



***How Animal Shelters Are Beating Ringworm
(And Yours Can, Too!)***
Live Webcast Audience Questions and Answers
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Dr. Moriello's Comments: The answers to these questions are general and answered for informational purposes only. Please consult your primary care veterinarian for specific medical advice.

General Questions

- 1) **Q: Will kittens with ringworm grow out of it as their immune systems mature and strengthen?**

A: Immune responses to diseases, in general, are comprised of two types: humoral (antibody response) or cell mediated. Recovery from ringworm is associated with a strong cell mediated response. If a kitten is sick or immune suppressed due to illness or stress, the kitten is more susceptible to infection. So yes, as the kitten's overall health improves the immune system will be able to mount an immune response to eliminate the infection.

- 2) **Q: Is there such a thing as "immune to ringworm"? We hear that cats will heal themselves with no treatment after a few years? Is that true?**

A: In studies we have conducted, juvenile cats will recover from ringworm with no treatment at all within 70 to 100 days. Ringworm is a self-curing disease and treatment is instituted to help speed recovery, minimize spread to other animals and lessen contamination of the environment.

- 3) **Q: I do a lot of TNR of feral cats and use my garage as a holding area and post-surgery "hospital". The spay/neuter clinic does not screen for ringworm. How can I minimize (or eliminate the possibility) of bringing ringworm into the house to my inside cats?**

A: There is no way to eliminate all risks of transferring contagious and infectious diseases from these cats to your pet cats. Ringworm is only one of many diseases that can be transmitted from feral cats to pet cats. You should be concerned about transferring any infectious and/or contagious disease to your pets. The best way to prevent this is to keep your own pets properly vaccinated and separated from the garage. Minimize the people that have contact with the cats in holding, i.e., children. In practical concerns, treat the cats as if you were working in a hospital. Wear separate clothing and shoes when you are in the garage. Wash these separately from other laundry in hot water. Regarding shoes, Croc-type are ideal because they can be washed. The most important thing is to wash them in hot soapy water with a brush (e.g., toilet bowl brush) and rinse them thoroughly. Then spray them with a disinfectant. Nothing in the garage should come into the home, i.e., have separate cleaning supplies, etc. Hand washing is mandatory. If your hair is long, tie it back and put it under a hat or baseball cap. Overall, the risk is low if you practice separation, barrier protection and good hygiene.

- 4) **Q: All of our cats are in foster homes. How long after a ringworm outbreak is it safe to bring in additional cats?**

A: The time length is not the key issue; the key issue is whether or not the area is still contaminated with infective spores. After treatment has been completed and the cats removed, have the foster caretakers thoroughly clean their home, especially focusing on the area where the cats were living. They should be triple cleaning: physical removal of hair and debris, scrubbing with a detergent and rinsing of the area. Aggressive mechanical cleaning can remove infective spores from items or surfaces where disinfectants cannot be applied. After cleaning, the foster home needs to be screened for environmental contamination. This is done by taking a Swiffer sheet and cutting it half. Put an X on the side that is used to sample the environment. Using the X side, use one to sample all surfaces “low” and the other half to sample all surfaces “high”. These soiled sides are then pressed onto fungal culture medium. Once these screening samples are culture negative, cats can be reintroduced into the foster home.

- 5) **Q: When you have a litter of kittens/puppies and only a single kitten/pup has ringworm how would you recommend treating the rest of the litter to make sure that they don't develop lesions? Do the principles for identification and treatment apply to puppies?**

A: I recommend bathing the other animals and using weekly lime-sulfur rinses. I would also recommend separating the known infected animals from the rest of the litter.

- 6) **Q: Are cats infectious before the first lesion pops up (during that first 14-21 days)?**

A: Yes. Ringworm infected cats are infective as soon as the ringworm organism (e.g., *M. canis*) starts shedding infective spores. In my experience with experimentally infective lesions, glowing hairs can be found at infection sites in less than 7 days post inoculation.

- 7) **Q: Ringworm can only live on skin? How long does it survive in a room? On carpet? In fabric?**

A: The spores do not multiply in the environment, they are dormant. Spores can remain viable in the environment for months to years. However, the key problem with infective spores in the environment is that they can be carried on the hair coat of cats making it impossible to know if the cats are culture positive from infection or “dust mop” carriage. We do not know how many infective spores must be present in a site to infect a cat. Also, aggressive routine cleaning (mechanical cleaning and detergent cleaning) will remove the spores.

- 8) **Q: Is there a difference between culture positive cat and an infected cat? Would you treat cats that have no lesions but have a positive culture?**

A: A culture positive cat can be fungal culture positive either due to infection or because it is mechanically carrying spores on the hair coat. Culture positive cats need to be examined for skin lesions and with a Wood's lamp to confirm infection. Would I treat a cat that has no lesions but is culture positive? This is a difficult question to answer without more information. How this cat is

treated depends upon the number of colony forming units on the culture plate and whether or not the cat has lesions. If only a few colonies are present, and the cat is free of lesions and Wood's lamp negative, I would recommend topical therapy with lime-sulfur, once or twice. If there are only a few colonies but the cat has lesions, and especially if they are Wood's positive, I would treat the cats as truly infected, if in a shelter. If there are too many lesions to count, I would treat the cat as truly infected and use an antifungal drug and lime-sulfur.

- 9) **Q: I have a litter of kittens and their mom for 6 weeks and just one of the kittens now has "crusty ears" and small lesions next to one eye. The mom has always had crusty ears and no other lesions (I thought sun damage) should I be treating all kittens?**

A: It is likely that if the queen has always had crusty lesions on her ears, other diseases need to be considered. All of the cats should be examined with a Wood's lamp and cultured. Crusty lesions on the ear margins could be caused by ringworm or ear mites or other parasites. Sun damage can cause damage to the ear margins of white cats, but this takes a long time and would not occur in kittens.

- 10) **Q: How would ringworm surveillance and control differ in a dog-only shelter? I am a DVM that works with a rescue that transports southern dogs to New England and they are quarantined for 48 hours.**

A: Ringworm is less common in dogs than in cats, however there are regional variations in prevalence. Ringworm is more common in the southern part of the United States. Again, the most important pathogen is *M. canis*. Dogs should be examined for skin lesions and with a Wood's lamp. The most at risk population will be puppies, but be sure to rule out demodicosis with skin scrapings as this is a very common cause of hair loss in puppies. Dogs that are stressed or in poor body condition are also at increased risk.

- 11) **Q: Are there different types of ringworm?**

A: The three major pathogens in animals are *Microsporium canis*, *Microsporium gypseum*, and *Trichophyton spp*. The most important pathogen is *M. canis* and it affects a number of species of animals, most importantly dogs and cats. *M. gypseum* is a soil organism and less commonly causes disease in dogs and cats. Also it causes very inflammatory lesions. *Trichophyton spp* infections can be contracted from exposure to rodents, horses or cattle. This pathogen can also cause very inflammatory lesions. The more inflammatory the lesions the more the body's immune system is alerted to the infection and mounts an immune response.

- 12) **Q: Can an ulcer on the inside of a lip cause a ringworm lesion on the outside of the lip?**

A: Ulcers on the inside of the mouth can be caused by many things, the most common being viral infection or trauma. *Microsporium canis* will not cause lesions on the inside of the mouth.

- 13) **Q: We have an outdoor shelter, and volunteers often brush multiple cats with the same brush – could we be spreading ringworm?**

A: Using the same brush on all cats can spread: fleas, lice, walking dandruff mites, other fur mites, and ringworm spores. I would suggest investing in inexpensive plastic combs/brushes that can be cleaned. It would be important to remove the hairs, wash the brushes/combs in hot soapy water and rinse them thoroughly. Then use a spray disinfectant.

14) Q: Can anything besides ringworm cause the hair to have that microscopic appearance?

A: The wide pale fragile appearance of the hairs and the retractile spores are very characteristic of ringworm. There are other diseases that affect the hair shaft of cat hair but none that look like what was shown microscopically.

15) Q: How long do spores live on debris or hair that is not on the cat?

A: Spores in hair or debris can remain viable for up to 18 months or even longer. However, regular cleaning that involves mechanical removal of debris and spores will greatly decrease their prevalence in the environment.

16) Q: What is the best way to treat staff that has contracted ringworm?

A: Staff should be instructed to see their physician for treatment.

17) Q: If a cat comes up with ringworm in a room with other singly kenneled cats, but all are cared for by the same staff person, would you recommend treating all the other cats who are kenneled in that same room?

A: This is a difficult question to answer without seeing the room and knowing the exact protocols in a shelter. If a truly infected cat has been identified, all cats should be examined for skin lesions and with a Wood's lamp by a veterinarian. Pending culture results, institute increased cleaning protocols, review staff handling of cats, and isolate the known infected cat and treat as per your shelter's protocol.

18) Q: Our cats roam free most of the day. Do you see problems with contamination issues?

A: If there is an infected cat in the group, all of the other cats are at risk for infection or at least risk for mechanical carriage of spores on their hair coat. Cats housed in open housing situations are at increased risk of infection if an infected cat is introduced in the group. If there is an infected cat in the room, the environment could become contaminated.

19) Q: Is there any evidence supporting air purifiers/HEPA filters and the reduction of ringworm in a home/shelter environment?

A: I doubt if these devices will be harmful, but I could not find any controlled studies to support their use for the control of dermatophytosis.

20) Q: How important is ventilation to preventing dermatophytosis or to aid in curing ringworm positive cats?

A: Ventilation does not have a “direct” effect on preventing or curing ringworm, but it is important to the overall health of cats. Improving the ventilation in rooms improves air quality and decreases respiratory diseases leading to a healthier cat population. Ringworm is more common in cats that are ill, poor groomers, or have reasons not to groom.

Cleaning and Disinfection

21) Q: We use opti-cide disinfectant and accelerated hydrogen peroxide. Is this ok?

A: Yes, but the most important part of disinfection is the mechanical removal of hair and debris. This can be done via vacuuming, sweeping, etc. The area should be cleaned until there is no grossly visible debris. Next, wash the area with detergent and scrub the area. Be aggressive. It is important to rinse the area with clean water and clean rags or towels. After the area is dry, then apply the disinfectant as prescribed on the label. The best effect is when the disinfectant is applied liberally to the target area and allowed to have a 10 minute contact time.

22) Q: Can you tell us some popular cleaning brands that kill *Trichophyton mentagrophytes*?

A: The availability of the commercial products is variable. I would suggest reading product labels and looking for “effective against *Trichophyton*”. You can also look up specific information about a product’s testing on-line.

23) Q: Could you please repeat why it is necessary to rinse the surface after cleaning? I am listening to this presentation at the office where it is a bit busy.

A: Residual amounts of detergent can inactivate disinfectant. Therefore, it is important to rinse surfaces and allow them to dry before applying a disinfectant.

24) Q: What mixture do you recommend of bleach to water?

A: I recommend 1 cup of bleach in a gallon of water, this will provide a 1:32 dilution.

25) Q: Where can I get a copy of the study showing accelerated hydrogen peroxide is an effective disinfectant against *M. canis*?

A: This data is not available until it is completes peer review.

26) Q: Will normal laundering, with a “good splash” of bleach tossed in, kill the spores on bedding, etc.?

A: This information is unknown for *M. canis*. Based upon studies with human laundry and *Trichophyton spp.*, hot water is necessary for disinfection.

27) Q: I've heard that spores die in a hot car. Any chance we could put items into an outdoor metal shed or van for a couple days during the Florida summer to decontaminate them if they cannot be washed effectively (such as cat furniture)?

A: The “spores in a hot car” anecdote is from my laboratory where we left some samples in a car during a hot humid heat wave for 72 hours and all samples were culture negative. I attempted to repeat this experiment however, and it failed. The difference was that the windows were tinted and the inside temperature of the car did not reach above 90 F. At this time I cannot recommend this procedure until we can reproduce this “accident”. Contaminated materials should be discarded if possible and replaced with objects that can be washed and properly cleaned.

28) Q: How do you disinfect carpet after ringworm?

A. This information is not known. At this time, I recommend aggressive vacuuming with a shop vac for five to ten minutes. Then wash the carpets with a carpet cleaner that has beaters that will remove residual hairs and debris. Let the carpet dry. Once it is dry take a toothbrush and aggressively toothbrush the carpet to test for residual spores. This toothbrush sample can be inoculated onto culture medium. Pending the culture results, continue aggressive vacuuming but be sure to clean the shop vac between each session.

29) Q: How does air conditioning or the use of fans in a shelter apply to spread of ringworm? What about with grooming dryers?

A: Fans and grooming dryers will mechanically blow hairs around the area. This could spread spores and result in spores being deposited onto the hair coat of cats. The major complication is that this could lead to false positive fungal culture results.

30) Q: I have heard that the airborne spread of ringworm spores is a problem – the wind kicked up and infected all of the cats in the area! I know direct contact is the primary mode of transmission, but I am wondering how likely this scenario is to infect cats.

A: The primary mode of transmission is direct contact. Windborne spread of dermatophytosis has not been documented.

31) Q: Our infirmary floor is painted concrete with non-slip sand finish. What would be a good cleaning tool for that? It tears mops apart.

A: High pressure hoses to remove debris from the rough surface followed by aggressive scrubbing with a deck brush.

32) Q: What do you think about Kuranda towers for shelter use in colony settings?

A: With respect to all disease control, the framework looks as if it can be washed and disinfected. The padding would need to be removable and washed. Ideally, replace the padded shelves with towels that can be changed daily.

33) Q: Is it true that ringworm spores are commonly in dirt outside and that is where people and animals pick up the spores.

A: Infective spores in the dirt are either *M. gypseum* or *Trichophyton ssp.* Transmission to animals requires exposure and microtrauma (digging).

34) Q: How long after infected cats leave a foster home can the foster home be used again? Would it just be when the Swiffer comes back negative?

A: The foster home can be used again when the cultures are negative. Pending the results, the foster family should continue to clean their home aggressively in the event that there are residual spores.

35) Q: We have a plastic bank of cages that housed ringworm positive cats. Would you recommend cleaning these cages, or getting rid of them because they are plastic?

A: Cages should be thoroughly cleaned with high pressure hoses to remove hair and debris, scrubbed several times with a detergent to remove debris, rinsed with clean water and then sprayed with a disinfectant. Alternatively, the cages can be discarded.

Wood's lamp

36) Q: Where is the best place to purchase a Wood's lamp?

A: This information is in the resources section, and on Maddie's InstituteSM website in the related links section. Click [here to access the information](#).

37) Q: Can a Wood's lamp hurt a cat's eye during examination around the face?

A: No.

38) Q: How effective is a Wood's lamp in diagnosis?

A: Wood's lamp examinations are used to identify infective hairs for microscopic examination. The purpose of the Wood's lamp examination is to identify potentially infective hairs that will confirm the infection. Wood's lamps are screening tools, not diagnostic aids.

39) Q: What is the difference between Wood's lamp and black lights?

A: A Wood's lamp is a type of black lamp, however it has special wave length frequency and cobalt filter that allows for a certain spectrum of light to glow.

40) Q: Are there a lot of false positives and/or false negatives with the Wood's lamps?

A: False negatives can occur when cats are lesion free but culture positive due to fomite carriage. False negatives can also occur if the cat has early lesions too small to be determined. False

negative examinations can also occur if the examination is done too quickly, with a poor quality Wood's lamp, a room that this is not darkened or an examiner that is not trained. False positive reaction are often the result of people confusing the glowing of oil from skin glands, blue white scales of dust, medication applications, or bathing of the animal prior to examination.

41) Q: You mentioned that it's very common for truly infected ringworm cats to glow (more than the literature reported 50%). What is the approximate percentage of your field studies?

A: The comment that 50% of strains glow is from the human literature and has been carried forward in the veterinary literature. In my experience, cats that are lesion free but culture positive due to fomite carriage are Wood's lamp negative. In my experience, it is very common for untreated lesional culture positive cats to have positive Wood's lamp examinations, if done properly.

42) Q: I heard there are 3 strains of ringworm but only one, the most common one for cats, glows under a Wood's lamp.

A: There are many different ringworm species, but the only veterinary pathogen of importance that glows is *Microsporum canis*.

Cultures

43) Q: Does a normal trichogram from the hair of a skin lesion rule out ringworm if the shelter cannot afford to culture?

A: The only way to be certain a skin lesion is not due to ringworm is to do a fungal culture.

44) Q: I have had multiple dermatophyte test medium (DTM) cultures where there is fungal growth and color change, but with microscopic exam I see filaments but not the macroconidia. Why would this be?

A: The color change on DTM is not diagnostic for ringworm. The color change occurs because of change in the pH of the medium. Many non-pathogens can grow on cultures and cause a color change on the fungal medium. The colonies that you want to focus on sampling are those that are pale or white and have a red color change develop around them as they are growing. *M. canis* is notorious for having variable production of macroconidia.

45) Q: At what stage of systemic treatment do you recommend starting cultures?

A: I recommend culturing cats every week and monitoring those cultures every week. See the resources for examples on sample data sheets. Weekly monitoring will detect cure faster and decrease the number of animal care days and treatment days. It will also help detect treatment related problems. For example, if a cat is not curing, this will be detected sooner and you can then track down the problem, which might be the treatment, lesions not being treated, etc.

46) Q: What is the best/fastest way to test other than DTM culture?

A: DTM cultures are the optimum. Careful examination of lesions and direct examination of Wood's lamp positive hairs are evidence of an infection.

47) Q: Does culturing during treatment with systemic drugs such as itraconazole influence culture results?

A: Fungal cultures from cats under treatment may grow more slowly. Often post treatment cultures will not become positive until the second week to third week of treatment. The hyphae will often look distorted as will the macroconidia. The macroconidia may be slow to grow, curved or have variable number of segments. It is important to hold incubated cultures for 21 days.

48) Q: What are the pros and cons of in-house vs. external laboratory culture and how long would you culture for?

A: In-house laboratories allow for daily observations of cultures and more rapid results. In addition, it also allows for the staff to perform colony forming unit counts or P scores (pathogen scores). However, this assumes that the shelter has adequate resources and space for performing the cultures. In-house cultures are often less expensive. Outside laboratories have staff and facilities capable to do cultures. The laboratory may or may not provide weekly updates or colony forming units unless asked.

See the resources for links on how to do in-house cultures. Cultures should be incubated for 21 days at 75-80F.

49) Q: We have been doing toothbrush cultures on incoming cats and get lots of *T. rubrum* and *T. terrestre*. None of these cats have ever become symptomatic. So when you say that *Trichophyton* can cause clinical signs do you mean only *T. mentagrophytes*?

A: The primary pathogen that causes outbreak concerns in shelters is *Microsporum canis*. It is not uncommon to isolate *Trichophyton spp* colonies from cats and unless the cats are lesional, my recommendation would be to focus on *M. canis* isolated from cultures. However, there have been case reports of cats having *Trichophyton spp* ringworm; these cats have been lesional. Often these cats are from rural areas or barns where there is exposure to large animals.

50) Q: After treatment, if lesions are gone and you get a positive culture result, do you consider that it is fomite, or do you start treatment again?

A: Clinical cure will often precede mycological (fungal) cure. It is not uncommon for cats to look normal but still be culture positive during treatment. Often these cats have small lesions that are difficult to see unless carefully examined. Wood's lamp examinations can be helpful in these cases as it may identify these subtle lesions. Ears, paws, tail and around the eyes are key places to look. A cat is cured when it has two negative fungal cultures at weekly intervals.

51) Q: Have you noted that when using RSM/DTM combo plates that *M. canis* colonies grow (with the green color change) much more quickly than on the DTM side?

A: Yes, this is a common finding with RSM/DTM. It is also common for the RSM side to rapidly turn completely green.

52) Q: Is there a standard petri dish size needed for P score?

A: A pathogen or P-score can be done on petri dishes no smaller than 66 mm, split plates, or square fungal culture plates.

53) Q: What does a fungal culture tell you that an exam under microscope doesn't?

A: If a cat has not been treated, then a positive Wood's and positive trichogram will confirm the infection. However, not all Wood's positive hairs or hairs that show abnormalities are culture positive – this occurs most commonly in post treatment samples.

Treatment

54) Q: Is shaving a cat a good idea? Or does it worsen?

A: In general, clipping hairs around an infection site will mechanically debulk the infective material. Whole body clipping may be needed when the cat has long hair, extensive lesions, or matted hair coat. When clipping the hair coat it is important to be careful not to cause microtrauma or thermal injury to the skin.

55) Q: Would you rather use a cream or oral meds?

A: Fungal creams are primarily designed to treat lesions on the hairless skin of people. In animals ringworm sheds infective spores over the entire hair coat so a whole body rinse (e.g., lime-sulfur) is recommended. Ringworm spores are the result of infection of hairs in the hair follicles; therefore the optimum treatment is a systemic oral medication.

56) Q: Our shelter had good luck with over the counter Lamisil for athlete's foot, jock itch, and ringworm on people. It cuts down the time until fur starts growing to about 10 days/2 weeks. It seems less harsh than other products & is cheaper. Is this safe for a cat?

A: Lamisil is a cream form of terbinafine. I do not recommend the use of creams to treat lesions in cats. Local treatment of lesions can lead to subclinical infections. It is important to remember that even though the lesions are clinically 'normal' does not necessarily mean that the cat is cured of ringworm.

57) Q: Do most shelters routinely lime-sulfur dip all new arrivals?

A: It is not a common practice to dip cats upon arrival. Being admitted to a shelter is a very stressful situation and being dipped upon admission would magnify the stress. With that said, dipping upon intake has been part of the protocol when processing large numbers of cats during a crisis (i.e., seizure of cats in humane situations).

58) Q: One of the shelters I work with does use the Inray. Is it completely useless? Or can we switch once these are used up?

A: Inray was designed for use in people where *Trichophyton spp* is the primary pathogen. Once the supply has been used, it is recommended changing to a product that has a larger volume of medium and a larger surface area to allow for P counts.

59) Q: We use fluconazole. Do you have any experience with that?

A: Yes. Fluconazole was effective when used at 10 mg/kg orally once daily in treating kittens with dermatophytosis. But it is not approved for use in cats or kittens.

60) Q: Is Terbinafine safe to use in young kittens?

A: Terbinafine is not approved for use in cats. I have used it in kittens at 8 weeks of age.

61) Q: What is recommended for systemic treatment for very young babies?

A: I would not use a systemic antifungal in a kitten less than 8 weeks of age.

62) Q: When you say mix fresh lime-sulfur each time, does that mean for each cat or each “dipping” session with all the infected cats?

A: Fresh for each dipping session.

63) Q: Can you use the itraconazole capsules and count those stupid small beads for dosing? Does that work?

A: That is one method of doing it, or it can be weighed out, or a capsule can be opened and divided into quarters.

64) Q: What are the risks of getting lime dip on the cats’ face, in the eyes and the mouth? How do you dry the cat or kittens – air dry, towel dry, or use a hair dryer?

A: Lime-sulfur should be applied carefully to the face using a sponge. Treated cats are air dried. It is important to allow the dip to air dry on the cats.

65) Q: What do you think of betadine solution on ringworm lesions?

A: Betadine has been found to be ineffective against infective spores.

66) Q: What is the typical length of treatment? I know that it is a minimum of 21 days, but in your opinion, what is the average time for most cases?

A: In general, cats or kittens with uncomplicated ringworm infections will respond to treatment in 6 to 8 weeks; however, the treatment end point is two negative consecutive fungal cultures.

67) Q: What about treating with Miconazole shampoo twice a week?

A: Miconazole is antifungal, but in general I do not recommend shampooing cats with dermatophytosis because it softens the hairs resulting in fracturing of the shafts. This releases more spores over the hair coat. It is my preference to use lime-sulfur dip and let it air dry.

68) Q: In the event of an outbreak, does dipping the entire population provide any protection against infection for uninfected cats?

A: The first most important step in an outbreak is to not move cats, and to start aggressively cleaning the shelter. I would not recommend immediate dipping of cats until an outbreak response plan has been designed. The first steps are to determine if there is an outbreak and how wide spread, or not, the problem is. Immediately dipping cats may complicate a veterinary assessment of the situation.

69) Q: At what point in their treatment can you “loosen” foster home precautions (i.e., let their children play with the kitten)? After how many dips or how many days on orals?

A: In my opinion, homes where there are children are not suitable care sites for kittens with ringworm. There is too much risk of possible spread to the children.