Feline Ringworm Infections in Shelters

Overview

Dermatophytosis or “ringworm” is a common skin disease in cats in shelters caused by the dermatophyte fungus *Microsporum canis. M canis* is a zoophilic dermatophyte that requires keratin in hair shafts and follicles for survival and replication. Ringworm is an important skin disease because it is contagious between animals and can be transmitted to people.

This document provides a basic overview of: 1) populations at risk; 2) transmission modes, incubation time, clinical disease, and duration of fungal shedding; 3) diagnosis; and 4) strategies for management and prevention in shelters.

Populations at risk

In the shelter setting, kittens are the most susceptible to *M. canis* infection. Many studies report increased risk in cats < 1 year old, and a recent study found that kittens <6 months old had 8X greater risk. Cats from large-scale hoarding environments are also at higher risk of dermatophytosis. Cats with FIV or FeLV infection do NOT have increased risk for infection.

Ringworm outbreaks due to *M. canis* commonly occur in the summer and fall (“kitten season”) when large numbers of kittens are admitted to shelters.

Clinical features

The primary route of *M. canis* transmission is direct contact with an infected cat. Infection from contact with environments contaminated by fungal spores is rare. Key to establishment of infection is damage to the skin, because healthy skin is a natural barrier to infection.

Skin lesions typically appear within 7 to 14 days after infection (incubation period). Hair loss, scaling, crusting, and erythema are the most common clinical lesions. Lesions can affect any area on the body but most often appear first on the face, ears, and legs/feet. Some lesions resemble military dermatitis and can be pruritic.

Diagnosis

Since ringworm is a contagious and zoonotic disease, rapid confirmation of true infection is needed for proper treatment that reduces risk for transmission to other susceptible animals and people. No one diagnostic test is considered the gold standard. The best diagnostic approach is to use a combination of the following tools:

- Wood’s lamp exam
- Microscopic exam of plucked hairs (trichogram)
- Fungal culture
- Dermatophyte PCR panel

The Wood's lamp is a point-of-care (POC) diagnostic tool. More than 90% of *M. canis*-infected cats have infected hairs that fluoresce a bright apple-green under the Wood's lamp UV light. A plug-in Wood's lamp with a wavelength of 320 to 400 nm and built-in magnification should be used. Fluorescence in small portions of infected hair shafts develops within the first week of infection and involves the entire hair shaft within 12 to 14 days. During and after treatment, the Wood's lamp exam will continue to be positive on the tips of the hairs as they grow out, even though the infection may have been eliminated

Trichograms, or direct microscopic exam of hairs is another POC diagnostic tool. Plucked hairs from around the lesions, especially those that fluoresce with the Wood's lamp, are added to a drop of mineral oil on a glass slide. A cover slip is applied for viewing under a microscope using the 10X objective. Infected hairs are much wider than normal hairs due to spores coating the shafts.

Fungal cultures are performed with dermatophyte test media (DTM) and samples acquired by brushing lesions with soft-bristled toothbrushes. Multiple lesions should be brushed to collect as many hairs as possible. The toothbrush samples can be cultured on POC DTM culture plates or submitted to a reference lab for culturing. POC DTM plates are inoculated by stabbing the toothbrush bristles onto the surface in 4–5 areas. Suspect dermatophyte colonies on DTM plates must be examined by microscope to confirm dermatophyte infection and determine the species. When DTM plate storage and incubation instructions are followed along with use of microscopic identification characteristics, studies have shown a 97% agreement between POC and reference lab culture results. However, when microscopic examination was not used for the POC cultures, there is a significant risk for incorrect diagnosis, usually a false positive. While it is recommended to hold DTM cultures for 14 days before recording test results, studies involving thousands of fungal cultures showed that cultures from truly infected cats are positive by days 7 to 10, with a median time of 5 to 7 days.

Toothbrush samples can also be submitted to Idexx for the Ringworm PCR Panel (test code 3565). This very sensitive test detects spores in samples from truly infected cats as well as from uninfected fomite carrier cats. PCR also detects dead spores in samples from treated cats, so it is not useful for determining if a cat is cured. The advantages of PCR testing are the rapid turnaround time of 3 days for initial diagnosis and identification of the dermatophyte species. In addition, a negative PCR result is very reliable and accurate for indicating lack of infection.

Disease Management

Ringworm is a treatable and curable disease. Ringworm infections will eventually resolve without treatment due to a vigorous immune response to the fungus, but this can take many weeks to months. Treatment shortens the course of disease to 4 to 6 weeks. Successful treatment requires concurrent use of systemic oral antifungals and topical disinfection of the hair coat. Topical therapy with lime sulfur dips (8 oz/gallon!) decreases shedding of infective material, kills spores, helps prevent new lesions, and decreases environmental contamination. Systemic therapy eradicates infection in the hair follicle and is considered to be a necessary part of therapy. Itraconazole (Itrafungol, 5 mg/kg PO daily for 21 days) and terbinafine (10 mg/kg PO daily for 21 days) are the most effective and safe treatments. Infected patients should be treated until mycologic and clinical cure are achieved.

Clinical cure commonly precedes mycologic cure. For infected cats without other health problems, the first post-treatment fungal culture is obtained after completion of the treatment protocol and the patient is lesion-free. If the culture is negative, the patient is assumed cured. For cats with other concurrent clinical conditions (e.g., URI), fungal cultures are not repeated until resolution of these conditions. At this point, two consecutive negative fungal cultures are required for determining mycological cure.

Infected cats and in-contact cats should be isolated to reduce risk for transmission to other cats and people. Studies have shown that while not all kittens in a litter have positive Wood's lamp exams at the same time, most of the littermates are infected by the time fluorescent lesions appear in the first kittens. The length of time kittens spend in "ringworm isolation" directly affects their welfare and social skills, especially when infection occurs during the critical socialization period of 3 to 8 weeks of age. Double-compartment housing and daily enrichment during ringworm isolation are musts. If a shelter can't house cats being treated in a manner that provides good welfare, the cats should be sent to foster care or to a facility that can provide good welfare.

Some cats test false positive with a Wood's lamp exam, trichogram, fungal culture, or PCR testing due to *M canis* carriage on their fur from contact with an infected animal or exposure to a contaminated environment. These "fomite" or "dust mop" cats are not truly infected and do not have any skin lesions. They should be treated once with a lime sulfur dip to kill the spores on their coat and moved on to placement.

Sanitation

The most important part of decontamination in a ringworm ward is the aggressive removal of contaminated hair and dander. The most important step for removing infective hairs and spores is mechanical cleaning by daily wiping down of occupied housing units and sweeping or vacuuming floors and other surfaces. The spot cleaning method should be used for daily cleaning of cages occupied by the same cats so that cats are not removed from their cage. Once the cages are tidied up by removing hairs and organic material from the surfaces, the surfaces are wiped down with a clean rag sprayed with disinfectant. Rescue (1:16) and Trifectant (2%) are the best disinfectants to use for ringworm environments, including cages and floors and countertops. While recommended for many years, bleach diluted 1:10 is too harsh for surfaces and for the cats and should not be used. The effective dilution for bleach is 1:31 (4 oz/gallon). Washing of laundry in cold water twice or washing once in hot water is effective for inactivating fungal spores.

Prevention

Compared to other common infectious diseases in shelters, there is no vaccine for ringworm. Prevention totally relies on effective population management strategies to divert kittens to housing options other than shelters such as foster homes and to shorten length of stay for those kittens that must enter a shelter. In addition, double-sided compartment housing in quiet rooms is a must to reduce stress during shelter stay. Different litters of kittens should not be mixed together for housing as this increases risk for ringworm transmission. Shelter staff must also be trained on proper use of the Wood's lamp and trichogram preps for prompt exam of cats with skin lesions. The bottom line is that shelters are not a safe and healthy environment for kittens and all other options should be pursued to keep them from coming in to the shelter or at least leaving the shelter as fast as possible.

Resources

- Moriello. Diagnosis and treatment of dermatophytosis in dogs and cats. Clinical Consensus Guidelines of the World Association for Veterinary Dermatology. *Vet Dermatol* 2017;28:266
- Moriello. Dermatophytosis. *Clinician's Brief*. August 2020

Cynda Crawford, DVM, PhD
Maddie's Shelter Medicine Program
College of Veterinary Medicine
University of Florida
crawfordc@ufl.edu
(352) 258-9263