforts on emerging diseases with those of other global initiatives, such as the global eradication of poliomyelitis and measles. She encouraged linkages between existing networks, and specific efforts that the Centers for Disease Control and Prevention (CDC) have recently undertaken to improve communications in the field, such as expanded free distribution of the *Morbidity and mortality weekly report*, and plans to start an emerging infections bulletin.

^a Single copies of this report are available from Centers for Disease Control and Prevention, National Center for Infectious Diseases, Office of Planning and Health Communication—EP, MS C-14, 1600 Clifton Road, Atlanta, GA 30333, USA.

Canada. Dr Joseph Losos described the Canadian government's initiatives on emerging diseases, including the Lac Tremblant Declaration from a recent meeting which recommended:

- developing a national strategy for surveillance and control of emerging and resurgent infections in Canada;
- developing a national strategy for communication and dissemination of information on this subject;
- providing increased funding for primary prevention programmes, as distinct from secondary or tertiary care; and
- establishing expert monitoring on ethics and jurisprudence in surveillance and public health interventions.

He mentioned their initiatives to improve communications, and specifically invited participants to join in an electronic bulletin board that they were starting. Several specific actions were planned, such as studies targeting antimicrobial resistance, nosocomial pathogens, building a virology network, and improving surveillance activities and infrastructure development, including sentinel public health units, paediatric sentinel hospitals, oncology centres, emergency room networks, and other hospital-based networks. Efforts would be made to share information by electronic mail and targeted links with other established networks such as those for nosocomial surveillance and asthma. A fax-link would be established, with expanded weekly and special reports. Specific roles for WHO could include developing and coordinating a global plan of action for emerging infections; facilitating and improving communications, especially electronic communications; creating and developing an in-house capacity to monitor, report and respond to emerging disease threats; recruiting and retaining expertise in this area; and fund-raising. Following his presentation, the comment was made of the need to educate policy-makers to protect and preserve surveillance capabilities, at both the national and international level, in the light of current health care reform discussions.

Institute of Medicine. Dr Polly Harrison explained that as a follow-up to the extremely well-received study that the Institute of Medicine had done on emerging infections, they were now attempting to carry forward that concept in a forum for emerging infections. Their objective is to continue to focus U.S. public attention on this important topic, with the goal of a long-term commitment of support. She explained that the forum would involve an expert committee of approximately 20 individuals who will

meet periodically over the course of 18 to 36 months, with the objective of stimulating fresh thinking on emerging diseases, clarifying policy and research issues, and defining problems which require attention. Targets for discussion will include surveillance and response, diagnosis and treatment, drug resistance, research issues, and education, training, and public awareness. A portion of their efforts will be directed to the global implications of emerging diseases. A critical piece of information that will be required is to determine the cost to governments of emerging infections, so that a logical argument can be made for savings to be gained from interventions.

The issue of costs associated with emerging infections elicited considerable discussion, especially with regard to the cost of antibiotic resistance. Comment was made regarding the treatment costs for vancomycin, and the dramatic increase in mycotic infections during the last decade. Points were made to revise the ICD system to reflect causes of death associated with antibiotic resistance, and perhaps the formation of a working group to quantify the costs associated with antibiotic resistance.

Comments were also directed at the need to "internationalize" the efforts described, since the focus had clearly been towards the developed world. Clearly the same problems are being experienced in developing countries, and it was deemed imperative that this group include a global perspective to these issues. For many African nations, this means specifically addressing malaria, tuberculosis and yellow fever. Other suggestions included linking emerging diseases with national development, and attempting to associate routinely collected epidemiological data with the occurrence of emerging infections (for example, HIV and tuberculosis), and ensuring that this information is part of the major public health decision-making processes of governments.

ProMED. Dr Stephen Morse summarized the purpose and activities of the International Program for Monitoring Emerging Infectious Diseases (ProMED), a project funded by the Federation of American Scientists. This international group of experts was formed to encourage the development of a global infectious disease surveillance system, which will identify and quickly respond to unusual outbreaks of infectious diseases. ProMED has no capacity to conduct these efforts themselves, but rather will attempt to build networks of interested parties, promote and facilitate long-term development towards these goals, and complement and assist programmes in emerging diseases by fund-raising, consensus-building, and assistance in the promotion and planning of these efforts. Included in their areas of interest are the threats of biological warfare.

International travel. Dr Robert Steffen summarized the magnitude and economic impact of international travel, showing that, in 1993, approximately 500 million arrivals were recorded in Africa, the Americas, East Asia and the Pacific, Europe, the Middle East and South Asia, totalling receipts of US\$ 324 080 million. Of these, approximately 40 million travellers went from developed countries to developing countries. Realizing the significant and increasing frequency of international travel, and recognizing that new microbial threats to health may have enormous costs, the International Society of Travel Medicine has adopted a resolution ("Urgent appeal for creation of a new global strategy to detect emerging microbial threats to health"). This resolution specifically calls upon WHO and other international organizations to "urgently take all necessary steps to reconceptualize, redesign, and implement a global surveillance strategy and system for the detection of emerging microbial threats to health." While Dr Steffen lauded the efforts of WHO to rapidly publish information regarding outbreaks of infectious diseases in the *Weekly epidemiological record*, he realized that for various reasons all outbreaks were not always promptly reported by Member States. He proposed development of an alternative, informal network, perhaps via electronic mail, whereby unofficial information regarding current disease activity could be informally distributed. This led to a discussion of outbreak reporting, and surveillance in general, and the associated economic disadvantages placed on countries when they report outbreaks of infectious diseases. With cholera, for example, formal admission of cholera transmission by a country may directly lead to the cancellation of imports from that country by others, not only of food products, but also of other material completely unrelated to cholera transmission. Thus, WHO must overcome the economic disadvantages of formal reporting placed on Member States if we are to build a reliable surveillance system.

Recent WHO initiatives. Dr J. LeDuc, Dr F.-X. Meslin and Dr Y. Motarjemi summarized WHO's efforts during the past two years to improve communications with other organizations concerned with emerging diseases, to reinforce contact with WHO Collaborating Centres that may assist in global surveillance efforts, and to develop a specific plan to address on a global scale the safety issues related to antibiotic resistance in zoonoses.

WHONET, a system for monitoring antibiotic resistance. Dr Thomas O'Brien presented a summary of WHONET, a computer program developed by him and his colleagues over the past few years to assist hospital laboratories in management of antibiotic

sensitivity results. This programme is flexible and is easily fitted to hospitals of various sizes or specialties. It allows systematic storage and retrieval of antibiotic sensitivity results, and easily reports data by specific area of the hospital, species of organism, or other characteristics. Dr O'Brien also discussed the biological basis for antibiotic resistance in bacteria, and demonstrated how data obtained through the use of WHONET could be managed to monitor global antibiotic resistance trends, and form the basis for targeted interventions to prolong the usefulness of various antibiotics.

Discussion

A lively discussion followed the presentations, and there was general agreement that the topic of emerging infections was clearly an important issue, and that WHO should be encouraged to take a leadership role in implementing and coordinating global efforts. Several specific issues are described below.

Programme title and time frame. It was proposed that Global Microbial Threats, Emerging and Re-emerging Infectious Diseases should be the title of the programme. As this was a major effort that would take considerable time and energy to implement, the goal should be to build progressively for the long term, step by step.

Coordination within WHO. To promote greater coordination within WHO with regard to surveillance activities and sharing of information, the nomination of the Division of Communicable Diseases as the Organization's focal point for emerging diseases was welcomed. Internal coordination activities could now begin.

Focus of efforts at the country level. While many initiatives are under way in developed countries, the main focus of efforts should be on global implementation, with specific actions at the country level in response to information provided. Workers in the field must be given specific advice on how to handle unknown diseases, and on where to seek laboratory assistance, clinical advice, or epidemiological support.

Linkage of clinical, epidemiological and laboratory programmes. Communication and collaboration between clinicians, laboratory workers, epidemiologists and other specialists such as medical entomologists and mammalogists, and public health officials should be improved, so that all available resources are brought together when addressing problems of new or re-emerging diseases.

Enhanced vaccine development. While vaccine development is not the focus of the programme of emerging diseases, it is none the less an obligatory

tool in the response to recognized disease challenges. For example, the reappearance of a lethal influenza pandemic, like the one in 1918, could well be more explosive today, given the current population densities and rapid movement of people. Current vaccine technologies could probably not keep pace with the realities of such a pandemic in the present era. While prompt recognition and definition of the problem will be the responsibility of the programme on emerging diseases, attention should also be focused on improving vaccine technology so that an appropriate response is feasible. Nucleic acid vaccines perhaps represent a promising technology in that regard.

Importance of funding and public awareness. Despite the current financial crisis, regular budget funding should be appropriated to this effort, which is extremely important and central to the mandate of WHO. A World Health Assembly resolution could therefore support this initiative. To increase public awareness of the importance of emerging infections, special efforts should be taken to educate both health care decision-makers and the general public.

Refugee populations and other complex humanitarian emergencies. Social unrest, leading to refugee populations and mass migrations, could play a significant role in the emergence or re-emergence of infectious diseases. Clearly greater attention needs to be placed on coordinating health care needs of these specific groups with those involved in surveillance for emerging diseases. A strong partnership needs to be forged in this area.

Maintaining technical capacity and improving communications. In order to maintain technical capacity among communicable disease experts in the field, especially since critical manpower shortages have been experienced at all levels, WHO could expand its training programmes to help overcome this problem. There was also a need to improve communications at all organizational levels.

Monitoring drug resistance. Apart from surveillance of antibiotic resistance, the monitoring of other forms of resistance, such as malaria drug resistance, antiviral drug resistance and pesticide resistance, was important.

Recommendations

Under the heading of four goals, various recommendations, with specific tasks for each one of them, were proposed for implementation.

Goal 1: Strengthen global surveillance of infectious diseases

- Global networks of WHO Collaborating Centres should be defined in order to recognize, and

respond to outbreaks of infectious diseases, including investigation of clinical and epidemiological characteristics of new, emerging, and re-emerging diseases.

- Local and regional partnerships for surveillance and public health response should be encouraged.
- Regional offices should assist in eliciting the cooperation of Collaborating Centres and laboratories, in defining how the Centres could contribute to global surveillance efforts, and in coordinating their activities.
- Formal surveillance should be initiated using Collaborating Centres and other cooperating laboratories.
- Global trends of antimicrobial resistance should be monitored by Collaborating Centres and laboratories.
- A dedicated global network of Collaborating Centres, laboratories and hospitals should be established.
- The WHONET-3 computer program for data management should be provided to each member of the network.
- A quality control programme should be created and maintained.
- Proficiency testing should be instituted.
- Regularly scheduled surveillance reports should be submitted to local, regional or international centres.
- Prompt analysis should be made of surveillance reports, with specific, targeted interventions to assist the contributing laboratories overcome the identified problems.
- Surveillance information should be periodically reported in regional or international publications.
- Zoonotic and foodborne diseases should be monitored through cooperation with existing and newly designated Collaborating Centres or laboratories.
- Collaboration should be strengthened with existing FAO and OIE zoonotic disease surveillance efforts.
- National focal points for surveillance of foodborne disease should be identified and a network of Collaborating Centres and laboratories created.
- Virus diseases should be addressed through a global network of Collaborating Centres and laboratories.
- The existing network of Arbovirus and Haemorrhagic Fever laboratories should be maintained and strengthened.
- Existing surveillance efforts on HIV should be coordinated with surveillance of other viral diseases.

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- The influenza network of Collaborating Centres and laboratories should be maintained and strengthened.
- Surveillance efforts associated with global eradication campaigns for poliomyelitis and measles should be coordinated with surveillance of other infectious diseases.
- Surveillance efforts for other vaccine-preventable diseases should be coordinated with global surveillance of infectious diseases.

Goal 2. Strengthen the international infrastructure necessary to recognize, report and respond to emerging infectious diseases

- Laboratory capabilities should be maintained and strengthened.
 - Diagnostic reagents should be available in cooperating laboratories to allow prompt, accurate diagnosis of common and unusual infectious diseases.
 - Collaborating Centres should assist in the preparation, quality control, and distribution of diagnostic reagents not commercially available, with the ultimate goal of regional self-reliance in diagnostic reagents production and delivery.
 - Laboratories should be properly equipped to conduct routine diagnostic testing.
- Training opportunities for staff involved in monitoring emerging infectious diseases should be encouraged.
 - Training programmes should be initiated to assist in technology transfer to Collaborating Centres and laboratories.
 - Expertise in rare or unusual infectious diseases should be maintained.
 - Short and long-term internships, perhaps in WHO or WHO Collaborating Centres and elsewhere, should be established.
 - Countries should endeavour to create career tracks to encourage retention of trained individuals.
- Communications among Collaborating Centres and with WHO (local, regional and headquarters offices) should be streamlined.
 - Frequent informal communications by telephone, fax, letter and E-mail should be encouraged.
 - Development should continue of electronic linkages for computer conferencing, data transfer, mutual analytical support and information exchange.
 - Pilot projects in communications should be encouraged, including links with the private sector and certain national centres.

- Periodic meetings of Centre Directors should be encouraged both on a regional and on a global basis.
- Formal communications between WHO country representatives, regional offices, and headquarters should be streamlined, building upon existing systems.
- Information gathered should be rapidly disseminated under specific plans, and formal co-authored publications should be encouraged.

Goal 3. Create an applied research programme

- Focus on problem definition, diagnosis, epidemiology and prevention of infectious diseases that are increasing, re-emerging, or emerging and are established as real or potential public health priorities locally or regionally.
 - Support special efforts on diagnostic techniques appropriate for developing countries.
 - Encourage the development and maintenance of quality assurance programmes in local or regional partnerships.
 - Collaborate with other interested organizations locally, regionally or internationally through commonly developed and implemented protocols, shared data, collaborative analysis, mutual support, and joint presentations and publications.
 - Evaluate and set standards for basic public health actions such as simple hygiene, encourage public health education, and evaluate disease avoidance and prevention strategies.

Goal 4. Strengthen international capacity for infectious disease prevention and control

- Develop specific guidelines for prevention and control of newly emerging and re-emerging infectious diseases.
 - Zoonotic diseases
 - Parasitic diseases
 - Foodborne diseases
 - Emerging viral and bacterial diseases
 - Therapeutic advice and policy considerations
- Develop recommendations to minimize the impact of antimicrobial resistance.
 - Encourage development of new antibiotics
 - Improve prescribing practices
 - Consider using antibiotics in combination
- Improve methods of communication and dissemination of information to ensure that guidelines reach the appropriate target groups.