
Infectious Disease in Dogs in Group Settings: Strategies to Prevent Infectious Diseases in Dogs at Dog Shows, Sporting Events, and Other Canine Group Settings



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This project was supported by the AKC Canine Health Foundation and the Orthopedic Foundation for Animals. The contents of this work are solely the responsibility of the authors and do not necessarily represent the views of the Foundations.

Introduction

The aim of this document is to serve as a resource for the recognition of risk, prevention and control of canine infectious diseases. Disease causing agents (pathogens) include **parasites**, viruses, bacteria, fungi, and protozoa. Hundreds of these infectious pathogens have the potential to be transmitted between dogs; however, only a subset of these commonly causes problems. Some are of particular concern in settings that bring groups of dogs together. Additionally, some of these pathogens can be spread between dogs and people (termed “**zoonotic**”), causing illness in people adding additional concerns.

Canine “get-togethers” and group events are extremely important social interactions for dogs and their owners. These events are very popular and fun and include a wide variety of activities such as dog shows, off-leash dog parks, canine athletic events and dog daycare. Thousands of dogs and people may attend a single event occurring over several days.

Bringing dogs together increases the risk of exposure to many infectious diseases (**Appendix 1**). Infectious agents introduced into these settings can lead to disease outbreaks that can potentially spread into the dog community with devastating consequences. This occurred during the rapid spread of canine parvovirus in the late 1970’s, and more recently with the H3N2 canine influenza virus (canine flu). Infectious disease awareness, prevention, and control strategies can decrease these risks and help protect the health of dogs and their owners.



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The AKC Canine Health Foundation and the Orthopedic Foundation for Animals funded a panel of canine infectious disease experts to develop scientifically-sound, evidence-based guidelines intended for people who organize, manage, staff, or participate in a variety of dog group settings, including:

- Dog shows (e.g. conformation, obedience, agility, rally)
- Canine sporting and performance events (e.g. field trials, herding, lure coursing, hunt test, dock jumping, flyball, weight pulls, earth dog test, tracking, sled racing)
- Off-leash dog parks
- Training and socialization classes (e.g. puppy classes)
- Dog daycare facilities
- Boarding facilities and other kennels that group house owned dogs
- Community events involving many dogs that may have close contact (e.g. festivals, expos, parades, fund raising events)

The recommendations in this document are based on established scientific principles of infectious disease prevention combined with two additional sources of information specific to dogs: first, a comprehensive review of the published scientific literature; and second, input from key opinion leaders, stakeholders, and experienced event participants through a national survey and targeted focus group discussions. The literature review included over 400 articles in peer-reviewed journals as well as major veterinary textbooks on canine infectious disease. Key websites devoted to canine parasites and infectious diseases were also reviewed. When setting-specific publications were lacking, recommendations were based on the collective expertise of the authors.

This document was developed with a variety of group settings in mind; **not all recommendations will apply to every group setting**. Events and settings vary in the types and number of dogs involved, the amount of contact between dogs, and the ease and feasibility of implementing recommendations.

Because risk, need, and practicality vary between settings, this document is meant to provide guidance for those responsible for infectious disease prevention. It will be at the discretion of facility managers and event officials to decide when and how these recommendations are implemented and to what extent compliance is enforced.

In addition to this document, the authors have developed the following resources:

- **A peer-reviewed journal article.** This freely available article aimed at veterinary professionals provides an in-depth background on this topic, specific disease risks, and supporting evidence for the recommendations.
- **A risk calculator.** This 10-minute on-line confidential tool calculates the user's specific dog infectious disease risk at canine group settings, providing advice for group event participants and event organizers.

- Several fact sheets addressing important pathogens for canine group settings.

The above items along with additional resources on the topic can be found at the following websites:

- **Infectious Disease in Dogs in Group Settings**
- **Worms and Germs Blog**

Several existing resources specifically address infection control in small animal veterinary clinic settings and should be reviewed for additional guidance as appropriate (Stull & Weese 2015, Canadian Committee on Antibiotic Resistance Infection Prevention and Control Best Practices for Small Animal Veterinary Clinics 2008, NASPHV Veterinary Standard Precautions Compendium 2015).

We hope this document and accompanying resources are helpful to all involved in dog group settings and will help to protect the health of dogs and people.

Factors that Determine the Outcome of Infectious Disease Exposure

Whether or not a dog will develop disease following exposure to an **infectious agent** is dependent on many factors. Some of these include:

1. Type of infection or infecting agent (pathogen)
2. How long the dog is exposed or in contact with the infectious agent
3. The amount (dose) of pathogen that the dog encounters
4. How the infection is transmitted (passed to the dog), e.g. feces ingestion, cough or sneeze
5. The dog's immune status or vulnerability of the dog to the agent (**Appendix 2**).

Some infectious agents spread quickly and easily, while others may require a large dose (amount) or very close contact with a contagious dog in order to cause disease. One of the more important characteristics of the infectious agent is how long it can live in the environment.

Some pathogens will be killed quickly (e.g. minutes to hours) due to drying or temperature changes in the environment, while others can survive for weeks or months, and may even surviving freezing temperatures and some disinfectants. Understanding the different disease-causing agents is essential to making plans that help reduce risk and protect dogs and people in these group settings.

Another important factor in the development and severity of disease is the dog's general health and immune status. In some cases vaccination can lead to **immunity** that protects the dog from infection or reduces the severity of illness. The main reason that younger age is a risk for disease is because younger animals may not yet have developed immunity to common infectious agents. Injury, illness, inadequate nutrition, and stress, even the stress associated with travelling, can all reduce the body's ability to fight infection, making a dog more prone to develop disease if exposed.

Transmission: How Infectious Diseases Spread

Infectious agents can be brought to and spread throughout canine group setting in many ways. Some of these include:

1. Infectious agents can live on or in dogs, people, other domestic animals, and wildlife.
2. Infectious agents can be in food, water, waste, feces, and the environment.
3. Vehicles and equipment can bring and spread infectious agents.
4. Many types of insects, such as mosquitos, ticks and fleas, can carry and transmit infectious agents through their bite.

Infected dogs are most contagious to other dogs when they are showing signs of disease; however, they may also be contagious before becoming ill and for a period of time after recovery. Some infections are contagious without ever causing obvious signs of disease. Given that healthy-appearing animals can spread infectious agents, it is reasonable to assume that any dog that enters a group setting is potentially infectious and able to spread disease to other dogs.

Depending on the infectious agent, dogs may spread it through respiratory droplets (e.g. cough, sneeze, or nose-to-nose touching), saliva, feces, vomit, urine, blood, wound seepage, and reproductive fluids (e.g. semen or vaginal discharge). Some infectious agents require close contact between animals for **transmission** to occur, while others can contaminate soil, water, cages, floors, and other objects (**fomites**) including toys, grooming equipment, leashes, food or water bowls, transmitting the infection indirectly. Still others can be transmitted through or on insects and ticks. Many infectious agents can survive outside of the animal for extended periods of time; therefore, preventive measures always need to take environmental contamination into consideration.

To cause disease, every infectious agent has to contact a **susceptible** dog; typically through ingestion (eating or biting and swallowing), inhalation (breathing in), or penetration (e.g. cuts or bites) through the mucous membranes or skin. Therefore, measures to prevent exposure

and interrupt routes of transmission are key aspects of prevention against most infectious diseases that affect dogs. The five major routes of transmission for infectious agents between dogs are direct **contact**, **aerosol**, oral, **vector**-borne, and fomite. Infectious agents utilize one or more of these routes to spread disease to new dogs. Measures to prevent disease transmission in dog group settings must take all of these routes into consideration.

Direct Contact Transmission

Direct contact transmission occurs when an infectious agent is transferred directly from one dog to another. This can occur through touching (e.g. nose to nose, or nose to bottom), licking, biting and mating. Infectious agents may also spread directly through tiny droplets of spray (aerosolization) produced through barking, sneezing and coughing. These droplets can easily travel several feet (1 meter) before landing on surfaces. Therefore increasing the distance between animal housing to at least 4 feet (1 meter) will help reduce droplet transmission. Dogs that are sick (e.g. coughing, sneezing) can spray droplets much greater distances (e.g. 18 ft, 6 meters). To prevent transmission by direct contact, dogs known or suspected to have an infectious disease should always be isolated (keep separated) from healthy dogs and removed from the event premises as soon as possible.



Airborne Transmission

Airborne transmission occurs when infectious agents are suspended in the air. While true airborne pathogens are rare, they are able to travel great distances (greater than 4 feet/1 meter) and remain suspended in the air for long periods of time before they are inhaled or settle on surfaces. Some pathogens can become airborne through barking, coughing or sneezing while others may become airborne following the evaporation of contaminated body fluids such as urine. They can be suspended or re-suspended in the air through mechanical actions such as wind, hair dryers, vacuums, fans, spraying water, and the shaking out of bedding or towels. Airborne infections can spread quickly through a group of dogs that share the same airspace. Good ventilation in indoor facilities will provide at least 10 to 20 air exchanges per hour which reduces the risk of airborne transmission. Overcrowding of dogs should be avoided, and sick animals should be isolated from other susceptible dogs so they do not share the same air space.



Oral Transmission

Oral transmission occurs when infectious agents are ingested. This often occurs through eating or drinking contaminated food, treats, or water, and oral contact with contaminated environmental surfaces such as the ground or floor (e.g. sniffing, eating or licking directly off the ground). It can also occur through mouth contact with contaminated animals or objects such as toys (e.g. ropes, balls), and body contact with contaminated surfaces or items such as brushes, followed by self-grooming. Ensuring a safe food and water supply, and close attention to **cleaning** and **disinfection**, will reduce the chances of oral transmission.

Fomite Transmission

Fomites are inanimate (non-living) objects and surfaces that are contaminated with infectious agents. They can facilitate the spread of infectious agents throughout a facility and even into the community; being of greatest concern when the infectious agent can survive outside of the animal for an extended period of time. Common fomites include items such as dog toys, leashes, bowls, grooming equipment, cages and bedding, but also human use items such as clothing, shoes, markers, pens, backpacks and other bags. Avoid sharing of items between dogs. Using disposable items and disinfecting non-disposable items between uses can help reduce fomite transmission.



Vector-Borne Transmission

Vectors are animals and insects that act as “intermediaries” and transmit infectious agents from an infected animal to a susceptible dog. Infectious agents can be transmitted by vectors either mechanically or biologically. Mechanical transmission occurs when the infectious agent is simply transported from dog-to-dog by a vector such as a human or a fly. Biological transmission occurs when the infectious agent is taken up by the vector, usually through a blood meal from an infected animal. The infectious organism lives within the vector until it is transmitted to a susceptible dog. Fleas, ticks and mosquitoes are common biological vectors of disease. Effective flea, tick, and mosquito preventive measures are important ways of reducing vector-borne disease risk.

Principles of Infection Prevention and Control

Infection prevention and control strategies are designed to protect dogs, personnel (owners, handlers, trainers, staff), and the community. These strategies require that everyone involved play an active role and consider actions that protect animals and people from the spread of infectious diseases. Not all infectious diseases can be prevented, but many can. Infection prevention and control measures can be broadly divided into two main categories: measures to decrease dog exposure to infectious agents and measures to decrease dog vulnerability to infectious agents.

Eliminating or decreasing **Exposure** is one of the most important aspects of infection control. If a dog is not exposed to a high enough dose of an infectious agent, then disease simply cannot occur. There are many ways to minimize exposure in a dog group setting, including:

- Ensuring that contagious dogs do not enter a group setting.
- Minimizing direct interaction (contact) with other dogs (when feasible).
- Avoiding contact with environments and objects that might be contaminated with infectious agents (e.g. not sharing equipment between dogs without first cleaning and disinfecting).
- Controlling disease vectors (insects and wildlife) or choosing locations/times of the year for events where/when disease vectors are less common.
- Encouraging hand **hygiene** (washing hands with soap and water or using an alcohol-based hand sanitizer) by all people, especially between touching different dogs not from the same owner.
- Using effective cleaning and disinfection practices.
- Early identification and **isolation** of potentially infectious dogs from other dogs in the group.



The **Vulnerability** of a dog to an infectious agent also plays an important role in determining if infection will occur. In general, dogs with good overall health and nutritional status are less susceptible to infections. Due to a still developing immune system and incomplete vaccination, puppies are generally more susceptible to infectious disease than adult dogs. In addition, dogs with existing health conditions (e.g. diabetes, cancer) are generally more susceptible to infectious disease than other dogs. In all dogs, a number of measures can be taken to minimize vulnerability of a dog in a group setting.

- Following veterinarian-recommended preventive care:

Recommended veterinary wellness care, including vaccinations and parasite control measures, are important aspects of reducing vulnerability to infectious agents. All dogs should receive the appropriate core vaccinations (**Appendix 3**) and parasite preventatives at the frequency recommended for dogs in group settings where they live, travel and compete.

- Decreasing stress in dogs:

Just as with people, stress can reduce the ability to fight off an infection. Efforts should be made to manage animal stress, which can commonly be expected with travel, changes in routine, confinement, diet changes, crowded environments, and being around unfamiliar places, people, and animals.

Evidence-Based Recommendations to Prevent Infectious Diseases in Dogs at Group Settings

The authors developed 64 recommendations aimed at preventing infectious disease in dogs in group settings based on careful review of the existing literature, input from a focus group of stakeholders and key opinion leaders, and a survey of canine group settings participants. The level of evidence for each recommendation is provided in an accompanying published article on the topic (Stull, 2016). The recommendations can be grouped into nine categories:

1. General recommendations
2. Vaccination
3. Insect and wildlife control
4. Vector (e.g. tick, fleas) control and vector-borne disease prevention
5. Enteric (intestinal tract) disease prevention
6. Environmental disinfection and hygiene
7. Additional exclusionary measures
8. Facility design and traffic control
9. Disease recognition and response

Each category is discussed below, emphasizing practical steps that can be taken at the individual dog level, dog group level, and environment level (checklists summarize these recommendations for the dog owner and setting organizer; [Appendices 7 and 8](#)). Addressing all three levels is important in reducing infectious disease in dog group settings. Recommendations are **bolded** in each section (a summary sheet with all recommendations is available [here](#)).

It is important to understand that not all recommendations are applicable or feasible for every dog group setting. Dog owners and event organizers are encouraged to use this and accompanying [resources](#) to identify key infectious disease risks for their setting(s) and appropriate recommendations to reduce these risks.



General Recommendations

Risk Assessment and the Infectious Disease Control Plan

It is easiest to prevent infections if the risks are known in advance. Some infectious agents are commonplace throughout certain environments and may be naturally present at certain group settings, while others present a risk only if introduced by an infected dog. The risks will vary based on the nature and location of the group setting, the activities that are expected to occur, the facilities and housing, the duration of the event, the time of year, and the individual dogs participating. For these reasons and overall awareness, **a risk assessment for each specific group setting or event should be performed and strategies put in place to reduce infection before it occurs.** An [on-line risk calculator](#) is available to help participants and organizers proactively perform a risk assessment for their dogs and event.

Identifying disease risks allows for development of venue-specific control and prevention strategies, protocols, and management practices. Examples include participation requirements, hand washing/sanitizing stations, isolation areas in case dogs become sick and cannot be immediately removed from the premises, and environmental management. All of these specific measures aimed at preventing the entry and spread of infectious diseases at a particular group setting should be developed and together form an infectious disease plan. The plan should also include instructions for how a potentially contagious dog should be handled. These include recognition of infected dogs and dogs to whom they may have passed the infection, isolation, medical evaluation, and environmental disinfection based on the suspected or confirmed infectious agent.

For each group setting, a written infection prevention and control plan should be in place and include strategies aimed at the individual dog, the population of dogs, and the environment.

Each facility, event, or group setting is unique, and detailed knowledge of specific infectious agents is necessary to accomplish the tasks described above. For these reasons it is recommended that organizers involve other relevant stakeholders, including a veterinarian, when performing a risk assessment, developing an infection control plan, or revising an existing infection control plan.

Every group setting should have access (on-site or off-site) to a veterinarian who can assist with developing and implementing infectious disease prevention guidelines specific for that group event or setting.

It is recognized that developing an effective infection control plan takes time and resources. It is recommended that, where appropriate, relevant parent organizations and overseeing bodies assist in preparing model or draft plans for a given event type or setting (e.g. largely in-door dog show, outdoor agility event). In such a case, individual groups can review their particular risks as stated above and personalize a draft plan to address these risks and the particulars of the venue.

Relevant disease management protocols should be incorporated into the rules and regulations of the setting, communicated to all participants prior to the event, and prominently displayed with signage at the facility or event. **To maximize compliance, requirements for involvement in group events, including pertinent jurisdictional regulations, as well as the rationale for such requirements should be clearly explained to participants prior to the event and enforced uniformly during the event.**

In addition to ensuring that participants are aware of disease management practices, it is important to ensure that all staff and volunteers working in the group setting are also well informed. **Training for all staff on canine infectious disease risks and prevention within the group setting should be required and documented.** Staff knowledge on this topic should be assessed periodically. A comprehensive training program might also include humane treatment of animals,

bite prevention, recognition of a sick dog, effective animal handling and restraint techniques and communication techniques to interact with owners. In summary, successful implementation of an infection control plan requires education, awareness, and compliance on the part of everyone involved.

Best practices for veterinary infectious disease control are often in-line with other areas, such as animal welfare. Dogs that are comfortable with reduced stress will be at a lower risk for infectious disease transmission than dogs in more stressful situations. Canine welfare guidelines have been previously developed and may be particularly useful for guiding facilities that temporarily house groups of dogs (e.g. dog daycare, boarding; [Appendix 4](#)).

Exclusion Criteria for Participation in Group Settings

Event officials and facility managers are encouraged to establish policies that prohibit entry and participation of dogs showing signs of infectious disease. **Only dogs without evidence of infectious disease should participate in group settings. Dogs that are suspected to be infectious or with signs of infectious disease (e.g. fever, cough, discharge from the eyes and nose, vomiting, diarrhea, skin infection, nervous system abnormality) should be reported to the responsible official, isolated from other dogs, and excluded from the setting, except or until a veterinarian documents the condition to be non-infectious.** Many different signs may be associated with infectious diseases; it is recommended to consult a veterinarian when developing a list of signs that could indicate infectious diseases of greatest concern for the specific group setting or event.



In addition, dogs recently recovered from an infectious disease may still be contagious. If the disease is known then a veterinarian can help determine how long the dog is likely to remain infectious. If the dog has recovered from a potentially contagious but unknown illness, a minimum waiting period of two weeks following resolution of signs would reduce, although not eliminate, the risk of spreading infection. In this case, the dog should be excluded from taking part in dog group setting events during these two weeks. Many state, province and national governments require that dogs have health

certificates prior to travelling into their jurisdiction to help ensure that diseases are not imported with the animal. Some governments allow exemptions for short- term travel/housing such as dog shows, but some do not. **Valid health certificates for out-of-state/ province/country dogs should be required for entry into group settings as indicated by jurisdictional regulations.** This requirement may be challenging (and compliance poor) for some settings, such as dog shows and agility events, where frequent, often weekly, inter-state/province travel occurs.

Vaccination Recommendations

Several of the infectious diseases that pose the greatest risk for dogs in group settings are preventable through vaccination ([Appendices 1 and 3](#)). By inducing immunity, vaccinations decrease susceptibility to certain infectious agents. Some vaccines will nearly eliminate the risk of infection, while others will reduce the risk of infection and the severity of disease if infected. Inadequate vaccination has been shown to be a primary factor in numerous infectious disease outbreaks in dog group settings. It is important to keep in mind that vaccination requirements for a group setting are established not just to protect the dog that is vaccinated, but also to reduce the risk to all of the dogs participating in the group setting. **Dogs should receive all core vaccines as appropriate for their age in accordance with published guidelines and maintain a current vaccination status for diseases of greatest risk in group settings** ([Appendix 3](#)).



The recommendation for puppies involved in group settings includes starting at a younger age and shortening the interval between boosters. All dogs should have a record of vaccination status (e.g. veterinary medical record), which can be presented upon request to event organizers.



Core Vaccines

Core vaccines are those that all dogs should have. According to the American Animal Hospital Association's (AAHA) Canine Vaccination Guidelines (Welborn, 2011), which were researched and developed by experts in the field of infectious diseases and immunology, core vaccinations for dogs in the US and Canada include canine distemper virus, canine parvovirus, canine adenovirus, and rabies ([Appendix 3](#)). These are all highly contagious diseases that often result in death of infected dogs. Fortunately, vaccines are very effective at preventing them. Following the initial 'puppy' series and revaccination at 1 year of age, boosters for these vaccines are generally recommended every three years.

Canine Vaccination Guidelines also have recommendations specifically for dogs in animal shelters. The shelter setting has much in common with other group settings including dogs originating from various locations, concentrated housing environments, potential direct contact with unfamiliar dogs, increased opportunity for disease transmission through fomites and shared surroundings, and potentially increased dog stress. For these reasons, the authors agreed that recommendations for the types of vaccines administered to shelter dogs should also be applied to dogs in other group settings. Based on the associated risks, canine parainfluenza virus and *Bordetella bronchiseptica* (Appendix 3) should also be considered core vaccines for dogs in group settings. Canine parainfluenza virus and *Bordetella bronchiseptica* (along with canine adenovirus-2) are some of the common infectious agents that cause kennel cough (also known as Canine Infectious Respiratory Disease Complex - CIRDC), a respiratory infection named for its frequent infection of dogs in group settings such as kennels. Intranasal/oral vaccination for *Bordetella bronchiseptica* and canine parainfluenza virus is recommended to help reduce the risk of infection in group settings.



For all vaccines, it is important dogs receive their primary series and boosters prior to involvement in the setting, with enough time for them to develop immunity (generally 7-28 days for primary series depending on the vaccine; Appendix 3). Appropriately timed boosters should be given based on continued involvement in the setting. An important note of caution: vaccines should not be given by routes other than those approved on the label. Giving an injectable vaccine as an intranasal

vaccine and vice versa can cause serious and potentially life threatening side effects.

If the vaccination status of a dog is unknown or not current, at a minimum a single dose of vaccine should be administered prior to involvement in the setting with an adequate time for the development of immunity. When vaccinating for canine distemper virus, canine parvovirus and canine adenovirus in an adult dog, immunity can be expected in 3 to 7 days. For *Bordetella bronchiseptica* and canine parainfluenza virus, organizers should require an intranasal/oral booster within the 6 months prior to participation.

All dogs should be vaccinated against rabies in accordance with the jurisdictional laws where the animal lives and where the group setting is located, and in accordance with recommendations (NASPHV Rabies Compendium). The initial rabies vaccination should occur at least 28 days prior to the dog entering the group setting to ensure appropriate time for immune response. In most jurisdictions, it is required that rabies vaccination be performed by or under the direction of a veterinarian.

Nosodes, controversial homeopathic remedies that are prepared by taking diseased matter from a sick animal such as tissue or nasal discharge, do not stimulate immunity directed at specific infectious agents and should not be considered a replacement for core vaccines. For dogs with existing, documentable medical conditions for which vaccination is not recommended, a letter from the dog's veterinarian describing the condition should be considered in place of vaccination.

Though rare, there are some dogs that are properly vaccinated but for various reasons do not develop protection. As the number of dogs that are un- or under-vaccinated increases in a setting, the risk of disease (including outbreaks) increases. Therefore, scrutiny of vaccine deferrals is important to ensure that they are truly needed and that those dogs represent a minority of the group.

Vaccine-preventable diseases must also be considered in all aspects of infectious disease control plans as previous vaccination does not always guarantee protection.

Antibody Titers as A Substitute for Vaccination

Part of the expected immune response to vaccination is the development of antibodies against a specific infectious agent. For some diseases, measuring the level of these antibodies (titer), following the initial vaccine series, is an effective way to demonstrate that the immune system responded to the vaccine.

Yearly measurements of antibody titers have been increasingly used as an indicator of sufficient immunity against certain infectious diseases, though immunity involves far more than antibodies. The use of titers to determine whether or not vaccination is necessary is controversial.

For many vaccine preventable diseases, especially those that are not considered core, a specific titer level does not indicate adequate protection against disease. For some diseases including CDV, CPV, and CAV, a positive titer level often, but not always, means the dog is currently immune. Although titer levels provide information about the past and the current status of immunity against some diseases, they do not predict the future (i.e. how long a dog will remain at a protective level). Additionally, low titer levels do not necessarily mean a dog is susceptible to infection. While titers do provide important information they can be difficult to interpret and interpretation varies between diseases. For canine parainfluenza, *Bordetella*, and other noncore vaccines (leptosporosis, Lyme disease, canine influenza), titer levels are not considered reliable for predicting immunity and do not adequately substitute for vaccination. For rabies, most jurisdictional laws currently require vaccination and demonstration of titer level is not an allowable alternative.

Vaccination of Puppies

When puppies are born their immune systems are not fully developed leaving them susceptible to many infections. Antibodies from the mother (maternal antibodies) are passed to the puppies through the placenta, and through colostrum in the milk which can be absorbed by the puppy during the first 18 hours of life. The levels of maternal antibodies decrease over several weeks falling to a level where vaccines can stimulate an immune response. Prior to this time vaccines will not be effective. As the maternal antibody level decreases the puppy also becomes vulnerable to disease.

For this reason a series of vaccinations are given at prescribed intervals in an effort to vaccinate puppies soon after maternal antibodies wane and before exposure to the vaccine preventable disease agents occur. In a typical **home setting**, where the risk of exposure is low, the established recommendation is to vaccinate with core vaccines (except rabies) every 3 to 4 weeks between 6 and 16 weeks (Welborn 2011).



In **animal shelters**, dogs are concentrated in close proximity to each other having come from different locations with varied backgrounds, all of which increase the risk of disease exposure. The recommendation for puppies in shelters is to start vaccination earlier than home settings, at 4 to 6 weeks, and to shorten the interval between boosters to 2 weeks so that there is a narrower window during which maternal antibodies are too low to protect the puppy and vaccination has not yet stimulated immunity (Welborn 2011). Similar conditions are found in many canine group settings, so following the vaccine recommendations established for high risk settings such as shelters is warranted ([Appendix 3](#)). This may also be the case for puppies kept at home who live in close contact with dogs that frequent canine group settings, as dogs do not have to be infected to carry disease agents from one location to another.

While an awareness of the behavioral aspects of socialization and the idea of 'getting used to' being at a canine group event holds merit for young dogs, the risks of this exposure to possible infection must be carefully considered. In some cases the benefits of having a puppy in a group setting outweigh the risks (e.g. puppy kindergarten, obedience classes). Even if they are undergoing the recommended

series of vaccines, additional precautions should be taken to protect them from potential exposures that could lead to infection. Healthy young dogs that have not completed their core vaccination series can be permitted to take part in certain group events intended for puppies, providing that other preventive measures described in this document are effectively used; for example, routine environmental cleaning and disinfection, minimizing dog-to-dog contact, establish **cohorts**, and prompt exclusion of sick or potentially infectious dogs.

Noncore Vaccines

Other vaccines are available that are considered optional or noncore (**Appendix 3**). Typically, owners select these, in consultation with a veterinarian, based on individual disease risks including a dog's geographic location, setting, and lifestyle (e.g. time spent in wooded areas, off-leash). Those managing group settings should utilize the same strategies, in consultation with a veterinarian, to determine which, if any, noncore vaccines should be recommended based on the likelihood of exposure associated with travelling to or participating in a particular venue. **Noncore vaccines such as Lyme, leptospirosis, and canine influenza virus should be considered based on a risk assessment of the potential for exposure to these infectious agents in the dog's home location and the event location.** In general, the duration of immunity produced by these vaccines does not consistently extend beyond one year, thus annual revaccination is recommended.

Lyme Disease (Borreliosis) – Vaccination should be considered in areas endemic for Lyme disease when the group setting or activities increase the chance of exposure to potentially infected ticks. These may include canine sport and performance events such as field trials, herding, hunting, and scent tracking among others. Some group settings in **endemic** areas may be able to mitigate their risk through careful selection and management of exercise and elimination areas. However, tick control is the most important part of Lyme disease prevention and the relevance of vaccination in a dog with a good tick control program is unclear.



Leptospirosis – Vaccination should be considered in group settings, both urban and rural, where dogs are likely to drink, swim or otherwise have contact with environmental water sources, such as ponds, lakes, streams, or even puddles that persist in poorly drained areas. Wildlife, and to a much lesser extent, livestock, can spread this infectious agent in their urine, so consider their presence and the likelihood of contaminating shared outdoor areas and open water sources. This is especially important for geographic locations and time periods known to have an increased risk for leptospirosis. When vaccination against leptospirosis is warranted, the 4-way vaccine that contains serovars Canicola, Icterohemorrhagiae, Grippotyphosa, and Pomona is recommended.

Canine Influenza Virus (CIV) – Vaccination should be considered when a vaccine-preventable strain of canine influenza (e.g., H3N8, H3N2) is known to be active in the area. Sporadic cases continue to occur across several regions of the country. Concerning activity would be ongoing transmission in a defined area or outbreaks noticed in association with group settings such as boarding kennels, shows, shelters, veterinary clinics and doggie daycares. Group setting organizers may also consider requiring vaccination of dogs that are coming from areas with CIV activity or outbreaks. Separate vaccines are available for CIV strains; one does not appear to protect against the other.

Insect and Wildlife Control Recommendations

Many infectious agents that affect dogs are maintained and spread by wildlife ([Appendix 1](#)). **As feasible, actions should be taken to prevent insects, rodents, and other wildlife (e.g. raccoons, skunks, opossums) from accessing or living in event facilities and dog housing areas.** Wildlife, including rodents, can spread infectious diseases directly through contact with animals, indirectly through contact with their food, water and environment, and indirectly through insects. Canine distemper outbreaks frequently occur in raccoon populations; leptospirosis is often associated with wildlife; rabies is most frequently spread by bats and raccoons; and *Salmonella* is passed in the feces of many types of animals, especially birds. Risks will vary based on proximity to wildlife and the presence of infectious agents circulating in those populations.



Outbreaks have occurred due to lapses in wildlife exclusion or poor dog containment. Facilities for group settings should be designed or selected with consideration given to preventing wildlife access, especially in areas where dogs are housed. Dog food can also attract wildlife and should be stored in a manner that prevents such access. A safe and effective control program against insects, rodents, and other wildlife should be used in and around buildings, parks, and kennels to reduce the risk of infections to dogs. **Care must be taken to ensure that the products (e.g. rodenticides, pesticides) used are safe for dogs and people.**

For outdoor areas, including exercise and elimination yards, organizers can consider wildlife exclusion fences and grounds management that reduce wildlife shelter and food resources thereby making the area less desirable. Preventing dog access to stagnant water sources is also recommended. When appropriate, restricting dogs to leash control can also reduce exposure risks.



Procedures, both indoors and outside, should minimize and manage waste that can attract rodents, raccoons, and other wildlife. Feces, unnecessary organic debris, and garbage (including uneaten human and dog food) should be immediately removed to assist in insect and wildlife control.

Some canine sporting events, such as search and rescue, scent tracking and hunt trials are conducted in natural field conditions where wildlife cannot be controlled. In these situations it is important to be aware of the local risks and ensure that owners are also well informed. For example, barn hunt trials often use rats and rat droppings during training and competition, leading to an increased risk for diseases such as leptospirosis, salmonellosis, and other intestinal infections. The use of pet rats and their droppings will typically decrease but not eliminate these risks.

Vector Control and Vector-Borne Disease Recommendations

Fleas, ticks, mosquitoes, and triatomines (kissing bugs) can carry infectious agents spreading them from dog-to-dog, and sometimes to people. This can usually be prevented with effective control of tick and insect vectors. Therefore, **efforts should be taken to reduce ectoparasites (e.g., fleas, ticks, mosquitoes) in the environment based on the risk for vector-borne disease in the area, the season, and the type of setting.** Environmental management (e.g. keeping grass cut short to reduce ticks) to minimize vector exposure along with use of effective prevention products for individual dogs are the keys to successful management and control of vector-borne disease.

Additionally, insects such as flies and cockroaches can carry infectious agents on their bodies, potentially spreading diseases such as *Salmonella* and canine parvovirus. Efforts to control these insects and minimize their contact with animal waste, animal food, and animals are important.

An effective flea and tick prevention program reduces the risk of canine infectious disease transmission within groups of dogs and should be in place for all dogs in group settings. Effective topical or oral flea and tick prevention products should be used prior to and during all group events based on season, weather, geography and the type of setting.



Fleas

Fleas are a common parasite of dogs, biting to get a blood meal. They are easily passed to other dogs leading to itching, hair-loss, and skin infections. Fleas are able to transmit tapeworms and various diseases to other dogs, and potentially people.



For individual dogs, many effective topical and oral flea prevention products are available and are considered part of a dog's basic wellness care plan. Almost all dogs have exposure to fleas through outside activities, and fleas can survive indoors and in sheltered locations year-round. For group settings in many locations in Canada and the US, a year-round flea prevention program may be needed for dogs. Even for geographic regions at low risk, this will help reduce the chance of a dog acquiring fleas from dogs coming from other areas where fleas are more common.

Regardless of the methods used for flea control, **dogs entering group settings should be free of fleas. Dogs infested with fleas should be treated with a rapid-kill product and excluded entry (or placed in isolation) until confirmed to be flea-free.** Depending on the situation and the preference of setting organizers, dogs can be screened for fleas visually or using a flea comb during a check-in process, owners can be asked to sign a form verifying their dogs are free of fleas, or compliance can be assumed following notification of the requirement.

Environmental management is also important for flea control. In indoor settings, fleas tend to hide and lay eggs in carpeting, under furniture and behind baseboards. **Surfaces that promote persistence of flea populations, such as carpet and upholstery, should be minimized in the group environment.** In the outdoor environment, fleas are most commonly found in cool, shady areas especially on soil. Reducing the number of sheltered areas and access to wildlife **reservoirs**, which can spread fleas to dogs, will also decrease the risk of flea infestation for dogs in group settings.

Ticks

The bite of a tick alone generally causes little concern. However, infectious agents can be transmitted after a prolonged period of attachment (several hours to days). Ticks are known to transmit several diseases to dogs and people, including Lyme disease, babesiosis, ehrlichiosis, anaplasmosis, Rocky Mountain spotted fever, hepatozoonosis, and tularemia. Historically, ticks have been most commonly found in warm, humid environments; however, their ranges have been expanding into colder climates and higher altitudes.



For individual dogs, many effective topical and oral tick prevention and control products are available and are considered part of a dog's basic wellness care plan in regions where ticks are present. "Tick season" lasts much longer than most people recognize. Newly hatched ticks, which are very small and often hard to see, become active in early spring, while many adult ticks survive the winter and are active on warmer days and in sheltered environments. For group settings in locations where ticks are present, a tick prevention program is encouraged for all dogs participating in group settings. For those dogs living and traveling in locations where ticks do not present a problem, tick prevention should be recommended for dogs that are originating from areas where ticks are a concern to prevent introduction of diseases.

Regardless of the method of tick control, **Dogs entering group settings should be free of ticks. Dogs infested with ticks should be excluded entry (or placed in isolation) until confirmed to be free of ticks. Individual ticks can be manually removed, but this must be done by someone who is familiar with proper tick removal technique.**

When deciding whether to recommend tick prevention for group settings in tick infested regions, **a risk assessment of outdoor events should include time of year (season). Whenever feasible, organizers should try to avoid scheduling outdoor events when the risk of tick exposure is highest. In most tick-infested regions, tick activity and exposure risk is lowest from November to March.**



Many tick species are found in woodland and tall grassy areas, with ground cover vegetation and leaves providing optimal humidity and protection. When possible, **where the risk of exposure to potentially infected ticks is high, outdoor group events should be located away from tick habitats, selecting open, sunny areas that are well mowed, free of leaf litter and other vegetation, and do not directly border tick habitats.** For areas that border tick habitat a barrier can be created by spreading a 3 foot path of mulch or rock bed along the edge, this will dry out ticks killing them if they try to cross. Wildlife exclusion techniques as previously described can also reduce tick numbers by keeping rodents and deer out of the area. In group settings with a high risk for tick exposure, owners should perform a full-body check of their dogs at least daily to identify and remove ticks, in addition to employing tick prevention and vaccination as warranted by the specific risks. The sooner ticks are removed from dogs, the lower the chance infected ticks are able to pass along the infection. **When ticks are established within a physical facility used for canine events or housing, safe and effective insecticide products should be used to remove ticks from the facility.** The brown dog tick is known to inhabit and lay eggs in cracks and crevices in buildings and outdoor runs where dogs are housed.

Mosquitoes

Mosquitoes are able to transmit several infectious diseases to dogs, including heartworm disease.

To minimize mosquito exposure at outdoor events, whenever possible, group settings should be located away from standing water, such as stagnant ponds or catch basins. Human-provided water sources should be changed at least twice per week to prevent mosquitoes from developing. In some situations, methods should be used to control mosquito larvae development (e.g., “dunks”) to reduce the risk of disease in the area. Efforts should be made to reduce standing water sources and containers that will hold water allowing for mosquitoes to breed and mature. For indoor settings windows and doors should be kept closed unless sufficiently screened to prevent mosquito entry.



For individual dogs, routine administration of heartworm prevention products is effective at preventing disease when bitten by an infected mosquito. In much of the US and parts of Canada, heartworm prevention is recommended for all dogs year-round as part of routine wellness care. There is some variation based on climate and expected exposure to mosquitoes. Dogs participating in group settings in areas where heartworm prevention is recommended should receive preventative. Any dog that is positive for heartworm disease can infect mosquitoes that bite them passing it on to other dogs that are bitten. Even puppies that are too young to begin treatment can become infected, so additional mosquito protection may be needed for them if this risk is present.

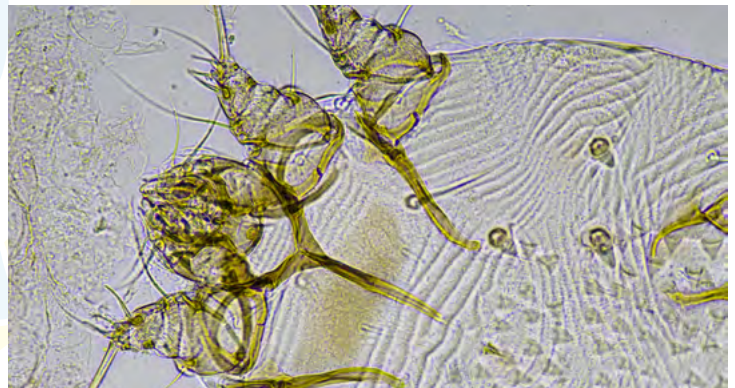
Triatome Insects

Triatomes carry the parasite that causes Chagas disease (American Trypanosomiasis), which is an **emerging disease** in North America. This disease has been found in a number of states along the southern US border. Groups of dogs, especially those outside at night, are at higher risk of exposure. **In areas where Chagas disease is a concern and the disease-causing vectors (triatomes) are known to be present, insecticides should be used to reduce vector prevalence. In areas where triatomes are endemic, dogs should be housed indoors whenever possible, especially at night, to decrease exposure to the vector**



Transmissible External Parasites

External parasites that infest the skin and ears, such as walking dandruff (*Cheyletiella* mites), ear mites (*Otodectes* mites), and mange (*Sarcoptes* mites) do not transmit infectious agents, but are highly contagious and cause skin disease. Close contact is often required so many group settings allow for the rapid spread of these parasites. Many flea products are also effective against mites, so dogs using those products should be protected. It is recommended that dogs with unexplained hairloss or ear infection be excluded from participation until they can be evaluated and diagnosed by a veterinarian.



Enteric Disease Recommendations

Several common diseases of dogs are transmitted through feces and feces-contaminated food, water, or environments. Some of these include viruses (parvovirus, coronavirus), bacteria (*Salmonella*, *Campylobacter*), protozoa (*Giardia*, coccidia), and intestinal parasites (roundworms, hookworms, whipworms, tapeworms). After passing from an infected dog, most of these infectious agents remain in the environment for a long time (days to months) where they remain infectious to other dogs. **To prevent exposure to intestinal infections and parasites, prompt dog feces removal and disposal should be encouraged and the eating of feces by dogs prevented.**

In group settings, it should be required that dog feces be picked up, bagged, and disposed of immediately. This is especially important for dogs with diarrhea; ideally these dogs should be excluded from the setting. Supplies and trash receptacles for feces removal should be readily available. Accidents in common areas that are not intended as a place for elimination should be thoroughly cleaned and disinfected after the feces is removed. Whenever possible, exercise and play areas should be separate from elimination areas to further reduce potential contact with infectious agents that may accumulate in elimination areas. Prominent signage may increase compliance with the venue's rules.

Some intestinal parasites present a health threat to people as well as to dogs. Given this and the frequency with which dogs are diagnosed with intestinal parasites, **all dogs in group settings should be on an effective deworming program based on risk.** Such a program will include routine dewormer (i.e. effective medication to remove intestinal parasites) and/or testing feces for intestinal parasites.

All dogs in group settings should be fed a conventional commercial diet or thoroughly cooked homemade diet to decrease the risk of spreading intestinal infections. Raw meat diets are a known source of foodborne infections (e.g. *E. coli*, *Salmonella*, *Campylobacter*, *Listeria*). Event participants choosing to feed their dogs uncooked (raw) animal product-based foods or treats that have not been treated to reduce pathogens (e.g. high pressure pasteurization, irradiation) should be directly responsible for ensuring that these are only fed to their dogs and for managing the infectious disease risk associated with this choice (e.g. promptly cleaning and disinfecting bowls and locations used to feed and prepare food items, prompt feces removal, hand washing).

Environmental Disinfection and Hygiene Recommendations

Cleaning and Disinfection

Given the nature of most group settings, the facilities and grounds have a high risk of contamination with infectious agents. Proper cleaning and disinfection results in a cleaner, healthier environment and helps prevent the spread of infectious disease to both animals and people. **A cleaning and disinfection program should be used for all structural indoor and outdoor dog areas, such as exercise and housing areas. Key principles for preventing infection should be followed, including prompt removal of feces and debris, cleaning with detergent and water, and correct use of a disinfectant. (appropriate product, dilution,**



and amount of time the disinfectant remains wet on the surface to ensure disease agents of concern are killed) in accordance with product instructions.

Cleaning and disinfection are two different processes. Cleaning entails removing all dirt, feces, and visible debris followed by a thorough scrubbing of all surfaces with a detergent to break down and remove oils and organic matter. Do not use high pressure water during the cleaning process as this can aerosolize pathogens, contaminating other areas; such equipment can be safely used following disinfection. The detergent should be rinsed off and surface allowed to dry before applying a disinfectant. Disinfection involves the use of a chemical disinfectant product (Appendix 5) selected for its effectiveness against specific infectious agents of concern. For instance, since canine parvovirus is notoriously difficult to kill and some disinfectants (e.g., quaternary ammonium compounds) are not reliably effective against it, organizers or owners concerned about parvovirus in their setting should select a disinfectant from those known to kill parvovirus (Appendix 5). Label directions should be followed (e.g. proper dilution, contact time, safety precautions).

Primary animal housing should be cleaned frequently enough to maintain a sanitary environment and should be thoroughly cleaned and disinfected between animals. Multi-use animal contact surfaces (e.g. grooming tables, scales, crates/runs) should be cleaned and disinfected between animals.



The floors in common and animal use areas should be cleaned and disinfected at least once a day. **Whenever possible, the flooring for the environment should be made from non-porous material that is easy to clean and disinfect.**

Management of Animal Waste

As explained in the *Enteric Disease Recommendations*, several important infectious disease agents are shed in feces (Appendix 1). Prompt removal of feces from group settings helps minimize environmental contamination and reduce the risk of disease spread.



Removal of feces also aids in eliminating flies, which can aid in the spread of certain infectious agents. Specific areas should be designated for elimination and all supplies necessary to remove feces should be available. Feces should be collected in a small waste bag and placed in a trash receptacle that has a lid. Most infectious agents survive better in shady and damp areas, so whenever possible select an area that is well-drained with maximum sun exposure. The use of mulch, gravel or other substrates in the elimination area can also reduce infectious agents by allowing for drainage, however these will be difficult (impossible) to disinfect. In areas that experience a lot of use (or are used over a prolonged period), substrate may need to be replaced on a regular basis to reduce the accumulation of long-lived infectious agents. Animals known or suspected to be infectious should not be allowed to urinate or defecate on porous surfaces (mulch, gravel, grass); non-porous surfaces (e.g. concrete) are preferred as these can be disinfected.

Hand Hygiene

Hands contaminated with infectious agents can be an important source of disease transmission. Many canine group settings involve hands-on contact with multiple dogs (e.g. mouth or bite checks), which further increases the risk of spreading infection between dogs. To reduce this risk, people should perform hand hygiene (i.e. clean their hands; wash with soap and water or use an alcohol-based hand sanitizer) after contact with anything that is likely to be contaminated. Hand hygiene is recommended before and after animal contact, after removing feces, after cleaning kennels/crates, after handling animal equipment, after contact with pet food, and before eating or drinking. **People with dog contact (e.g. owners, trainers, handlers, staff, and event judges) should wash hands with soap and water (or apply an alcohol-based hand sanitizer) upon entry and exit to the group setting and between contact with each dog. When this is not practical due to the circumstances of the group setting, hands should be washed or sanitized between groups of dogs. Event organizers should ensure hand wash and/or sanitizer stations are available and conveniently located.** Visitors and spectators should be discouraged from having direct hands-on contact with dogs. Washing with soap and water or using an alcohol-based hand sanitizer are similarly effective in killing/removing most infectious agents of concern in dog group settings. Since alcohol-based hand sanitizers are often easier to provide and use, these are usually preferred. When hands have dirt on them or there is a dog known or suspected to have a disease for which hand sanitizer is not effective (i.e., parvovirus, *Clostridium*, *Cryptosporidium*), washing hands with soap and water is necessary.



Event officials who are required to have direct hands-on contact with multiple dogs should wash or sanitize hands between dogs, if possible, or at least between dog groups. Where dental (“bite”) evaluation is necessary, event officials are encouraged to use hand sanitizer between each dog. It is important sanitizer is properly used; hands rubbed until the product has evaporated to avoid the presence of residual alcohol on the hands. Alternatively, each dog’s owner or exhibitor may be allowed to open and display their own dog’s mouth for visual inspection. Many infectious agents can be spread through contact with saliva or nasal discharges; perhaps of greatest concern in this type of setting would be canine influenza (flu).



Animal Hygiene

Through normal interactions with their environment there are multiple opportunities for dogs to contaminate their coats with potentially infectious agents. **To reduce fecal contamination, ectoparasites, and other pathogens on hair coats, owners should bathe dogs with a routine pet shampoo. For repeat entry settings, such as daycare, bathing should occur on a regular basis or whenever there is visible debris on a dog. Regular brushing may be useful when frequent bathing is not practical.** Bathing is strongly encouraged after activities that bring dogs into contact with areas that are very likely to be contaminated, such as rolling in the grass in the elimination area or swimming in a pond. Special care should be taken to ensure that all visible feces and organic material have been removed from the haircoat. This reduces the chance of contamination of the personnel working with animals and of potential fomites such as equipment or bedding.

Management of Fomites

Fomites are items that can become contaminated with infectious agents and serve as a source of infection through future contact with animals.

When possible owners should bring their own necessary items from home to the group setting (e.g. bedding, toys, grooming tools, water/food bowls), and these should not be shared with other dogs. Items provided by the setting (leashes, collars, toys, and bedding) should not be shared between dogs. Following use, equipment (e.g. clipper blades, grooming tools, water/food bowls, and non-disposable medical items such as thermometers) should be appropriately cleaned and disinfected, especially prior to use with a different dog. In situations where semi-permanent dog groups are established (e.g. dog daycare) precautions are most important when moving items between dog groups.

Single use, disposable items are one way to reduce fomites, especially when proper cleaning and disinfection is inconvenient or not possible. Items that are dedicated to the use of one dog are also preferred, but even these should be cleaned and disinfected before taking them home or to another venue. For towels, blankets, leashes, toys, and anything else that can safely be laundered, washing followed by thorough drying on high heat will destroy most infectious agents. Heavily soiled items should be discarded. Items such as event props, retrieval objects, athletic obstacles, and exhibition structures can also become contaminated and serve as fomites. Consider cleaning and disinfecting these items at least daily, ideally between animal groups or individual dogs when feasible.

Additional Exclusionary Considerations

There are certain items (risk groups) that increase the group setting disease risks high enough that animals in these risk groups should be excluded from certain group settings. In addition to those already discussed, some general categories of exclusion may include young age, illness, and recent travel history.

Young dogs are most likely to acquire, become ill, and spread many of the infectious diseases that occur in group settings. In general, dogs less than one year of age are at greatest risk for acquiring an infectious disease, especially puppies under 6 months of age. Depending on the group setting, some organizers may consider excluding dogs under a certain age, especially if they are too young to have completed their core vaccination series. For group settings where puppies are allowed, additional protection can be provided for them by creating a separate area for housing and increasing the cleaning and disinfection efforts in the areas they frequent. Some venues may also set up a separate elimination area for them.

Animals that are currently experiencing clinical signs associated with an infectious disease are typically very contagious. Dogs should not be admitted to a group event if they are sick with a contagious illness or have unexplained hairloss that could be associated with fleas, mange, or ringworm. Dogs with signs suggestive of an infectious disease such as fever, coughing, sneezing, unusual discharge from the eyes or nose, diarrhea, or vomiting should be refused entry or isolated until a veterinarian can examine them.





Dogs infected with a disease elsewhere can bring the disease back to their home region and this may lead to further spread of infection. Dogs travelling to other states, provinces or countries have increased risk of exposure to infectious agents, including some that might not exist in their home region. In this way dogs can carry infectious diseases to new locations, which can lead to establishing new diseases in our countries. **Dogs originated from or having spent time in locations outside Canada and the US**

should be excluded from group settings for a minimum of two weeks following return/entry. Signs of disease that develop during this time should be assessed by a veterinarian and reported to the setting manager before the dog is allowed to participate.

Consideration should be given to restricting event entry to only dogs participating in the group setting. Dogs brought on site for adoption, sale, socialization, or other purposes could be potential carriers and introduce infectious disease into the group, and they may also be susceptible to becoming infected by infectious agents in the group setting. The latter is a particularly high risk for puppies. **Dogs not formally involved in the setting likely increase overall infectious disease risks and, especially young dogs, should be excluded from the setting.** If they will be admitted to the group setting, organizers should know in advance, ensure that they meet participation requirements, accommodate them with needed space or housing, and keep records on them, just as they would those dogs that are participating.

Facility Design and Traffic Control Recommendations

All facilities used for canine group settings should provide an environment that is favorable to maintaining animal health and well-being. To minimize the opportunity for entry and spread of infectious agents in a group setting, **careful attention should be placed on dog and human traffic control and on layout of the facility or event setting.** Unrestricted movement of people magnifies risk and organizers should consider what areas should be restricted to authorized persons only. Unless it is essential to the group setting, the public (e.g. visitors, spectators) should be excluded from dog housing areas. Other areas such as those designated for puppies and isolation of sick animals should be further restricted to only those necessary to the care of those animals.

When selecting or setting up a location, it is important to consider the paths that people and their dogs will need to walk in order to get from place to place. Ideally, they should not walk through multiple housing areas to get to their own

housing area or to other important locations in the setting including exercise and elimination areas. Efforts should also be made to avoid crossing of the walkways in areas that will be congested with frequent comings and goings. Improving the efficiency of flow and ensuring that travel from place to place is as direct as possible will help reduce the transmission and spread of disease.



When dog density is too high, such as with dogs housed very close to each other or with cages stacked on top of each other, there is a much greater potential for the spread of infectious disease. The number of animals increases contamination of the environment, including the air; crowding also makes cleaning and disinfection more difficult. Dogs housed close to one-another have a greater chance of spreading infectious agents through coughing, sneezing, and even breathing. Additionally, close housing can increase stress for dogs who may feel threatened or anxious; this stress can affect a dog's ability to fight off infection if exposed. **To reduce the risk of spreading infections, high density kennel situations should be avoided, especially for young puppies and dogs that have not been fully immunized with a complete core vaccination series. Animal density should not interfere with the ability to appropriately disinfect the setting environment and maintain adequate air quality.** Group settings should not house a greater number of dogs that exceeds their capacity to provide proper care.



The greatest risk of contagious disease spread in group settings is through direct dog-to-dog contact between a susceptible dog and an infected dog shedding infectious agents. For many diseases this **shedding** can occur even if the dog appears to be in good health. At canine group settings, there are many areas where dogs are likely to have direct contact with one another including kennels, exercise areas, elimination areas, grooming areas, exhibition areas, and even the parking lot. **Unnecessary dog-to-dog contact should be minimized while still providing the intended benefits of the setting.**

When dog-to-dog contact is an important part of the setting (e.g. daycare), semi-permanent small groups (cohorts) should be established to reduce new contacts and disease spread. Group housing and play groups (e.g. dog day care facilities) where two or more dogs share the same enclosure or play space provides beneficial social interaction for dogs, but increases the opportunity for infectious disease transmission, thus, the benefits and risks should be carefully weighed for each situation.



Group settings should have a dedicated isolation area where dogs known or suspected to be infectious can be immediately segregated from other dogs if they are unable to be immediately removed from the setting. The location of this area should allow for physical and procedural separation from other dogs. This can be to an on-site dedicated isolation area or an off-site area identified for this use prior to the event. The designated isolation facility should ideally be located in a secure, restricted area as far away as possible from common-use, public, and animal housing areas. Signage should identify the isolation area as a restricted area. People attending to animals in isolation should wear dedicated clothing (e.g. gowns, gloves) to reduce the chance of contaminating their clothing and spreading pathogens to other dogs. All surfaces and enclosures in the isolation area should be easy to clean and disinfect. Ideally, only designated trained staff should work in the isolation area, and access should otherwise be restricted. Whenever possible, organizers should ensure that air flow through the facility does not move from the isolation area into other dog areas, as this can facilitate the spread of disease.

Each setting will vary with traffic control and related concerns. Organizers of outdoor settings should consider any additional environmental concerns. For instance, natural water sources, such as streams, ponds, and puddles, pose a disease risk as they may contain infectious agents originating from wildlife or domestic animal waste (e.g. the bacteria causing leptospirosis). Unless important to the purpose of the group setting, contact with these water sources should be avoided. Excluding dog entry to these areas with fencing is ideal. For group settings where water contact is essential, careful consideration should be given to the specific body of water used. In general, if it is deemed safe for human recreational activities it will also be safe for the dogs. Some water bodies are routinely tested by local public health entities for *E. coli* content (as an indicator of fecal contamination) and toxic algae among other health concerns. Similar testing could be performed prior to a dog competition if indicated.



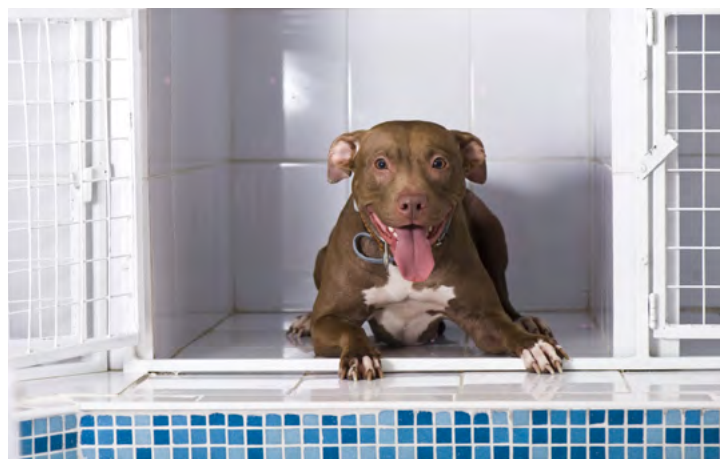
Disease Recognition and Response Recommendations

Timely identification and awareness of disease is important in preventing transmission of infectious agents to other dogs. For disease identification to be effective in a dog group setting, all staff, handlers and owners must know what early warning signs and diseases to report, when to report them, to whom to report, and there must be actions taken based on reports. Policies containing this information should be written and periodically reviewed. Disease awareness and action policies are critical for prevention and containment of outbreaks.



Event organizers should consider establishing a policy requiring that any dog with signs of potential infectious disease be reported immediately to a designated event official, as this poses a risk for disease spread to the entire population of dogs at the venue. **People should carefully watch their dogs and report any signs that potentially indicate an infection. Staff, handlers and owners should visually monitor dog health and report dogs exhibiting any of a predetermined set of signs to the manager and veterinarian associated with the setting** (Appendix 6 has a list of example reportable conditions and syndromes). Someone must be in-charge of immediately reviewing and documenting all disease reports. During review, it is important to determine the likely level of concern related to the group setting and identify groups of such reports that may suggest transmission between dogs at an event.

Any dog that becomes ill or is believed to be infectious should be immediately removed from the group setting (to isolation or removed from the premises) until evaluated by a veterinarian. While in isolation, physical and procedural measures should be used to minimize the risk of transmission to other dogs and reduce contamination of the environment, based on the recommendations of the setting veterinarian. Depending on the nature of the infectious disease (e.g. respiratory, intestinal, skin), appropriate infection control measures should be implemented, especially cleaning, disinfection, fomite control, and hand hygiene procedures as described in previous sections of this document. Group setting organizers should plan on having an inventory of protective outerwear for personnel to use with infectious animals, including disposable gloves, shoe covers, and outerwear (e.g. gowns). Entry and exit procedures should follow strict hygiene and disinfection protocols.



When a case of infectious disease is suspected, it is important to get a diagnosis quickly and identify susceptible animals that might have been exposed. Sometimes cases are not recognized until there are several, which can complicate investigation and response efforts. Knowledge of the likely pathogen, including how it is transmitted, ability for the agent to survive in the environment, ability for disinfectants to kill the pathogen, delay between when a dog is exposed to when it develops signs of disease, amount of time a dog may be infectious, and reliability of diagnostic tests, is important in appropriately identifying and responding to disease transmission concerns.

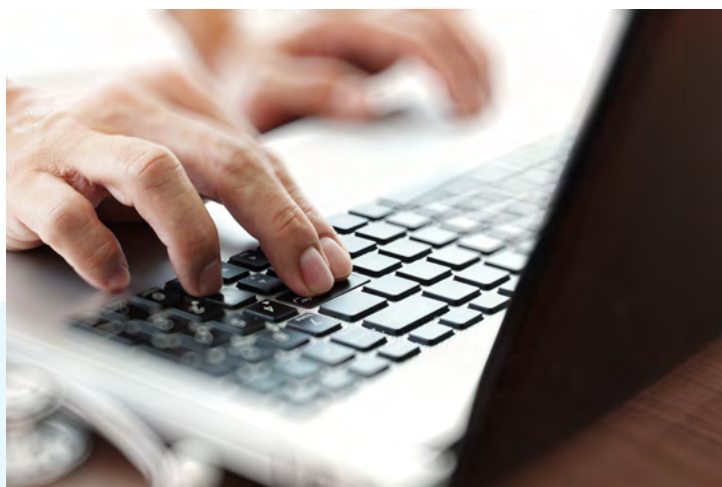
Risk Assessment				
Severity	Disaster	High	Medium	Minimal
Probability	Critical	Critical	High	Medium
Regularly	Critical	High	Medium	Medium
Probable	Critical	High	Medium	Medium
Occasional	Critical	High	Medium	Low
Rarely	High	Medium	Medium	
Notable				

A risk assessment should be performed and an outbreak management plan developed for all group settings. The plan should describe how information will be acquired and evaluated to identify disease transmission associated with the setting, approaches for how affected and exposed animals will be handled, actions that will be taken to stop disease transmission, and who will be responsible for overseeing response actions and communication with the public. Development and implementation of the plan should involve a veterinarian and the group setting manager.

For some group settings such as boarding kennels and daycares, intake of new dogs may need to stop temporarily to prevent additional exposures.

For other group settings that involve many of the same animals at different venues (e.g. shows, sporting events), events in the immediate future may need to be canceled.

Even a single case of an infectious disease that manifests in a group setting is significant and should be documented. It is important to remember that cases can develop after an event from exposures that occurred at the group setting; this timing can range from days to weeks depending on the infectious agent. **Coordinators of group settings should have in place a “surveillance program” as a way to find out about and keep track of reported infectious diseases in participating dogs, focusing on dogs that develop signs at the setting and up to two weeks after attending.** Investigating these cases can provide information that can help prevent future disease transmission in the setting.



To facilitate surveillance and outbreak response, contact information should be recorded on all event participants and all dogs brought to the event to ensure appropriate and timely communication and containment of disease in the event of an outbreak. **Group setting organizers should employ record keeping systems that capture individual dog information regarding dates of involvement in the setting, location/housing during their attendance, required health documentation, reported disease/syndrome concerns, and contact information for owners/ handlers.**



Some information can be collected in advance through registration and/or a comprehensive check-in and check-out procedure can be utilized by event managers to ensure they know what dogs are on the premises. Identification of a dog's primary location within the group setting when tied with the location of the contagious dog can be used to identify dogs who were likely exposed and at greatest risk of developing disease.

If a susceptible dog has been exposed to a potentially contagious dog, a risk assessment should be performed to determine what measures should be taken. This may include excluding the dog from the group setting for a pre-determined period of time. Susceptible dogs with known exposure to a contagious animal should be excluded from the group setting for the time it takes for that disease to manifest following exposure or a time period otherwise determined by a veterinarian. When the specific disease is unknown or there is inadequate information, two weeks from last exposure is a reasonable exclusion period. During an infectious disease outbreak, all dogs on the premises should be continuously monitored for signs of illness by owners, handlers, and staff regardless of perceived risk.

Following resolution of all related cases it is important to review the information collected to identify details and factors that can assist with preventing future cases of infectious disease in the group setting.

Conclusion

Although difficult to quantify, infectious disease risks at canine group settings are clearly evident. Risks following introduction of infectious diseases into group settings are high, as dog-to-dog contact is likely, and severe consequences can follow as dogs spread pathogens back into the community and potentially over large geographic areas. Disease risks can be minimized by addressing key areas in disease prevention planning, including vaccination, insect and wildlife control, vector

and vector-borne disease prevention, enteric disease prevention, environmental disinfection and hygiene, facility design and traffic control, and disease recognition and response. As risks vary within and between settings, it is important for group setting organizers to adopt recommendations that are most in-line with their specific disease risks and seek the assistance of knowledgeable individuals in that area and setting.



Glossary of Terms

Aerosol – Particles or droplets often of respiratory fluid that are suspended in air and can spread infectious agents through the air by cough and sneezing.

Cleaning – A process that removes visible dirt, debris, and organic material (e.g. animal excretions or blood) from an object or surface through manual washing and detergents.

Cohort – A group of animals that are kept together and share similar health risks.

Core Vaccine – Vaccines that all dogs should receive, regardless of circumstances or location.

Direct Contact – Close physical contact between animals (e.g. face rubbing, licking, nose to nose, skin to skin, breeding), which enables direct transmission of certain infectious agents between animals.

Disinfectant – A chemical product used to eliminate most microbes from an object or surface, through the process of Disinfection.

Ectoparasite – Parasites that live on or in the skin (e.g. fleas, ticks, mites, lice).

Emerging Disease – A newly occurring or newly recognized infection in an animal population.

Endemic – Infectious diseases that are always present in an area or animal population.

Enteropathogen – A microorganism or parasite that lives in and causes disease in the intestinal tract.

Fomites – Contaminated inanimate objects and surfaces that can carry infectious organisms, which can then infect a susceptible animal. Examples include cage surfaces, clippers, toys, bedding, food/water bowls, and event props.

Group settings – Locations, facilities, and events where dogs temporarily come together in a shared environment.

Hygiene – Cleanliness that is accomplished through the processes of cleaning (see definition) and disinfection (see definition).

Immunity – The protective state that enables an animal to resist infection.

Incubation Period – The time between exposure to an infectious agent and the first signs of disease.

Infectious Agent – A microorganism (e.g., virus, bacteria, fungus, protozoa) or parasite that is transmissible and causes disease in animals.

Isolation – The use of special temporary housing to separate an animal known or suspected to be infectious from other healthy animals in order to prevent the spread of infection.

Necropsy – An examination or autopsy of a deceased animal for diagnostic purposes.

Noncore Vaccine – Vaccines that are optional and only given to certain dogs based on individual circumstances or geographical location.

Parasite – An organism that lives in or on a larger animal host. Internal parasites in dogs include various species of worms and protozoa (e.g. *Giardia*) that live in the intestines, and worms that live in the respiratory tract or heart (e.g. *Dirofilaria* heartworms). External parasites in dogs include fleas, ticks, and mites.

Pathogen – An infectious agent (e.g. virus, bacteria, fungus, parasite) that can cause disease in animals.

Quarantine – The use of special temporary housing to reduce infection risk by limiting contact of an animal with other animals, usually because the animal may have been exposed to an infectious agent and could become infectious at a later time.

Reservoir – A population of animals that are carriers of an infectious agent, and therefore can be a source of disease transmission to other susceptible animals.

Shedding – The release of an infectious agent from an infected animal, which can contaminate the environment or transmit infection to another animal.

Subclinical Infection – A “stealth” form of infection in which the animal does not show apparent signs, but can still spread infection to other animals.

Susceptible – When an animal is vulnerable to becoming infected, usually because it lacks the immunity or ability to resist infection.

Transmission – The spread of infectious disease from one animal to another.

Vector – An insect that acquires an infectious agent from one animal and transmits it to another.

Virulence – The ability of an infectious agent to cause severe disease.

Zoonotic – Refers to a type of infectious agent that is transmissible from animals to people.



Appendix 1:

Infectious Diseases of Concern in Canine Group Settings

(Adapted from Stull et al, JAVMA 2016;249: 612-627)

Disease/Infectious Agent	Disease Severity	Transmission Routes in Group Settings	Prevention Methods Most Important for Group Settings
VIRUSES			
Canine adenovirus-1 (infectious canine hepatitis)	Severe	Direct contact; fomites	Vaccination (core) ¹ Careful attention to cleaning and use of specific disinfectants Care with fomites (e.g. cages, clippers, toys, event props) Hand hygiene Isolation of infected dogs Separation (limiting dog-to-dog contact) Limiting wildlife exposure
Canine coronavirus (enteric)	Mild to moderate	Direct contact; fomites (contaminated with feces)	Cleaning and disinfection Feces control Care with fomites (e.g. cages, clippers, toys, event props) Hand hygiene Isolation of infected dogs Separation (limiting dog-to-dog contact)
Canine distemper virus	Mild to severe	Direct contact; aerosols; fomites	Vaccination (core) ¹ Cleaning and disinfection Care with fomites (e.g. cages, clippers, toys, event props) Hand hygiene Isolation of infected animals Separation (limiting dog-to-dog contact) Limiting wildlife exposure
Canine herpesvirus-1	Mild (adults) to severe (puppies)	Direct contact; aerosols; fomites	Cleaning and disinfection Limiting exposure to infectious fluids during the whelping or postpartum period Care with fomites (e.g. cages, clippers, toys, event props) Hand hygiene Separation (limiting dog-to-dog contact) Limiting wildlife exposure
Canine infectious respiratory disease complex (kennel cough; includes canine parainfluenza virus, canine adenovirus-2, and others)	Mild to moderate	Direct contact; aerosols; fomites [Zoonotic - low risk]	Vaccination (core) ¹ Well-ventilated animal housing Cleaning and disinfection Care with fomites (e.g. cages, clippers, toys, event props) Hand hygiene Isolation of infected dogs Separation (limiting dog-to-dog contact)

Disease/Infectious Agent	Disease Severity	Transmission Routes in Group Settings	Prevention Methods Most Important for Group Settings
Canine influenza virus (CIV)	Mild to severe	Direct contact; aerosols; fomites	Vaccination (non-core) ¹ Well ventilated animal housing Cleaning and disinfection Care with fomites (e.g. cages, clippers, toys, event props) Hand hygiene Isolation of infected dogs Separation (limiting dog-to-dog contact)
Canine papilloma virus	Mild; rarely severe	Direct contact	Cleaning and disinfection Hand hygiene Separation (limiting dog-to-dog contact)
Canine parvovirus	Severe	Direct contact; fomites (contaminated with feces or vomit)	Vaccination (core) ¹ Careful attention to cleaning and use of specific disinfectants Feces control Care with fomites (e.g. cages, clippers, toys, event props) Hand hygiene Isolation of infected dogs Separation (limiting dog-to-dog contact) Limiting wildlife exposure
Pseudorabies	Severe	Direct contact with wildlife; fomites	Limiting exposure to swine and raw pork products
Rabies	Severe	Animal bites; contact with saliva [Zoonotic]	Vaccination (core) ¹ Isolation of infected dogs Limiting wildlife exposure
BACTERIA			
Anaplasmosis	Mild	Tick bites [Zoonotic – dogs not involved in transmission]	Tick control Limiting or controlling exposure to outdoor environments with infected vector
Bartonellosis	Mild, but potentially severe	Flea and tick bites [Zoonotic]	Flea and tick control Limiting or controlling exposure to outdoor environments with infected vector Separation (limiting dog-to-dog contact)
Bordetellosis	Mild	Direct contact; aerosols; fomites [Zoonotic – low risk]	Vaccination (core) ¹ Well-ventilated animal housing Cleaning and disinfection Care with fomites (e.g. cages, clippers, toys, event props) Hand hygiene Separation (limiting dog-to-dog contact)
Brucellosis (<i>B. canis</i>)	Mild to severe	Direct contact (mating); fomites [Zoonotic]	Isolation of infected dogs Spay/neuter Testing (surveillance) program

Disease/Infectious Agent	Disease Severity	Transmission Routes in Group Settings	Prevention Methods Most Important for Group Settings
Campylobacteriosis	Mild to moderate	Fomites (contaminated with feces); raw food [Zoonotic – high risk]	Cleaning and disinfection Feeding of commercial or homemade cooked diet Feces control Care with fomites (e.g. cages, bowls, toys, event props) Hand hygiene
Ehrlichiosis	Mild to moderate	Tick bites [Zoonotic]	Tick control Limiting or controlling exposure to outdoor environments with infected ticks Limiting wildlife exposure
<i>Escherichia coli</i> , including multi-drug resistant	Mild to severe	Direct contact; fomites [Zoonotic – low risk]	Cleaning and disinfection Care with fomites (e.g. cages, clippers, bowls, event props) Hand hygiene Separation (limiting dog-to-dog contact)
Leptospirosis	Mild to severe	Fomites (urine) [Zoonotic]	Vaccination (non-core) ¹ Limiting exposure to environmental water sources or livestock Limiting wildlife exposure
Lyme disease (borreliosis)	Mild to severe	Tick bites [Zoonotic - dogs not involved in transmission]	Vaccination (non-core) ¹ Tick control Limiting or controlling exposure to outdoor environments with infected vector
<i>Mycoplasma</i> spp	Mild to severe	Respiratory: direct contact, aerosols, fomites; hemotropic (within cells in blood): ticks speculated	Respiratory: Well-ventilated animal housing Hand hygiene Separation (limiting dog-to-dog contact) Hemotropic: Tick control speculated
Q fever (coxiellosis)	Mild to moderate	Direct contact; fomites [Zoonotic]	Feeding of commercial or homemade cooked diet Limiting exposure to infected livestock and their birthing materials
Rocky Mountain Spotted Fever	Moderate	Tick bites [Zoonotic - dogs not involved in transmission]	Tick control Limiting or controlling exposure to outdoor environments with infected ticks
Salmonellosis	Variable (generally mild)	Fomites (contaminated with feces); raw food [Zoonotic]	Cleaning and disinfection Feces control Care with fomites (e.g. cages, bowls, toys, event props) Isolation of infectious dogs Avoiding raw foods and treats that are not processed to eliminate pathogens (e.g. high pressure pasteurization) Limiting wildlife and livestock exposure

Disease/Infectious Agent	Disease Severity	Transmission Routes in Group Settings	Prevention Methods Most Important for Group Settings
<i>Staphylococcus</i> spp, including methicillin or multi-drug resistant	Mild to severe	Direct contact; fomites [Zoonotic]	Cleaning and disinfection Care with fomites (e.g. cages, clippers, toys, event props) Separation (limiting dog-to-dog contact) Hand hygiene
<i>Streptococcus equi</i> ssp <i>zooepidemicus</i>	Variable	Direct contact; aerosols; fomites [Zoonotic]	Cleaning and disinfection Care with fomites (e.g. cages, clippers, toys, event props) Hand hygiene Separation (limiting dog-to-dog contact)
Tularemia	Severe	Direct contact; fomites; insect bites [Zoonotic]	Feeding of commercial or homemade cooked diet Limiting exposure to wild rodents and rabbits Tick control Limiting or controlling exposure to outdoor environments with infected ticks
PARASITES			
Babesiosis	Mild	Tick bites; dog bites [Zoonotic]	Limiting exposure to fighting dogs Tick control Limiting or controlling exposure to outdoor environments with infected ticks
Chagas disease	Severe	Triatomine bug feces [Zoonotic]	Triatomine bug control Limiting or controlling exposure to outdoor environments with infected triatomine bug
<i>Cheyletiella yasguri</i> (mites)	Mild to severe	Direct contact; fomites [Zoonotic]	Mite control Separation (limiting dog-to-dog contact)
Coccidiosis	Mild	Fomites (contaminated with oocysts in feces)	Careful attention to cleaning and use of specific disinfectants Feeding of commercial or homemade cooked diet Endoparasite control Feces control
Cryptosporidiosis	Mild to moderate	Fomites (contaminated with oocysts in feces) [Zoonotic]	Feces control Limiting exposure to contaminated water sources Care with fomites (e.g. cages, clippers, toys, event props) Hand hygiene Isolation of infected dogs Separation (limiting dog-to-dog contact)
<i>Dirofilaria immitis</i> (heartworm)	Mild to severe	Mosquito bites [Zoonotic – low risk]	Mosquito control Heartworm preventative medication

Disease/Infectious Agent	Disease Severity	Transmission Routes in Group Settings	Prevention Methods Most Important for Group Settings
Encephalitozoonosis	Mild to severe	Fomites (contaminated with spores from urine or feces) [Zoonotic]	Feces control
Giardiasis	Mild to moderate	Fomites (contaminated with cysts in feces) [Zoonotic]	Cleaning and disinfection Feces control Care with fomites (e.g. cages, clippers, toys, event props) Hand hygiene Separation (limiting dog-to-dog contact)
Hepatozoonosis	Mild to severe	Tick ingestion	Tick control Limiting or controlling exposure to outdoor environments with infected vector Limiting wildlife exposure
Hookworm	Mild to severe	Fomites (contaminated with larvae in feces) [Zoonotic]	Endoparasite control (deworming) Feces control
Leishmaniasis	Mild to Severe	Sandfly bites; dog bites [Zoonotic]	Sandfly control Limiting or controlling exposure to outdoor environments with infected sandflies Bite prevention
<i>Otodectes cyanotis</i> (ear mites)	Mild to moderate	Direct contact [Zoonotic]	Mite control Separation (limiting dog-to-dog contact)
Roundworm	Mild to severe	Fomites (contaminated with eggs in environment from feces) [Zoonotic]	Endoparasite control (deworming) Feces control Limiting wildlife exposure
Sarcoptic mange	Moderate to severe	Direct contact [Zoonotic]	Mite control Care with fomites (e.g. cages, clippers) Separation (limiting dog-to-dog contact)
Tapeworm	Mild	Ingestion of infected fleas [Some species zoonotic]	Limiting wildlife exposure Flea control
Whipworm	Mild	Fomites (contaminated with eggs in feces)	Endoparasite control (deworming) Feces control
FUNGI			
Dermatophytosis (ringworm)	Mild to moderate	Direct contact; fomites (contaminated with spores) [Zoonotic]	Care with fomites (e.g. cages, clippers) Hand hygiene Isolation of infected dogs Separation (limiting dog-to-dog contact)

¹Core = vaccinations recommended to be given to all dogs participating in canine group events/settings.

Non-core = vaccinations suggested to be given to some dogs participating in canine group events/settings depending on specific risks (e.g., time of year, type and location of event).

See Appendix 3 for further details including schedule with ages and frequency of vaccination.

Appendix 2:

Factors Determining Outcome of Infectious Disease Exposure

Determinants of Infection	
Infectious Agent (Pathogen)	- Ability to spread between animals (infectivity) - Ability to cause disease (pathogenicity) - Ability to cause severe disease (virulence) - Route(s) of exposure - Time between exposure and onset of signs of disease (incubation period) - Stability of agent outside of the animal (survivability) - Susceptibility to disinfectants
Individual Dog	- Age - Health status - Nutritional status - Immune status - Vaccination status - Parasite control
Population (Animal Group)	- Level of dog-to-dog contact - Level of person-to-dog contact - Density of dogs - Movement of dogs - Population turnover - Ages (mix of puppies with adult dogs) - Presence of subclinical carriers of infection
Environment	- Geographic location - Time of year (season) - Temperature, humidity, and air quality (ventilation) - Venue or facility characteristics - Indoor versus outdoor setting - Exposure to insects (vectors) - Exposure to rodents and other wildlife
Method of Transmission	- Direct contact - Droplet - Airborne - Oral (e.g. food or water) - Fomite - Vector-borne

Appendix 3:

Recommended Vaccines for Dogs in Group Settings Exposure

(Adapted from Welborn LV, et al. 2011)

Core Vaccines

Vaccine	Initial Vaccination	Revaccination	Comments
Canine distemper virus + Canine adenovirus 2 + Canine parvovirus 2	A single dose should be administered at least one week prior to entry into the group setting.	For dogs less than 18 weeks of age, revaccination should occur every two weeks until 18-20 weeks of age. ¹ Dogs should be revaccinated at 1 year of age and then at three or more year intervals. ²	
Intranasal/oral <i>Bordetella bronchiseptica</i> + Intranasal canine parainfluenza virus	A single dose should be administered shortly before, but at least 3 days prior to entry into the group setting.	Depending on risk, dogs should be revaccinated every 6-12 months, if they are expected to have on-going exposure to group settings.	
Rabies virus	A single dose should be administered at least 28 days prior to entry into the group setting. Dogs as young as 12-16 weeks, depending on local regulations, should be vaccinated.	Dogs should be revaccinated one year after the initial vaccination with a three year vaccine. Following the second vaccination, dogs should be revaccinated every three years.	Local laws and regulations for the state in which the group setting resides will ultimately dictate the vaccine protocols required of entrants to the setting

¹Puppies involved in group settings should follow the vaccine recommendations established for other high risk settings. This involves more frequent boosters for a longer period than puppies not involved in these settings. See the section [Vaccination of Puppies](#) for further details.

²Antibody titers are considered valid indicators of protective immunity for CDV and CPV-2 and may be used to guide revaccination for these pathogens. Dogs without antibodies to CDV and CPV-2 should be revaccinated, while dogs that have been actively immunized by vaccination or naturally by infection that have antibodies to CDV or CPV-2 do not need to be revaccinated.

Non-Core Vaccines

Vaccine	Initial Vaccination	Revaccination	Comments
<i>Borrelia burgdorferi</i> (Lyme disease)	For dogs at risk, one dose should be administered not earlier than 12 weeks of age, with a second dose two – four weeks later.	Dogs with on-going risk should be revaccinated annually or prior to the start of tick season as determined regionally.	Recommended for dogs who reside in areas of the USA and Canada where Lyme disease is endemic or for dogs traveling to outdoor group settings where Lyme disease is endemic.
Canine influenza virus	For dogs at risk, one dose should be administered not earlier than six weeks of age, with a second dose two – four weeks later.	Dogs with on-going risk should be revaccinated annually.	Highly strain dependent, and specific type recommended for at-risk area or event setting
Leptospirosis	For dogs with increased risk of exposure, the two-dose series should be administered at least one week prior to entry into the group setting.	Dogs with on-going risk should be revaccinated yearly.	Dogs that will have exposure to environmental water sources, such as rivers, ponds and streams, in the group setting or home environment should be vaccinated. A four-way killed whole cell or subunit bacterin vaccine that contains serovars Canicola, Icterohemorrhagiae, Grippotyphosa, and Pomona is recommended.

Appendix 4:

Summary of Existing Guidelines for Facilities that Temporarily House Groups of Dogs

(Adapted from Newbury et al. 2010, AVMA Companion Animal Care Guidelines)

Facility Operational Item	Guidelines
General Procedures	• Facility personnel (volunteer and paid) trained in infectious disease risk and prevention. • Written protocols for daily cleaning and disinfection (e.g., dog enclosures, food/water bowls, floors, countertops, sinks, drains, animal tables, animal equipment, trash containers, mop buckets). • Written protocols for personnel hand hygiene and protective clothing. • Flooring and surfaces nonporous and easy to clean and disinfect. • Layout and traffic flow that minimizes unnecessary contact between dogs. • Daily monitoring of all dogs by personnel trained to recognize illness. • Dedicated isolation area and/or protocols for handling sick dogs.
Dog Enclosures (e.g., kennels, cages, runs, pens, crates)	• Structurally sound, escape-proof, able to keep other animals out. • Secured by door latches in good working order. • Sufficient to keep the dog warm, dry, and clean. • Readily cleaned and disinfected. • Safeguards against injury from sharp edges or gaps that could entrap limbs. • Sufficient in size and space to be compatible with the size of the dog. • Allows the dog to turn and move about freely. • Allows the dog to easily stand, sit, stretch, make postural adjustments, and move its head without touching top of enclosure. • Allows the dog to lie in a comfortable position at full body length with its limbs extended. • Allows the dog to assume a comfortable position for feeding, drinking, urinating, and defecating. • Spacing of at least 4 feet between enclosures that face each other. • Mobile crates and cages are not stacked on top of each other.
Shared Enclosures (Group Housing) and Play Groups	• Physical space is adequate for the number of dogs sharing it. • The group size sharing the same enclosed space is minimized (e.g., not to exceed 6 dogs). • Co-mingled dogs are all healthy, up-to-date on all core vaccines, and free of parasites. • Dog groups selected and monitored for behavioral compatibility. • Competition for food is prevented. • Puppies under 20 weeks of age are not group housed except with littermates. • Intact sexually mature male and female dogs are not grouped together.
Temperature and Humidity	• Ambient temperature: between 60° F (15.5° C) and 80° F (26.6° C). • Relative humidity: from 30 to 70% (low to moderate humidity).
Air Quality and Ventilation	• Good air flow with at least 10 to 20 fresh air exchanges per hour
Lighting	• Indoor housing facilities provide natural light when feasible. • Artificial lighting approximates natural light in duration and intensity. • Lights turned off at night to promote natural sleep-wake cycles (circadian rhythm), which helps to reduce stress
Water Source	• Access to fresh clean water at all times. Water bowls changed daily or whenever they are visibly soiled. • Shared or communal water sources avoided as these increase the risk of disease transmission. • Drinking from natural water sources, such as streams, lakes, and ponds, prevented as these can be contaminated and pose an infectious disease risk.

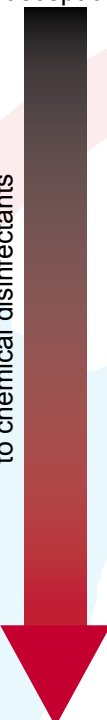
Facility Operational Item	Guidelines
Feeding Practices	• Food and water bowls made of a material that is readily cleaned and disinfected between dogs. • Food and water bowls not shared between animals. • Food preparation areas cleaned and disinfected daily. • Adult dogs fed fresh palatable dog food once or twice daily; growing puppies have food more often, or free choice. • Daily food intake for each dog monitored. • Uneaten food discarded after 12 hours to prevent spoilage and attraction of insects and rodents. Uneaten food offered to one dog never fed to another animal. • Feeding of uncooked or untreated (e.g. high pressure pasteurization, irradiation) meat diets and treats discouraged due to risk of bacterial and parasite contamination. • Food stored in sealed containers to maintain freshness and prevent exposure to insects and wildlife.



Appendix 5: Disinfectants

Spectrum of Selected Disinfectants

(Adapted from Linton et al. 1987, Block 2001, Canadian Committee on Antibiotic Resistance Infection Prevention and Control Best Practices for Small Animal Veterinary Clinics)

	Agent	Alcohols*	Aldehydes*	Alkalis: Ammonia*	Biguanides: Chlorhexidine*	Halogens: Hypochlorite (Bleach)	Oxidizing Agents	Phenols*	Quaternary Ammonium Compounds
 Most Susceptible Susceptibility of microorganisms to chemical disinfectants Most Resistant	Mycoplasmas	++	++	++	++	++	++	++	+
	Gram-positive bacteria	++	++	+	++	++	++	++	++
	Gram-negative bacteria	++	++	+	+	++	++	++	+
	Pseudomonads	++	++	+	±	++	++	++	±
	Enveloped viruses	+	++	+	++	++	++	++	+
	Chlamydiae	±	+	+	±	+	+	±	-
	Non-enveloped viruses	-	+	±	-	++	+	±	-
	Fungal spores	±	+	+	±	+	±	+	±
	Acid-fast bacteria	+	++	+	-	+	±	++	-
	Bacterial spores	-	+	±	-	++	+	-	-
	Coccidia	-	-	+	-	-	-	+	-

++ Highly effective; + Effective; ± Limited activity; - No activity

*Not generally recommended for routine environmental disinfection due to one or more of the following: limited activity/spectrum in the environment, toxicity, lack of significant advantages over better options.

Examples of pathogens from select categories:

Mycoplasmas: *Mycoplasma canis*; **Gram-positive bacteria:** *Staphylococcus* spp, *Streptococcus* spp; **Gram-negative bacteria:** *Bordetella bronchiseptica*, *Salmonella* spp;

Pseudomonads: *Pseudomonas aeruginosa*; **Enveloped viruses:** Influenza virus, herpesvirus; **Non-enveloped viruses:** canine parvovirus, canine adenovirus; **Fungal spores:** Dermatophytes (*Microsporum canis*); **Bacterial spores:** *Clostridium difficile*, *Clostridium perfringens*; **Coccidia:** *Cryptosporidium canis*, *Isospora* spp

Properties of Disinfectants Recommended for Routine Disinfection of Environmental Surfaces and Equipment

Active agent	Product examples	Contact time	Advantages	Disadvantages	Comments
Hypochlorite	Bleach 1:10-1:50 dilution of household bleach	1-5 min	Broad spectrum effective against most resistant organisms (non-enveloped viruses, bacterial spores, dermatophytes). Readily available. Cost effective.	Corrosive for some surfaces. Poor stability when exposed to light. Poorly active in the presence of organic debris (e.g. dirt, manure). Can discolor fabrics.	Good for various environmental surfaces. Efficacy decreases with increasing pH, decreasing temperature, presence of ammonia and nitrogen. Reserve high concentration (1:10) for specific circumstances with resistant microorganisms. 1:32-1:50 more commonly used. Never mix with anything. Change diluted solutions daily. Do not store in clear containers.
Potassium peroxymonosulfate (oxidizing agent)	Virkon Trifectant	10 min	Broad spectrum, with activity against non-enveloped viruses and bacterial spores. Active in the presence of moderate organic debris.	Corrosive, especially with metal surfaces.	Commonly used routine disinfectant. Care must be taken when handling concentrated product. Consider rinsing metal and concrete surfaces after required contact time.
Accelerated hydrogen peroxide (oxidizing agent)	Accel Peroxigard	1-10 min	Broad spectrum, with activity against non-enveloped viruses, bacterial spores and ringworm. Good activity in moderate organic debris. Low toxicity. Biodegradable. Does not appear to be corrosive, unlike other oxidizing agents	More expensive than other options.	Excellent choice for environmental disinfection.
Quaternary ammoniums	Various	10-30 min	Low cost. Low toxicity. Stable under storage. Good against gram negative and many gram positive bacteria, and enveloped viruses.	Limited impact on non-enveloped viruses, bacterial spores, ringworm. Inhibited by organic debris.	Common environmental disinfectant, but spectrum may be inadequate for some situations.

Appendix 6:

Example Reportable Surveillance Conditions for Use by Canine Group Setting Organizers

Pathogen specific	Case Definition ¹
Canine influenza virus	CONFIRMED • Consistent clinical signs (cough +/- fever, lethargy, mucus discharge from eyes and nose, and; • Laboratory evidence of infection² SUSPECTED • Compatible clinical signs (see above), and; • Linked to a confirmed case (i.e. dog had contact with one or more dogs that are confirmed cases and transmission is likely), and; • Untested for the virus or test results are inconclusive
Canine parvovirus	CONFIRMED • Laboratory evidence of infection³ SUSPECTED • Compatible clinical signs, and; • Suspected exposure or vulnerability (young age, unvaccinated)
Syndromes or Non-specific Pathogen Outbreaks	
Acute respiratory disorder	Acute respiratory disorders (e.g., coughing, sneezing, mucus discharge from eyes and nose, labored breathing); without a clear diagnosis
Acute gastrointestinal disorders	Significant diarrhea, vomiting, or abdominal discomfort; without a clear diagnosis
Outbreaks, non-specific	Subjective reporting of cluster of animals with similar signs, apart from diseases listed. Outbreaks may be of an unconfirmed agent or confirmed diagnoses of pathogens not otherwise listed.

1. Examples adapted from: Worms and Germs Map website; County of Los Angeles Veterinary Public Health website. Parvovirus in dogs - case definition; Rupple-Czerniak A, et al. 2013.

2. Evidence includes 4 fold increase in serum antibody, positive nasal or pharyngeal swab PCR, or positive IFA (immunofluorescence antibody assay) on lung tissue.

3. Evidence includes PCR positive feces, rectal swab or intestinal sample, or ELISA positive result on feces, rectal smear or intestinal sample.

Appendix 7:

Checklist for Dog Group Setting Organizers

Area/Item	Level Implemented	Comments
F=Fully, P=Partially, N=Not implemented, NA=Not applicable		
GENERAL RECOMMENDATIONS		
Veterinarian available to help develop and implement protocols	F P N NA	
Training for all involved staff on protocols (documented and assessed)	F P N NA	
Policy excluding dogs suspected to have an infectious disease	F P N NA	
Policy requiring valid health certificates for dogs traveling from out of the state, province, or country, as indicated by municipal requirements	F P N NA	
Risk assessment performed and regularly updated	F P N NA	
Infection prevention and control plan developed and followed	F P N NA	
Requirements for involvement clearly stated to participants before arrival	F P N NA	
VACCINATION RECOMMENDATIONS		
Requirement for dogs to be up to date on recommended core vaccinations (see text)	F P N NA	
Requirement for minimum of a single dose of vaccines prior to entry, with adequate time for immunity	F P N NA	
Requirement for vaccinated against rabies (per jurisdictional laws)	F P N NA	
If young dogs involved, special attention to other preventive measures addressed	F P N NA	
Noncore vaccines suggested based on setting and time of year	F P N NA	
Vaccination status individually verified	F P N NA	

Area/Item	Level Implemented	Comments
F=Fully, P=Partially, N=Not implemented, NA=Not applicable		
INSECT AND WILDLIFE CONTROL RECOMMENDATIONS		
Efforts aimed at limiting insects, rodents, and other wildlife from accessing the facility or dog housing areas	F P N NA	
Feces, organic debris and garbage immediately removed	F P N NA	
Safe and effective insect and wildlife control program used (buildings, parks, and kennels)	F P N NA	
VECTOR CONTROL AND VECTOR-BORNE DISEASE RECOMMENDATIONS		
Requirement for use of effective flea and tick preventive products prior to and during event (based on season, geography, type of setting)	F P N NA	
Dogs entering settings monitored for ectoparasites (fleas/ticks); if found, dogs treated with a rapid-kill product and excluded from entry until free of the ectoparasite	F P N NA	
Minimal use of surfaces that encourage fleas (carpet, upholstery)	F P N NA	
If American trypanosomiasis is a concern, insecticides used to reduce triatomine bugs	F P N NA	
If outdoor event held in location with high chance of disease from ticks, schedule for when the risk of ticks is lowest	F P N NA	
If outdoor event and high chance for contact with infected ticks, event held away from wooded areas and tall grass	F P N NA	
Grass in outdoor areas where dogs spend time is kept short and free of litter, and brush	F P N NA	
Setting located away from standing water, such as stagnant ponds or catch basins. Human-provided water sources (e.g., water bowls) changed at least twice per week	F P N NA	
ENTERIC DISEASE RECOMMENDATIONS		
Requirement for effective deworming program (based on season, geography, and type of setting)	F P N NA	
Prompt removal and disposal of dog feces encouraged	F P N NA	
Requirement to feed a standard commercial diet that has been processed to reduce foodborne bacteria or thoroughly cooked homemade diet	F P N NA	

Area/Item	Level Implemented	Comments
F=Fully, P=Partially, N=Not implemented, NA=Not applicable		
ENVIRONMENTAL DISINFECTION AND HYGIENE RECOMMENDATIONS		
Cleaning and disinfection program developed and implemented for indoor and outdoor exercise, grooming, and housing areas	F P N NA	
Flooring in the setting made from non-porous material (easy to clean and disinfect)	F P N NA	
Requirement for owners/handlers to bring own items (e.g. bedding, toys, grooming tools) and discouraged from sharing. Equipment and soft goods provided by the setting is for single animal use and is routinely cleaned and disinfected.	F P N NA	
Encourage staff, owners, handlers, and others with dog contact to wash hands or apply an alcohol-based hand sanitizer on entry to and exit from the setting and between contact with each dog	F P N NA	
Hand washing or alcohol-based hand sanitizer stations readily accessible and functional	F P N NA	
Owners required to bathe dogs prior to entry (repeated entries: on a regular basis/whenever debris is visible)	F P N NA	
ADDITIONAL EXCLUSIONARY CONSIDERATIONS		
Dogs originated from or spent time outside Canada and the United States excluded from settings for 2 weeks following their return or entry	F P N NA	
Dogs not formally involved in the setting excluded from the setting	F P N NA	
FACILITY DESIGN AND TRAFFIC CONTROL RECOMMENDATIONS		
High-density kennel situations avoided	F P N NA	
Unnecessary dog-to-dog contact minimized; semipermanent small subgroups established	F P N NA	
Presence of a dedicated isolation area (allows for physical and procedural separation from other dogs)	F P N NA	

Area/Item	Level Implemented	Comments
F=Fully, P=Partially, N=Not implemented, NA=Not applicable		
DISEASE RECOGNITION AND RESPONSE RECOMMENDATIONS		
Surveillance program in place to monitor for infectious diseases, focusing on dogs that develop clinical signs at the setting	F P N NA	
Owners or handlers encouraged to report suspected or confirmed cases of infectious disease that develop in their dogs within 2 weeks of after attending a group event	F P N NA	
Record keeping system used to gather individual dog information (e.g. dates of involvement, location and housing, reported disease concerns, and contact information for owners or handler)	F P N NA	
Staff, handlers, and owners encouraged to visually monitor dog health and report dogs with any of a predetermined set of signs (syndromic surveillance) to the setting coordinator or veterinarian	F P N NA	
Any dog that becomes ill or believed to have an infectious disease immediately removed from the setting	F P N NA	
Dogs exposed to dogs with infectious disease identified	F P N NA	
Susceptible dogs with known exposure to another dog or dogs with infectious disease excluded from the setting for 2 weeks, or as recommended by a veterinarian	F P N NA	
Plan developed for responding to reports of suspected or confirmed infectious disease in dogs involved in the setting (see text)	F P N NA	
Person identified who is responsible for overseeing response actions and communication with the public	F P N NA	

Appendix 8:

Checklist for Owners/Handlers of Dogs Participating in Group Settings

Area/Item	Level of Compliance	Comments
A=Always, S=Sometimes, N=Never, NA=Not applicable		
GENERAL RECOMMENDATIONS		
You would stop participation for any dogs suspected to have an infectious disease	A S N NA	
You obtain valid health certificates for dogs when traveling from out of the state, province, or country as indicated by setting/municipal requirements	A S N NA	
You perform a risk assessment (and regularly update) for types of settings in which participate	A S N NA	
You review and follow requirements for setting involvement	A S N NA	
VACCINATION RECOMMENDATIONS		
You ensure all dogs are up to date on recommended core vaccinations (see Appendix 3)	A S N NA	
You ensure a minimum of a single dose of vaccines prior to entry, with adequate time for immunity (see Appendix 3)	A S N NA	
You ensure all dogs are vaccinated against rabies (per jurisdictional laws)	A S N NA	
If young dogs involved, you follow special attention to other preventive measures	A S N NA	
You consider noncore vaccines based on setting and time of year (see Appendix 3)	A S N NA	
You carry and provide documentation of vaccination status of all dogs	A S N NA	
INSECT AND WILDLIFE CONTROL RECOMMENDATIONS		
You immediately remove feces, organic debris and garbage at the setting	A S N NA	

Area/Item	Level of Compliance	Comments
A=Always, S=Sometimes, N=Never, NA=Not applicable		
VECTOR CONTROL AND VECTOR-BORNE DISEASE RECOMMENDATIONS		
You use effective flea and tick preventive products prior to and during events (based on season, geography, type of setting)	A S N NA	
You monitor your dogs for ectoparasites (fleas/ticks) and if found treat with a rapid-kill product and exclude from entry until free of the ectoparasites	A S N NA	
ENTERIC DISEASE RECOMMENDATIONS		
You follow an effective deworming program (based on season, geography, and type of setting)	A S N NA	
You feed only a standard commercial diet that has been processed to reduce foodborne bacteria or a thoroughly cooked homemade diet	A S N NA	
ENVIRONMENTAL DISINFECTION AND HYGIENE RECOMMENDATIONS		
You follow a cleaning and disinfection program for indoor and outdoor areas for which you are responsible	A S N NA	
You bring your own items (e.g., bedding, toys, grooming tools) and do not share with others	A S N NA	
You wash hands or apply an alcohol-based hand sanitizer on entry to and exit from the setting	A S N NA	
You bathe your dogs prior to entry (for repeated entries: on a regular basis/ whenever debris is visible)	Y N NA	
ADDITIONAL EXCLUSIONARY CONSIDERATIONS		
For any of your dogs originated from or having spent time outside Canada and the United States – you exclude from settings for 2 weeks following their return or entry	A S N NA	
You only bring dogs formally involved in the setting	A S N NA	
FACILITY DESIGN AND TRAFFIC CONTROL RECOMMENDATIONS		
You minimize unnecessary dog-to-dog contact	A S N NA	

Area/Item	Level of Compliance	Comments
A=Always, S=Sometimes, N=Never, NA=Not applicable		
DISEASE RECOGNITION AND RESPONSE RECOMMENDATIONS		
You report to setting organizer any of your dogs that develop clinical signs of disease at a setting	A S N NA	
You report suspected or confirmed cases of infectious disease in your dogs that develop within 2 weeks of attending a group event	A S N NA	
You provide information as requested by the setting (e.g. dates of involvement, location and housing, reported disease concerns, and your contact information)	A S N NA	
You visually monitor your dog's health and report to setting organizer dogs with any of a predetermined set of signs	A S N NA	
You immediately remove from the setting any of your dogs that become ill or are believed to have an infectious disease	A S N NA	
You exclude from the setting for 2 weeks (or as recommended by a veterinarian) any of your susceptible dogs with known exposure to another dog or dogs with infectious disease	A S N NA	



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