Emerging infectious diseases

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The emergence or re-emergence of infectious diseases stems from the increasing world population, rapid international travel on a large scale, and increased exposure of human beings to disease vectors in nature.

A report published by the United States Institute of Medicine in 1992 called attention to signs that the fight against infectious diseases was far from won, despite great advances in the development of antibiotics and vaccines. The report cited emerging or newly identified infectious diseases as evidence for this and also highlighted re-emerging or resurgent infectious diseases hitherto thought to have been overcome.

It is now clear that the emergence or re-emergence of infectious diseases is partly the result of a shift of resources away from infectious disease control, public health and sanitation. It is aggravated by the fact that antibiotics which were once effective against some of the most common human infections have gradually become ineffective. In addition, changes to the environment may bring the animals and insects that carry disease into closer contact with human beings. During the past 20 years, more than 30 new microorganisms have emerged, some of which cause dramatic and lethal disease in localized outbreaks or over great distances, at the cost of enormous suffering and expense to society. Meanwhile many common diseases have re-emerged and spread rapidly after periods when they were no longer considered to be a problem.

The term "emerging infections" refers to newly identified and previously unknown infectious diseases which cause public health problems, either locally or internationally. They include: a fatal respiratory disease caused by a virus called sin nombre; a variant Creutzfeldt-Jakob disease which is suspected, though not proven, to be associated with a similar disease in cattle called bovine spongiform encephalopathy; HIV infection, which is now a worldwide cause of human suffering and death and a heavy economic burden; and some rare but equally devastating diseases such as Ebola haemorrhagic fever. These diseases may be new in human beings, or may have been present for a long time but not recognized. But many emerging diseases are thought to be the result of people coming into closer contact with natural reservoirs of disease in the environment, which has permitted a jump of the infectious agent across the species barrier from animal to human being. Other examples of new or newly detected infectious diseases of global concern include Legionnaires' disease, haemolytic uraemic syndrome caused by Escherichia coli O157:H7, Lyme disease, hepatitis C and E, and a new form of cholera caused by Vibrio cholerae O139.
Re-emerging infectious diseases are infections that have been known about for some time but had fallen to such low levels that they were no longer considered a public health problem. They often reappear in epidemic proportions. Well-known examples are: tuberculosis, which is increasing worldwide partly owing to its close association with HIV infection; cholera, which has been reintroduced into countries where water and sanitation systems have deteriorated; and dengue or "breakbone" fever, which has occurred in urban areas where mosquito control has broken down.

**Drug resistance**

Resistance to antibiotics is a phenomenon common to both emerging and re-emerging infections. Many well-known antibiotics are no longer effective against common infections such as pneumonia, gonorrhoea and tuberculosis. At the same time, fewer new antibiotics are being released on the market, partly because of the high cost of developing and licensing them and partly because they have a potentially short life because of the development of resistance. If the arsenal of drugs against infectious diseases loses its power, the future for patients with even a common local infection will become bleak.

Several factors contribute to the emergence and re-emergence of infectious diseases, but most can be linked with the increase in the number of people and in population movements, rapid international travel, overcrowding in cities with poor sanitation, changes in the handling and processing of large quantities of food, and increased exposure of human beings to the carriers and natural reservoirs of disease. Other factors include a deteriorating public health infrastructure which is unable to cope with population demands, and the emergence of resistance to antibiotics resulting from their increased misuse.

Travel has always been a means by which disease has spread across the world. In the 14th century in the city-state of Venice it resulted in protective legislation which has evolved, over the centuries, into the current International Health Regulations. Today, well over 50 million people use international air

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**International Health Regulations**

The first recorded quarantine regulation was written in Venice in 1377 to protect the city-state from diseases carried by shipborne rats. Nearly five centuries later, in 1851, the first International Sanitary Conference laid down certain principles for protection against disease, but another century elapsed before a wide variety of measures were forged into the International Sanitary Regulations of 1951. In 1969, the International Health Regulations (IHR) were adopted, aimed at ensuring maximum security against the international spread of disease.

The official reporting of three communicable diseases – cholera, plague and yellow fever – is required under the IHR, but no international body – not even WHO – has the mandate to enforce this reporting. Consequently some outbreaks go unreported when a country believes its economic interests might be adversely affected. When Peru was hit by cholera in 1991, and when India suffered an outbreak of pneumonic plague three years later, both countries promptly reported the fact. Their trade and travel losses were estimated at US$ 700 million and $1700 million respectively.

Today, new and re-emerging infectious diseases not dealt with under the IHR have the same potential for spreading across national boundaries. The 1995 outbreak of Ebola haemorrhagic fever in Zaire was fortunately contained before it could spread beyond the frontiers. Similarly, the 1993 outbreak of hantavirus pulmonary syndrome in the United States provoked national alarm about the possibility of cross-border transmission, but again the IHR were not applicable.

Following a World Health Assembly resolution in 1995, WHO is now revising and updating the IHR to make them more applicable to infection control in the 21st century. They will cover "defined syndromes representing disease occurrence of international importance" and will set out the measures national health authorities should institute to protect their territories from infectious diseases.
transport each year. The concerns expressed in Venice related to cholera, plague and smallpox which were transmitted from one continent to another by ship. Now it is not only possible but quite likely that a disease will appear days after the arrival of an infected traveller rather than during the voyage.

Emerging and re-emerging infections reflect the constant struggle of microorganisms to survive, primarily by finding breaks in the barriers which normally protect human beings from infection. Such breaks may result from high-risk human behaviour, failure of disease detection systems, failure to control mosquitos and other carriers of disease, breakdown of water and sanitation systems, and deforestation which forces forest animals closer to human settlements in search of food. These breaks have developed rapidly in just a few decades, at the same time as interest in infectious diseases has waned and resources for their detection and control have decreased. Because such diseases appeared to pose a declining threat, funds for their control were channelled to efforts against other problems. Experts on infectious disease retired or left the field and students turned to more rewarding subjects than viruses and bacteria—in short, the infrastructure for control of communicable disease began to crumble.

**WHO's response**

Since 1992 the alarm over emerging and re-emerging diseases has echoed around the world. Great concern was expressed by the Member States of WHO in a resolution of the World Health Assembly in 1995, which urged all countries to strengthen surveillance for infectious diseases in order to promptly detect re-emerging diseases and identify new ones. The success of this resolution depends on the ability to obtain information about infectious diseases and a willingness to communicate this information nationally and internationally. WHO therefore established the Division of Emerging and other Communicable Diseases Surveillance and Control (EMC), which is charged with strengthening national and international surveillance and control of communicable diseases, including those that represent new, emerging and re-emerging public health problems, for which it must ensure a timely and effective response.

One of the main functions of WHO, through EMC, is to provide technical assistance and training in communicable disease surveillance and control, and in public health laboratory support. EMC has also set up mechanisms for timely exchange of information on the current communicable disease situation worldwide and on the experiences of countries in disease surveillance and control. This information may be obtained from printed WHO publications and through the EMC World Wide Web site on http://www.who.ch/programmes/emc. WHO's collaborating centres, linked electronically with WHO headquarters and regional offices, form a worldwide network for infectious disease monitoring and early alert of outbreaks. The International Health Regulations are being revised and adapted to the scale of international traffic and trade expected in the 21st century.

Another crucial role of WHO is to assist countries to respond to epidemic emergencies. EMC ensures that it is possible to mobilize international rapid response teams of WHO staff and other experts in response to epidemic threats, in collaboration with the Division of Emergency and Humanitarian Action. WHO, through EMC and in partnerships with other bodies, will provide the key to cost-effective action for a world which is on the alert and able to contain infectious diseases.

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**A global partnership**

A worldwide partnership of countries, NGOs, international organizations and individuals is required to respond adequately to the threat of emerging diseases. The logo selected for this year's World Health Day (see back cover) tries to show how this partnership ensures their rapid detection and effective containment. As one of the partners in this global effort, WHO is strengthening three global monitoring systems. These bring together specialized laboratories and disease surveillance systems from all countries, and feed information electronically to the World Wide Web and other international electronic and print media.

The first is the WHO system of collaborating centres, specialized laboratories and institutions with expertise in the diagnosis and epidemiology of infectious disease. During recent epidemics it has become clear that some laboratory centres have not kept up with changes in technology, while others have failed to develop expertise in some of the newer infectious disease challenges. In strengthening this system of collaborating centres, WHO is urging governments to provide the resources to keep the centres up to date, to increase the number of centres in developing countries and to ensure that all centres are linked electronically.

The second system consists of two WHO networks: WHONET for monitoring antimicrobial resistance, and the programme for monitoring gonococcal antibiotic susceptibility. Through these, WHO regularly obtains standardized and quality-ensured information on the current state of antimicrobial resistance, and helps countries to use this information for sound national drug policies.

The third system is the International Health Regulations (IHR), currently the only international public health legislation which requires reporting of infectious diseases (see box on page 5). WHO is revising the IHR, and it is foreseen that the regulations will eventually require reporting of clinical syndromes of potential worldwide importance so that there can be an immediate and appropriate international response.

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