

## Emerging Infectious Disease



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**The term 'emerging diseases' has become synonymous with new, previously unknown infectious agents, or with known infectious agents which are either spreading geographically or increasing in incidence. An analysis by Jones et al (2008) showed that since 1940 there has been a steady increase in new diseases, and new diseases are continuing to emerge today. Most of these new diseases are of minor importance with respect to human or animal health, but occasionally important, highly pathogenic diseases arise, such as we have seen in recent years with SARS and Nipah virus, or with new variants or strains of known diseases such as avian H5N1 influenza, the current pandemic strain of H1N1 2009 influenza virus, and extremely drug resistant tuberculosis.**

These diseases are emerging as a consequence of a complex matrix of factors including climate change, changes in land use, changing demographics, global movement of animals, people and commodities, the development of new technologies, and population density. Indeed most factors are the result of human activities, so in a sense we have only ourselves to blame! However, while most novel agents are of only minor consequence, and often are of more interest as scientific curiosities, others can be much more serious, causing significant morbidity and mortality and/or significant economic losses.

Perhaps the most significant diseases which arise as new variants or 'reassortants' are new influenza A strains, especially those with pandemic potential. Thus the Spanish flu pandemic in 1918-19 resulted in over 40 million deaths, and the estimated global cost of avian H5N1 influenza has already exceeded US\$20 billion. Other diseases provide examples of either high mortality and/or morbidity such as HIV which causes approximately 2 million deaths per annum and the pulmonary hantaviruses which, since their first discovery during an outbreak in the US, have been causing significant disease throughout the Americas, or examples of enormous economic losses both locally such as bovine spongiform encephalopathy which has cost over US\$25 billion in the UK, and SARS which cost the global community, especially south-east Asia, well in excess of US\$40 billion. Australia has not been immune to these enormous costs – equine influenza has been estimated to have cost Australia AU\$1 billion, and should

Australia suffer an outbreak of foot-and-mouth disease, it could cost us up to AUD13 billion.

Epidemic prone diseases are unpredictable in their nature; we do not know when, where and how the next outbreak will occur, only that a new disease will emerge in the near future. HIV and SARS were completely unexpected, emerging from wildlife to infect people. While the world was watching H5N1 avian influenza emerge and spread in Asia and subsequently in Europe and Africa, a new influenza A H1N1 virus has emerged in North America from a swine source. We do not know what the next emerging disease will be or when it will occur. The probability is that it will arise from wildlife as over 75% of emerging diseases are zoonoses. However, because of the unpredictable nature of these disease events, we need to be well positioned nationally (and internationally) to forecast, manage and mitigate the risk of outbreaks and to minimise their impact when they do occur.

This requires that emerging infectious disease research and adoption reduce specific risks of disease emergence by building our national capability and capacity to rapidly respond to minimise impact. The importance of local and global surveillance programmes cannot be over-emphasised – the rapid detection and verification of a new disease is essential if we are to have any chance of responding in time to mitigate its effects. We also need to have a global, regional and national ability to respond to new and potentially catastrophic disease epidemics and pandemics.

The papers in this special edition of Microbiology Australia highlight these disease risks, providing current information on diseases seen either as threats to Australia and our region, or as diseases of scientific interest which may increase our scientific knowledge and understanding of the process of disease emergence.

**Professor Stephen Prowse** is the CEO of the Australian Biosecurity Cooperative Research Centre for Emerging Infectious Disease (AB-CRC) and an Adjunct Professor in the Faculty of Biological and Chemical Sciences at the University of Queensland. Professor Prowse has a background in disease research in humans and livestock with a focus on pathogenesis, and the development of vaccines and diagnostics.

**Professor John Mackenzie** retired from his position as Professor of Tropical Infectious Diseases and Premier's Fellow at Curtin University in 2008, and Deputy CEO of the Perth Node of the AB-CRC. He remains associated with Curtin University as a Professorial Fellow, and has appointments at WHO.