One world – one health

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How we got here

Outbreaks of avian influenza, severe acute respiratory syndrome (SARS), Ebola hemorrhagic fever, bovine spongiform encephalopathy (BSE) and other emerging diseases have alarmed the public, caused massive economic losses, jeopardised business and diplomatic relations, and threatened the public's trust in the ability of health professionals to protect them. These diseases, which are able to cross the Darwinian divide between animals and people, do not depend on humans for their survival. This gives them a competitive advantage which demands that we revisit basic strategies for disease control.

The global transport of plants, animals and animal products, which includes hundreds of exotic species of wildlife, provides safe passage for their bacteria, viruses, fungi, and prion proteins.[1] Surveillance of infectious diseases is most useful when it occurs as close to their source as possible, rather than waiting to measure morbidity and mortality in distant lands. Currently, no government agency is responsible for, or capable of, the surveillance and prevention of the myriad of diseases residing around the world. None are given the responsibility for robustly pursuing the simplest of concepts – the health of people, animals and the environment in which we all live, are inextricably linked.

Some steps are being taken. Since 2005 the United Nations Food and Agriculture Organization has collaborated with the Wildlife Conservation Society to coordinate responses and investigations of highly pathogenic avian influenza virus in wild birds. The World Organization for Animal Health (Office International des Epizooties (OIE)) has committees to address wildlife-related disease and zoonotic and emerging diseases and is working to develop broader, more routine reporting capabilities. The World Health Organization (WHO) was limited to responding only to information officially provided by countries that may or may not know about, or want to reveal, the presence of a disease. Recent changes in WHO's guidance related to the International Health Regulations will allow for information gathering without going through official channels and this could greatly help in global response time.

Where we are

Of the over 1,400 infectious diseases currently known to modern medicine, most are shared between humans and animals.[2] From an anthropocentric point of few, most of these infectious agents are labelled zoonotic, which describe diseases of animals that infect people. Anthrax, Rift Valley fever, plague, Lyme disease, and monkeypox are just a few examples. The other group that moves across species boundaries, the anthropozoonotic diseases, are typically found in humans but can, and do, infect animals. Human herpes virus, human tuberculosis, and human measles are all transmissible to a variety of animal species with devastating consequences. This traditional division of infectious agents into two groups obscures the reality that these diseases can move back and forth, and change characteristics in the process.

The consensus of scientific opinion on the origin of HIV/AIDS links it to human consumption of non-human primates along with their simian immunodeficiency viruses, estimated to have taken place in Africa late in the first half of the 20th century.[3] Recent Ebola hemorrhagic fever outbreaks in humans in Africa have a similar history. The virus infects people, gorillas, chimpanzees and monkeys, causing severe internal and external haemorrhaging.[4] When subsistence hunters discover a sick or dead animal in the forest, they bring it home to feed their families and trade with neighbours. The Ebola virus then easily infects those handling the meat and a chain of contacts and infections ensue. Each of the human outbreaks in central Africa during the late 1990s and the first years of this century were traced to humans handling infected great apes.

The SARS coronavirus has been associated with the trade in small wild carnivores. SARS first appeared as a severe pneumonia in China's Guangdong Province in late 2002. It was an unknown disease and very infectious. Within a matter of weeks, it spread via a hotel visitor in Hong Kong to five continents. By July of 2003, WHO tallied 8,437 cases, with 813 deaths. A coronavirus (a family of viruses found in many animal species) was finally discovered to be the culprit, and it was also detected in masked palm civets that were farmed in the region and sold for human consumption. Later, evidence of the virus was also found in raccoon dogs, ferrets and badgers in the wildlife markets, as well as domestic cats living in the city and a closely related coronavirus in bats commonly sold in the same markets. Epidemiological studies have concluded that the first human infections did indeed come through animal contact, though the exact species has not been definitively identified.[5,6]

Exact quantification of the global wildlife trade is impossible since it ranges in scale from extremely local to major international routes and much is illegal. Figures compiled by the Wildlife Conservation Society from a variety of sources for just the live wildlife trade indicate that each year roughly 40,000 live primates, 4 million live birds and 640,000 live reptiles are traded globally. Daily, wild mammals, birds and reptiles flow through trading centres where they are in contact with humans and dozens of other species before being shipped to other markets, sold locally, and even freed back into the wild with new potential pathogens.[7,8]

Going forward

Building bridges across disciplines to solve health problems can have simple but significant synergistic effects. Studies in South America have shown that livestock diseases can pose more

threats to wildlife than vice versa. In much of the world, reducing disease in domestic animals would improve human health and livelihoods, as well as to help protect wild animals from livestock and other domestic animal diseases. Conversely, our work in Central Africa with Ebola hemorrhagic fever in gorillas and chimpanzees has shown that networks of local villagers and hunters, park managers and staff, government public health officials, and regional laboratories can detect outbreaks of Ebola in great apes and notify local communities of the risks. We believe that due to these efforts in northen Republic of Congo, for the first time, outbreaks in animals have not resulted in the spread of the disease to humans. This broader, one health approach is much more effective and inexpensive than the traditional 'quarantine and stamping out' efforts after an outbreak has already begun. A set of guiding concepts on these themes, called the Manhattan Principles, was developed by human and animal health specialists in conjunction with wildlife conservation professionals and is available at www.oneworldonehealth.org.

Another large-scale example of a worldwide private–public collaborative effort is the Global Avian Influenza Network for Surveillance of wild birds (GAINS), based on the premise that wild birds around the world can serve as sentinels for the early detection of the virus' presence to warn public health and agricultural health professionals. Interest in the GAINS programme continues to grow and working relationships with local institutions are being built in over 34 developing countries (www.GAINS.org).

Human and animal health practitioners need to understand that it is indeed our responsibility to become a part of a collaborative solution. We need to explain to our clients and our patients that our health and the health of all living things in our environment cannot be separated. We must engage the public in discussion about our health rather than just telling them what to do. Global health will not be achieved without a philosophical shift from the 'expert dictates' paradigm inherent to both science and medicine, to a broader, multi-stakeholder approach, based on the understanding that there is only one world and one health.

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Advances and retreats in tuberculosis in the last 30 years

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In the UK, the incidence rate of tuberculosis (TB) has changed little, from 19 per 100,000 population in 1980 to 13 by 2006. During the same period, however, the UK dropped from 12th to 23rd in the league table of the 53 states in the European region of the World Health Organization (WHO) – that is, 22 countries in Europe had a lower incidence by 2006.[1] For the most part, these are small states in Western Europe with limited migration, eg Iceland, Luxembourg, Malta, the Nordic states and Slovenia, where improving social conditions, as well as public health measures, have reduced the incidence. In the UK, there has been a major shift from the bulk of cases arising in native-born people to most cases being in the foreign born, especially in those from the Indian subcontinent. In the former Soviet countries of Eastern Europe, eg Ukraine and Belarus, incidence has remained high, but is lower than in the Caucasus, eg Georgia, Armenia and Azerbaijan, and in Central Asia, eg Kazakhstan (which, for historical reasons, is classified as in the European region). The underlying causes here include enduring poverty, economic crises, especially around the breakup of the former Soviet Union, antiquated approaches to TB control, and inflexible health systems. Overall, however, incidence in Eastern Europe is now falling slowly.

Meanwhile, rates in South East Asia have stayed almost constant, at around 180/100,000, but with a doubling of the population in that time. The region is dominated by India, the number one supplier of TB cases each year with 1.9 million estimated cases in 2006. The Western Pacific, notably China, has seen a gentle decrease to nearly 100/100,000, with more dramatic falls in Latin America, Central Europe and high-income countries.

The biggest jolt to TB case numbers came from HIV: as a result, sub-Saharan Africa has seen incidence treble, rising to an average high of about 420/100,000 in those countries with an HIV prevalence of 5% or more, falling slightly since 2003.[1] Globally, in 2006 there were an estimated 9.2 million new cases of TB, with 700,000 cases in those with HIV infection, and 1.5 million deaths of which about 200,000 were HIV infected. The TB epidemic appears recently to have flattened off, and incidence is even falling although total case numbers are still rising due to population increases (Fig 1). Incidence would have begun to fall a decade earlier were it not for HIV.[2]