Briefing note on public health security to the

In August and September 2000, 33 international athletes from the Americas, Africa and the Pacific Rim who participated in the *Eco Challenge* (a triathlon in the jungles of Malaysia) returned home while still in the incubation period of leptospirosis, an infection carried in rodents and transmitted to humans in contaminated water. Once home and sick, their uncommon infection proved difficult to diagnose. Of the 109 athletes affected, 29 became severely ill, requiring prolonged hospitalization.[7]

Each year airport malaria – malaria in persons working in airports or living nearby who have never travelled to tropical countries – is identified somewhere in North America, Europe and other geographic areas that do not have endogenous malaria.[8] Airport malaria is caused by the bite of malaria-infected mosquitoes that travel in passenger compartments or holds of aeroplanes that fly international routes. Once bitten and sick, unsuspecting humans, who have no history of travel to parts of the world where malaria is present, prove to be a diagnostic challenge to health workers. Airport malaria is thus associated with high death rates because of delayed diagnosis and treatment.

If domestic mosquitoes that are able to carry malaria live in the vicinity of the airport and bite those persons who have airport malaria, malaria can then be transmitted to other

Because of measures to stop the spread of BSE among livestock, including culling of entire herds of cattle where infection had been detected and bans on trade of British beef, the estimated loss to the UK economy was estimated at over US$ 9 billion during the first eight years after its recognition.[13] As comparison, the culling of chickens and ducks to stop the 1997 outbreak of avian influenza cost the Hong Kong economy an estimated US$22 million, while the cost of culling chickens and lost trade during the present avian influenza outbreak in Thailand has been estimated to date at US$2.6 billion.[14]

Animals were also implicated in an outbreak of Rift Valley fever on the Arabian Peninsula when, in 2000, Rift Valley fever is thought to have crossed the Red Sea in livestock from eastern Africa destined for trade in Saudi Arabia and Yemen.[15,16] Eastern Africa had an epidemic of Rift Valley fever in cattle and humans in the late 1990s as a result of several important factors that occurred simultaneously – discontinuation of cattle vaccination programmes, flooding associated with the el niño phenomenon that resulted in increased mosquito vectors to carry the Rift Valley Fever Virus, and forced co-habitation of small parcels of dry land by humans and cattle. The Rift Valley virus is now positioned to regularly infect humans in the Arabian Peninsula through the bite of local mosquitoes unless animals that carry the virus are regularly vaccinated. The impact of Rift Valley Fever on the economies in Saudi Arabia and Yemen is still being assessed.

Finally, in 2003 and 2004 the polio virus spread from Nigeria to 12 polio-free countries in West, Central and Southern Africa. In four of these countries polio outbreaks occurred and spread polio widely, while in the other eight localized outbreaks occurred without widespread transmission. The immunization campaigns to stop polio transmission in these countries are projected to have cost over 100 million dollars by the end of 2005.[17]

Bioterrorism: an additional threat to public health security

In October 2001, several letters containing *Bacillus anthracis* spores were sent through the US postal service to private sector and government buildings. Between 2 October and 19 November, investigators identified a total of 22 cases of bioterrorism-related anthrax: 11 were confirmed as inhalational anthrax, causing severe pneumonia, and 11 (seven confirmed and four suspected) were cutaneous anthrax, appearing as ulcers of the skin. Five of the 11 inhalational infections were fatal.[18] Post-exposure prophylaxis to prevent the development of inhalational anthrax was given to over 10,000 persons who were exposed to environments contaminated with *B. anthracis* spores, and permanent and costly measures to detect further contaminated letters were put in place in the US postal system..

Following this deliberate and malicious use of anthrax in the US in 2001, the perception of the infectious disease threat quickly broadened. Now, just three years later, preparedness for a possible deliberately caused infectious disease outbreak, bioterrorism has become a great concern in many countries. It has raised many questions about the capacity of public health infrastructures to respond to outbreaks of massive proportions, the best strategies for protecting populations, and the extent to which resources should be

Global surveillance and response: a safety net to increase public health security

Concern about the international spread of infectious diseases is not new. In the 14th century, ships that were potential carriers of plague-infected rats were forcibly quarantined in the harbour of the city-state of Venice to prevent importation of plague, and then in other seaports around the world.[20] By the 19th century, there was a series of international agreements between the newly-industrialized countries that culminated in the mid-20th century with the International Health Regulations (IHR).[21] Accepted by all Member States of the World Health Organization (WHO) in 1969, the objective of the IHR is to maximize public health security against the international spread of infectious diseases while ensuring minimum impact on trade and travel. The IHR are the only international regulations that require reporting of infectious diseases. At the same time, they provide norms and standards for air and sea ports designed to prevent the spread from public conveyances of rodents or insects that may be carrying infectious diseases. The IHR also describe best practices to be used to prevent the spread of these diseases internationally

To broaden the disease coverage of the IHR as new infectious diseases continue to be identified (over 30 during the past twenty five years); to increase their sensitivity for outbreak detection; and to provide guidance on more effective control measures for air and sea ports, the IHR are currently being revised to serve as an up-to-date framework for 21st century global surveillance for, and response to, infectious diseases .

The revised IHR will thus provide the framework for a global safety net to rapidly detect and coordinate international responses to infectious diseases that have not been effectively detected and responded to nationally. This safety net has been under development since 1997 as the WHO Global Outbreak Alert and Response Network [22]. This overarching network presently interlinks, in real time, over 100 existing laboratory and disease reporting networks that together possess much of the data, expertise, and skills needed to keep the international community constantly alert and ready to respond to infectious diseases that threaten to spread internationally.[23] The network ensures that the necessary laboratory and epidemiological skills are kept sharp, since the call-out for natural outbreaks at the global level is fre

strengthening capacity for outbreak detection and response nationally, and in developing countries bilaterally or through multinational mechanisms,
increasing robustness of the WHO-coordinated international system for outbreak alert and response as a safety net if national capacity fails to detect and contain, and
establishing some type of risk management/insurance fund to provide incentives for countries to comply with the IHR and take steps to protect themselves and [†]others from potential high short term economic losses.

With strong advocacy and adequate resources, a fully operational system - functioning national surveillance and response capacities linked to a strong and responsive international alert and response system - can be in place within five years or less.

The estimated cost is 300 million Canadian dollars per year for 5 years. Potential funding sources, in addition to traditional development cooperation funds and funding from the Ministries of Health (contributing to this global public good is in their direct interest), are private sector investment banks, insurance and other risk management companies, and airlines that have already expressed interest in contributing to some type of fund that would help lower the risk of global epidemics and their potential economic costs by strengthening national and global alert and response.

References

[1] Heymann, DL, Rodier G. SARS: Lessons from a new disease. Learning from SARS: Preparing for the next disease outbreak. 234-245. Institute of Medicine Forum on Microbial Threats, 2004

[2] Knight J. How and who does SARS kill? In SARS: what have we learned? *Nature* 2003; 424: 121–6.

[3] International Air Transport Association.

[4] Orecklin M. The surprising impact of SARS. *Time Magazine*, 5 May 2003.

[5] Taux RV, Mintz ED, Quick RE. Epidemic cholera in the New World: translating field epidemiology into new prevention strategies. *Emerg Infect Dis* 1995; **1**: 141–146.

[6] Cash RA, Narasimham V. Impediments to global surveillance of infectious diseases: consequences of open reporting in a global economy. *Bull World Health Organ* 2002; **78**: 1353–67.

[7] Sejvar J, Bancroft E, Winthrop K, Bettinger J, Bajani et al. Leptospirosis in “Eco-Challenge” athletes, Malaysian Borneo, 2000. *Emerg Infect Dis* 2003; **9**(6): 702–7.

[†] A potential fourth area necessary for the response component of this effort would be the provision of adequate incentives including push /pull mechanisms of financing for the public/private sectors to conduct needed R&D and produce/scale up production of needed vaccines, medicines and diagnostics