

# Chapter 4

## The continually changing threat of infectious disease

From the Second World War until the late 1970s, the health community perceived infectious diseases as a receding threat. The development of antimicrobial drugs, immunization programmes and the better nutritional status enjoyed by the populations of the industrialized countries made it appear, for a short while, as if human progress over microbes might be inexorable. But the events of the 1980s and 1990s have quashed this optimism. The emergence of HIV/AIDS, the spread of drug-resistant strains of organisms such as *Mycobacterium tuberculosis*, *Plasmodium falciparum* and *Staphylococcus aureus*, and the resurgence of once-controlled diseases, such as diphtheria in the former Soviet Union, have combined to deliver an unwelcome message: many battles may have been won, but not the war.

The relationship between humans and microbes has always been a dynamic one. Either through genetic changes in a microbe that alter its relationship with

its host, or demographic and behavioural factors that offer the microbe new opportunities (see Table 4.1), the balance of power shifts continuously. For all the current intense public interest in “emerging and re-emerging” diseases—a broad term that covers everything from newly identified infections to the resurgence of old enemies—there is nothing new about this continuous flux.

At the end of the 20th century, however, two factors have coincided to cause particular concern. The first is that widespread use and misuse of antimicrobials since the 1940s has led to the emergence and spread of growing numbers of drug-resistant pathogens. The second is that demographic changes have been rapid and on a massive scale. The global trends towards urbanization, higher-density settlements, and mass, rapid intercontinental travel are just some examples of the ways in which humans have changed their interactions with

**Table 4.1 Factors in the emergence and re-emergence of infectious diseases**

Broad factor	Examples of specific factors	Examples of diseases
Microbial adaptation and change	Antigenic drift; plasmid transfer; response to specific selection pressures in environment.	Antigenic drift in influenza; subtype divergence in HIV-1; emergence of antibiotic resistance in, for example, <i>Streptococcus pneumoniae</i> , <i>Mycobacterium tuberculosis</i> , <i>Shigella dysenteriae</i> , <i>Staphylococcus aureus</i> , <i>Neisseria gonorrhoeae</i> ; emergence of drug resistance in <i>Plasmodium falciparum</i> .
Human demographics and behaviour	Societal events: population growth and migration (especially urbanization); war or civil conflict; urban decay; sexual behaviour; changing eating habits and technologies for food processing and bulk food preparation; intravenous drug use; use of high-density facilities; international travel; illegitimate trade.	Spread of HIV and other STDs; spread of TB, malaria, Lassa; spread of leishmaniasis in Sudan, India; cholera in refugee camps; increase in microbial food poisoning in the industrialized countries.
	Health system failures: breakdown or curtailment of prevention/treatment/vector control programmes; inadequate laboratory facilities, infection control measures or health care capacity.	Spread of drug-resistant strains of bacteria and malaria parasites; nosocomial transmission of microbes; resurgence of tuberculosis in the established market economies; resurgence of diphtheria in Russia and Ukraine; resurgence of African trypanosomiasis in Zaire; measles epidemics in the Americas.
	Changes in land use: e.g. agriculture; dams; changes in water ecosystems; deforestation/reforestation; famine.	Schistosomiasis; malaria; Argentine haemorrhagic fever; Hantavirus pulmonary syndrome; possible factor in emergence of Ebola virus.

Note: Categories are not mutually exclusive: several factors may contribute to the emergence of a disease.

Source: adapted from Satcher 1995:10