Pet ADVOCACY NETWORK

ZOONOTIC DISEASE PREVENTION SERIES FOR RETAILERS

Pet ADVOCACY NETWORK

Dear Pet Retailer:

This document, the **Zoonotic Disease Prevention Series for Retailers**, contains a series of informational flyers describing some important, but not well known, zoonotic diseases that can be transmitted between companion animals and people. They were developed to inform retail store staff about the nature of these zoonotic infections and how to reduce the risk of infection.

These resources were produced by members of the Pet Advocacy Network's (formerly PIJAC) Zoonoses Committee, a select group of industry professionals, veterinarians, and public health experts, in 2016-17, and reviewed and updated in 2021. Two new flyers, on Hookworms and Toxocariasis were created and added in 2021.

The zoonotic diseases in this series are:

- Atypical Mycobacteriosis
- Campylobacteriosis
- Giardiasis
- Hookworms
- Lymphocytic Choriomeningitis
- Psittacosis/Avian Chlamydiosis
- Rat Bite Fever
- Ringworm
- Salmonellosis
- Seoul Virus
- Toxocariasis
- Toxoplasmosis
- Zoonotic Diseases in Dogs and Cats

Zoonotic diseases have become a more prominent issue in the pet care community, in some cases resulting in legal action against retailers. Even though the risk of illness is relatively small for most zoonotic infections, we believe it is important to take steps to protect the health of retail staff and pet owners.

This series is intended for retail store associates, who generally are more knowledgeable about a variety of pets and are at risk of exposure due to repeated contact with the animals and their environment. Although the flyers present guidance on disease prevention in the retail environment, much of the advice applies to the public as well, and front-line staff may find the information valuable when interacting with and educating customers.

Although these flyers are not designed for public distribution, you may wish to consider developing some form of consumer education at the time of purchase/adoption based on the

key messages in this series and through the trusted public health websites provided here as references. We suggest you include:

- Name of disease
- Disease-causing organism (e.g., bacteria, virus, fungus, parasite)
- Pets that can carry the disease
- How the disease spreads to people
- Symptoms of disease in humans and pets (if any) – including timing and progression
- General notes on treatment in humans and pets (if any) – we believe specific treatment regimens should be left to medical and veterinary professionals
- Guidance on steps to lower the risk of diseases spreading to people
- References to additional information, including public health websites such as the Centers for Disease Control and Prevention's (CDC) Healthy Pets, Healthy People: https://www.cdc.gov/healthypets/index.html

Additional information on animal care and zoonotic disease prevention can be found on our website **petadvocacy.org**.

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Zoonotic Disease Prevention Series for Retailers

Campylobacteriosis

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Disease Vectors

Campylobacteriosis is a bacterial disease typically causing gastroenteritis in humans. Several species of *Campylobacter* may cause illness in livestock (calves, sheep, pigs) and companion animals (dogs, cats, ferrets, parrots). Among pets, dogs are more likely to beinfected than cats; symptoms present primarily in animals less than 6 months old. Some apparently healthy dogs and cats can be infected and spread the bacteria without showing symptoms. Most cases of human campylobacteriosis result from exposure to contaminated food (particularly poultry), raw milk, or water, but the bacteria may be spread through the feces ofcompanion animals, typically puppies or kittens recently introduced to a household.

The principal infectious agent in human cases, *C. jejuni*, is common in commercially raised chickens and turkeys that seldom showsigns of illness. Dogs and cats may be infected through undercooked meat in their diets or through exposure to feces in crowded conditions. *Campylobacter* prevalence is higher in shelters than in household pets. *Campylobacter* infection should be considered in recently acquired puppies with diarrhea.

Symptoms, Diagnosis & Treatment

Symptoms of *Campylobacter* infection in humans typically occur 2-5 days after exposure and include diarrhea (sometimes bloody), cramping, abdominal pain, fever, nausea and vomiting. In the vast majority of cases, the illness resolves itself without treatment, generally within a week, and antibiotics are seldom recommended. Symptoms may be treated by increased fluid and electrolyte intake to counter the effects of diarrhea. In people with weakened immune systems, infectionmay spread throughout the body through the bloodstream, and medical treatment including hospitalization may be necessary. Long-term complications, though uncommon, may occur including a type of arthritis or Guillain-Barré syndrome, a rare autoimmune disease that can lead toparalysis.

Symptomatic dogs and cats have diarrhea that may be bloody with mucus and sometimes bile-stained, reduced appetite and vomiting. In dogs less than 6 months old, diarrhea typically lasts 3-7 days, returning intermittently up to two weeks. Some apparently healthy dogs and cats can be infected and spread the bacteria without showing symptoms.

Diagnosis in humans and companion animals involves laboratory culture of fecal samples or culture-independent diagnostic methods.

Antibiotic resistance has been documented among various *Campylobacter* species and subspecies. Therefore treatment should be under the direction of a veterinarian. Typically, antibiotic therapy is reserved for young animals or pets with severe symptoms, but treatment of symptomatic pets may be appropriate in households to reduce the risk of human infection. Along with treatment, puppies and dogs with *Campylobacter* should be isolated to prevent the spread of the bacteria. *Campylobacter* infections are often self-limited and supportive care is often the only treatment needed. If puppies or dogs are determined to be in need of antibiotics, treatment should be guided by antimicrobial resistance testing.

Prevention

- Wash hands with soap and water immediately after handling pets.
- Symptomatic pets:
  - ◊ Disinfect enclosure, food and water bowls.
  - ◊ Immediately clean up feces; wear disposable, waterproof gloves during cleanup.
  - ◊ Regularly clean/disinfect bedding.
- Don't feed raw meat diets or raw milk to pets.
- Keep pets out of kitchen and food preparation areas.
- Young children should always be supervised in hand washing after handling pets.

References

CDC: Campylobacter (https://www.cdc.gov/campylobacter/index.html), Healthy Pets Healthy People (https://www.cdc.gov/healthypets/)
Medscape (https://emedicine.medscape.com/article/213720-overview): Campylobacter Infections
Medline Plus (http://medlineplus.gov/ency/article/000224.htm): Campylobacter infections
Overview of Enteric Campylobacteriosis, Merck Veterinary Manual, http://www.merckvetmanual.com/digestive-system/enteric-campylobacteriosis/overview-of-enteric-campylobacteriosis

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Giardiasis

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Disease Vectors

Giardiasis is an intestinal infection caused by *Giardia duodenalis* (also known as *Giardia intestinalis* and *Giardia lamblia*), a parasite that commonly affects humans, dogs and cats. The risk of a zoonotic infection from companion animals is thought to be low because the type of *Giardia* that infects humans is usually not the same type that infects dogs and cats. Spread of this illness occurs through exposure to *Giardia* cysts shed in feces, ingesting the cysts directly, or from contaminated food or water. *Giardia* can survive for several weeks in moist, cool soil. Giardiasis is not spread through contact with blood.

Symptoms, Diagnosis & Treatment

Giardiasis symptoms typically appear one to two weeks after exposure. Clinical illness in humans, dogs and cats is similar and usually includes diarrhea accompanied by bloating, abdominal discomfort, nausea and vomiting.

Puppies and kittens are more likely to be infected, and most adult dogs in the U.S. do not have *Giardia* due to regular checkups and treatment. Giardiasis spreads readily in dogs and cats in crowded conditions such as kennels and shelters. Some animals may have been exposed to *Giardia* but do not have symptoms because the parasite may be eliminated or be present in a chronic asymptomatic state. Because symptoms of giardiasis in dogs and cats may indicate several illnesses, diagnosis should be made by a veterinarian.

There are no over-the-counter treatments for giardiasis in dogs and cats (CDC.gov); effective drug treatment must be done under veterinary care. Typically, dogs and cats are treated on an outpatient basis unless the animal has becomesick and weak. Prescription drugs may be combined with bathing to reduce the likelihood of repeat infection. Repeat fecal exams are often required to confirm that the infectionhas been cured (PetMD.com). To prevent re-infection during treatment, clean the pet's area frequently. Remove any fecal material and sanitize any surfaces the pet has had contact with (water/food bowls, toys, bedding, floors):

- Steam cleaning: 158°F (5 minutes) or 212°F (1 minute, 3 minutes at elevations>6500 feet).
- Dishwasher safe toys, water and food bowls: dishwasher with dry cycle or final rinse at least 113°F (20 minutes), 122°F (5 minutes,) or 162°F(1 minute).
- Disinfection: quaternary ammonium compound, chlorine bleach solution (3/4 c bleach to 1 gal water), accelerated hydrogen peroxide, or other products labeled for *Giardia*. Follow label directions for contact time.
- *Giardia* cysts do not survive desiccation (drying out); allow allsurfaces to dry thoroughly after cleaning.

Prevention

Although the risk of contracting giardiasis from dogs and cats is thought to be small, good hygiene should be practiced, particularly with a symptomatic pet:

- Wash hands with soap and warm water after contact with the pet.
- Wear gloves when cleaning pet bedding or other
- contact areas.
- Remove fecal material daily.
- Limit pet exposure to symptomatic companion animals.

References

Giardia and Pets http://www.cdc.gov/parasites/giardia/prevention-control-pets.html
Companion Animal Parasite Council: https://capcvet.org/guidelines/giardia/
Merck Veterinary Manual:
http://www.merckvetmanual.com/mvm/digestive_system/giardiasis/overview_of_giardiasis.html
Giardiasis in Dogs and Cats http://www.petmd.com/dog/conditions/infectious-parasitic/c_multi_giardiasis
CDC Healthy Pets Healthy People: https://www.cdc.gov/healthypets/

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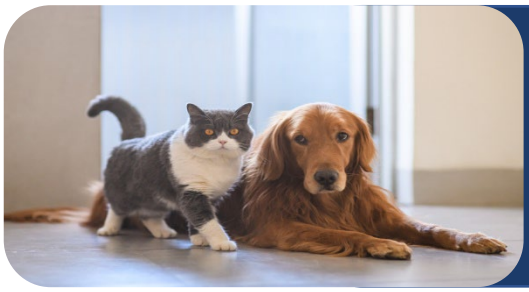

Zoonotic Disease Prevention Series for Retailers

Hookworms

Disease Vectors

Zoonotic hookworms are hookworms that live in animals but can be spread to humans. Dogs and cats can become infected with several hookworm species, including *Ancylostoma braziliense, A. caninum*, and *Uncinaria stenocephala*. The eggs of these parasites are shed in the feces (poop) of infected animals and can end up in the environment, contaminating the ground where the animal defecated. People become infected when the hookworm larvae penetrate unprotected skin, especially when walking barefoot or sitting on contaminated soil or sand.

Symptoms, Diagnosis & Treatment

The most significant signs of hookworm in dogs are related to intestinal distress and anemia. The parasites anchor themselves to the intestinal lining so that they can feed on tissue fluids and blood. Pale gums and weakness are common signs of anemia. Some dogs with hookworm infection experience significant weight loss, bloody diarrhea, dull and dry hair coat, or failure to grow properly. Dogs may also exhibit coughing in severe cases. It is not uncommon for young puppies to die from severe hookworm infections. Signs of hookworm infection in cats include anemia, blood in the stool (a black 'tarry' appearance to the stool), a dull and dry coat, and weight loss. For dogs and cats, skin irritation and itching, especially of the paws, can be signs of a heavily infested environment, since the larvae burrow into and along the skin.

Zoonotic hookworm infections in people result in a skin condition called cutaneous larva migrans (CLM). People are infected when animal hookworm larvae penetrate the skin, causing skin inflammation that is red and itchy. Raised, red tracks appear in the skin where the larvae have been and these tracks may move in the skin day to day, following the larvae's movements. The symptoms of itching and pain can last several weeks before the larvae die and the reaction to the larvae resolves. In rare cases, certain types of animal hookworm may infect the intestine and cause abdominal pain, discomfort, and diarrhea.

If you think you have CLM, talk to your health care provider, who will look for the characteristic signs and symptoms and ask about exposure history to zoonotic hookworm. There is no blood test for zoonotic hookworm infection. The animal hookworm larvae that cause CLM) usually do not survive more than 5 – 6 weeks in the human host. In most patients with CLM, the signs and symptoms resolve without medical treatment. However, treatment may help control symptoms and help prevent secondary bacterial infections. Antiparasitic treatments may be prescribed by a health care provider.

Prevention

- Have puppies and kittens dewormed by your veterinarian at an early age. Puppies and kittens may need to be dewormed more than once. Follow your veterinarian's advice on how frequently puppies and kittens need to be tested and treated.
- Start or keep your pets on a medication program that prevents, treats, and controls these worms. Your veterinarian can recommend treatments to eliminate and help prevent these worm infections. Since these products are available in many forms, you and the veterinarian can choose which one works best for your dog or cat. Ask for the product that is most effective against the worms that are most common in your area.
- Avoid touching soil, sand, plants, and other objects that might be contaminated by animal feces. Wear shoes and take other protective measures to avoid skin contact with contaminated sand or soil.
- Wash your hands with soap and water after playing with your pets or other animals, after outdoor activities, and before handling food or eating.
- Teach children the importance of washing hands to prevent infection.
- Teach children that it is dangerous to eat dirt or soil.
- Keep play areas, lawns, and gardens around your home free of animal feces. Cover sandboxes and restrict animal access to play areas.

- Do not allow children to play in areas that are soiled with pet or other animal feces.
- Clean your pet's living area at least once a week. Feces should be either buried or bagged and disposed of in the trash. Wash your hands after handling pet waste.

References

https://www.cdc.gov/parasites/hookworm/
https://www.cdc.gov/parasites/resources/roundworms_hookworms.html
https://vcahospitals.com/know-your-pet/hookworm-infection-in-dogs
https://vcahospitals.com/know-your-pet/hookworm-infection-in-cats

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Zoonotic Disease Prevention Series for Retailers

Lymphocytic Choriomeningitis

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Disease Vectors

Lymphocytic choriomeningitis is a disease that develops after infection with the lymphocytic choriomeningitis virus (LCMV). The virus primarily spreads to people through contact with urine, feces, saliva or blood from the house mouse (*M. musculus*), wild or captive bred, which is the natural reservoir for this virus (Edling 2011). High densities of infected mice, which may be present during an outbreak in a breeding colony, may lead to aerosol transmission of the virus to humans. Syrian hamsters (*Mesocricetus auratus*) also carry LCMV, and in rare instances, rats, guinea pigs, or other rodents may become infected from contact with infected mice or hamsters. It is estimated that 5% of wild house mice in the U.S. carry LCMV (CDC 2013), although this can vary by location; locally, 9% of house mice in Baltimore, MD were found to have antibodies to the virus (Edling 2011), suggesting that they had previously been infected with the virus. Among house mice and hamsters, LCMV can spread from infected dams to their babies during pregnancy and after birth, perpetuating the prevalence of the virus in wild and captive populations. Infected mice and hamsters can shed the virus for several months or throughout their lives, and there is no vaccine or treatment.

Symptoms, Diagnosis & Treatment

Typically, human exposure to the virus results in an asymptomatic or mild illness (aseptic meningitis) without need for treatment. Some patients, however, may experience a variety of symptoms including fever, headache, muscle aches, loss of appetite, and nausea. After a few days of apparent recovery, the fever may return along with symptoms of meningitis such as headache and stiff neck. If symptoms reappear you should contact your doctor.

Infection during pregnancy has been associated with severe problems in the fetus, including hydrocephalus, chorioretinitis and mental retardation (CDC 2013). Although the disease in healthy adults is rarely fatal, three organ transplant recipients died after receiving infected tissues; the organ donor had been exposed to an infected pet hamster (Amman 2007).

Currently, blood tests are commercially available that can detect the virus or antibodies to LCMV in mice. Post-mortem sampling of tissues (kidney, liver, and spleen) is most effective for virus testing, while serum or whole blood is used to detect antibodies. Edling (2011) has investigated the feasibility of testing breedingstock in commercial facilities using environmental swabs for genetic analysis.

Prevention

Pet owners should wash their hands with soap and running water after handling pet rodents, live or frozen feeder rodents, their cages or bedding. Cages should be cleaned in a well-ventilated area that is not used for food preparation. Pet rodents should not be nuzzled close to your face. Pregnant women and those with weakened immune systems should avoid contact with pet and wild rodents.

Staff training should include general information on LCMV including how the virus spreads to people. Appropriate personal protective equipment should be used, depending on the task performed. It is recommended that protective outerwear, gloves, and facial protection, including goggles and a NIOSH-certified and fit-tested N95 respirator be worn during power washing ofrodent areas or equipment. Stress the importance of handwashing with soap and running water after handling animals. Staff should be encouraged to tell their healthcare provider that they work with rodents if they become ill with a febrile illness (marked or caused by a fever) or symptoms of meningitis.

Prevention and control of LCMV infection in rodents is the key to preventing occupationally-acquired LCMV at culture/distribution facilities. Barriers to the entry of wild mice (e.g., secure doors, windows, drains) are recommended, and facilities should maintain an active pest control program (e.g., rodent traps at the perimeter of the facility, in rodent rooms, and in areas where feed is stored). In the case of breeding anddistribution facilities for feeder mice, secure confinement of stock is recommended to decrease the opportunity for contact with wild mice.

Noteworthy Cases

In 2012, CDC investigated a rodent breeding facility where a staff member developed aseptic meningitis that was caused by LCMV infection. Subsequent testing revealed that 13 of 52 employees had current or past infection. Five employees sought medical treatmentand four of these were diagnosed with aseptic meningitis. LCMV antibodies were identified in 21% of frozen mice from the facility, leading to a quarantine of the facility including a hold on further shipments of rodents, depopulation of all live mice, and disposal of frozen mice. Live mice had been shipped to 21 states, but to date no further LCMV infections have been reported.

References

Amman, B. R., B. I. Pavlin, C.G. Albariño, J. A. Comer, B. R. Erickson, J. B. Oliver, T. K. Sealy, M. J. Vincent, S. T. Nichol, C. D. Paddock, A. J. Tumpey, K. D. Wagoner, R. D. Glauer, K. A. Smith, K. A. Winpisinger, M. S. Parsely, P. Wyrick, C. H. Hannafin, U. Bandy, S. Zaki, P. E. Rollin, And T. G. Ksiazek. 2007. Pet Rodents and Fatal Lymphocytic Choriomeningitis in Transplant Patients. Emerging Infectious Diseases 13(5): 719-725.

Centers for Disease Control and Prevention. Lymphocytic Choriomeningitis (LCMV). http://www.cdc.gov/vhf/lcm/

Edling, T. M. 2011. Screening for lymphocytic choriomeningitis virus in pet industry rodents. M.S. Thesis, Johns Hopkins Univ., April 29, 2011. 25 pp.

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Zoonotic Disease Prevention Series for Retailers

Psittacosis/ Avian Chlamydiosis

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Disease Vectors

Psittacosis is an infection spread to humans from birds, caused by the bacterium *Chlamydia psittaci*. The infection is called avian chlamydiosis in birds and has been found in over 460 species (NAHSPV 2016) and caused symptoms in roughly 150 species (Eidson 2002). As the scientific name implies, this disease is more common among members of the parrot family with 57 species susceptible, especially cockatiels and parakeets (budgies). However, the infection also occurs in pigeons, all species of poultry, and shore birds.

The primary way the bacteria spreads to people is from breathing dried secretions or excretions from infected birds, primarily feces, feathers or other contaminated material that becomes airborne. Spread may also occur via mouth-to-beak contact and from handling infected birds. Although it is possible, person-to-person spread of psittacosis is thought to be rare (NASPHV 2016). Those at risk include pet bird owners and breeders, pet shop employees, zoo employees, poultry workers, veterinarians, diagnostic laboratorians, and wildlife workers.

Symptoms, Diagnosis & Treatment

Psittacosis is not a common disease; from 2006-2012, 58 cases were reported to CDC although it is likely that additional asymptomatic or mild cases were not diagnosed or reported (CDC Psittacosis webpage). The disease typically develops 5-14 days after exposure, and symptoms range from mild, non-specific illness to serious respiratory problems including pneumonia; in severe cases, other organs may be damaged. Typically, patients experience flu-like symptoms including fever, chills, headache, muscle aches and dry cough. Antibiotic therapy with tetracycline drugs is effective and full recovery is expected over 2-3 weeks (NAHSPV 2016, Medline 2013). People exposed to birds with avian chlamydiosis should seek medical attention if they develop influenza-like symptoms or other respiratory illnesses.

Clinical signs in birds are often subtle and not exclusive to of *Chlamydia psittaci,* making diagnosis difficult. Clinical signs include ruffled appearance, poor appetite, weight loss, lethargy, respiratory disease, and lime green droppings. Some birds have ocular discharge, leading to the term “one eyed cold” (Long Beach Animal Hospital webpage). Chronically infected birds may have tremors, unusual head movements or paralysis of the legs. Many infected birds show no symptoms of disease but can shed bacteria in droppings and secretions. Doxycycline is the drug of choice for treating avian chlamydiosis; treatment of infected birds should be directed by a veterinarian. Routine use of prophylactic antibiotic treatment is highly discouraged because it may lead to resistant strains of bacteria.

Prevention

The National Association of State Public Health Veterinarians (2016) provides an excellent summary of measures to prevent and control psittacosis and avian chlamydiosis. Some of the key points are:

- Practice good husbandry to reduce stress in pet and store birds**.** Position enclosures to prevent the transfer of fecal matter, feathers, food, and other materials. Exhaust ventilation should be sufficient to prevent accumulation of aerosols and prevent cross contamination of rooms.
- The bottom of the enclosure should be made of a wire mesh. Solid-sided enclosures or barriers should be used if enclosures are adjoining. Substrate/litter that will not produce dust (*e.g.*, newspapers) should be placed underneath the mesh.
- Clean all enclosures, food bowls, and water bowls daily. Soiled bowls should be emptied, cleaned with soap and water, rinsed, placed in a disinfectant solution, and rinsed again before re-use. Enclosures should be thoroughly scrubbed with soap and water, disinfected, and rinsed in clean running water before housing new birds.
- Inform all persons in contact with birds or bird-contaminated materials about potential health risks. Pet store workers and owners of psittacine birds should consider any flu-like symptoms as possible psittacosis and inform their healthcare providers that they have had contact with psittacine birds. Confirmed cases of psittacosis in people should be reported to public health authorities.
- When cleaning enclosures or handling potentially infected birds, caretakers should wear protective clothing,

which includes a smock or coveralls, gloves, eyewear, protective footwear, a disposable surgical cap, and a disposable fitted particulate respirator. Surgical masks may not be effective in preventing transmission of *C. psittaci*.

- Necropsies of potentially infected birds should be performed in a biological safety cabinet. The carcass should be moistened with detergent and water to prevent aerosolization of infectious particles during the procedure.
- To the extent possible, bird enclosures should be placed to prevent the transfer of fecal matter, feathers, food, and other materials.
- Enclosures, bowls, and substrate should be cleaned and/or disinfected often to remove possible sources of infection. Particulate matter should be removed before disinfecting with ammonium compounds, accelerated hydrogen peroxide or bleach.
- Avoid purchasing or selling birds that have signs consistent with avian chlamydiosis.
- Pet stores should avoid housing together birds from different sources and should consider quarantining newly acquired susceptible species.
- Quarantine newly acquired or exposed birds and isolate ill birds in a separate air space from other birds and non-caretakers.
- Birds that have been to shows, exhibitions, fairs, and other events should be quarantined for at least 30 days and tested before they are returned to a group.
- Birds with frequent public contact (*e.g.*, bird encounters, long-term care facilities, schools) should be tested in consultation with a veterinarian to reduce potential human exposure.
- Test birds before they are to be boarded or sold on consignment and house them in a room separate from other birds pending test results.
- To aid in traceback following confirmed psittacosis, records of transactions of susceptible birds should be kept for at least one year.

SPECIFIC MEASURES FOR CLEANING HABITAT OF INFECTED OR EXPOSED BIRDS

- Thoroughly scrub soiled enclosures of infected or exposed birds with a detergent to remove all fecal debris, rinse and disinfect (most disinfectants require 5-10 minutes of contact time), and re-rinse to remove the disinfectant.
- Discard all items that cannot be adequately disinfected (*e.g.*, wooden perches, ropes, nest material, substrate/litter).
- Minimize the circulation of feathers and dust by wet mopping the floor frequently with disinfectants; prevent air currents and drafts within the area.
- Reduce contamination from dust by spraying the floor with a disinfectant or water before sweeping it. A vacuum cleaner or pressure washer may aerosolize infectious particles and should be used with caution.
- Frequently remove waste material from the enclosure (after moistening the material) and burn or double-bag the waste for disposal.

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Centers for Disease Control and Prevention. 2013. http://www.cdc.gov/pneumonia/atypical/psittacosis.html

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National Association of State Public Health Veterinarians (NASPHV). 2016. Compendium of Measures To Control *Chlamydiapsittaci* Infection Among Humans (Psittacosis) and Pet Birds (Avian Chlamydiosis), 2016. 36 pp.

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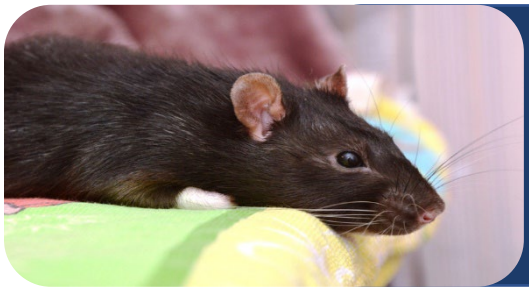

Zoonotic Disease Prevention Series for Retailers

Rat Bite Fever

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Disease Vectors

Rat bite fever (RBF) is a rare disease in North America, caused by the bacterium *Streptobacillus moniliformis*. As the name implies, rats are a reservoir for these bacteria but generally do not exhibit symptoms of illness. RBF has been reported in and transmitted by mice, gerbils, and guinea pigs (CDC 2013, Center for Food Security & Public Health 2013), but rats are the primary source of infection in people. Bacteria are spread to humans through a bite or scratch, from contact with rat secretions, or less frequently by consuming contaminated food or drink.

Symptoms, Diagnosis & Treatment

Symptoms in people appear within three weeks of exposure (typically 3-10 days) and include swelling around the wound, fever,enlarged lymph nodes and a rash on the extremities, typically on the hands and feet. Antibiotic therapy (penicillin, tetracycline) has been effective in treating the infection. However, untreated infections can lead to severe complications and even death.

Following a rodent bite, antibiotics should not be given prophylactically because the disease is rare. If a fever or any of the above symptoms develop within 21 days of close contact with a rodent, the person should notify their health care provider of their contact with a rodent and be evaluated for rat bite fever and treated if appropriate.

In the event of a confirmed case, customers that purchased an animal in contact with the positive rat should be notified. Inventory management and record keeping is important to be able to trace the history and potential exposure of store animals.

Testing rats for *Streptobacillus moniliformis* in a timely manner requires submitting an oral swab to a qualified laboratory for evaluation. There is no known effective treatment in rats, and the likelihood is high that other animals in contact with a positive rat also have the bacteria. Therefore, store owners should strongly consider euthanizing exposed animals, and should contact customers who have purchased rats that were exposed.

Prevention

Adopt handling procedures to minimize the chance for rat bites. Move rats to another cage or enclosure when cleaning their habitat so they do not feel threatened.

Staff regularly handling rats should consider protective gloves, e.g., nylon/PVC coated gloves that are flexible and easily sanitized; inexpensive latex gloves can be worn over the protective gloves and discarded between habitats to prevent cross-contamination. Hand washing with soap and running water is recommended after handling rodents, their cages or bedding.

Store associates involved with rats (feeding, cleaning, etc.) should be provided information on RBF, including the nature of the disease, signs of infection, and what to do following a bite or exposure.

References

Centers for Disease Control and Prevention. Rat Bite Fever. http://www.cdc.gov/rat-bite-fever/

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Zoonotic Disease Prevention Series for Retailers

Ringworm

Pet ADVOCACY NETWORK

Disease Vectors

Ringworm (also called dermatophytosis) refers to a collection of fungal diseases of the skin. Ringworm is a common name that reflects its appearance in skin infections in humans. Species of fungus that cause dermatophytosis in humans fall within three genera that live in the soil or have animal hosts: *Microsporum*, *Trichophyton* and *Epidermophyton*. The first two genera can be zoonotic. In dogs and cats, *Microsporum canis* is the principal cause of dermatophytosis. Several species of *Trichophyton* are zoonotic and originate on dogs, horses, hedgehogs, rodents, rabbits, monkeys and birds; one species (*T. mentagrophytes*) accounts for 10% of canine cases.

Symptoms, Diagnosis & Treatment

Humans

The symptoms of ringworm in humans are itchy, red, raised, scaly patches often with sharply defined edges; the patches are often redder around the outside giving the appearance of a ring. Bald patches result from ringworm in the hair, and discolored nails are seen when the fungus affects the hands and feet (Medline 2013). A number of over-the- counter antifungal medicines are effective in treating ringworm. In cases where topical treatment does not cure the infection, or where ringworm is accompanied by extreme inflammation, prescription oral antifungals combined with steroids are appropriate.

Animals

According to the Merck Veterinary Manual, clinical signs of dermatophytosis in cats are variable but the disease manifests itself in hair loss, scaling and crusting, generally around the ears and face and extremities. Kittens are affected more commonly than adult cats. Some cats will not have symptoms but are still capable of spreading the fungus to humans. In dogs, dermatophytosis often presents as hair loss with scaly patches and broken hairs. In some cases, follicles may become infected and furunculosis (skin boils) develops.

Infection in dogs, cats, guinea pigs and rats often occurs in younger animals and can be self-limiting, but treatment with topical antifungals may hasten recovery. Some evidence suggests that clipping the hair of long-haired cats or cats with generalized dermatophytosis may aid in preventing spreading infection to other pets or to humans.

Prevention

To prevent the spread of fungus, pets with symptoms should be seen by a veterinarian. Wash hands with soap and water after handling pets that may be infected. Because fungal spores may persist in shed skin cells and hair from animals, it is important to clean pet bedding with bleach solution or dispose ofit appropriately. Pets treated for dermatophytosis should be monitored to make sure the infection has been successfully cleared.

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Zoonotic Disease Prevention Series for Retailers

Salmonellosis

Disease Vectors

Salmonellosis is caused by the bacterium *Salmonella*. Although the majority of infections result from contaminated foods, an estimated 11% of all cases are attributed to animal exposure. Even an animal that appears healthy can carry *Salmonella*—you cannot tell simply by looking at your pet if it has *Salmonella*. *Salmonella* is found in the intestinal tract of many animals including reptiles, amphibians, rodents (including frozen feeder mice and rats), live poultry (e.g., chicks, chickens, ducklings, ducks, geese, turkeys), and dogs and cats (bacteria may be shed in feces). Infection may result from hand-to-mouth contact after directly handling animals, as well as after indirect contact through cleaning cages or bedding, handling food or food bowls, or touching other things in the area where the animal lives (Hale 2012). Children are more likely than adults to contract salmonellosis.

Symptoms, Diagnosis & Treatment

Most people infected with *Salmonella* develop diarrhea, fever, and abdominal cramps 12 to 72 hours after infection. *Salmonella* infection has an incubation period of 12–72 hours, and illness usually lasts 4–7 days. Acute uncomplicated gastroenteritis is typical; however, serious illness sometimes occurs. Occasionally, *Salmonella* invades normally sterile sites (e.g., blood, cerebrospinal fluid, bone). Infection is usually diagnosed by culture of a stool sample. In many patients, no treatment is needed.

Antibiotics may be necessary for infections that spread from the digestive system to other parts of the body. Contact your health care provider for more information about treatment.

Prevention

M *Salmonella* can spread from animals to people through hand-to-mouth contact either directly from animals or indirectly through the environment. Indirect spread can occur through contact with anything in areas where animals live or through consumption of food or drink prepared in contaminated environments. Live poultry infected with *Salmonella* typically appear healthy but can intermittently shed bacteria.

In general, salmonellosis from animal contact is preventable by thoroughly washing hands with soap and water after contact with animals or their environments. It is important not to wash food bowls, cages, habitats, and other equipment in the areas where food is prepared.

Pets should always be kept away from food preparation areas. Children are more prone to *Salmonella* infection than adults. Certain pets, such as reptiles, amphibians, and live poultry, are not appropriate in homes with children under 5, adults over 65, and people with weakened immune systems, due to the increased risk of severe complications from salmonellosis.

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Zoonotic Disease Prevention Series for Retailers

Seoul Virus

Pet ADVOCACY NETWORK

Disease Vectors

Seoul virus is one of several hantaviruses that colonize Norway rats and causes Hemorrhagic Fever with Renal Syndrome (HFRS) in humans. Seoul virus is found worldwide; other viruses that cause this disease (Hantaan, Dobrava, Saaremaa, Puumala) are found in Asia and Europe. Wild and pet Norway rats (and black rats) may carry Seoul virus, which can be spread to other rats and humans through exposure to aerosolized urine, feces, or saliva of infected animals, as well as via dust from rat nests or bedding. Other infection routes are through a bite from an infected animal, or direct contact of urine, feces, or saliva into an open wound or human mucous membranes (eyes, nose, mouth).

Symptoms, Diagnosis & Treatment

Symptoms of Seoul virus/HFRS in humans usually develop 1 to 2 weeks after exposure (in rare cases, up to 8 weeks). Initial symptoms begin suddenly and include intense headaches, back and abdominal pain, fever, chills, nausea, and blurred vision. Facial flushing, inflammation or redness of the eyes, or a rash may occur. Severe cases may lead to acute kidney failure or bleeding disorders.

People with exposure to rats and symptoms of HFRS should seek health care. Commercial blood tests are available to detect antibodies to the virus. Local or state health departments may provide or facilitate testing for Seoul virus.

Treatment in humans involves management of fluid and electrolyte levels. Antiviral drugs may be effective in the early stages of the illness. No figures on deaths from Seoul virus are available, but the fatality rate for another virus with moderate symptoms (Puumala) is less than 1%.

Seoul virus is spread between rats through direct contact (e.g., during mating or fighting), or through exposure to soiled bedding and other contaminated materials. Infected rats do notbecome ill and can shed virus in their urine, feces, and saliva throughout their lives. Blood tests available through veterinarians are recommended to confirm Seoul virus in rats. Molecular tests also can detect virus DNA in rats, but because infected animals may not shed virus continuously, this test is not recommended.

Because infected rats continue to shed the virus intermittently and there is no treatment available to eliminate infection, euthanasia is recommended to eliminate the risk of the virus spreading to humans and other rats.

Prevention

- Wash hands with soap and warm water aftercontact with the pet.
- Take steps to prevent contact between wild ratsand pet rats; store your pet's food in a secure container.
- Avoid contact with rat saliva, urine, and feces (including when handling bedding or nesting mate-rial).
- Wear gloves if there is a possibility of contact with saliva, urine, or feces, particularly if a person has skin wounds or abrasions.
- Do not vacuum or sweep rat droppings, urine, or bedding, which can make the virus airborne.
- Follow CDC guidelines for cleaning areas contaminated by infected rats: https://www.cdc.gov/rodents/cleaning/index.html

References

Hemorrhagic Fever with Renal Syndrome (CDC): https://www.cdc.gov/hantavirus/hfrs/index.html

Seoul Virus Frequently Asked Questions (CDC): https://www.cdc.gov/hantavirus/outbreaks/seoul-virus/faqs-seoul-virus.html

Healthy Pets, Healthy People (CDC): https://www.cdc.gov/healthypets/

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Zoonotic Disease Prevention Series for Retailers

Toxocariasis

Disease Vectors

Toxocariasis is an infection that can spread from animals to humans, which is caused by parasitic roundworms commonly found in the intestine of dogs (*Toxocara canis*) and cats (*Toxocara cati*). Dogs and cats infected with *Toxocara* can shed *Toxocara* eggs in their feces. Adults and children can become infected by accidentally swallowing dirt that has been contaminated with dog or cat feces that contain infectious *Toxocara* eggs. People can also get infected from eating undercooked meat containing *Toxocara* larvae (immature worms), although this is rare.

The most common *Toxocara* parasite of concern to humans is *T. canis*, which puppies usually contract from their mother before birth or from her milk. The larvae mature rapidly in the puppy's intestine; when the puppy is 3 or 4 weeks old, the worms begin to produce large numbers of eggs that contaminate the environment through the puppy's feces. After the eggs pass into the environment, it takes about 2 to 4 weeks for infective larvae to develop in the eggs. If a person ingests one of these infective eggs, they can get toxocariasis. Toxocariasis is not spread person-to-person like a cold or the flu.

Symptoms, Diagnosis & Treatment

Adult roundworms live in the affected cat or dog's intestines. Many cats and dogs do not have signs of infection; however, cats and dogs with heavy roundworm infections, especially puppies, can have diarrhea, vomiting, weight loss, dull hair, and a potbellied appearance. Kittens or puppies may cough if the roundworm larvae move into the lungs. Pet owners may notice the adult roundworms in their cat or dog's feces or vomit. The roundworms will appear white or light brown in color and may be several inches long. If you are concerned that your pet may have roundworms, contact your veterinarian. They may take a stool sample, and a roundworm diagnosis is confirmed if eggs are visible in the feces under a microscope.

Many people infected with *Toxocara* do not have symptoms and do not ever get sick. Some people may get sick from the infection and develop the following:

- Ocular toxocariasis: Ocular toxocariasis occurs when *Toxocara* larvae migrate to the eye. Symptoms and signs of ocular toxocariasis include vision loss, eye inflammation or damage to the retina. Typically, only one eye is affected.
- Visceral toxocariasis: Visceral toxocariasis occurs when *Toxocara* larvae migrate to various body organs, such as the liver or central nervous system. Symptoms of visceral toxocariasis may include fever, fatigue, coughing, wheezing, or abdominal pain.

In most cases, *Toxocara* infections are not serious, and many people, especially adults infected by a small number of larvae (immature worms), may not notice any symptoms. Severe cases are rare, but are more likely to occur in young children, who often play in dirt or eat dirt contaminated by dog or cat feces. If you think you or your child may have toxocariasis, you should see your health care provider.

Toxocariasis can be difficult to diagnose because the symptoms of toxocariasis are similar to those of other infections. A blood test is available that looks for evidence of infection with *Toxocara* larvae. In addition to the blood test, diagnosis of toxocariasis includes identifying the presence of typical clinical signs of visceral toxocariasis or ocular toxocariasis and a compatible exposure history. Visceral toxocariasis is treated with antiparasitic drugs. Treatment of ocular toxocariasis is more difficult and usually consists of measures to prevent progressive damage to the eye.

Prevention

- Have puppies and kittens dewormed by a veterinarian at an early age. Puppies and kittens may need to be dewormed more than once. Follow your veterinarian's advice on how frequently puppies and kittens need to be tested and treated.
- Start or keep your pets on a medication program that prevents, treats, and controls worms. Your veterinarian can recommend treatments to eliminate and help prevent these worm infections. Since these products are available in many forms, you and your veterinarian can choose which one works best for your dog or cat.
- Wash your hands with soap and water after playing with your pets or other animals, after outdoor activities, and before handling food or eating.
- Teach children the importance of washing hands to prevent infection.
- Cover sandboxes and restrict animal access to play areas.
- Teach children that it is dangerous to eat dirt or soil.
- Do not allow children to play in areas that are soiled with pet or other animal feces.
- Clean your pet's living area at least once a week. Feces should be either buried or bagged and disposed of in the trash. Wash your hands after handling pet waste.

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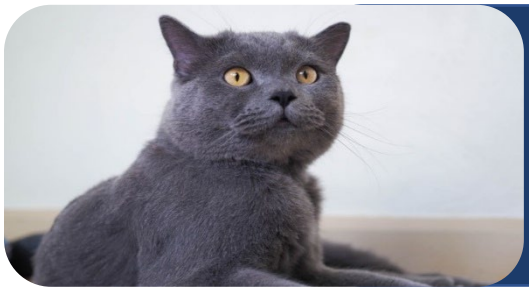

Zoonotic Disease Prevention Series for Retailers

Toxoplasmosis

Pet ADVOCACY NETWORK

Disease Vectors

Toxoplasmosis is caused by the protozoan parasite *Toxoplasma gondii*. Although this parasite is very common in the environment, it rarely causes symptoms in healthy people. Most human exposure is through gardening, consuming undercooked meat of infected intermediate hosts (particularly pork or lamb), or unwashed fruit and vegetables. However, zoonotic spread can occur from accidentally ingesting contaminated cat feces while cleaning a litter box. Women who are infected with toxoplasmosis for the first time during pregnancy or shortly before becoming pregnant can transmit the parasite to their unborn child, which may lead to serious medical problems.

Cats are the definitive host for *T. gondii* (the parasite can complete its life cycle only in felines), but humans and several other animals can be infected with intermediate stages of the parasite. An infected cat will shed oocysts in its feces, starting 3 -10 days after it has been exposed, continuing to shed for up to two weeks. The oocysts become infective 1 - 5 days after shedding. In the environment, oocysts are ingested by rodents, birds, or other animals, which may become prey for cats, completing the parasite life cycle.

Symptoms, Diagnosis & Treatment

Most infected people do not have symptoms. In some cases, flu-like symptoms develop (body aches, swollen lymph nodes, headache,fever, fatigue) that resolve without treatment. However, people with weakened immune systems are at risk for serious complications, and their symptoms can include headache, confusion, poor coordination, seizures, lung problems, and blurred vision. Pregnant women might not have symptoms but can still spread the parasite to their unborn child resulting in stillbirth or miscarriage. Babies that survive often encounter severe symptoms that do not develop until later in life. Closely supervised medical treatment is essential for severely affected patients.

Adult cats with toxoplasmosis often show no signs of illness and require no treatment. In young pets (kittens and puppies) with less developed immune systems, symptoms depend on which tissues are infected and include fever, diarrhea, cough, shortness of breath, itching, and seizures. Cats with feline immunodeficiency virus may develop acute generalized toxoplasmosis. Diagnosis is symptom-based, identification of antibodies to the infection, and microscopic tissue examination.

When a cat has an acute case of toxoplasmosis, veterinarians may prescribe anti-parasitic drugs and/or antibiotics to relieve symptoms and secondary infections; however, this treatment is not a cure, i.e., all parasites are not eliminated. Cat owners should consult with their veterinarians about treatment.

Prevention

Preventing exposure of zoonotic transmission:

- Keep cats indoors; don't allow them to hunt or roam.
- Keep outdoor sandboxes covered.
- Do not allow cats to use a garden or children's play area as their litter box.
- Feed cats only canned or dried commercial food or well-cooked table food, not raw or undercooked meats. Do not feed cats unpasteurized milk.
- Change the litter box daily; wash your hands with soap and warm water afterwards.
- Control rodent populations and other potential intermediate hosts.
- Wear gloves while gardening; wash your hands thoroughly afterwards.

Pregnant or immunocompromised individuals:

- Avoid changing cat litter if possible. If no one else can do it for you, then wear disposable gloves and wash your hands thoroughly with soap and water afterwards. Cat litter boxes should be changed daily.
- Do not adopt or handle stray cats, especially kittens.
- Do not get a new cat while you are pregnant.

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Zoonotic Disease Prevention Series for Retailers

Zoonotic Diseases of Dogs and Cats

Pet ADVOCACY NETWORK

Dogs and cats can carry several pathogens (parasites, fungus, bacteria, viruses) that can be spread to humans. Many of these diseases are familiar to pet owners (e.g., salmonellosis, rabies), while others are less well-known. Below are some of the relatively common zoonotic pathogens of dogs and cats.

Bacterial Diseases

Salmonellosis (dogs and cats): caused by the bacterium *Salmonella* and found in the intestinal tract of many animals. Infection may result from hand-to-mouth contact after directly handling animals, as well as after indirect contact through cleaning cages or bedding, handling food or food bowls, or other items in the area where the animal lives.

Campylobacteriosis (dogs and cats): *Campylobacter* bacteria infect the gastrointestinal tract of animals and humans, sometimes causing diarrhea.This infection can be spread to humans through fecal contamination from household pets.

MRSA (dogs and cats): a human disease sometimes spread to pets and then "given" back to the owner. Pets can be short-term carriers but generally are not the source of this illness.

Brucellosis (dogs): a disease found in dogs caused by the bacterium *Brucella canis*. Infected dogs can spread the disease to people and other dogs. While infection from a family pet is possible, dog breeders and veterinarians involved with birthing (whelping) puppies may be at higher risk.

Cat Scratch Disease (cats): caused by *Bartonella henselae* bacteria. Most commonly found in children after a scratch or bite from a cat. Infection appears at the bite or scratch site in about 1-2 weeks; lymph nodes may become swollen and tender.

Parasites

Giardiasis (dogs and cats): an intestinal infection caused by a protozoan parasite. The type of *Giardia* thatinfects humans is usually not the same type that infects dogs and cats.

Toxoplasmosis (cats): caused by a protozoan para- site (*Toxoplasma gondii)*, generally spread through improper handling of raw meat or contact with cat feces. Toxoplasmosis can result in serious illness in people with weakened immune systems and in the fetus when a woman is infected during pregnancy or shortly before becoming pregnant.

Toxocariasis (dogs and cats): a parasitic disease causedby ingesting eggs of dog or cat roundworms. Human infection occurs through contact with environments contaminated with dog and/or cat feces (playgrounds, sand boxes).

Rabies Virus

In the U.S., rabies is carried by wild animals, primarily bats, raccoons, foxes and skunks. Unvaccinated family pets are susceptible if bitten or scratched by an infected animal. Vaccination of dogs and cats is effective in preventing rabies in companion animals.

Ringworm

A broad term for a group of fungal diseases of the skin. Some diseases infect only humans, others are limited to animals, but some may be shared between people, dogs, cats andother animals. Kittens infected with *Microsporum canis* are highly contagious, often causing infections in multiple household members. In such cases, a coordinated plan between the veterinarian and healthcare provider is needed to treat the disease and disinfect the household.

For more information on giardiasis, toxoplasmosis, ringworm and other zoonotic diseases, consult Pet Advocacy Network's Zoonotic Disease Prevention resources and http://www.cdc.gov/healthypets/index.html

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