Zoonosis: What Is All the Fuss About?

Zoonosis is defined medically as “a disease that can be transmitted from animals to people or, more specifically, a disease that normally exists in animals but that can infect humans.”\(^1\) Currently, there is no legal definition of zoonosis. For those who live and work with animals, zoonoses are occupational hazards that most other professionals do not encounter. These hazards extend to pet owners, and humans can also transmit disease to their companion animals.

By their very nature, zoonotic diseases exist in the animal population; this source is referred to as a disease reservoir. A reservoir can be an animal or an inanimate object; the latter is referred to as a fomite. Soil, water, and plants can also serve as reservoirs.\(^2\)

More than 800 zoonotic pathogens are known to affect humans, with 20 to 30 of these resulting from contact with dogs and/or cats.\(^3,4\) An estimated 75% of emerging infectious diseases are zoonotic, primarily of viral origin.\(^5\) Normal microbial changes can influence the spread of a zoonotic disease from a wildlife reservoir; this is of particular concern for veterinary professionals who work directly with wildlife, as well as for clients who live in more rural areas, where their animals may come in contact with infected wild animals or fomites.

Microbial changes include mutations (e.g., genetic drift in viruses), activation and silencing of individual genes, genetic recombination, and conjugation, transformation, and transduction of bacteria.\(^6\)

**TRANSMISSION**

Three elements are required for successful disease transmission: (1) a source of infection, (2) host susceptibility, and (3) a route of transmission. Animal sources of infection include endogenous microflora that are pathogenic to humans, such as *Salmonella* spp in chickens; environmental sources include contaminated walls, floors, counters, cages, bedding, equipment, supplies, feed, soil, and water. Host susceptibility to infection varies greatly among the general population, with increased susceptibility seen in humans who are unvaccinated, very young or elderly, immunosuppressed, or pregnant or who have injuries (e.g., scratches, bite wounds) that pose a break in the normal defense mechanisms.\(^3\)

The three main routes of pathogen transmission are contact, aerosol, and vector-borne transmission.\(^3\) **BOX 1** outlines some of the more common zoonotic pathogens encountered in veterinary practice and their routes of transmission.
Direct contact can be through ingestion of the pathogen (usually via the fecal–oral route), puncture wounds (e.g., needlesticks, bites), or mucous membrane exposure. Indirect contact transmission can happen through exposure to fomites, such as when cleaning cages and equipment or handling dirty laundry.

Aerosol transmission is possible when a pathogen travels through the air, whether via large droplets deposited on mucous membranes or smaller particles that can be inhaled. Large droplets can be generated by patient coughs, sneezes, and vocalization and by veterinary personnel during such procedures as lancing of abscesses and dentistry procedures. Particles may also become aerosolized through the use of suction units, during bronchoscopy, and when sweeping, vacuuming, and using high-pressure spray washers. In general, the risk of aerosol transmission increases with proximity and duration of exposure to the source; however, once aerosolized, certain pathogens may remain infective over long distances, depending on particle size, the nature of the pathogen, and such environmental factors as temperature and humidity.

Vector-borne transmission occurs when vectors such as fleas, mosquitoes, and ticks transmit disease as a result of their normal feeding activities. Working outdoors may
increase the risk of exposure to insects and other biologic vectors. Each vector may have the ability to transfer more than one disease during each period of contact.

**EDUCATION**

Preventing zoonoses starts by understanding the ways diseases can be transmitted between humans and animals. The next step is education of veterinary personnel and clients. A 1999 study surveyed 327 veterinarians and 322 physicians about how often they encountered zoonotic diseases to suggest the appropriate role each profession should play in educating the public on zoonotic diseases, prevention, and precautions. The findings indicated that veterinarians encounter zoonotic diseases in their practices or discuss them with their clients more frequently than physicians. Small animal practitioners encountered zoonotic disease more frequently than large animal veterinarians; however, the small animal veterinarians indicated they encountered or discussed zoonotic diseases on a weekly rather than a daily basis. Physicians indicated that they felt that “veterinarians should play an equal or greater role in advising patients about zoonotic diseases” and that “veterinarians should be involved not only in controlling zoonotic disease pathogens in animals, but also in providing information for patients and physicians.” However, despite these feelings, there was almost a complete lack of communication between physicians and veterinarians about zoonotic disease issues.

If physicians are not asking patients about the pet population in their homes and veterinarians are not asking clients about the health status of humans in the household, it is difficult, if not impossible, to advise clients about the zoonotic risks associated with pet ownership as well as measures that can be taken to mitigate those risks. Veterinary technicians can begin the educational process by asking clients about elderly people living in the home and whether their pets interact with individuals who are on immunosuppressive drugs.

**LEGAL ISSUES**

As the incidence of zoonotic disease rises, the legal impact on the veterinary health care team could become significant. Concern among veterinarians is increasing because of the threat of legal liability for a practice’s failure to diagnose and treat an animal with a zoonotic disease and educate owners about the risks of these diseases. The Companion Animal Parasite Counsel (capcvet.org) provides excellent, up-to-date resources to help practitioners, and the American Animal Hospital Association’s Parasite Counselor Program (aaha.org/ professional/education/parasite_counselor.aspx) aids in training staff on zoonosis and parasite transmission. Lawyers can also become involved in liability surrounding infection with zoonotic disease. In the 1990s, a child in New Haven, Connecticut, sustained permanent vision loss due to ocular larval migration of Toxocara spp acquired from a puppy. The pet store that sold the puppy to the family settled out of court for $1.5 million.

To help avoid legal action against the veterinary health care team, a proactive approach is best. The practice should identify resources to educate the entire staff about zoonotic diseases, especially parasites. Clients must be educated about the health risks of zoonotic diseases in their pets. Client handouts (see p. 51) help reinforce these messages. Preventive parasite control programs should be developed and recommended. It is important to record all medical treatments provided and to note treatments and tests that were recommended but declined by owners. To be certain that the parasite monitoring system is as accurate as possible, the staff must ensure that samples used are fresh and representative of the animal in question, use the most accurate method (centrifugation of samples rather than gravity floatation), and be well trained to accurately identify what is found under the microscope. Clients should sign consent forms releasing the veterinary practice from liability if they decline recommended diagnostic procedures such as deworming.

**PREVENTION**

**Veterinary Standard Precautions**

Because the most common mode of transmission is direct/indirect contact, the best way to prevent transmission is through the use of Veterinary Standard Precautions (VSPs). VSPs are guidelines designed to minimize the risk of zoonotic infections from recognized and unrecognized sources and should be used whenever personnel may be exposed to potentially infectious materials, including feces.
blood, body fluids, and exudates, or when skin is not intact. VSPs include strategies to reduce the potential for bites and other traumas that may result in exposure to zoonotic pathogens. Each practice should develop VSPs to fit its individual risks and exposures. Model plans can be found in the Compendium of Veterinary Standard Precautions for Zoonotic Disease Prevention in Veterinary Personnel.

Injury Prevention
Dog and cat bites, kicks, scratches, and crush injuries account for most occupational injuries among veterinary personnel. According to one source, up to 18% of dog bites and up to 80% of cat bites become infected with a mix of aerobic and anaerobic bacteria. Measures to prevent bite injuries include physical restraints, bite-resistant gloves, muzzles, sedation or anesthesia, and reliance on experienced veterinary personnel rather than owners for restraint. A note should be made in the medical record about animals with aggressive tendencies or a history of biting or that are unpredictable, and this should be communicated to attending personnel. Veterinary professionals cannot rely on clients to provide this information before a bite has occurred.

Needlestick injuries are the most frequent accidents in the veterinary workplace. They usually involve inadvertent injection of vaccines but could also result in inoculation of bacteria from fine-needle aspirates or blood draws.

Handwashing and Disinfectant Use
Consistent, thorough handwashing is the single most important measure to reduce the risk of disease transmission. In veterinary practice, handwashing is preferred over the use of alcohol-based lotions or rubs because of routine contamination with organic materials such as blood, feces, urine, and saliva. Most disinfectants do not penetrate organic material; therefore the contamination would still be present on the skin under the material if only a lotion or rub is used.

Handwashing with plain (not antibacterial) soap and running water mechanically removes organic material and reduces the number of bacterial organisms on the skin. The handwashing process should take at least 20 seconds.

Personal Protective Equipment
Wearing gloves helps reduce the risk of pathogen transmission by providing a physical barrier between the skin and the pathogen. Gloves are not a substitute for handwashing. While wearing gloves is not necessary when handling healthy clients must be educated about the health risks of zoonotic diseases in their pets. Client handouts help reinforce these messages.
animals, gloves should be worn when handling an animal with evidence of disease or whose medical history is unknown. Gloves should always be worn when contact with feces, blood, body fluids, secretions, excretions, exudates, and the handler's nonintact skin is likely, including when cleaning cages, tabletops, litterboxes, and environmental surfaces such as keyboards and telephones.

Gloves should be changed between examinations of individual animals or animal groups such as litters of puppies or kittens, between clean and dirty procedures performed on a single patient, and whenever they become torn or their integrity is in question. Dirty gloves should be removed promptly after use, and contact between the skin and the outer glove surface should be avoided during removal. Prompt glove removal before touching objects such as cage doors, medical equipment, and supplies can help to prevent surface (fomite) contamination. Disposable gloves should not be reused. Hands should be washed as soon as gloves are removed to eliminate any potential contamination.

Facial protection prevents the mucous membranes in the eyes, nose, and mouth from contact with infectious materials and should be worn whenever exposure to splashes or sprays is likely, such as during lancing of abscesses, flushing of wounds, dentistry procedures, nebulization of medications, suction or lavage of wounds, and necropsies. Adequate facial protection includes a surgical facemask and goggles or a face shield. A surgical facemask provides adequate protection during most veterinary procedures that generate potentially infectious large droplets. The type of shield selected depends on the extent of anticipated droplet generation. For example, a dental procedure would be expected to generate more droplets than would emptying a suction container during surgery.

Protective outerwear such as laboratory coats and coveralls are designed to protect street clothes or scrubs from contamination. Unless designed to be fluid resistant, they should not be used when splashing or soaking with potentially infectious material is likely. Wet clothes should be promptly changed whenever they become visibly soiled or contaminated with feces or body fluids. Clothes should be changed daily and not worn outside of the work environment.

Nonsterile procedure gowns provide a better moisture barrier than laboratory coats and can be used for general care of animals in isolation. Impermeable gowns should be used when splashes or large quantities of fluids are present or anticipated. Disposable gowns should not be reused. Reusable fabric gowns may be worn repeatedly for the same animal in isolation but should be laundered between contact with different animals or when soiled. Gloves and gowns should be removed and placed in the garbage or laundry bin before leaving the animal’s environment. Hands should be washed immediately after leaving the area.

Vector Control
For vector-borne diseases, effective vector control is an integral part of any intervention strategy. Integrated pest management is a comprehensive approach used to prevent and control various pests that can transmit diseases. This approach uses several strategies. Physical barriers to infestation include sealed building entry and exit points, window screens, and metal or thick plastic containers for food storage. Rodent traps should be maintained and monitored, and potential vector nesting materials and breeding sites should be eliminated. For example, standing water should be regularly removed, and/or mosquito dunks should be used in standing water tanks or rain barrels. Use of insecticides and pesticides should be part of a whole plan, not the only tactic used to control pests.

CONCLUSION
This article cannot provide a complete or exhaustive list of standard precautions regarding zoonoses, but it addresses the most relevant points for veterinary personnel and pet owners. Public education and behavioral changes are important factors in successful control of disease transmission. Zoonoses should be discussed as part of client education. Pet owners should be provided with gloves (and possibly surgical masks) when appropriate to help prevent exposure at home. It is in everyone’s best interest to keep some areas of our lives separate from our animals—especially the more pathogenic ones.

References