Manthan, International Journal, Vol. 12, June, 2011, Pages 33-34
ISSN No. 0974-6331 www.bbmanthan.info

Resurgence of Infectious Diseases and Emergence of New Infections

Diwakar Tejaswi

Consultant Physician & Medical Director, International Health Organization & PAHAL
Exhibition Road, Patna-800001, Bihar, India

The environment influences our health in many ways - through exposures to physical, chemical and biological risk factors. Globally, nearly one quarter of all deaths and of the total disease burden can be attributed to the environment.

Over the last 30 years the reversal in the declining death rate due to infectious diseases has alarmed international health experts. Dramatic successes in eradicating small pox, controlling polio and tuberculosis, and eliminating vector-borne diseases such as yellow fever, dengue and malaria from many regions convinced most experts the era of infectious diseases would soon be over. Unfortunately this optimistic prognosis was premature as a number of diseases have dramatically reemerged. Tuberculosis (MDR and XDR TB), cholera, dengue, plague, and malaria have increased in incidence or geographic range, as have new drug-resistant strains of bacteria. In addition newly recognized diseases, such as AIDS or H1N1, have emerged.

The present global emergence of infectious diseases is clearly associated with the social and demographic changes of the past 50 years, particularly urbanization and globalization, with the attendant spread of pathogens (agents causing disease) via infected humans, hosts, vectors or commodities. The change in the environment caused by human activities is also apparent in the transformation of much of our landscape and conversion of regional systems once dominated by natural ecosystems. Factors include expansion into urban or peri-urban habitat, deforestation, and the spread of intensive farming. The environment's role in the emergence of diseases is apparent in the connections between the direct consequences of human changes to urban and rural landscapes and ecosystems, and the secondary effects on disease emergence factors. Developing irrigated agriculture, for example, can create breeding grounds for mosquitoes, a vector for malaria. Likewise the inadequate storm drainage and sewerage systems often associated with rapid urbanization not only increase the breeding habitat for disease vectors but facilitate the spread of waterborne pathogens causing cholera and leptospirosis.

Overwhelming evidence points to human demographic changes as the major direct and indirect factor contributing to the increase in infectious disease, with somewhat different dynamics and mechanisms at work in urban and rural environments. In the first case the increasing number of people crowded into dense settlements has dramatically increased opportunities for food, water, rodent and vector-borne pathogens to "colonise" and persist in human populations. Each pathogen has unique transmission and adaptive characteristics that determine a minimum population for survival (the threshold for measles is about 250,000 people). Whether the threshold is 100,000 or a million the number of large urban settlements and the average settlement size has been growing fast in recent decades. The number of cities of one million or larger was 76 in 1950, 522 in 1975, and 1122 in 2000, and is set to exceed 1600 by 2015. This 20-fold increase translates to a roughly similar increase in global infectious disease vulnerability due to this one factor alone.

This type of growth has indirect social and environmental consequences that contribute to multiplying the actual increase in population. Poverty, poor living conditions, including lack of sanitation and infrastructure for waste-water and solid waste management, increases opportunities for vector- borne diseases and others passing from animals to humans. The geographic spread and expansion into peri-urban areas of the mosquito *Aedes albopictus*, exquisitely adapted for breeding in discarded plastic containers and used automobile tires, is a good example of how a potential vector of viral diseases has taken advantage of environmental change. Lack of sanitation and waste water treatment, and industrial scale intensification of animal production systems the world over; contribute to exotic species, and the proliferation and spread of water and food-borne pathogens. Increasingly frequent outbreaks of infections are caused by these and other organisms, many of which may eat alongside or prey on wild mammals and birds as natural parasites. The contamination of surface waters and spread of pathogens is further promoted by the alteration of catchments and watersheds accompanying urbanization, and intensive farming around cities. Channeling streams, removing vegetation on the banks, and filling in wetland - all of which accompany unplanned urbanization - eliminate the natural retention and nutrient recycling systems, as well as

barriers to surface run-off contaminated with intestinal pathogens. Nutrient pollution leading to oxygen depletion in estuaries, lakes, streams and even stretches of ocean, such as the Gulf of Mexico, helps such pathogens survive too.

In rural areas population and consumption play a less direct role in contributing to disease emergence, particularly as rural emigration is fuelling the demographic explosion in cities. It is more that urban areas are driving a sustained increase in the timber trade, agriculture, stock raising and mining, resulting in turn in deforestation and changes in land use that are transforming rural landscapes and natural areas in ways that often facilitate the emergence of disease. Deforestation or even "patchy" reforestation leads to ecological changes such as increased edge habitat and local extinction of predators that favour some disease vectors and reservoir species. Encroachment of individuals and settlements on natural ecosystems brings humans into contact with known and novel pathogens. The spread and intensification of farming results in the development of irrigation systems, ideal breeding sites for mosquitoes and a habitat for opportunistic insects and rodents that may be vectors or reservoirs for disease. Dams provide a favorable habitat for other vectors.

Climate change represents a potential environmental factor affecting disease emergence

Shifts in the geographic ranges of hosts and vector, the effect of increasing temperature on reproductive, development and mortality rates on hosts, vectors, and pathogens, and the effects of increased climate variability on flooding and droughts all have the potential to affect disease incidence and emergence positively or negatively. At present there is insufficient evidence to indicate what the net effect will be once climate changes begin to have a major affect on ecosystems. However, a dominant theme emerging from research on the ecology of infectious disease is that accelerated and abrupt environmental change, whether natural or caused by humans, may provide conditions conducive to pathogen emergence: pathogen adaptation, host switching, and active or passive or dispersal.

The resurgence of infectious diseases worldwide reflects our quick-fix mentality, with poor development planning, a lack of political determination and institutional inertia. It is not the inevitable result of development, environmental change, or even incremental population growth. On the contrary much can be done to reverse the current trend. As well as rebuilding the public health infrastructure for infectious diseases, there is substantial evidence and a growing number of examples of how regional planning and development, including urbanization, agricultural expansion, and the management and conservation of forests and other ecosystems can minimize and even reduce outbreaks of infectious disease as well as environmental damage. Basically we need an integrated approach to pathogen control. This approach will involve meshing social and economic development programs, environmental and natural resource management, with intervention based on the reinvigorated field of disease ecology and methods involving community participation.

Correspondence:
Phone: 91-612-2206964, 91-9835078298(M)