



Pet Dogs & Human Health

As of the year 2000, it was estimated that there were approximately 3.5 million domestic dogs in Canadian homes. Many dog owners live in very close contact with their canine companions. It is common for dogs to nuzzle and lick their owners, and many dogs sleep in the same bed as their owners. Given the high frequency of very close contact between dogs and people, as well as dogs and other domestic animals in some cases, dogs have the potential to play a significant role in disease transmission and public health. It is important to be aware of the various zoonotic diseases which dogs can carry, as well as the simple precautions that can be used to help reduce their spread.



Dog Ownership Counseling

It is important to counsel prospective dog owners about the time and financial commitments involved in dog ownership, and also about what age and breed of dog would be best for them, and from where to obtain their new pet. Young dogs, particularly those housed in groups, are more likely to carry certain pathogens and parasites. In order to decrease the risk of a dog transmitting disease to an owner, it is recommended that the dog should be:

- ▶ **Well socialized and accustomed to handling:** this is most easily done when the dog is still a puppy, and will make the dog less fearful of different situations and less likely to bite or scratch a person.
- ▶ **Examined regularly by a veterinarian:** in order to assess the overall health of the dog, and check and treat (if necessary) for external and internal parasites. The dog's claws should also be kept well trimmed.
- ▶ **Spayed/neutered:** this will help to decrease roaming and aggression towards other dogs, the tendency for male dogs to urine mark, and eliminates the possibility of pregnancy in female dogs. Pregnancy can cause recrudescence of latent infections and results in a group of young, disease-susceptible puppies in the home.
- ▶ **Kept leashed:** this decreases the chances of a dog running into the bush, drinking and/or eating things that may result in transmission of disease to the dog, and becoming sick or injured due to contact with other pets or wildlife.

If a new dog is to be introduced into a household in which it will be in contact with higher-risk individuals who may have increased susceptibility to infectious disease (e.g. young children, immunocompromised individuals), it is recommended, in addition to those points noted above, that the dog should be:

- ▶ **At least one year old:** this decreases the likelihood of patent parasitic and some bacterial infections, and makes it easier to judge the dog's overall temperament to ensure it is relatively friendly and docile.
- ▶ **Examined thoroughly by a veterinarian PRIOR to being taken home:** The dog can be kept in isolation at a clinic or at another house for a short time if treatment for a particular condition is necessary.
- ▶ **Already house-trained:** to help ensure that fecal matter and associated pathogens are not spread in the house.
- ▶ **Not acquired from a shelter:** because such dogs usually have an unknown medical history and may be in contact with other sick animals at the shelter facility, even if they do not appear sick themselves.

Management



Environmental Fecal Contamination

- ▶ Feces the most important source of canine zoonotic pathogens, many of which can survive in the environment for long periods of time.
- ▶ It is important to try to prevent environmental contamination with these pathogens, especially in areas around clinics where a large number of dogs defecate and may come in contact with the feces of other dogs.
- ▶ Feces should be collected as soon as possible and disposed of in the garbage.
- ▶ Also counsel clients on the importance of "poop-scooping," especially in areas where there are many dogs (e.g. dog parks) or where children play (e.g. parks, yards)

It is important to thoroughly wash one's hands with soap and running water after scooping or otherwise contacting (directly or indirectly) any dog feces. In busy clinic settings, compliance with hand hygiene recommendations is often poor. Use of alcohol-based hand sanitizers is often a more convenient alternative, and bottles can be placed in more accessible locations than sinks. The risk of becoming sick from a fecally-transmitted pathogen from a dog is minimal to most people, but it is higher for young children and immunocompromised individuals (e.g. HIV/AIDS, transplant and cancer patients). If possible, these higher-risk individuals should not handle dog feces.



Feeding

Dogs should NOT be fed raw meat or eggs. Uncooked meat and raw animal-based treats (e.g. untreated pigs ears) are often contaminated with bacteria such as *Escherichia coli*, *Campylobacter* sp. and *Salmonella* sp., which can infect the person preparing the food for the dog. These bacteria can also infect the dog, which may result in clinical disease or subclinical infection. In either case, the dog then becomes a vector for spread of the bacteria in the household.

Bite Avoidance

- ▶ To decrease the risk of being injured by a dog, individuals should be taught to recognize both fearful and aggressive behaviour in dogs. Owners should teach their dogs submissive behaviours such as rolling over.
- ▶ Never try to reach over or across a fearful or aggressive dog. Avoid direct eye contact with very aggressive dogs.
- ▶ Some dogs are protective of their owners and are more easily handled in another room. Others may be submissive to their owners but aggressive to other kinds of people, in which case the owner may be able to help.
 - ▶ The use of a muzzle, if necessary, often allows the handler to restrain the dog more securely, which is ultimately safer for the animal and personnel involved.
 - ▶ Do not hesitate to use injectable sedation, local or even general anesthesia for procedures in fractious dogs if there are no contraindications. It will be easier on the animal and safer for personnel.
 - ▶ Do not allow high-risk individuals (e.g. children, immunocompromised individuals) to hold a dog during any procedure with which the dog is unfamiliar.



Vaccines

The American Animal Hospital Association Canine Vaccine Task Force recommends all dogs to be vaccinated against rabies virus, Canine Parvovirus (CPV-2), Canine Distemper Virus (CDV), and Canine Adenovirus 2 (CAV-2). Vaccines for *Bordetella bronchiseptica* (kennel cough), *Borrelia burgdorferi* (Lyme disease), *Leptospira interrogans* (leptospirosis), and Canine Parainfluenza Virus (CPIV) should only be given to dogs at specific risk for these infections (e.g. *B. bronchiseptica* for dogs boarded in kennels or attending dog shows, *B. burgdorferi* for dogs living in or visiting endemic areas or those at increased risk of exposure to the vector tick). The use of the *L. interrogans* vaccine must be evaluated based on the regional prevalence of the serovars contained in the specific vaccine, and there may be an increased risk of severe vaccine reactions in puppies and toy dog breeds. Vaccines for *Giardia*, Canine Coronavirus (CCV) and Canine Adenovirus 1 (CAV-1) are generally not recommended for dogs, primarily because the risk of disease does not warrant vaccination based on the product efficacy and side effects.

Of the diseases against which the core and non-core vaccines are targeted, rabies, *B. bronchiseptica* and *L. interrogans* are potentially transmissible to humans. Although *B. bronchiseptica* is a recognized cause of disease in humans, evidence of direct transmission from animals to people is largely circumstantial, and the risk is likely very small in most cases. In contrast, contaminated urine of dogs with leptospirosis is highly infective to people, particularly those who are immunocompromised. Dogs that are at increased risk of becoming infected with *L. interrogans* or that have regular contact with immunocompromised individuals should be vaccinated regularly with a multivalent vaccine. Appropriate vaccination helps to keep dogs healthy overall, and decreases the likelihood that an animal will become ill with a disease that is transmissible to humans. Care must also be taken to avoid exposure of higher-risk individuals to intranasal veterinary vaccines, such as that for *B. bronchiseptica*, ideally by administering them in a different room.



Parasite Control

In general, a fecal floatation using the zinc sulfate concentration technique (ZSCT) should be performed yearly for dogs to look for evidence of nematode eggs. Canine echinococcosis is common in northern and western Canada, and the eggs of the parasites are indistinguishable from *Taenia* spp. eggs. The nematode of most concern in dogs in terms of its zoonotic potential is the roundworm, *Toxocara canis*, the larvae of which can cause visceral, ocular or neurological larval migrans, particularly in children. The larvae of canine hookworms (i.e. *Ancylostoma braziliense* and possibly *Acylostoma caninum* and *Uncinaria stenocephala*) have the potential to cause cutaneous larval migrans. These conditions are very uncommon in Canada. The tapeworm, *Dipylidium caninum*, which is transmitted by fleas, can infect dogs, cats and humans who ingest an infected flea, but human infection is very rare.



Dogs as Sources of Disease

When trying to identify the source of illness in a dog or of an infectious disease, one should address the following topics with the owner in order to gain more information regarding the disease in question.

- What measures are being taken for tick and flea control for the dog
- Whether the dog visits a veterinarian regularly and has up-to-date vaccines and deworming
- Whether the dog has contact with other dogs, cats or wild animals
- Whether the dog is allowed to walk in the bush and swim in ponds, streams, lakes etc.
- If the dog traveled out of the area recently (e.g. last six months)
- If there are rodents, raccoons, skunks or other vermin in or around the residence



However, it is also important to remember that many of the potentially zoonotic diseases of dogs can be carried by these animals in a subclinical form, or as part of their commensal bacterial flora, with no obvious signs of illness.

Zoonotic Diseases of Dogs

The following is not an exhaustive list of zoonotic pathogens carried by dogs, but includes those of primary concern and those which are frequently asked about. It is important to be aware of the zoonotic potential of these conditions and the associated human health concerns. Please refer to individual disease information sheets for additional details.

Brucellosis:*

- ▶ A bacterial infection caused by *Brucella canis*, which causes primarily reproductive problems in dogs with few or no other clinical signs. Human infection with any species of *Brucella* is uncommon. When clinical signs occur they are most often non-specific (fever, headache, myalgia), but more severe infections have been reported. Transmission occurs by mucous membrane contact with contaminated urine, milk, semen, vaginal discharge and particularly placental tissue and fluids at whelping.

Campylobacteriosis:*

- ▶ An infection caused by *Campylobacter jejuni*, a bacterial species that is sometimes carried in the intestinal tract of pets such as cats, dogs and birds. In animals and people, *C. jejuni* most often causes diarrhea, which often contains blood, and sometimes vomiting as well. The bacteria are transmitted by the fecal-oral route.

Dog Bite Wound Infections:

- ▶ The proportion of dog bite wounds that become seriously infected is less than that of cat bite wounds (approximately 4%-20%). Infection is usually caused by bacteria such as *Pasteurella* spp., *Streptococcus* spp., and *Staphylococcus* spp., and most infections are polymicrobial, including anaerobic bacteria. The infecting organisms are often carried in the mouth of dogs as part of their commensal flora. The amount of physical trauma caused by a dog bite, particularly one caused by a large dog, may be more of a concern than the infection.

Cryptosporidiosis:*

- ▶ An infection caused by some species of the protozoal genus, *Cryptosporidium*. *C. parvum* and *C. canis* are found in dogs. *C. canis* does not usually cause clinical disease in people or dogs. Clinical signs associated with *C. parvum* are primarily related to diarrhea, which can be profuse, especially in people. In dogs, *C. parvum* infection is typically subclinical except in the young or immunocompromised. Cryptosporidiosis is an increasingly common cause of death in AIDS patients. The infection is transmitted by the fecal-oral route, but infective oocysts can also survive for a long time in the environment.

Dermatophytosis (ringworm, dermatomycosis):

- ▶ A fungal skin infection caused by one of several species of *Microsporum* or *Trichophyton*. Infection in dogs can mimic a wide variety of dermatitides. In humans it can cause well-delineated areas of red, raised, itchy skin that are often lighter in the center and therefore appear as a "ring." The fungus is transmitted by contact with the skin, fur or dander of an infected animal, particularly if the person's skin is damaged or moist.

Echinococcosis:

- ▶ Disease caused by an uncommon tapeworm of dogs, *Echinococcus granulosus*. Ingestion of the worm's eggs from the feces of an infected dog or wolf can result in the formation of hydatid cysts in the liver, lungs or elsewhere in the body. The cysts grow very slowly, but can create space-occupying lesions. It is also possible for the cysts to become infected, resulting in abscess formation, or to rupture, resulting in metastatic cysts in other parts of the body or even severe allergic reaction.



Giardiasis:*

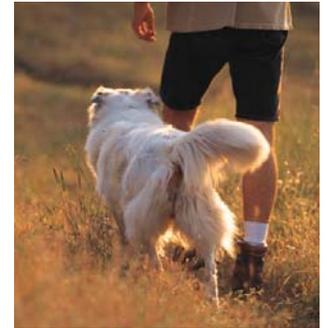
- ▶ An infection caused by the protozoal parasite, *Giardia intestinalis*. Infection is most often subclinical, but when they occur signs of infection are related to diarrhea without vomiting. Only some strains carried by pets are potentially transmitted to humans. People are more likely to acquire infection from drinking or swimming in inadequately treated water.

Larval migrans (cutaneous, visceral, ocular etc.) caused by hookworm and roundworm larvae:

- ▶ This condition can be caused by various members of *Ancylostoma* spp., *Uncinaria* spp. and *Toxocara* spp., some of which infect dogs. Eggs of the parasites are passed in the feces of infected animals, and release larvae which can penetrate a person's skin or are accidentally ingested. The larvae then migrate under the skin (cutaneous), through various internal organs (visceral) and occasionally the eye or brain (ocular or neurological), causing irritation and inflammation (larval migrans). The ocular form can result in blindness. Infection is most likely to occur in young animals and children, but human infection is very rare in Canada.

Leptospirosis:

- ▶ A bacterial infection caused by various serovars of *Leptospira interrogans*, which is passed in the urine of infected animals and people. The organism travels through the blood and tends to localize in the kidneys or liver, but it can also infect other tissues. *Leptospira* can penetrate the skin, and transmission can also occur by ingestion, usually of water contaminated with urine from infected wildlife, or sometimes from infected pets.



Lyme Disease:

- ▶ Caused by a bacterial spirochete, *Borrelia burgdorferi*, this disease is not directly transmissible from dogs to humans, however both species are susceptible to infection from ixodid ticks which carry the organism in some areas. In dogs it may cause fever, polyarthritis and renal disease. In people signs of rash, meningitis, rheumatoid arthritis and myocarditis may occur.

Rocky Mountain Spotted Fever:

- ▶ A rickettsial infection caused by *Rickettsia rickettsii*. The reservoir hosts of the organism include rodents, small mammals and birds, and it is transmitted to people and pets by infected ticks. Clinical signs in animals and people include fever, myalgia, arthralgia, signs of vasculitis and neurological signs. Although people cannot be infected directly by a dog, a dog may carry infected ticks into the household where they may then feed on and transmit the organism to a person. Transmission can also occur when ticks are crushed during removal from a dog with bare fingers.

Rabies:*

- ▶ A viral infection of the nervous system which is almost always fatal once clinical signs appear. Dogs are usually infected by direct contact with a rabid animal, most often a skunk, fox, raccoon or bat. Transmission occurs when the saliva of an infected animal comes in contact with a wound (such as a bite or scratch) or mucous membrane.

Salmonellosis:*

- ▶ An infection caused by one of many serovars of *Salmonella enterica* subsp. *enterica*. It typically causes diarrhea, but in some cases it can cause much more serious disease. The bacteria are passed in the feces of an infected animal, which may or may not also show signs of diarrhea. Transmission is by the fecal-oral route.

* Notifiable disease in people in Canada.

Infection Control



Bite Care: Any wound from a dog, be it in a person or another animal, should be washed immediately and thoroughly with soap and running water. All bite wounds should be reported to the local public health unit. Medical attention should be sought, and antimicrobial prophylaxis considered, for any bite wound associated with:

- ▶ the hand or any joint or bone
- ▶ an immunocompromised individual
- ▶ any kind of crushing injury
- ▶ excess redness, pain, swelling, discharge or fever

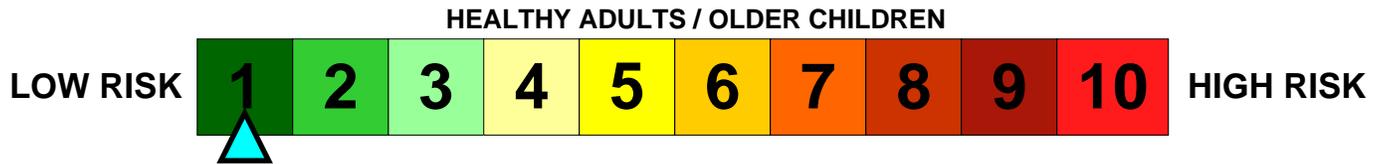
Any dog that bites a person, especially if its rabies vaccination status is out of date or unknown (e.g. a stray), must be isolated for 10 days and observed for signs of rabies. If signs of the disease develop the dog will be euthanized and tested for rabies.

Hand Hygiene: Hands should be washed with soap and water after handling any pet, including dogs. This is especially important after coming in contact with urine, feces or any bodily discharge from a dog. This simple precaution can reduce the transmission and spread of several of the zoonotic pathogens which are carried by dogs.



Zoonotic Disease Risk

The zoonotic risk to the **general population** (healthy adults and older children) posed by most domestic dogs is:



Groups at higher risk of acquiring a zoonotic disease from a dog include **immunocompromised individuals** (e.g. HIV/AIDS, transplant and cancer patients), infants and **young children** (less than 5 years old), and the elderly. For these groups, the zoonotic risk posed by most domestic dogs is likely:



Precautions for Immunocompromised Dog Owners & Young Children

- Keep the animal's claws well trimmed. Plastic nail caps can also be applied to help prevent scratching.
- If possible, have someone else clean up feces in the yard and when out on walks. Otherwise wear gloves and be very diligent about hand washing afterwards.
- Keep the dog in good health by having regular examinations by a veterinarian, as well as up-to-date vaccines and regular fecal exams to check for intestinal parasites. Ensure that the dog is free of fleas and ticks.
- Feed a high-quality commercial dog food that does not contain any raw ingredients. Also do not feed raw animal-based treats such as untreated pig ears.
- Do not let the dog sleep in the same bed as the person in question.
- Do not let the dog lick the person in question, particularly on the face, nor should they handle the dog if it seems ill.
- Always supervise young children when they play with a dog. Teach them:
 - ▶ to always be gentle and quiet so the animal does not become upset, frightened or excited.
 - ▶ never to approach a dog they do not know.
 - ▶ to always wash their hands after playing with a dog.
- Hand washing with soap and water after handling a dog or contacting any urine, feces or other bodily secretions is one of the simplest and most important means of infectious disease control.



Additional Information:

- Finley R, Reid-Smith R, Weese JS. Human health implications of *Salmonella*-contaminated natural pet treats and raw pet food. Clin Infect Dis. 2006;42:686-691.
- Greene CE. Infectious Diseases of the Dog and Cat. 3rd ed. Edinburgh: Elsevier Saunders, 2006.
- Hemsworth S, Pizer B. Pet ownership in immunocompromised children – a review of the literature and survey of existing guidelines. Eur J Oncol Nurs 2006;10:117-127.