

# ZOONOTIC DISEASE CONSIDERATIONS IN DOGS

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A zoonotic disease is one shared by animals and humans. Diseases can be transmitted by a variety of means including bites, scratches, saliva, feces, urine, inhalation of infectious particles, contact with a transport or intermediate host, exposure to contaminated water, food, soil or vegetation.

Animals can be reservoirs, definitive or intermediate hosts or vectors for disease. There are over 250 known zoonotic diseases of which 30 to 40 involve dogs and cats.

**So far there are no substantiated reports that indicate that healthy, well-cared for and trained therapy dogs pose any greater risk to residents of nursing homes or patients in hospitals than the humans that these people have contact with on a daily basis. There is a higher likelihood of contracting an infectious disease from another human than from a healthy well-groomed dog.**

**Most zoonotic disease can be easily prevented with good hygiene practices. Hand washing/sanitizing is the number one most effective prevention for the spread of any disease!** In some situations where maximum protection is required (immunocompromised individuals, certain areas of hospitals or nursing homes, etc), hand washing/sanitizing can be done before and after contact with the pet to not only prevent contracting a disorder from a pet but to prevent the pet from becoming a vector for human disease transmitted by an infected person touching the dog.

It goes without saying that children, particularly of an age where they will not be aware of safety issues or washing hands, should ALWAYS be supervised around any animal. This is a universal precaution and will not be repeated under the recommendations for prevention with each of the diseases listed in this article.

Healthy, well-groomed dogs can provide a number of important benefits including:

- Counteracting loneliness which as has been noted in several articles as the single most important contributor to premature death
- Lowering blood pressure and heart rate in both children and adults - one study showed increased survival of cardiac patients.
- Benefiting the physical and mental health of children and adults in a variety of situations.

The human population that is at highest risk for contracting zoonotic disease includes individuals who are:

- Immunocompromised
- HIV/AIDs patients
- Pregnant women
- Infants or very young children
- Cognitively impaired
- Post-surgical or who have open wounds
- Asthmatic

The following is a list of zoonotic diseases that can affect dogs and man. I have included a brief outline of pertinent information regarding transmission of disease and prevention. If more detail is needed on each disease I invite you to consult the reference list at the end of this article and get more information. **The most important things to remember are that basic good hygiene practices, being appropriate about where the dogs will be used and keeping dogs in good health will prevent any significant disease situation.**

# GASTROINTESTINAL DISEASES

## PARASITIC

### *Toxacara canis* (Dog Roundworm)

- Adult worms live in small intestine of the host (dog) and can produce 100,000 eggs/worm/day
- Almost 100% of puppies are born infected with *T. canis*
- Infective larva forms 15 or more days after leaving the intestine
- Infective larva that are ingested return to the intestinal tract of the dog and mature in 4 weeks
- **\*Worms cannot be transmitted to dogs or humans through fresh stool since the larva need 15 days to develop into an infective state**
- Transmission to humans is primarily through contact with contaminated soil (sandboxes, gardening, dog parks, etc)
- Humans are an aberrant host and most contact with infective larva do not cause disease
- If infective larva do live long enough in a human to migrate through tissue they may go to the eye, causing retinal disease (ocular larva migrans), or through the viscera causing abdominal pain or allergies (visceral larva migrans)
- Most at risk are children who play in a dog toilet area and put hands in mouth
- **PREVENTION in dogs**
  - Using heartworm medication with anthelmintic monthly
  - Fecal flotation examination at least annually
  - Treat ALL puppies starting at weaning until 12 weeks of age with appropriate anthelmintics
  - Pick up dog stools promptly and dispose of properly (not in compost bin)
- **PREVENTION in humans**
  - Closely supervise children when in potentially infected areas
  - Wash hands after contact with soil/ use gloves when gardening
  - Follow prevention measures in dogs

### *Ancylostoma sp.* and *Uncinaria sp.* (Dog and Cat Hookworm)

- Dog and cat hookworms are not the same species as the human hookworm
- Adults live in the small intestine of the host (dog or cat) and feed on blood
- Eggs passed in stool take 1 to 3 weeks to develop into infective larva
- **\*Worms cannot be transmitted to humans or dogs through fresh stool because larva need 1 to 3 weeks to develop into an infective state**
- Infective larva in dogs can be taken in orally, can penetrate skin or can go through milk or placenta and eventually reach intestine or encyst in muscle
- Human is an aberrant host and most contact with infective larva does not cause disease
- In some people, especially if exposed to large numbers of larva, one of two self-limiting disorders can develop:
  - Cutaneous larva migrans – infective larva penetrate skin, travel a few millimeters and die leaving a red, raised, linear, pruritic tract
  - Visceral larva migrans – infective larva penetrate skin or are ingested and travel briefly and then encyst and die in various organs like lungs or muscle causing pain
- Disease in humans is most common in the South as larva need moisture and warmth
- **PREVENTION in dogs**
  - Same as listed for *Toxacara*

- **PREVENTION in humans**
  - Follow guidelines to keep dog healthy
  - Avoid walking barefoot or in sandals in dog parks, beaches, or dog or cat toilet areas in yard
  - Wear gloves when gardening, have clothing cover when working in crawlspaces

#### ***Dipylidium caninum* (Double-pored Dog Tapeworm)**

- Dogs are the principal definitive host and fleas are the intermediate host (they eat the worm egg and then larva develops)
- Worm must go through transformation in the flea in order to be infective
- Adult worm lives in intestine and produces segments filled with eggs that break off and are passed in stool
- Infestation is transmitted by ingesting an infected flea
- **\*Humans, or other hosts cannot become infected by direct contact with fresh stool, only by ingesting infected flea**
- **PREVENTION in dogs and humans**
  - Examine stools and perianal fur for gross evidence of tapeworm segments
  - Annual fecal flotation for dog
  - Control fleas on dog and in environment

#### ***Giardia spp.***

- Protozoa that is a common cause of diarrhea world-wide – several species
- **\*Giardia may be species-specific and zoonotic potential is unclear and unproven**
- In dogs, disease is not common – if present most often seen in puppies
- Disease in humans most often transmitted through contact with contaminated water such as lakes, hot tubs, pools, municipal water supply or uncooked food washed in contaminated water
- **PREVENTION in humans**
  - **Wash hands after contact with any fecal material (human or otherwise) or contaminated water/proper cleanup of material**
  - Be aware of source of drinking water
  - Wash food with contaminated water and cook properly

#### **Cryptosporidiosis**

- Coccidia lives in GI tract of many mammals including humans – not host specific
- One of the most common causes of watery diarrhea in humans world-wide
- **Not a common disease in dogs**
- Coccidia organisms live in GI tract and pass infective oocysts in stool
- Disease transmitted by ingestion of infected oocysts
- Transmission to humans most commonly through contaminated food or water
- Immunocompromised individuals most at risk
- **PREVENTION in humans and dogs**
  - **Wash hands after contact with any fecal material or fecal contaminated material from any source (human or animal)**
  - Prompt and proper cleanup and disposal of fecal material
  - Annual fecal examination of dog

## BACTERIAL

### *Salmonella spp, Camplobacter spp, E. coli*

- These bacteria may be commonly found in small numbers in “normal” flora of a variety of species of animals including humans – can be passed in stools of clinically normal animals/humans
- Severity of clinical disease is related to the number of bacteria ingested and the amount of toxin produced – some bacterial species are more pathogenic than others – immunocompromised individuals are at highest risk for disease
- Use of antibiotics does not presume removal of all of these bacteria from the GI tract in clinically ill OR clinically normal individuals – in fact inappropriate use of antibiotics can potentially create clinical disease
- **Fecal material from any species including humans should be assumed to contain some pathogenic bacteria and therefore good hygiene protocols should be always used.**
- Humans most likely to contact large number of bacteria from contact with raw meat, improperly cooked food, unwashed fruits and vegetables from questionable sources, not washing hands after using bathroom or contact with fecal material from individuals with vomiting or diarrhea
- **PREVENTION in humans**
  - **WASH HANDS after handling fecal or fecal contaminated material, raw meat or raw meat contaminated items.**
  - Do not allow a dog that has had vomiting or diarrhea to visit a facility until a minimum of 48 hours after returning to normal.
  - Do not take a dog to a facility for a minimum of two hours after a meal – this allows the dog to defecate before the visit and in addition the teeth can be brushed and the muzzle wiped clean if needed.
  - Remove and dispose of any fecal material using proper hygiene
  - Keep pet’s fur free of fecal material
  - Do not kiss a dog on the mouth or allow the dog to lick your mouth
- **Comments on feeding raw diets to dogs**
  - Some preliminary studies indicate that some of the enteric pathogens in raw meat may be passed through into the stool of dogs fed a raw diet
  - The dogs remain clinically normal and the percentage of pathogens is not significantly higher than in some populations of normal dogs fed a non-raw diet.
  - Since ALL fecal material, whether animal or human, should be considered contaminated (and therefore good hygiene should be in place), the possible small increase in pathogens in the stools of some dogs fed a raw diet should not eliminate them from a visitation program
    - A well-trained therapy dog is housebroken and will not defecate in a facility as well as being well-groomed (no fecal material on coat)

## VIRAL

### Calicivirus

- **No proven zoonotic potential**
- Self-limiting disease with recovery usually in 24 hrs.
- One report in a nursing home showed 14 out of 17 residents developed diarrhea and vomiting 24 hrs after a therapy dog visit
- Dog also developed vomiting and diarrhea 24 hr after visit
- Were unable to prove dog was cause – **just as possible dog was mechanical vector carrying virus from one infected resident to others via the coat**

- **PREVENTION in humans**
  - Same recommendations as with bacterial GI disease
  - In addition, consider having residents wash/sanitize their hands BEFORE and AFTER contact with dog to prevent dog from becoming a mechanical vector for transmission of human disease. (Just as facility workers clean their hands before and after handling each patient)

## SKIN DISEASE

### Bite Wounds

- Bite wounds are not specifically a zoonotic disease, but they can be contaminated with a variety of bacteria that can cause a wound infection
- **PREVENTION in humans**
  - A properly certified therapy dog has been appropriately socialized and screened – these dogs are very tolerant of handling, noises and movements - the risk of the dog biting is extremely small
  - Handlers should not put their dogs in situations where the dog will feel the need to defend itself (patients/residents/students hitting the dog, pulling on the dog's hair very roughly, running up to the dog and grabbing it, etc)
    - Certified dog therapy team handlers have been educated on how to protect their dogs in potentially high risk situations
    - In addition, a facility staff member should be present in all situations where multiple patients/ residents/ students are going to be gathered to help manage and monitor the situation
    - A facility staff member should be present with any patient/student/resident that is moderately to severely cognitively impaired during a therapy dog visit to help manage the situation

### Dermatophytosis – (Ringworm)

- *Microsporum canis*, *Microsporum gypseum*, *Trichophyton mentagrophytes* are common superficial skin diseases of animals and humans worldwide.
- These organisms are fungi and are most common in warm humid climates – they can also be found in the soil
- The fungi live on the hair and skin and produce infective spores enclosed within the hair shaft which then breaks off and contaminates the environment
- Transmission is by direct contact with infective spores
- Not a common disease in dogs – most often seen in newly acquired pets or immunocompromised dogs
- Cats are more commonly carriers than dogs – estimated only 8% of dogs are clinically normal carriers
- Easily treated in all species – this is a superficial infection
- **PREVENTION in dogs and humans**
  - Daily observation of dog's skin and coat – obtain veterinary attention for any abnormalities
  - Dogs with skin lesions should not be allowed to visit a facility
  - Wash/sanitize hands after handling dogs

### ***Malassezia dermatitis* – (Yeast Skin Infection)**

- This is a common yeast found on both normal and abnormal skin of dogs, cats, man and other species world-wide
- Disease is caused by overgrowth of yeast and inflammation of the skin and is most common in immunocompromised individuals
- Disease characterized by pruritus, skin inflammation and thickening
- **\*Zoonotic potential suspected but not definitively proven**
  - Exposure to normal skin flora of dogs is **NOT a risk because numbers of organisms are too low to cause problem**
- **PREVENTION in dogs and humans**
  - Wash hands after handling dogs, particularly if they have skin inflammation
  - Do not use dogs in therapy program with any inflammatory skin lesions, open wounds or otitis externa

## **PARASITIC**

### **Fleas**

- Over 2000 species of fleas world-wide but only a few affect dogs and cats
- Zoonotic importance:
  - Adult fleas prefer their natural host but newly emerged fleas will feed on any warm-blooded host – leading to red, pruritic bumps particularly on ankles, lower legs and arms
  - Fleas can act as vectors for certain blood borne diseases – this is **RARE** in the dog but more common in other mammal hosts
  - Fleas are the intermediate host for the dog tapeworm (see earlier section)
- **PREVENTION in dogs and humans**
  - Monthly topical flea prevention for dogs starting one month before and ending one month after flea season or year round as indicated by climate
  - Treat environment if there is flea infestation already present

### **Ticks**

- Ticks are not species specific and will feed on any warm-blooded animal
- Zoonotic importance:
  - Ticks are vectors for blood borne disease
  - In some cases, the dog is a reservoir of disease, in other cases the dog is only the host for the tick
- Tick bites can cause local irritation, nodular reactions, pain, hypersensitivity reactions and rarely neurological reactions (tick paralysis).
- **PREVENTION in dogs and humans**
  - Use topical flea prevention in dogs starting one month before and ending one month after tick season or year round as indicated by climate
  - Examine dog daily, particularly around head and neck area for ticks and remove promptly and properly – dispose of tick properly – **wash hands after handling tick**
  - Control ticks on humans directly through use of protective clothing and insect repellent if traveling in tick infested areas

### *Otodectes cynotis* (Ear mite)

- Primarily found in ear canal of infected dogs – easy to diagnose and treat
- Mites are not host-specific and can rarely establish themselves on humans through direct contact causing a temporary, self-limiting papular eruption and pruritus
- **PREVENTION in dogs and humans**
  - Prompt veterinary attention for any ear disease
  - Treat all pets in household if any are positive for ear mites – wash hands after treatment
  - Use of monthly topical flea and tick prevention will prevent infestation by ear mites
  - Dogs with ear infections should not be allowed to visit a facility

### *Sarcoptes scabiei* var. *canis* (Canine Scabies)

- Highly infectious mite that prefers dog as host
- Mites can occasionally live temporarily on humans causing intense pruritus and papular eruption primarily on hands, arms and abdomen – disease self-limiting – mites can only live for up to six days on aberrant host
- **PREVENTION in dogs and humans**
  - Get veterinary attention for dogs with skin lesions - treat all dogs in household if one is positive for scabies
  - Use of monthly flea/tick prevention on dog will prevent mite infestation
  - Dogs with skin lesions should not be allowed to visit a facility

### *Cheyletiella* sp (Fur mite or “Walking Dandruff”)

- Highly contagious mite that can infect a wide range of mammals including dogs
- In humans disease can be characterized by red, raised lesions on the arms, trunk and buttocks which develop into yellow-crusted lesions that are intensely pruritic – disease in humans is self-limiting
- **PREVENTION in dogs and humans**
  - Use of monthly topical flea/tick prevention will prevent AND treat mite infestation
  - Dogs with skin lesions should not be allowed to visit a facility
  - Wash hands after handling dog with skin or fur lesions

### Lice

- **\*Lice are species-specific therefore dog lice are NOT a source of infestation in humans – there is NO zoonotic potential**

## MISCELLANEOUS

### Poison Ivy, Oak or Sumac

- **Not a true zoonotic disease but dog can act as a transport media (hair coat) for urushiol oil from plant**
- Urushiol oil does not appear to cause disease in dogs
- Allergy to this substance is one of the most common allergies in the U.S. affecting over 50% of the population
- **PREVENTION in humans**
  - Do not allow dog to have contact with these plants prior to a visit to a facility

- Any time there is suspected contact by dog with these plants, thoroughly wash dog with copious amounts of soap and water and include any leashes, collars, blankets or other gear that might have had contact with affected dog or plants

## HEMOTOLOGIC DISEASE

### GENERAL

- **These diseases are not directly transmitted from animals to man – they need an insect vector**
- Dog may only be host for vector or may additionally be reservoir or host for disease

### *Borrelia burghdorferi* – (Lyme Disease)

- Bacterial disease carried by ticks – dogs are host for ticks, can become infected but are not a reservoir of disease
- Ticks must be attached for 36 hours before bacteria can be transferred to blood
- Lyme disease can affect a wide variety of species including humans
- **PREVENTION in humans and dogs**
  - Use of monthly topical tick prevention on dog during tick season or year-round as climate dictates
  - Daily examination of dog or human for ticks and prompt and proper removal and proper disposal – **wash hands after handling ticks**
  - Use of Lyme disease vaccine in dogs is controversial and is not universally recommended – its use is not indirectly or directly protective for humans

### Leishmaniasis

- Protozoal parasite transmitted by sand flies – dog is major reservoir world-wide for disease but **no direct transmission to humans**
- Disease still very rare in the U.S.
- **PREVENTION in humans**
  - Use of insect repellants in areas infested with sand fleas

### *Dirofilaria immitis* – Dog Heartworm

- Dog heartworm (a filarial worm) is not the same species as the human heartworm
- Dogs, cats, coyotes, foxes, wolves and ferrets are definitive hosts – humans are aberrant hosts
- Larva must go through development in mosquitoes to become infective – mosquitoes transmit the disease to another host
- Lesions in humans are rare – caused by infective larva living long enough to migrate to lungs before dying
  - Body's response to dead larva causes "coin" lesion of scar tissue in lung
  - No clinical disease is caused, however "coin" lesion may occasionally be misdiagnosed as neoplastic lesion
- **PREVENTION in dogs and humans**
  - Monthly heartworm prevention in dogs starting one month before and ending one month after mosquito season or year round depending on climate
  - Protective clothing and insect repellants in humans during mosquito season

# MISCELLANEOUS DISEASE

## Allergies

- Allergies to animals are caused by an immune reaction to an allergen in animal dander, saliva or urine
- Allergic reaction may be immediate or delayed up to 12 hours
- This is not specifically a zoonotic disease, but the immune response is brought about by contact with animals
- Humans with asthma are most at risk of a serious allergic reaction
- **PREVENTION in humans**
  - Avoid contact with pets if known allergic reaction or asthma exists
  - Frequent bathing of pet (no more than once weekly for the health of the pet) will reduce but will not remove all allergens
  - Use of special air filters or air cleaning systems will reduce allergens as well as frequent cleaning of the environment and reducing the use of carpeting

## Rabies

- Rhabdovirus that can be carried by any warm-blooded animal
- From 1980 to 1997 33% of rabies in humans were due to exposure outside the US
- 85% of all reported cases of animal rabies in the US are in bats (the majority), raccoons, skunks, foxes and coyotes – NOT PETS
- Disease transmitted through contact with infected saliva - either contaminating a wound or through contact with mucous membranes
- **PREVENTION in humans and dogs**
  - Keep dogs current on rabies vaccinations – provides barrier to infected wildlife

## Leptospirosis

- Caused by spiral-shaped bacteria found world-wide in a variety of species of wild and domestic animals (most commonly farm animals)
- Bacteria is shed in urine of infected animals
- Transmission occurs when bacteria comes in contact with mucous membranes or broken skin
  - **Disease is not spread directly from human to human or dog to human without urine contact**
- Humans most commonly contract the disease through environmental contact with contaminated water
  - Streams, rivers, ponds, lakes especially in agricultural areas or sewage contaminated areas
  - Moist soil contaminated with animal urine (more common in tropics)
- Both dogs and humans can develop clinical disease
- *Leptospira* vaccines for dogs are available but do not cover all serovars that may be in environment and have a higher rate of anaphylactic reactions
  - Are recommended based on risk factors in dog's environment
- **PREVENTION in humans and dogs**
  - Avoid contact by dogs or humans with potentially contaminated water sources for swimming or drinking
  - Vaccinate dog with *Leptospira* vaccine if living in high risk area
  - Use gloves when cleaning up urine if there are abrasion on the hands
  - Wash hands after contact with urine

### **Methicillin Resistant *Staphylococcus aureus* – MRSA**

- MRSA is an increasing problem in hospitals, nursing homes and around immunocompromised individuals
- **\*Currently pets are not considered a significant health risk as a cause for primary MRSA infections for healthy individuals**
- **Zoonotic potential for MRSA is unclear** – colonization in pets may be acquired from humans initially
- A few cases reported where both humans and pets had concurrent MRSA infections/colonization which were persistent until both species were treated – unclear where MRSA started
- Clinical cases of MRSA infections in dogs (although rare) are acquired:
  - through contact with MRSA infected human
  - post-surgically at veterinary hospitals after surgery (infected post-surgical wound) or in ICU where original source of MRSA is unclear (humans? other animals?)
- **PREVENTION in humans**
  - Dogs living with immunocompromised individuals or visiting areas of hospitals or nursing homes with MRSA infection history may need to demonstrate negative paired nasal/rectal cultures for MRSA done on a routine basis
  - If human is diagnosed with MRSA, perform paired nasal/rectal cultures on ALL pets in household to detect potential reservoirs of infection
  - USE ANTIBIOTICS RESPONSIBLY in humans and pets

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