

PET INDUSTRY JOINT ADVISORY COUNCIL ZOO NOTIC DISEASE PREVENTION SERIES FOR RETAILERS





Atypical Mycobacteriosis



Disease Vectors

Mycobacterium marinum is the causative agent of a disease of the skin often known as “fish tank granuloma” or atypical mycobacteriosis. While relatively common in fish, human cases are infrequent in the U.S., with an estimated 100-150 cases annually (MedicineNet.com 2013). These bacteria are widely distributed and occur in fresh, salt and brackish water; aquaria; and aquaculture systems. The majority of cases originate from food fish processing, but infections can occur in aquariums. Infections in fish are more common in aquaculture where fish immune systems may be stressed by crowding and lower water quality, but the disease may occur in the home aquarium as well.

Symptoms, Diagnosis, and Treatment

Although these zoonotic bacteria are related to the species that cause tuberculosis in humans, *M. marinum* does not infect the respiratory system. Symptoms are found on the extremities of an infected person in the form of granulomas (nodules) where the body attempts to “wall off” the invading bacteria. The infection occurs when someone with an abrasion or puncture wound is exposed during the cleaning of an aquarium or other equipment where fish are cultured. A small red bump may appear within a few weeks and result in swelling of lymph nodes and the development of additional nodules. *M. marinum* is a slow-growing bacterium and this process may continue over a few months. Mild infections in healthy individuals may resolve on their own, but in some cases an extended course of oral antibiotics is required. If diagnosis is delayed, the infections can mimic rheumatoid arthritis, gout, or fungal infections (Medscape 2013). Persons with compromised immune systems are at greater risk. Children are rarely infected.

It may be difficult for the hobbyist to detect infected fish. Symptoms in fish are often generalized, manifesting in weight loss or poor condition, accompanied by a loss of scales and lesions (Floyd 2011).

Prevention

Aquarium owners with injuries to the hands and arms and those with weakened immune systems should avoid cleaning their tanks and equipment.

Incoming shipments of fish from sources where atypical mycobacteriosis has been found should be isolated for 30 days and testing of individual fish should be considered. Because there is no cure for atypical mycobacteriosis in fish, it is strongly recommended that infected fish be euthanized and tanks and equipment cleaned with a surfactant to remove organic material and disinfected with Lysol®, sodium chlorite or 70% ethyl alcohol (avoid 30% ethyl alcohol which requires at least 10 minutes contact time); common disinfectants including chlorine bleach, Roccal® and Virkon-S® are not effective.

When an infection has been confirmed, staff should wear gloves when cleaning tanks or handling aquarium gravel or filters. Individuals with breaks in their skin (i.e., cuts or other abrasions) should have no direct contact with mycobacteria-infected areas. Skin wounds should always be covered, preferably with a bandage and water-tight gloves, and, gloves should be worn when handling fish, especially during necropsy. Persons with weakened immune systems should not come in contact with mycobacterial-infected material (Floyd 2011).

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Campylobacteriosis



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 be infected than cats; symptoms present primarily in animals less than 6 months old. Most cases of human campylobacteriosis result from exposure to contaminated food (particularly poultry), raw milk or water, but the bacteria may be transmitted via the feces of companion 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 show signs 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 and 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, infection may spread throughout the body through the bloodstream, and medical treatment including hospitalization and antibiotic therapy may be necessary. Long term complications, though uncommon, may occur including a type of arthritis or Guillain-Barre syndrome, a rare autoimmune disease that can lead to paralysis.

Symptomatic dogs and cats have diarrhea that may be bloody with mucus and sometimes bile-stained, reduced appetite and vomiting. In dogs < 6 months old, diarrhea typically lasts 3-7 days, returning intermittently up to two weeks. Some apparently healthy dogs and cats are asymptomatic carriers of *Campylobacter*.

Diagnosis in humans and companion animals involves laboratory culture of fecal samples. DNA analysis is used to differentiate specific strains.

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, the pet should be removed to a clean environment and tested to determine if the bacteria remain in feces.

Prevention

- Wash your 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 always should be supervised in hand washing after handling pets.

References and Links

CDC (<https://www.cdc.gov/campylobacter/index.html>): Campylobacter

CDC: <https://www.cdc.gov/healthypets/>: Healthy Pets Healthy People

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



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. Transmission 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 and 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 USA 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 become sick 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 infection has 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 contacted (water and 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; allow all surfaces 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 and Links

Giardia and Pets <http://www.cdc.gov/parasites/giardia/prevention-control-pets.html>

Companion Animal Parasite Council: <http://www.capcvet.org/capc-recommendations/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

Healthy Pets Healthy People: <https://www.cdc.gov/healthypets/>

5/30/17



Lymphocytic Choriomeningitis



Disease Vectors

Lymphocytic choriomeningitis is a disease that develops after infection with the LCM virus. The principal transmission route to humans is via contact with urine, feces, saliva or blood from the house mouse (*M. musculus*), wild or cultured, 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). Among house mice and hamsters, LCMV is transmitted both horizontally and vertically from infected dams to offspring, 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 and Diagnosis

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 breeding stock in commercial facilities using environmental swabs for genetic analysis.

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 treatment and 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.

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11/14/16



Psittacosis Avian Chlamydiosis



Disease Vectors

Psittacosis is an infection transmitted to humans from birds, caused by the bacterium *Chlamydia psittaci*. The infection is called avian chlamydiosis in birds where it 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 transmission route to humans is from breathing dried secretions or excretions from infected birds, primarily feces, feathers or other contaminated material that becomes airborne. Transmission may also occur via mouth-to-beak contact and from handling infected birds. Although it is possible, person-to-person transmission 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 and 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 web page). 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). Persons exposed to birds with avian chlamydiosis should seek medical attention if they develop influenza-like symptoms or other respiratory tract 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 web page). 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*.

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Psittacosis / Avian Chlamydiosis



- 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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Rat Bite Fever



Disease Vectors

Rat bite fever (RBF) is a rare disease in North America, where the infectious agent is 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 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 transmitted to humans through a bite or scratch, from contact with rat secretions, or less frequently by consuming contaminated food or drink.

Symptoms, Diagnosis, and 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, the person should be evaluated by a health-care provider 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.

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. Rats may be handled by the base of the tail; if the animal becomes agitated and begins to “spin”, put the rat on a solid surface or in a container. Another option is to grasp the rat around the midsection, applying only enough pressure to control the animal.

Staff regularly handling rats should consider protective gloves, e.g., nylon/PVC coated gloves (\$4 - \$8/pair) 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

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Ringworm



Disease Vectors

Ringworm (also called dermatophytosis) refers to a collection of fungal diseases of the scalp, body and feet. 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 inhabit the soil or have animal hosts: *Microsporum*, *Trichophyton* and *Epidermophyton*. The first two genera have zoonotic species of concern. 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 and Treatment

Humans

The symptoms in humans of ringworm 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 be asymptomatic but still capable of transmitting 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 anti-fungals 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 transmission 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 of it appropriately. Pets treated for dermatophytosis should be monitored to make sure the infection has been successfully cleared.

11/10/16

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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) and live poultry (e.g., chicks, chickens, ducklings, ducks, geese, turkeys), 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 and Treatment

Most persons 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 duration is typically 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. Children under 5, pregnant women, senior citizens, and people with weakened immune systems run a greater risk of infection; contact your health care provider for more information.

Prevention

Most zoonotic pathogens are transmitted from animals to people through hand-to-mouth contact either directly from animals or indirectly through the environment. Both direct and indirect contact with infected animals can lead to human salmonellosis. Indirect transmission can occur through contact with anything in areas where animals live or through consumption of food/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's 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, pregnant women, senior citizens and persons with weakened immune systems, due to the increased risk of severe complications from salmonellosis.

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- Harker K.S., C. Lane, E. De Pinna, G. K. Adak, 2011. An outbreak of *Salmonella* Typhimurium DT191a associated with reptile feeder mice. *Epidemiol. Infect.* 139, 1254–61.



Seoul Virus



Disease Vectors

Seoul virus is one of several hantaviruses that colonize Norway rats and cause Hemorrhagic Fever with Renal Syndrome (HFRS). 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 transmitted 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). Transmission of Seoul virus between people is thought to be very rare.

Symptoms , Diagnosis and 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.

Persons 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 testing.

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 transmitted between rats through direct contact (e.g., during mating or fighting), or through exposure to soiled bedding and other contaminated materials. Infected rats do not become 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 transmission to humans and other rats.

Prevention

- Wash hands with soap and warm water after contact with the pet.
- Take steps to prevent contact between wild rats and 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 material).
- 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 and Links

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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Toxoplasmosis



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 transmission can occur from accidentally ingesting contaminated cat feces while cleaning a litter box, bedding, toys or other items. A special case is the transmission from a pregnant woman to her unborn child, which may lead to serious medical problems.

Cats are the ultimate 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 and Treatment

Most exposed people are asymptomatic. In some cases, flu-like symptoms develop (body aches, swollen lymph nodes, headache, fever, fatigue) that resolve without treatment. However, people with weakened immune system are at risk for serious complications, and their symptoms include headache, confusion, poor coordination, seizures, lung problems, and blurred vision. Pregnant women can be asymptomatic yet transmit the parasite to the 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 high risk 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 vary depending 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 based on symptoms, 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; do not 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; wear disposable gloves and wash your hands with soap and warm water afterwards.
- Control rodent populations and other potential intermediate hosts.

Pregnant or immunocompromised individuals:

- Avoid changing cat litter if possible.
- Do not adopt or handle stray cats, especially kittens.
- Do not get a new cat while you are pregnant.
- Wear gloves while gardening; wash your hands thoroughly afterwards.

References and Links

CDC.gov: <http://www.cdc.gov/parasites/toxoplasmosis/>

Toxoplasmosis in Cats http://www.vet.cornell.edu/fhc/health_information/brochure_toxo.cfm

Mayo Clinic: <http://www.mayoclinic.org/diseases-conditions/toxoplasmosis/basics/definition/CON-20025859>

Merck Veterinary Manual: <http://www.merckvetmanual.com/generalized-conditions/toxoplasmosis/overview-of-toxoplasmosis>

WebMD.com: <http://www.webmd.com/baby/toxoplasmosis#1>

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Some Zoonotic Diseases of Dogs and Cats

Dogs and cats may carry several pathogens (parasites, fungus, bacteria, viruses) that can be transmitted to humans under the right circumstances. Many of these diseases are familiar to pet owners (e.g., salmonellosis, rabies), while others are less publicized. This summary touches on some of the relatively common zoonotic pathogens of dogs and cats.

For more detailed information on giardiasis, toxoplasmosis, ringworm and other zoonotic diseases:

<http://pijac.org/animal-welfare-and-programs/zoonotic-disease-prevention/retailerresources/#flyers>

<http://www.cdc.gov/healthypets/index.html>

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 things in the area where the animal lives. (see the PIJAC Salmonellosis flyer for more information).

Campylobacteriosis (dogs and cats): *Campylobacter* bacteria infect the gastro-intestinal tract of animals and humans, sometimes causing diarrhea. Although most human illness results from handling raw poultry or consuming undercooked food, this infection can be transmitted to humans through fecal contamination from household pets.

MRSA (dogs and cats): a human disease sometimes transmitted 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): Canine brucellosis is a disease found in dogs caused by the bacterium *Brucella canis*. Infected dogs can spread the disease to people, but infection from a family pet is rare. Dog breeders and veterinarians involved with birthing (whelping) puppies are more at risk.

Cat Scratch Disease (cats): caused by the bacteria *Bartonella henselae*. It is most commonly found in children following a scratch or bite from a cat. Infection appears at the site of the bite or scratch within about one to two 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* that infects humans is usually not the same type that infects dogs and cats.

Toxoplasmosis (cats): also caused by a protozoan parasite (*Toxoplasma gondii*), generally spread through improper handling of raw meat or contact with cat feces. While rare in the U.S., toxoplasmosis can result in serious illness in people with weakened immune systems and in the fetus when a woman is infected during pregnancy.

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

Rabies virus: In the U.S. rabies is carried by wild animals, primarily 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 and other 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.