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OUTBREAK INTERVENTION: DERMATOPHYTOSIS

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Epidemiology

Dermatophytosis, or ringworm, is the most important contagious and zoonotic skin disease of cats housed in high density, high turnover facilities such as shelters, foster homes, and catteries. In addition to this high risk environment, other predisposing factors for infection include breed (Persian); age (kittens); damaged skin from trauma, allergies, or external parasites; concurrent disease, particularly if the disease or its treatment causes immunosuppression; lack of self-grooming to remove fungal spores; and warm, moist climates. The stress of high density housing with continual co-mingling of cats contributes to risk of ringworm infection, especially since many cats develop debilitating respiratory infections in association with the stress of these circumstances.

Compared to individual pet cats living in homes, management and control of ringworm in a population is far more challenging and likely to fail unless certain key strategies are employed. In the past, many shelters and catteries adhered to a policy of “recognize and euthanize” to prevent or react to outbreaks of dermatophytosis in cats. This is now recognized to be avoidable if rigorous surveillance, diagnostic, and treatment protocols are followed. These strategies include: 1) a diagnostic strategy for identification of infected cats; 2) appropriate isolation housing for both infected and exposed cats; 3) effective and cost-efficient treatment protocols that achieve timely cures and minimize environmental contamination; 4) diagnostic testing to confirm cures; and, 5) decontamination protocols to prevent exposure of naïve cats.

Transmission

The most common dermatophyte in cats is Microsporum canis. Recently, infection with Trichophyton spp. Infections have been documented in cats and may represent an emerging or previously underdiagnosed condition. Infective fungal spores are acquired from direct contact with an infected cat and/or a contaminated environment. Uninfected cats can be contaminated with fungal spores and serve as fomite carriers. Hairs with fungal spores are easily shed into the environment and may be carried by dust or drafts or other fomites over large distances, including through heating and ventilation ducts. The incubation period from exposure to clinical disease is 1 to 3 weeks. Many cats do not develop clinical signs, but are still infectious. A true carrier state is not likely, but cats can remain infectious for several weeks following spontaneous clinical resolution if not properly treated with antifungal medications.

Clinical Signs

The classic ringworm lesions include circular areas of hair loss and scaling or crusting, particularly on the face, pinnae, feet, and tail. However, ringworm can also present as a generalized military dermatitis or large areas of alopecia without crusting. The fungus can also infect claws and nail beds. Ringworm lesions can also mimic or complicate other dermatological conditions such chin acne, stud tail, and eosinophilic ulcers and plaques. Lesions may or may not be pruritic.

Diagnosis

Ringworm cannot be diagnosed simply by finding classical lesions. Any skin lesion in a cat in a high risk environment should be screened first with a Wood’s lamp, followed by use of the toothbrush technique for a dermatophyte culture to confirm the presence or absence of ringworm infection.

The Wood’s lamp is useful and cost-effective screening tool, but successful identification of M. canis-infected lesions is dependent on proper technique. A true Wood’s lamp should be used instead of another type of UV light, because the Wood’s lamp emits a UV wavelength that induces fluorescence by M. canis. As opposed to the battery-powered models, the plug-in Wood’s lamps generate a stronger light that is more likely to induce fluorescence. The Wood’s lamp should be plugged in and turned on for 10 minutes to warm up prior to diagnostic use. The screening should be done in a completely dark room, and the lamp held over suspicious lesions for several minutes since some M. canis strains take some time to respond by fluorescing.

Although useful for screening, the Wood’s lamp has a high rate of false negative reactions because only about 50% of M. canis strains fluoresce under UV light stimulation. Therefore, a negative Wood’s lamp screening does not rule out ringworm. All suspicious lesions, whether negative or positive by Wood’s lamp
screening, should be cultured. As with the Wood’s lamp, proper technique is the key to success. Cats should be wiped with a damp cloth to remove contaminants, followed by brushing the suspect lesions at least 30 times with a new toothbrush. Exposed cats without lesions can be brushed in areas where ringworm lesions commonly develop (face, ears, and feet). The toothbrushes should be stored individually in plastic bags in the dark at room temperature. After the 3-week protocol, a positive culture need full treatment.

The most important component of antifungal treatment for a population is topical rinses with lime sulfur (LymDyp®) or miconazole/chlorhexidine gluconate (Malaseb® Concentrate) rinses to immediately reduce environmental contamination.1,2,4 Shampoos and other topical products are not effective. The antifungal rinses are applied twice weekly to culture-positive cats and exposed culture-negative cats. Shaving the coat can traumatize the skin and worsen lesions, so it is not recommended unless the coat is very long or matted or if ringworm lesions are severe. In addition, it is not necessary to apply an Elizabethan collar to prevent grooming because the lime sulfur has not been associated with adverse effects such as ulceration of the tongue or oral cavity.

Systemic antifungal medication is an important adjunctive therapy to the topical rinses for treatment of a population in order to achieve the shortest time-to-cure interval.1,2,5 The time-to-cure interval is critical because extended stays increase risk of spread, tie up precious resources, and impede movement of cats to adoption. Itraconazole (10 mg/kg) is very effective when given daily for 21 days1-4. Compliance with a daily treatment schedule is more likely than following a pulse treatment schedule. Fluconazole and terbinafine are also effective but more costly. Ketaconazole should not be used in cats due to hepatotoxicity. Lufenuron is ineffective. Treated cats should be observed daily for adverse side effects such as loss of appetite, vomiting, etc.

Starting after the first topical rinse, toothbrush cultures are performed weekly to determine when to discontinue therapy. Fungal cure is defined as 2 consecutive negative toothbrush cultures. Fungal cure may occur prior to resolution of lesions (clinical cure). Conversely, clinical cure in less affected cats may occur prior to fungal cure.

In an open clinical trial in a shelter,5 treatment of dermatophyte-infected cats with a combination of oral itraconazole daily (10mg/kg daily) and twice weekly topical lime sulfur rinses for 3 weeks was both effective and safe. Infected cats were housed in an isolation room with uninfected “roommate” cats that were littermates, bonded pairs, and queens with nursing kittens. The uninfected cats received the same treatment protocol as the infected cats. The cats were not shaved prior to the rinses and were allowed to groom while the rinse dried on the coat. Toothbrush fungal cultures were performed on all cats weekly. After the 3-week treatment with itraconazole, the twice weekly rinses were continued until the cat was “cured” as defined by 2 consecutive negative weekly fungal cultures. The average number of treatment days to fungal cure was 18 and ranged from 10 to 49 days. However, the cured cats were held in isolation for an additional 3 weeks while waiting for the final culture results. This extended the total time in isolation to 6 weeks for most cats. The average number of lime sulfur rinses required for fungal cure was 6 with a range from 3 to 15. None of the cured cats developed ulcers from licking the lime sulfur and all tolerated the daily itraconazole treatment without visible adverse effects. None of the “roommate” cats became infected. Many cats with severe infections achieved fungal cure before the skin lesions resolved (clinical cure). Following the final culture reports, the cats were rinsed with lime sulfur before moving into the general population to minimize accidental fomite carriage of spores.

**Treatment**

Not all cats that are culture-positive for *M. canis* are truly infected. Those with lesions are most likely infected. However, positive cats without lesions may be transiently contaminated with stray spores and not really infected. For these cats, the amount of fungal growth on the culture plate can indicate whether they are infected and need treatment, or are simply a mechanical carrier that needs only decontamination. To help with determination, a pathogen scoring system has been devised based on monitoring of cats entering shelters over a period of many years (http://giveshelter.org/resources/dermatophyte.php). Cats with no lesions, a low pathogen score, a negative Wood’s lamp screening, and a positive culture may only require a single lime sulfur dip as long as a repeat culture is negative. Those with lesions, a high pathogen score, and a positive culture need full treatment.

Treatment is recommended to promote faster resolution, decrease contamination of the environment, and minimize the risk of transmission to other cats or people. In addition to culture-positive cats, all culture-negative cats in direct contact with infected cats should be treated. There are several successful treatment regimens for the single pet cat living in a home, but the treatment and management of a population of cats in a shelter, foster home, or cattery is more likely to fail unless there is strict adherence to a rigorous protocol.

Treatment of dermatophyte-infected cats with a combination of oral itraconazole and twice weekly topical lime sulfur rinses for 3 weeks was both effective and safe. Infected cats were housed in an isolation room with uninfected “roommate” cats that were littermates, bonded pairs, and queens with nursing kittens. The uninfected cats received the same treatment protocol as the infected cats. The cats were not shaved prior to the rinses and were allowed to groom while the rinse dried on the coat. Toothbrush fungal cultures were performed on all cats weekly. After the 3-week treatment with itraconazole, the twice weekly rinses were continued until the cat was “cured” as defined by 2 consecutive negative weekly fungal cultures. The average number of treatment days to fungal cure was 18 and ranged from 10 to 49 days. However, the cured cats were held in isolation for an additional 3 weeks while waiting for the final culture results. This extended the total time in isolation to 6 weeks for most cats. The average number of lime sulfur rinses required for fungal cure was 6 with a range from 3 to 15. None of the cured cats developed ulcers from licking the lime sulfur and all tolerated the daily itraconazole treatment without visible adverse effects. None of the “roommate” cats became infected. Many cats with severe infections achieved fungal cure before the skin lesions resolved (clinical cure). Following the final culture reports, the cats were rinsed with lime sulfur before moving into the general population to minimize accidental fomite carriage of spores.
This trial in a shelter population showed that the majority of cats with ringworm were cured after 3 weeks of oral itraconazole daily and 6 lime sulfur rinses administered twice weekly. In addition, this protocol prevented contact cats from becoming infected. Depending on how space is allocated and available, some shelters may be able to house cats in isolation for 6 weeks until complete fungal cure is confirmed. If space is limited, an alternative approach is to house the cats in isolation for 3 to 4 weeks during treatment, then move them to a less restricted area while waiting on the final negative culture.

Environmental decontamination
The success of the ringworm treatment protocol for a population depends on effective environmental decontamination. Successful strategies include: 1) isolation of infected and exposed cats, preferably in a closed room with separate ventilation with surfaces that are amenable to disinfection with bleach (no carpet or wood); 2) strict adherence of staff in proper isolation techniques, including wearing disposable protective clothing; 3) confinement of cats to cages for the entire treatment period to minimize environmental contamination; 4) use of closed storage containers for food and supplies to avoid contamination; and, 5) adherence to cleaning protocols that include daily bedding changes with washing in bleach and drying in a drier at high heat; daily sweeping and vacuuming of floors and counters; and once weekly disinfection of the entire room with 10% bleach solution (100 mL bleach + 900 mL water). 1,2,5 There should be at least 2 applications of the bleach solution, allowing the surfaces to dry in between applications. Cats must be put in disposable carriers or carriers that can be bleached for temporary relocation to another area during the bleach treatments of the housing area. Ringworm spores are not killed by quaternary ammonium products, potassium peroxy monosulfate (Trifectant® or Virkon®), or povidone-iodine.

For monitoring the success of environmental decontamination, a Swiffer® wipe can be cut into small squares for swiping different surfaces. The Swiffer® swipes should be stored individually in plastic baggies until they are pressed onto the surface of dermatophyte plates for culture. During management of a ringworm outbreak, the swipes should be performed before each weekly treatment of the isolation housing area with bleach.

Prevention of ringworm outbreaks
An effective ringworm prevention strategy includes a protocol for monitoring both the cats and the environment for fungal contamination.1,2,5 Cats should be examined on admission into the facility and observed daily while in the facility for lesions. Some facilities have incorporated a Wood’s lamp screening of all cats at admission, while others with a history of ringworm outbreaks treat all cats with topical lime sulfur rinse at admission. Swipes for dermatophyte culture should be performed on a regular basis in all cat housing areas to monitor for environmental contamination.

References