What are emerging and re-emerging infectious diseases?

Emerging infectious diseases are those due to newly identified and previously unknown infections which cause public health problems either locally or internationally.

Recent emerging diseases include a highly fatal respiratory disease caused by a virus called *sin nombre*; a variant of Creutzfeldt-Jakob disease, a disease of the central nervous system which is suspected, though not proven, to be associated with a similar disease in cattle called bovine spongiform encephalopathy; HIV infection which causes AIDS, with its sequelae of human suffering and economic burden; and diseases such as Ebola haemorrhagic fever with a potential for international spread. Other examples of new or newly detected infectious diseases of global concern include a new form of cholera, a haemolytic uraemic syndrome, hepatitis C and hepatitis E, Legionnaires' disease, and Lyme disease. Although it is not always possible to know if these diseases are new in humans, or whether they have been present but unrecognized throughout the years, many emerging diseases are thought to be due to a closer contact of man with their reservoirs in nature, with a successful «jump» of the infectious agent from animal to man across the species barrier.

Re-emerging infectious diseases are those due to the reappearance and increase of infections which are known, but had formerly fallen to levels so low that they were no longer considered a public health problem.

Re-emerging infectious diseases often reappear in epidemic proportions. Tuberculosis is increasing worldwide due in part to its close association with HIV infection; cholera has been re-introduced into countries and continents where it had previously disappeared, and where it can spread because water and sanitation systems have deteriorated; dengue or «breakbone» fever has started to occur in urban areas where mosquito control has broken down.

Microorganisms resistant to antibiotic drugs emerged and spread soon after the introduction of these drugs and in parallel with their use. Many well-known antibiotics are no longer effective to treat common infections such as otitis, pneumonia, gonorrhoea and tuberculosis. At the same time, fewer
new antibiotics are released on the market, partly because of the high cost of developing and licensing them and because the development of resistance reduces the «useful life» of antibiotics. If the arsenal of drugs against infectious diseases loses its power, the future for patients with even a banal ear infection will become bleak.

What causes emergence or re-emergence of infectious diseases?

Several factors contribute to the emergence and re-emergence of infectious diseases, but most can be linked with the increasing number of people living and moving on earth: rapid and intense international travel; overcrowding in cities with poor sanitation; changes in handling and processing of large quantities of food; and increased exposure of humans to disease vectors and reservoirs in nature. Other factors include a deteriorating public health infrastructure which is unable to cope with population demands, and the emergence of resistance to antibiotics linked to their increased misuse.

Travel has always been a vehicle to spread disease across the world, and the central protective legislation edicted in the 14th century by the City-state of Venice has evolved, over the centuries, into the current International Health Regulations. The volume of travel has dramatically increased in recent years: presently well over 50 million people use international air transport each year. The speed of travel has similarly increased: whereas cases of cholera, plague and smallpox were slowly transported from one continent to another by ship and could be recognized during the voyage, it is now possible and quite likely that an infected traveller will only develop signs of the disease several days after arrival.

Emerging and re-emerging infections reflect the constant struggle of microorganisms to survive. One of the ways microorganisms have found of surviving is to overcome the barriers which normally protect humans from infections. This may follow deforestation, which forces forest animals closer to man in search of food, or failure to control mosquitoes and other carriers of disease to humans, or a breakdown in water and sanitation systems, or failure to detect diseases early, or failure of immunization programmes, or high risk human behaviour.

All of these have been observed within the past decades, together with a waning concern – and decreasing resources – for infectious disease control. During the first half of the 20th century deaths from infectious diseases declined steadily because of improved hygiene and nutrition. This trend was strengthened with the advent of vaccines and antibiotics during the 1940s and culminated in the late 1970s in the eradication of one infectious disease, smallpox. Because at that time infectious diseases appeared to be a decreasing threat, funds for their control were channelled to other problems, experts on infectious disease retired or left the field and students turned to more rewarding subjects than viruses and bacteria - the infrastructure for communicable disease control began to crumble.
The global response

Since 1992 alarm over emerging and re-emerging diseases has resulted in a number of national and international initiatives to restore and improve surveillance and control of communicable diseases. The Member States of WHO expressed their concern in a resolution of the World Health Assembly in 1995, urging all Member States to strengthen surveillance for infectious diseases in order to promptly detect re-emerging diseases and identify new infectious diseases. The World Health Assembly recognized that the success of this resolution depends on the ability to obtain information on infectious diseases and the willingness to communicate this information nationally and internationally. This resolution has been translated by WHO into the establishment of the Division of Emerging and other Communicable Diseases Surveillance and Control (EMC), whose mission is to strengthen national and international capacity in the surveillance and control of communicable diseases, including those that represent new, emerging and re-emerging public health problems, for which it ensures a timely and effective response.

BSE

Bovine Spongiform Encephalopathy (BSE) was first described in the United Kingdom in November 1986 and up to mid-1996, approximately 160,000 cases had been confirmed. By mid-1996, BSE had been reported from 10 other countries and areas; in one group of countries the disease occurred in native cattle, while in another group cases were only identified in cattle imported from the United Kingdom.

This fatal neurological disease of cattle is associated with a transmissible agent, the nature of which is not yet fully understood.

It was known that similar transmissible agents caused brain disease in humans, including kuru, and the various forms of Creutzfeldt-Jakob Disease (CJD). The latter can be sporadic, familial, or occur accidentally as the result of a medical procedure (injection or graft of infected human material).

On 20 March 1996, the United Kingdom announced the existence of a cluster of 10 persons identified with what appeared to be a variant of CJD. Full investigation of these cases led to the conclusion that exposure to BSE was the most likely hypothesis. By late 1996, a total of 14 cases of the variant form of CJD have been reported in the United Kingdom and one confirmed in France.

The suspicion of a link between BSE, and the new variant form of CJD through the satisfaction of an essential need such as nutrition, has had important implications for public health and a devastating impact on consumer’s confidence in beef safety and thereby the cattle industry. It has forced us to think through the links between public health, industrial development, technology, economic constraints, market and trade practices, public information and consumer safety. In the case of BSE and the new variant form of CJD, advancement of our scientific knowledge should permit policy-makers to ensure both the continuation of economic activities dependent on the cattle industry and the safeguard of public health.
Hepatitis C

Viral hepatitis is a major global public health problem. The discovery of the hepatitis C virus (HCV) in 1989 ended a period of intensive international research efforts aimed at the elusive «Non-A, Non-B» virus, which was well known as a cause of post-transfusion hepatitis. Although HCV is not as infectious as hepatitis B or HIV, as many as 80% of infected people can become chronically infected and risk serious long term effects such as liver cancer which places HCV among pathogens of primary concern to humanity.

As with all recently discovered diseases, there is considerable controversy within the scientific community regarding prevalence, incidence, natural course, patho-biological implications, socio-economic burden and management of acute and chronic hepatitis C. However, the route of transmission through transfusion with unscreened blood, through the use of inadequately sterilized equipment or through needle-sharing among drug-users is well documented. Sexual and perinatal transmission have been reported but are uncommon. Additional studies are needed on possible alternative transmission modes.

Based on prevalence rates ranging from 0.1% to 33% in different countries, WHO estimates today that as many as 3% of the world’s population could be infected with HCV and that there may be some 200 million chronic carriers who are at risk of developing liver cirrhosis and/or liver cancer.

Although the socio-economic impact of chronic hepatitis C has only been partly studied, the costs are likely to be high, as was found in studies dealing with chronic hepatitis B. Treatment with interferon is effective in about 20% of patients. For the remaining 80%, international research efforts should focus on combined antiviral therapy. It is clear that 90% of patients who are in need of treatment today cannot afford it.

No vaccine is available, but most HCV infections can be prevented by:

- Screening of blood and blood products worldwide.
- Destruction of disposable medical material and adequate sterilization of reusable medical material.
- Promotion of public education about the risks of using inadequately sterilized material.
- At a time when traditional public health activities are weakened and when conditions in public health laboratories are deteriorating, the challenge of a new disease places extensive pressure on the medical community and additional financial burdens upon society.
Alarming outbreaks of tuberculosis caused by multidrug-resistant strains in the United States have lately stirred public interest. In Minneapolis, a person with tuberculosis infected 41 people in a neighbourhood bar. In Western Canada, a health care worker infected 100 other people. In recent years, outbreaks of tuberculosis in wealthy countries have been investigated in discotheques, churches, subways, schools, airplanes, court rooms, and even on a riverboat casino.

Tuberculosis is easily transmitted from person to person. One-third of the world's population – nearly two thousand million people, from New York City to New Delhi – has already become infected. The infection with the tuberculosis bacillus may lie dormant for many years; some people may not even progress to the disease at all. Active tuberculosis has a better chance of developing when the person's immune resistance is weakened, as is the case for women suffering from hormonal and nutritional stresses of pregnancy or for people living with HIV/AIDS. People dually infected with the tuberculosis bacillus and with HIV are 30 times more likely than HIV-negative individuals to become seriously ill with tuberculosis.

In 1993, the World Health Organization declared tuberculosis a global emergency. Tuberculosis is now the leading infectious killer of adults, and will have killed at least 30 million people within the next ten years if current trends continue. It is likely that no other infectious disease is creating as many orphans and devastating as many families as TB. This huge toll is the price the world is paying for complacency.

A cost-effective and proven drug treatment exists, but careless tuberculosis treatment practices are triggering bacilli that are resistant to once-effective drugs. Multidrug-resistant tuberculosis develops when doctors or other health workers prescribe the wrong drugs or the wrong combination of drugs. It also occurs if the right anti-tuberculosis drugs are not taken on a consistent basis, or are not taken for the entire six months of treatment. Powerful tuberculosis drugs should not be prescribed without ensuring that they are taken correctly.

That is why the Global Tuberculosis Programme of WHO is urging all countries to adopt the DOTS (directly observed treatment, short-course) strategy, in which health workers or volunteers watch tuberculosis patients under their care swallow each dose of the medicine for at least the first two months of treatment and monitor their progress toward cure. The strategy is already showing remarkable success in many countries.

WHO is vigorously promoting DOTS: it trains key health workers, assists governments and health ministries worldwide, promotes research into effective ways to cure tuberculosis, contributes to the cure of tuberculosis patients, and mobilizes funds and political commitment to address the pandemic adequately.

The existing BCG vaccine prevents severe tuberculosis in children, but it does not have much impact on the disease in adolescents and adults. Research to develop a new and more efficient tuberculosis vaccine is under way. A range of candidate vaccines is now available.