INFECTIOUS DISEASES—A 'DEAD' SPECIALTY REVIVES

By Bernard Dixon

For physicians training as little as 20 years ago, communicable disease was a dead-end as a vocation and an increasing yawn as an intellectual discipline. Drugs and vaccines, sanitation and nutrition, had defeated the killer microbes, leaving cancer, cardiovascular conditions, and mental illness as the real targets for research, health care, and careers in medicine. A 1974 editorial in *The Lancet*—"Infectious diseases—end of a specialty"—summed up the mood.

Since then, things have gone badly wrong. We have seen AIDS and Legionnaires' disease, bovine spongiform encephalopathy, and the rise of food-bourne diseases caused by rotaviruses and helicobacters—not to mention Lassa fever, Ebola fever, and many other newly recognized maladies and pathogens. Infections are back with a bang. And most of those that hit the headlines are caused by viruses.

Many of those headlines focus on the startling novelty of these developments, which appear to have pitched us back towards an age when humans were powerless to deal with plague and pestilence. The media can be criticised on occasions for projecting such impotent alarm—for example, in overlooking the capacity of modern science to characterise the nature of HIV with both alacrity and finesse. At the same time, the popularisers are not too far removed from many experts in fretting over the unpredictability with which our new enemies arise. Despite the best endeavours of networks such as the World Health Organisation's (Geneva, Switzerland) influenza reference centers, the random nature of mutation and recombination persuades us that events such as the acquisition of virulence traits and alterations in host range are beyond rational forecast.

Does this emphasis on unforeseeable happenings conform with reality? Or is it a pessimistic distortion of the true nature of the microbial world and its interactions with humankind? That issue is explored in a remarkable paper by Stephen Morse of Rockefeller University (New York) in the current issue of *Perspectives in Biology and Medicine* (**34**:87, 1991). Morse's assessment, based on a mountain of information condensed into 20 crisp pages and 55 references, amounts to a buoyant view of our capacity to anticipate and cope with viral hostility. He believes that many of the molecular changes responsible for alterations in virus behaviour can be anticipated—but far more important than these mutations and recombinations are "changes in traffic patterns that give viruses new highways." If Morse is right, his message is of pressing importance for public health authorities and bioindustry alike.

Taking the prime example of a "diabolical new development in virus evolution," Morse concedes that AIDS is unusual and that its organism has novel features. But he insists that the uniqueness of AIDS as a disease has obscured the many features that HIV shares with other viruses. Even its apparent hallmark, a predilection for the CD4 surface protein of T lymphocytes, is now known to occur elsewhere too. And the epidemology of AIDS, probably beginning with movement along the Mombasa-Kinshasa highway in Africa, could have been inferred from an analysis of alterations in virus traffic and in particular from what was known about hepatitis B. "Long before the virus etiology of AIDS was defined, epidemiologic work demonstrated the similarity of transmission patterns for AIDS and for hepatitis B, with identical high-risk practices and risk groups. This information could have, at least in theory, pointed the way to suitable precautions to limit spread," says Morse.

On a broader canvas, it seems that the majority of so-called novel viruses and correspondingly "new" diseases have not been thrown up by the capricious lottery of viral evolution. They have emerged through shifts in traffic patterns—as through the creation of new routes for viruses to migrate from animal hosts to humans and from small or isolated human populations to larger groups. Arguably the most significant triggers for such alterations in virus traffic are agricultural and environmental changes—deforestation, for example—that are attributable to human intervention.

"The optimistic message is that the possibly unpredictable path of viral evolution need not necessarily be fully charted before we can anticipate viral emergencies," say Morse. "The central problem is changing relationships between humans and their environment." The many examples cited in his survey range from influenza pandemics, now suspected of originating from gene mixing during the integrated pig and duck farming practised in south China, to Argentine hemorrhagic fever, which emerged in the 1950's when clearing of the pampas and maize planting precipitated a population explosion in mice chronically shedding the virus in their urine.

Epidemiology rivals economics in being more impressive in explaining events afterwards than in forecasting them. If Morse is right, however, our powers of prediction over viral disease could be increased considerably if only the right categories of information are sought and obtained. Three new perspectives are indicated. First, multidisciplinary thinking is required to delinate potential changes in the possibilities for new traffic highways, and to find informative analogies between the behaviour of familiar and unfamiliar organisms. Second, we need to understand what restrains the emergence of new strains—why, for example, influenza virus goes on the global rampage only every 20 years for so. Third, techniques such as the polymerase chain reaction should be exploited in systematic efforts to reveal and study unknown viruses in nature before they precipitate troubles in human society.

Buttressed by these three new approaches, medical microbiology would be neither completed history, nor an uneasy specialty struggling to forecast the unforecastable, but a science of hitherto unrealised predictive power. ///