



Emerging and re-emerging zoonoses in veterinary practice

Changes in host, pathogen and environment have created new challenges for controlling diseases in pets, people

By Leonard C. Marcus,
VMD, MD., Dipl. ACVP
CONTRIBUTING AUTHOR

Over the past three decades an array of new (emerging) infectious diseases have been discovered in humans and animals. Some “old” diseases have re-emerged in a new fashion such as resurgent incidence, broadened host or geographic range, altered drug resistance or newly recognized means of transmission. Many of these emerging and re-emerging diseases are zoonotic. Undoubtedly, some of these “new” diseases were

around for a long time, but were only recently discovered through research and new technology. Others are new and have emerged because of environmental changes. Some zoonoses are potentially emergent because they are possible agents of bioterrorism. This article will review some of these emerging and re-emerging zoonoses with emphasis on their impact on veterinary practice. The discussion will be based on their emergence because of changes in the host, the pathogen and the environment.

■ Changes in the host

Acquired immune deficiency syndrome (AIDS) and iatrogenic immunosuppression, e.g., radiation, splenectomy or chemotherapy for neoplastic or immunologic diseases, have resulted in a rapidly expanding reservoir of people susceptible to opportunistic infections, many of which are, or can be, zoonotic. It is thought that AIDS was originally zoonotic, with the causative agent, the human immunodeficiency virus (HIV) probably derived from a virus in West African chimpanzees.

It is inappropriate for veterinarians to delve into their clients’ medical conditions, except as it relates directly to veterinary practice (e.g., knowing a client has a zoonosis could lead to diagnosis in the source animal). Nevertheless, veterinarians should advise, discreetly and generically, that immunodeficiency can make people uniquely susceptible to infections acquired from animals.

If a client volunteers that he/she or a household member is immunodeficient, the veterinarian can suggest measures to reduce zoonotic risk, e.g., recommending purchase of healthy, mature animals and rigorously maintaining the animals’ health with appropriate and timely preventive and therapeutic measures. It is especially important that animals with diarrhea, cough, nasal discharge or skin disease be brought for diagnosis and treatment. Clients should be warned of specific zoonotic risks, such as septicemia with *Capnocytophaga canimorsus* from a dog bite in splenectomized people and severe forms of bartonellosis from a cat scratch in patients with AIDS.

It is especially important to advise clients about sanitation. They should be advised on how to dispose of, and reduce exposure to, animal excrement and secretions. Frequent and adequate hand washing should be emphasized to reduce the risk of salmonellosis, campylobacteriosis, cryptosporidiosis, giardiasis and other enteric zoonoses. Personal hy-

giene will also reduce the risk of acquiring these infections from human sources.

People receiving tissue derived from other species (xenotransplantation) have unique risks for zoonoses. They may have increased susceptibility to infection because of their underlying disease, and they are immunosuppressed to prevent graft rejection. The donor organ itself may harbor zoonotic pathogens.

Baboons, swine and cattle are possible donor species. Retroviruses, such as simian immunodeficiency virus, simian foamy viruses, baboon endogenous virus, porcine endogenous virus, bovine immunodeficiency viruses and bovine T-lymphotropic virus, are of particular concern because of their high prevalence, the difficulty in preventing or eradicating them and the lack of knowledge about their pathogenicity, virulence and further transmissibility in people (from recipients to others).

Transmission of non-viral pathogens such as toxoplasmosis is of less concern because more is known about prevention and treatment.

■ Changes in the pathogen

Antibiotic resistance is a major medical problem. More than half the antibiotics manufactured in the United States are used for livestock production, mostly for growth promotion. There is substantial and growing evidence that this leads to antibiotic resistance in *Salmonella*, *Campylobacter* and other enteric bacteria.

Genes determining antibiotic resistance can be transmitted between bacterial species. The inappropriate use of antibiotics in human and veterinary medicine has resulted in increasing morbidity and mortality in people (and probably in animals) from drug-resistant bacteria.

The subtherapeutic use of antibiotics in livestock is rationalized by economic arguments, but we may be getting cheaper meat at the cost of human disease.

Antibiotic use could be reduced by

better husbandry, less crowding, more immunization, improved sanitation and nutrition.

Selection for antibiotic resistance can be reduced by appropriate therapeutic use of these drugs. Whenever possible and practical, antibiotics should be

chosen on the basis of culture and sensitivity, or at least, on the basis of a Gram stain of exudates.

Clients should be educated on the cost-effectiveness of these measures. In the absence of such laboratory support, choose antibiotics to cover the most probable pathogens. Follow standard infectious disease guidelines for duration of treatment. Do not

treat viral infections with antibiotics unless there is proof or reasonable suspicion of secondary bacterial infection.

■ Changes in the environment

International travel for business, pleasure or education brings an increasing number of people in contact with exotic disease. Refugees can bring their endemic diseases to new areas. Animals and animal products are transported internationally with increasing frequency and speed. Regulations to prevent transport of disease can be thwarted by illegal means. Illegal trade in wildlife is second only to illegal trade in drugs.

A dramatic example of an imported zoonosis is West Nile virus, first detected in New York City in 1999. How it was introduced is unknown, but it is now established along the Atlantic Coast of the United States and threatening parts of Canada and the American Midwest, involving people,

horses and many species of birds.

Suburban sprawl in the United States and deforestation worldwide bring people in contact with wild animals and arthropod vectors. Predators are often selectively hunted or trapped for their fur or because they are feared, resulting in proliferation of prey species, such as rodents and deer. Tick-borne diseases, often harbored by mice, and other rodent transmitted diseases are prominent among emergent zoonoses. Examples include Lyme disease, ehrlichiosis, hantaviruses and various viral hemorrhagic fevers (Lassa fever, Bolivian and Argentinian hemorrhagic fevers, etc.).

Raccoons adapt well to civilization, and more can be found in cities and suburbs than in forests. Raccoon rabies was introduced in Virginia/West Virginia by animals imported from Florida or Georgia in 1978. It has spread as an epizootic involving all southern coastal, mid-Atlantic and New England states and neighboring parts of Canada, killing thousands of animals and costing millions of dollars in animal control and immunization (of people and animals).

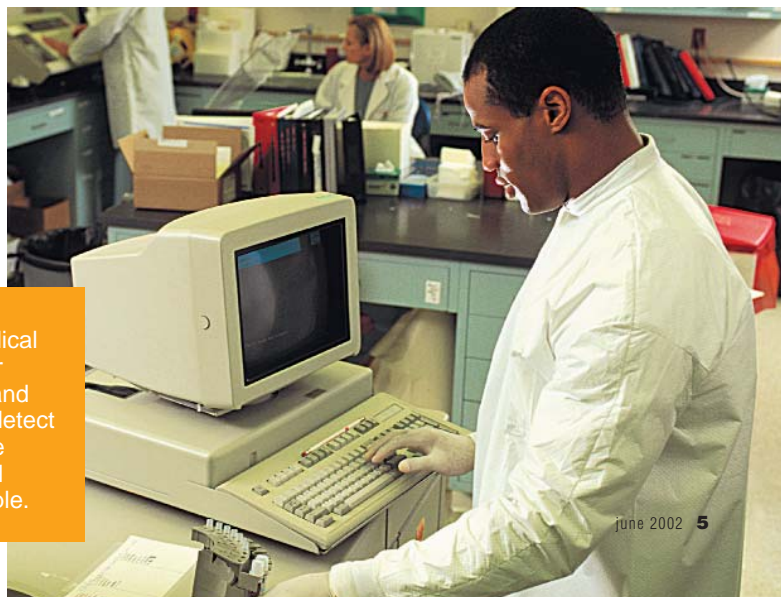
The raccoon roundworm, *Baylisascaris procyonis*, has been recognized as a cause of ocular and neurologic disease, including some fatalities, in humans, mostly children, since 1985. Raccoons also can harbor *Salmonella*, *Campylobacter*, *Leptospira*, fleas, ticks and other zoonotic agents. They can inflict severe bite wounds.

They're not good pets and aren't even safe when dead; if you eat them, cook them well to avoid trichinosis and toxoplasmosis.

Echinococcus multilocularis is a tape-

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Advances in medical technology better equip scientists and veterinarians to detect how diseases are being transmitted from pets to people.



worm in the intestine of foxes, dogs and cats. The larval stage (alveolar hydatid cyst) can occur in humans, with significant morbidity and mortality. Its geographic range has been spreading from midwestern Canada into neighboring states in the United States. There is fear that it could be introduced into southern states by hunting clubs importing foxes from enzootic areas. Dogs and cats that are permitted to roam outdoors in enzootic areas and consume wild rodents (the usual intermediate host) should be routinely dewormed with a taeniacide such as praziquantel to reduce human exposure. Keeping pets indoors and enforcing leash laws also reduce risk.

A man-made problem, quite literally, is bioterrorism. Except for smallpox, the organisms most likely to be used in germ warfare against people are zoonotic. Examples include anthrax, plague, brucellosis, tularemia, Q-fever, glanders, viral hemorrhagic fevers and some viral encephalitides. In addition, animal diseases such as foot and mouth disease could be introduced, with potentially devastating economic impact. Veterinarians should be alert to detect and report unusual outbreaks of illness, especially if there is evidence that humans also are getting sick. They should be familiar with the geographic distribution of these diseases and report their occurrence outside known endemic areas. They should also report geographic and tem-

poral occurrence of diseases suggesting an unusual point source of infection, e.g., by aerosol or contamination of water.

■ Idiopathically emergent zoonoses

Some recently described zoonoses have emerged for no immediately apparent reason. Examples include several viruses harbored by fruit-eating bats (flying foxes). Rabies was thought to be absent from Australia until a lyssa virus was found in fruit-eating bats in 1996. Two human deaths have been ascribed to this virus.

A paramyxovirus, initially called equine morbillivirus, now called Hendra virus, has caused fatal infections in horses and people. It was first described in Queensland in 1994. While the reservoir of infection appears to be in flying foxes, the means of transmission to other species is unknown, but it is possible that cats, which can carry the virus in their urinary tracts, may be a bridge vector.

A major epidemic causing respiratory and neurologic disease in pigs and encephalitis in humans occurred in Malaysia in 1998 and 1999. Retrospectively, there is evidence this disease has occurred in Malaysian pigs since 1996. The causative agent, another paramyxovirus called Nipah virus, is apparently also carried by flying foxes.

Fruit-eating bats in Australia and Southeast Asia may have harbored lyssa, Hendra and Nipah viruses, undetected, for many

years. It is not clear why these infections, with fatal human involvement, have recently become apparent.

■ Conclusion

Veterinarians have a responsibility to control and prevent zoonoses. Staff and clients should be educated about means of transmission. Hygienic measures, including hand washing and sanitary disposal of animal waste, should be emphasized. People at risk for zoonoses should be referred to physicians for medical care. Veterinary records should indicate that such advice was given.

Special intensive efforts should be made to prevent and treat infectious diseases in animals owned by immunodeficient clients. Antibiotics should be used appropriately, to reduce the risk of developing resistance. Unusual presentation of disease, especially if there is evidence of human co-infection, should be promptly reported to boards of (human and animal) health and consultation sought with specialists in microbiology, infectious disease, public health and pathology.

Wild animals should not be kept as pets, and they should be kept away from areas where children play, e.g., by fencing and not leaving food for them in such areas.

Veterinarians should support public health measures such as leash laws and pooper-scooper laws. They should be on public health committees. They should talk to local physicians informally and give formal presentations at medical meetings on matters of mutual concern. Communication between medical, veterinary and public health personnel is essential for control of zoonoses. **DVM**

Suggested reading

- Emerging Vector-Borne and Zoonotic Diseases. Supplement to Compendium on Continuing Education for the Practicing Veterinarian 2002; 24, no. 1 (A).
- Angulo, FJ, Glaser, CA, Juranek, DD et al. Caring for pets of immunocompromised persons. *J Amer Vet Med Assoc* 1994; 205: 1711-1718.
- Relman, DA and Olsen, JE. Bioterrorism preparedness: what practitioners need to know. *Infections in Medicine* 2001; 18: 497-514.
- Gorbach, SL. Antimicrobial use in animal feed – time to stop. *N Engl J Med* 2001; 345: 1202-1203.
- MacKenzie, JS, Chua, KB, Daniels, PW, et al. Emerging viral diseases of Southeast Asia and the Western Pacific. *Emerg Infect Dis* 2001; 7(3 suppl): 497-504.

Web sites for current information:

- Centers for Disease Control and Prevention (www.cdc.gov) is a venue for accessing current information on bioterrorism (www.bt.cdc.gov) and the journal, *Emerging Infectious Diseases* (www.cdc.gov/eid).
- www.humanitarian.net/eidnet
- www.promedmail.org.

Dr. Marcus graduated from the School of Veterinary Medicine at the University of Pennsylvania in 1962. He is board certified in veterinary pathology. Dr. Marcus is also a physician with specialized training in topical medicine. He is a graduate of the Albert Einstein College of Medicine. He is former director of the parasitology lab for the Massachusetts Department of Public Health and formerly taught parasitology at the Tufts University schools of medicine and veterinary medicine. He has a full-time private practice in Newton, Mass. specializing in travelers' health, tropical medicine, parasitology, and vector-borne diseases and zoonoses.