Emerging zoonotic diseases

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Emerging infectious diseases have become a topic of considerable interest over the past few years. In 1992 the Institute of Medicine published a report outlining the threat from emerging diseases and published recommendations to allow the United States to be better prepared to recognize and rapidly respond to these public health threats (1). Subsequently the Centers for Disease Control and Prevention in Atlanta, Georgia issued a document in which they outlined strategies for addressing emerging infectious disease threats (2).

In Canada the Laboratory Centre for Disease Control (LCDC) convened a multidisciplinary workshop on emerging infectious diseases issues in December 1993 at which approximately 40 scientists provided expert input. The following objectives were achieved: first, a consensus was developed on the relevancy and importance of emerging pathogens in Canada; second, specific areas of concern were identified and recommendations were made for the possible emergence of new pathogens that might threaten the health of all Canadians; and third, Canada’s participation in newly developing global surveillance networks to detect emerging pathogens was discussed (3).

A major group of emerging diseases identified are zoonotic diseases. This report provides a brief discussion of zoonotic diseases seen in Canada as well as predicted and observed emerging diseases of zoonotic etiology.

Zoonotic diseases are maintained in nature in vertebrate animals, possibly with an arthropod vector serving as intermediary, and are transmissible to humans. A broad range of organisms may have a zoonotic disease etiology, including fungi, parasites, bacteria, rickettsia and viruses.

Fungi of the genera trichophyton and microsporum may cause ringworm and have domestic animal reservoirs such as dogs, cats, cattle and horses and wild animal reservoirs including mule deer, opossums, foxes, squirrels and other rodents. Ringworm in humans arising from zoophilic species tends to be of greater severity.


Many bacteria have been documented in Canada that have a zoonotic disease etiology, including those that cause diseases such as anthrax, Lyme disease, leptospirosis, plague, yersiniosis, tularemia, brucellosis and bovine tuberculosis. The list also includes numerous enteric organisms such as salmonella (bovine, poultry, porcine), campylobacter (previous sources plus canine and feline), helicobacter (poultry, porcine, canine, feline), verotoxigenic *Escherichia coli*, *E coli* O157:H7 (bovine) and *Bacteroides fragilis* (ovine), and nonenteric bacteria such as bartonella, clostridia, corynebacterium and pasteurella genera. Finally, chlamydiosis caused by *Chlamydia psittaci* and found in a large number of bird species has been encountered.

Rickettsial infections also occur in Canada. The most prevalent of these is Q fever caused by *Coxiella burnetti*, which may infect a wide variety of wild and domestic animals, with cattle, goats, sheep and cats appearing to have a role in transmission of infection to humans, primarily by infectious aerosols. Rocky Mountain spotted fever, a tick-transmitted zoonosis with rodents and small animals as reservoirs, has been reported from several Canadian provinces and typhus group infections, possibly murine typhus, have also been documented.

Viral zoonoses in Canada include rabies, which is prevalent in wildlife in several provinces although human cases are rare, and contagious ecthyma or orf, a dermatitis of poxvirus etiology with reservoir in sheep and goats. Several arthropod-borne viruses of human disease potential have been isolated in Canada, including mosquito transmitted viruses such as western equine encephalitis, eastern equine...
encephalitis, St Louis encephalitis, and California serogroup (snowshoe hare, Jamestown Canyon), and tick transmitted viruses such as Powassan and Colorado tick fever. More recently a hantavirus, tentatively named Sin Nombre virus, has been documented in deer mice from British Columbia to Ontario.

EMERGING ZOONOTIC DISEASES

The Institute of Medicine report on emerging infections (1) identified the following zoonotic disease agents that have a relevance to the Canadian situation: *Borrelia burgdorferi*, *Campylobacter jejuni*, *E. coli* O157:H7, *Helicobacter pylori*, *Listeria monocytogenes*, *California serogroup viruses* (Jamestown Canyon, snowshoe hare), hantaviruses (Sin Nombre), rabies virus, anisakiasis, cryptosporidium, *G. lamblia*, *S. stercoralis* and *Toxoplasma gondii*.

Several other emerging pathogens were mentioned in the Institute of Medicine report that do not have proven significance in Canada but are worthy of consideration, including *Ehrlichia chaffeensis* (a major tick vector, *Amblyoma americanum*), is not endemic in Canada but adult ticks are occasionally documented, bovine spongiform encephalopathy agent (an imported case was seen in Alberta), hantaviruses (*Seoul*-like virus) and babesia (*Ixodes scapularis*, endemic only at Long Point, Ontario but adult ticks have been observed in many provinces). Not mentioned in the Institute of Medicine report but also worthy of mention are human granulocytic ehrlichiosis (which tick vector is involved is uncertain, but *I. scapularis* is suspect), bartonella (documented in Quebec and Atlantic Canada by serological studies of cats and likely distributed throughout Canada) and the parasitic diseases trichinellosis and metorchis conjunctis (personal communication).

In addition to the pathogens noted previously, other zoonotic diseases will emerge. For example, western equine encephalitis virus has not caused an epidemic in Canada for over 10 years but future epidemics will occur. Outbreaks of exotic diseases such as pneumatic plague, Ebola and dengue fever will provide risks for travellers abroad as well as for imported cases in Canada. Racon rabies will likely hit Ontario in 1995 or 1996. It is possible that the very efficient mosquito disease vector *Aedes albopictus* that was introduced to the United States from Asia in the 1980s will colonize parts of Canada and bring with it increased threats of new arboviral disease. Finally, other zoonotic diseases will be encountered that cannot be predicted at present.

WORKING GROUP RECOMMENDATIONS

Several of the specific recommendations from the LCDC-sponsored workshop on emerging disease issues are particularly relevant from a zoonotic diseases perspective. They include the following:

- that LCDC address zoonoses such that an effective means of information sharing is established among interested groups, ie, veterinary medicine, Agriculture Canada, regulatory bodies, Canadian Cooperative Wildlife Health Centre, public health;
- that LCDC address vectors, vector-borne diseases and the use of pesticides such that Canada maintains a capability in medical entomology – there is support to create and facilitate linkages with international resources in medical entomology on issues related to vector-borne diseases potentially entering Canada – and that the nature and extent of vector control and pesticide use in Canada be determined and the findings communicated to the public health community; and
- that LCDC address parasitic agents such that accessibility to laboratory facilities with good quality, timely service in the diagnosis of parasitic diseases is maintained in Canada.

Emerging diseases will continue to be a problem. Dr Allan Ronald has predicted that during the next five years at least 10 and perhaps as many as 50 significant new public health emergencies will occur in Canada (4). Some of these will be zoonotic diseases. It is important to institute appropriate surveillance and laboratory measures to monitor and detect these diseases in order to minimize the public health risk.

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REFERENCES
