Ringworm (Dermatophytosis)

Table of Contents:
Introduction
Diagnosing Ringworm
Treating Ringworm
Verifing Cure
Preventing Ringworm
Managing Ringworm in a Private or Foster Home
Summary of Prevention and Treatment

Introduction

Ringworm in an individual cat is a nuisance; however, ringworm in an animal shelter can lead to completely unmanageable outbreaks, thousands of dollars in diagnostic and medical costs, the possibility of spread to adopters and staff, and an intolerable blow to shelter status in the community. It is vital to have a consistent and effective strategy to prevent and manage this disease.

What is Ringworm?

Ringworm "dermatophytosis", is a fungal infection affecting the skin, hair and occasionally nails of animals (and people). Three species of ringworm fungus most commonly affect cats and dogs. *Microsporum canis*, *Trichophyton mentagrophytes* and *Microsporum gypseum*.

Who Gets Ringworm?

The dermatophyte species that affect cats and dogs can be passed between these two species as well as to humans and other species.

Factors that increase risk of ringworm

- **Age**: Animals of any age are susceptible, but young animals (<1 yr old) & geriatric animals are at the highest risk.
- **Species and breed**: Cats are at greater risk than dogs. Persian cats and Yorkshire Terriers are at relatively high risk, as are long haired cats in general.
- **Immune status**: Conditions that compromise the immune system such as FIV, FeLV, pregnancy/lactation, malnutrition, or anti-inflammatory drugs, cancer, stress.
- **Preexisting Conditions**: Animals with preexisting conditions that compromise grooming (such as URI) or skin integrity (such as flea allergies, overgrooming, external parasites) are at increased risk.

How is ringworm spread?

*T. mentagrophytes* is thought to be contracted mainly from exposure to rodent nests, and *M. gypseum* from contaminated soil, though the potential exists for spread from animal to animal in a contaminated environment. *M. canis* is most often spread from contact with an infected animal or a contaminated environment, and therefore is by far the most likely to be a serious problem in a shelter.

Ringworm is very durable in the environment. Ringworm can persist in carriers, furniture, carpets, dust, heating vents, furnace filters and the like, and can infect animals housed in a contaminated environment months and even years later. (See information on environmental clean-up to learn more about determining sources of significant contamination.) Ringworm can be spread readily on grooming implements, contaminated toys and bedding, or by humans on clothing and hands. It can be found on the hair of animals from a contaminated environment even when the animal itself is not showing any signs. In nature, the incubation period for ringworm is between 4 days and 4 weeks.

Diagnosing Ringworm?

Accurate diagnosis of ringworm is very important: the consequences of a false positive test may be severe for the individual animal diagnosed, especially at agencies that must euthanize ringworm positive animals. The consequences of a false negative may be even more severe, as it may allow an infected individual to spread ringworm within a facility or to a foster or adoptive home. Unfortunately, there is no rapid, reliable test for diagnosis of ringworm. There are ways to confirm its presence, but no definitive way to confirm absence except by
If it is necessary due to practical considerations to make a "best guess" without performing a fungal culture, history, clinical signs and results of Woods lamp examination should be considered together. For instance, a classic ring shaped lesion in a kitten, especially if multiple members of a litter are affected, is very likely to be ringworm even if Woods lamp results are negative. On the other hand, ringworm is uncommon in adult dogs, so even a suspicious lesion is more likely to have another cause unless there is a highly suggestive history (i.e. known recent exposure, endemic area).

Clinical appearance

The name "ringworm" comes from the most common appearance of a circular area of hair loss and scaling. The most common locations include the face, ears, feet and tail. However, ringworm can present with a wide range of appearances, including large areas of hair loss with or without crusts and exudate. Ringworm can cause infection of the toe nails and nail beds. Ringworm may either resemble or secondarily infect conditions such as flea allergy dermatitis, stud tail? and chin acne? in cats. Especially consider ringworm as a possible cause of these conditions if the cat is known to have been recently exposed. Ringworm lesions may or may not be pruritic (itchy).

There are other possible causes for all the types of lesions described above, so definitive diagnosis based on appearance alone is not possible. In a shelter study, the majority of cats with skin lesions were not infected with ringworm, AND a significant number of cats with no grossly apparent lesions were culture positive. Therefore, fungal culture should ideally be used to confirm or rule out ringworm in all cats, especially those at high risk due to presence of skin disease, breed or exposure risk. The most common differential diagnoses to be considered include demodectic mange and staphylococcal folliculitis.

Wood's lamp

The Woods lamp is an ultraviolet light with a specific wave length of light which causes some strains of Microsporum canis to fluoresce. Although not a perfect diagnostic test due to the relatively high frequency of false negative results, a Wood's lamp - correctly used - can be a helpful and cost effective screening tool. It has been estimated that somewhere between 30-80% of M. canis strains will fluoresce; the actual frequency in ringworm-infected cats has not been documented but may be higher than the 50% commonly quoted. Bright apple green fluorescence coating the hair shafts is strongly suggestive of infection and warrants isolation and fungal culture. A negative Wood's lamp exam does not rule out infection and suspicious lesions should always be cultured. Some drugs and other products, notably tetracycline drugs and ointments (e.g. doxycycline, terramycin), will also fluoresce. Fluorescence induced by dermatophyte infection can be distinguished from fluorescence due to contaminants by the fact that ringworm can not be easily rinsed off. Observation of known lesions will help develop proficiency in recognizing true fluorescence. In order to maximize the usefulness of this test, it is important to use the right equipment, correctly:

- A true Wood's lamp should be used, as opposed to a generic UV light. Woods lamps fluoresce at a particular wave length (360 nm).
- A plug-in, rather than battery model, is ideal as the stronger light is more likely to generate fluorescence.
- Perform the exam in a completely dark room.
- Allow the light to warm up for 5-10 minutes, and hold the lamp over the suspect areas for at least 5 minutes, as some strains take time to fluoresce.
- Look the animal over carefully, especially on the face, feet, belly, and inside the ears

Although absence of Woods lamp fluorescence by no means rules out ringworm infection, a positive result is a good indicator to at least isolate the animal until fungal culture results can be determined.

Direct Microscopic Examination

Like the Woods lamp, positive findings in direct examination can diagnose ringworm, but negative findings do not rule it out. False negatives occur between 40% - 70% of the time. Results can be improved through practice.

Hair may be suspended in mineral oil and examined directly. Some people recommend clearing the sample of keratin by suspending it in 10 - 20% KOH or chlorphenolac prior to examination. The slide is then allowed to stand for 30 minutes at room temperature. Infected hairs appear swollen, frayed, irregular or fuzzy in outline, and the normal structure of cuticle, cortex, and medulla is lost. Arthroconidia (beaded chains of small rounded cells) and hyphae can sometimes be seen. Hyphae are uniform in diameter, septate and variable in length and degree of branching. Dermatophytes do not form macroconidia in tissue, so any macroconidia seen represent other species of fungus.

Recognition of affected hairs takes practice. To get experience in making a diagnosis by this method, examine known infected hairs from a Woods lamp-positive lesion. Doubtful cases should be cultured.

Fungal culture

Ultimately the only truly reliable way to diagnose ringworm is via fungal culture. Performance of this test in-house where possible, as opposed
to sending it out to a diagnostic laboratory, has several advantages. In order to properly manage an outbreak of ringworm affecting multiple cats, numerous cultures are required: for risk assessment in exposed cats, diagnosis of suspect lesions and confirmation of cure after treatment. This can quickly become a prohibitive expense if cultures are not done in a cost effective way. Reading cultures in-house also permits a speedier diagnosis in positive cases – growth often occurs within a week, allowing earlier initiation of treatment. The amount of growth on a culture plate can help differentiate possible carriers from truly infected cats. Foster parents can be instructed in the proper technique for toothbrush culture collection, and can simply bring samples in for ongoing monitoring purposes rather than bringing in all the infected cats each time.

**Notes on successful ringworm culture:**

Plate style cultures are easier to inoculate via toothbrush than the little jars, and also easier to take samples from for microscopic examination. Plates that combine dermatophyte test medium on one side (to give a red color change with most species of dermatophytes) with rapid sporulating medium or Sabouraud's dextrose agar on the other side (to aid in microscopic identification of colonies) are ideal.

**For lesions:**

- Pluck plenty of individual hairs using hemostats or a gloved hand from suspect lesions (if hairs are Woods lamp positive, choose those). Press hairs firmly into culture. Even for those animals with lesions, toothbrush culture may be preferred as described below.
- A tooth brush may also be used

**For animals with no lesions or multifocal lesions:**

- If coat contamination is suspected, wipe the animal down with a damp cloth prior to culture
- Using a toothbrush from a freshly opened package, brush the animal at least 30 times, especially suspicious areas, around the face and inside and outside of pinnae, and around the nail beds
- If toothbrushes are transported prior to culture inoculation, make sure they are not exposed to high heat (e.g. in a hot car) as this can destroy spores and lead to false negative culture results
- Make sure culture medium is at room temperature when inoculated
- Press the toothbrush firmly into culture medium, but not so firmly that the culture medium is disrupted
- Don't forget to label the sample with date and animal ID

**Identification**

Not all dermatophytes turn the dermatophyte test medium red, so false negatives are possible. Some other types of non-pathogenic fungi can cause the red color, so false positives are possible too. To be certain of a diagnosis of ringworm, it is imperative to microscopically examine and positively identify the fungus. This is accomplished by microscopic examination of a “tape prep”:

- Place a drop of lactophenol blue stain on a slide
- Dab the sticky side of a piece of tape on the suspect colony
- Place the tape over the drop of stain and examine under the microscope

Most culture media kits come with a guide to microscopic identification. Descriptions and photos for fungal identification can be found in Muller and Kirk's Small Animal Dermatology, 6th Edition, page 122 (Saunders).

Culture plates are available from many sources. Derm duets can be obtained from Bacti-labs, The culture on RSM can be microscopically examined to positively identify the fungus present.

**How is ringworm treated?**

In most cases, pet animals spontaneously recover from ringworm within about 3 months. Awaiting self-cure is certainly a reasonable choice in a one animal household where contagion is not a major concern. However, in a shelter environment or foster situation, a more rapid resolution is highly desirable. Treatment should be directed towards speeding recovery and reducing environmental contamination.

**A truly awesome resource on dermatophyte culture and treatment**

Dr. Sandra Newbury, DVM, Director of Animal Medical Services at the Dane County Humane Society working in conjunction with Karen A.
Moriello, DVM, DACVD from the School of Veterinary Medicine at the University of Wisconsin-Madison have conducted an ongoing study of naturally occurring shelter ringworm to develop cost effective systems for screening and treatment. As a result of their findings Dr's. Newbury and Moriello have developed a ringworm treatment information site entitled Dermatophyte Treatment in a Nutshell. This site contains detailed information on the treatment strategies they have found most effective in a shelter environment. The recommendations below are based in large part on their findings.

Clipping and shaving
Clipping is often un-necessary in short and medium haired cats, and may worsen lesions through microtrauma and mechanical spread of spores. However, clipping is indicated for seriously long haired cats and those that may be unable to groom due to conformation (e.g. Persians), concurrent severe upper respiratory congestion, or matted coat. Clipping may also be useful in cats whose coats simply become un-manageable after dipping. Clipping should be performed gently with a #10 blade - taking great care to avoid clipper burn - and hair should be carefully disposed of afterward. Clipping with a closer blade causes excessive trauma and increases the chance of worsening lesions. Clipping should be performed in a room that is easily cleaned since it causes heavy environmental contamination (see below), and instruments used should be carefully cleaned and dedicated only to that purpose, never used on healthy animals (ie don't use the surgery clippers for ringworm cats!). It is important to wear protective clothing whenever handling a ringworm cat in a shelter, and especially when clipping. In a facility with an easily cleaned euthanasia room, this might be a relatively good place for clipping ringworm cats.

Topical dips and shampoos
The most important component of treatment in a population is topical therapy. This is critical in order to reduce immediate and ongoing environmental contamination. Of all available topical therapies, lime sulfur dip is cost effective, relatively easy to apply rapidly to a number of cats, and has been documented to work in a shelter setting. Miconazole shampoo in combination with chlorhexidine may also be effective; chlorhexidine alone is not. Enilconazole dip, although reportedly effective, is not available for this use in the United States (it is regulated by the EPA rather than the FDA, which does not permit off-label use in the same way). Some currently available topical treatments are ineffective or only partially effective; use caution if selecting another treatment besides lime sulfur dip. Chlorhexidine shampoos and locally applied topical ointments are not effective.

Lime sulfur details:
- Use 8% concentration
- Apply twice weekly throughout treatment
- Okay in pregnant and nursing cats, kittens > 2-3 weeks old
- Wipe nursing moms, keep kittens warm
- E-collar afterward may not be necessary

Lime sulfur application
- Do not pre-wet the cat
- Consider using a pesticide sprayer for application: details at http://www.giveshelter.org/ringworm-treatment-program.html
- Keep eye flush handy, flush generously if dip gets into cat's eye

Systemic treatment
Systemic treatment is an important adjunct to topical therapy, especially in a shelter where time-to-cure is an important consideration. Extended stays in a shelter or foster care increase the chance of spread, use precious isolation space, and may reduce the adoptability of the patient, especially if kittens are allowed to grow old in treatment. The drawbacks of systemic treatment are the relatively high cost of the drugs and the possibility of toxic side effects. Itraconazole is a good choice due to its demonstrated efficacy, relative safety, and long half-life in the skin. Fluconazole and terbinafine are also reportedly effective. Griseofulvin is effective, but more likely than itraconazole to cause toxic side effects, and is becoming increasingly difficult to obtain. Ketoconazole should be avoided in cats if possible, as it is relatively likely to cause hepatotoxicity in this species. Lufenuron (Program) has been shown in repeated studies to be ineffective.

Animals on any systemic anti-fungal should be closely monitored, and all directions for administering the drugs carefully followed. These drugs should be avoided in pregnant animals. Compounding may be necessary to allow administration of sufficiently small doses for kittens. Alternatively, capsules can be divided manually into smaller doses, using gel caps, meatballs or butter.

Things that don't work
Although many treatments are reportedly effective for individual cats, the frequency of self-cure makes these claims somewhat difficult to assess in the absence of supporting scientific evidence. In a population, treatment failure is more evident and common, and the requirements for highly effective treatment are rigorous. The following treatments have failed to demonstrate efficacy in controlled studies:

- Lufenuron (Program)
- Topical creams and ointments
- Chlorhexidine shampoo or as a disinfectant
Verifying Cure

It is imperative to recognize that animals can still carry infective fungi even after signs appear to have completely resolved. Animals may be considered cured after 3 consecutive weekly fungal cultures are negative. (If twice weekly lime sulfur and systemic itraconazole are used, 2 cultures may be adequate.) Fungal culture should be obtained, using the toothbrush collection method, starting at week 1 of treatment. Animals housed in a contaminated environment may become incidentally contaminated: if this is a concern, the animal should be kept in a clean carrier or room for 5-10 days prior to obtaining the culture.

Because the fungal cultures take about two weeks to verify negative results, this means that treatment and documentation of cure will take a minimum of 6-8 weeks, and may take as long as 3-4 months. Housing and socialization of the animal during this period are important considerations when deciding whether treatment in the shelter is practical.

Preventing Ringworm

There is currently no vaccine available that is protective against ringworm.

The best protection, as with many infectious conditions, is to practice excellent husbandry. Kittens, which are at highest risk, should be screened with a Woods lamp and careful visual examination prior to being placed in foster homes or group rooms. Remember that about half of cases will not be detected with the Woods lamp. Kittens should be housed separately from adult cats. For areas with high levels of ringworm, all kittens or litters should be housed separately in an easy to bleach area for at least two weeks and observed before being allowed the run of a house or being placed in group housing (recalling that the incubation period is 4 days to 4 weeks, so this quarantine will catch some but not all cases).

When placing a cat or kitten in a foster home or other environment suspected to be contaminated, take a fungal culture before placing the animal in that environment. If initial fungal culture was negative and the cat develops ringworm, you at least then know for sure that the environment is contaminated and you can take further steps as needed.

Preventing ringworm in a shelter setting Identify affected animals

- Carefully inspect all incoming animals and all animals being considered for foster care or group housing. Look for any areas of hair loss, scabbing, or crusting, especially focal areas affecting the face, ears, feet or tail.
- Perform Woods lamp examination of all suspicious lesions and all cats being considered for placement in group housing or foster care. Use correct technique and recognize the limitations of this exam (false negatives possible).
- Direct microscopic examination of hairs from suspicious lesions. Practice technique and recognize limitations (false negatives possible).
- Fungal culture and microscopic identification in all cases where definitive diagnosis is required.

Segregate affected animals from the general population

- All surfaces with which ringworm suspect cats have had contact should be immediately cleaned, then disinfected with bleach diluted at 1.5 cups per gallon. This includes floors, carriers, transport vehicles and counter tops.
- Clearly identify suspect animals (i.e. post a sign on their cage)
- House individually in cages that can be easily cleaned and bleached.
- In foster care, house in large dog crate or easily cleaned room such as bathroom until at least two weeks of effective topical treatment has been completed.
- Ideally, house ringworm suspects separate from other animals. If that is not possible, at least keep them separate from highest risk groups (kittens, pregnant moms, cats with URI).
- Wear protective clothing when working in a ringworm quarantine room or working with affected animals (protective clothing, gloves, shoe covers or boots used only for that purpose). Discard or launder protective clothing daily.
- Clean cages and all surfaces in the room daily with bleach diluted at 1:32 while animals are housed there. Contact time of 15 minutes is required.
- Heating and cooling vents should be vacuumed and disinfected at least weekly. Furnace filters should be changed weekly.
- Dishes & other washable items can be run through a dishwasher provided water temperature reaches at least 43.30 C (1100 F).
- Bedding should be washed daily during treatment. Ringworm laundry should be washed separately from other laundry. Bedding or toys that can not be washed should be discarded.
- Following housing a ringworm animal, clean the cage with bleach diluted at 1:10 for at least two consecutive applications (air drying between) before using the cage for another animal.
- Carefully clean all areas that can?t be bleached using a damp mop or electrostatic cleaner such as a Swiffer (®) followed by
vacuuming. Discard the vacuum cleaner bag.

Environmental decontamination

The foundation of environmental decontamination is identification and treatment or removal of affected animals coupled with careful mechanical cleaning. Ringworm will be most persistent in a moist environment protected from exposure to sunlight, and can remain infective for months or even years. Efficacy of a number of cleaning agents against ringworm has been tested. Only concentrated bleach and 1% formalin have been shown to be effective in killing 100% of spores in a single application. Concentrated bleach is too harsh to be routinely used, so multiple applications of bleach diluted 1:10 with prolonged contact time are recommended. High heat (> 110 degrees) is also effective. This temperature can be attained by commercial dishwashers, some commercial steam applicators (but not necessarily home steam carpet cleaners) and clothes dryers. Quaternary ammonium compounds (i.e. parvo-sol®, chlorehexadine (Nolvasan®) and potassium peroxymonosulfate (Trifectant®, Virkon-S®) have not withstood independent trials to demonstrate efficacy.

Environmental cure: the 5 D?s

Environmental decontamination is usually straightforward in a typical shelter with easily bleached and mechanically cleaned cages. It can present a much greater problem in a home or more home-like environment such as a group cat room. Application of harsh disinfectants to every contaminated surface is an impossible goal in such environments. Fortunately, much can be accomplished through identification, removal and treatment of carrier cats, followed by repeated application of elbow grease. Environmental culture can take the guesswork out of decontamination, and spare a lot of un-necessary work and worry. Clean carefully, disinfect where possible, then take cultures of possibly contaminated areas to evaluate success. If the culture is negative, the area can probably be safely re-opened to feline inhabitants. If positive, at least you know for sure you have to go back and try again. This can save a lot of agony over whether to replace carpets, furniture etc. The five D?s of ringworm decontamination are:

- **Diagnose**
  - Recognize and treat infected and carrier cats. No amount of cleaning or disinfection will work if one or more cats are re-contaminating the environment.
  - Remember to check other pets in a foster home, especially cats.
  - Human lesions also need to be treated.

- **Discard**
  - Heavily exposed items such as scratching posts that can not be easily washed or bleached should be discarded.

- **Debulk**
  - Careful mechanical cleaning goes a long way towards removing ringworm contamination. This includes clearing cluttered surfaces, use of an electrostatic cleaning product such as a Swiffer® to remove as much dust and hair as possible from every surface, and vacuuming of all accessible areas. Commercial steam cleaning of carpets may be helpful for both mechanical cleaning and heat destruction of spores. Where possible, furnace filters and air vents should be cleaned and/or replaced. However, cleaning of duct work is often not necessary.

- **Disinfect**
  - Apply bleach at 1.5 cups per gallon to all bleachable surfaces

- **Document success through environmental culture**
  - Cut Swiffer® into small sections, wipe possibly contaminated surfaces until visibly dirty
  - Press Swiffer® repeatedly onto fungal culture plate, culture as usual
  - Repeat the five D?s as necessary until environmental cultures are negative!

**What procedures should be implemented in the event of an outbreak at an animal shelter?**

**Risk assessment for exposed cats**

When any cat from a population is diagnosed with ringworm, the question arises: what do you do about the other cats in the environment? Do they all need to be cultured? Must they all be isolated while awaiting culture results? Will they all need treatment? The answer to these questions is dependent on several factors. Not all cats in the same house or even the same room as a ringworm-infected cat will become infected themselves. The risk of infection depends on the cat?s individual immune status and grooming habits, the overall cleanliness of the environment, and the level of proximity between the exposed and infected cats. Some questions to ask include:

**What is the baseline sanitation level?** Is this a highly cleanable environment such as a bank of stainless steel cages in an otherwise empty room? Is this a home with lots of scratching posts, furniture and carpeting to collect spores? Somewhere in between, such as a bank of cages in a messy room, with lots of junk piled about? Is bleach used on a routine basis for cleaning?

**How closely exposed were the cats?** Were they each in separate cages, with minimal handling by staff likely to be carrying infection on their clothing? Was there some shared space such as an exercise area or ?get acquainted room? where the cats co-mingle or spend time without cleaning between occupants? Are cats allowed to wander loose during cleaning but caged separately otherwise?

**Is there evidence of spread?** Has more than one cat been affected? Are all affected cats from one area of the shelter, or has it shown up in
more than one room? Are cats that have been in the shelter long term (> 2-4 weeks) affected? (This suggests acquisition of infection in the shelter, as opposed to coming in already infected.)

If the environment is basically clean, cats are generally kept reasonably separated, and overall cat health is good, it is not uncommon for cats to survive a minor exposure without becoming infected. Ideally, all exposed cats will be toothbrush-cultured, but this is often impractical and may not be necessary in a reasonably well-run shelter. On the other hand, toothbrush cultures all around are generally required in a foster home where there are extensive opportunities for contact, in a cage-free cat shelter or group cat room, or any time there is evidence of significant spread (multiple cats affected). For more information on interpretation of fungal cultures (“pathogen scores”) and management based on culture results, please see [http://www.giveshelter.org/ringworm-treatment-program.html](http://www.giveshelter.org/ringworm-treatment-program.html).

In the event of a true outbreak, many shelters will find it impossible to shut down intake for the duration of treatment. In such cases, it will be necessary to create a clean, separate area for new incoming cats. If this is impossible, a single dip in lyme sulfur at intake can reduce the chances of infection if cats must be admitted to a contaminated environment.

As is always the case, prevention of an infectious disease outbreak is far cheaper and easier on all concerned than management of an outbreak. After an outbreak of any kind, all personnel should meet to ensure that all staff and volunteers understand how the situation came about and what methods of control were most effective in ending the outbreak. From this informational meeting a plan to prevent outbreaks in the future should be, developed, written down, posted and distributed, so that all involved are aware of their role in prevention of future outbreaks.

**Managing Ringworm in a Foster Home or Private Home**

Daily cleaning will minimize the amount of environmental contamination that builds up while affected cats are housed there. In addition, thorough cleaning will be needed after the affected cats have left the environment (or recovered). This will be much easier if cats are limited to a small area of the house that has minimal furniture and carpeting (e.g. a large dog crate, bathroom). This is particularly critical until the first two weeks of effective topical treatment have been completed, and ideally until at least one negative fungal culture has been obtained.

**Cleaning the home environment in the event of a ringworm infection:**

**Daily**

- All non-porous surfaces should be damp mopped, Swiffered® and/or vacuumed (to gather up infectious hairs) and cleaned with bleach at 1:32. This includes floors, walls, counter tops, windowsills, and carriers.
- Rugs should be vacuumed twice daily. Vacuum cleaner bags should be regularly discarded.
- Bedding and protective clothing should be changed daily, and laundered separately in hot water with a quarter cup of bleach and dried in a dryer (or discarded).

After affected cats have been cleared out, follow the five Ds as described above. The extent to which extensive cleaning will be necessary depends on the level of environmental contamination. If kittens romped through the house for some time before diagnosis, or an effective topical treatment was not used consistently, extensive efforts may be required. If on the other hand the cat was kept reasonably confined to a cleanable area and effectively treated from the outside, basic cleaning may be adequate. Some steps to consider include those below.

- All exposed animals should be tested for ringworm as described above to make sure they are not subclinically affected.
- All exposed bedding, toys, brushes, etc should be discarded.
- All non-porous surfaces should be thoroughly cleaned and disinfected where possible with bleach at 1:10. This should be repeated at least twice.
- All exposed carpets and furniture should be vacuumed daily for one week, and the vacuum cleaner bags discarded daily.
- All heating and cooling vents should be vacuumed or filters replaced. It is not usually necessary to have ducts commercially cleaned.
- Carpets should be commercially steam cleaned. Steam cleaning with cleaners that use hot tap water is ineffective, as the water does not reach a high enough temperature.
- Clothing that was worn when in contact with the cats should be washed in hot water with bleach, then dried in a dryer or by hanging in sunlight.
- Environmental cultures should be performed to verify success of decontamination prior to re-opening the foster home to new cats.

**Summary of Ringworm Prevention**

- There is no effective vaccine.
- There is no absolutely reliable screening test.
- Practice good husbandry: keep animals clean, well-nourished, treat other diseases and internal parasites, avoid overcrowding and stress.
- Avoid mixing kittens with adult cats.
- Perform careful visual exam of all incoming animals and isolate suspects.
Further screening of foster and group housing candidates as described
During an outbreak or in areas that have frequent problems with ringworm, separate housing of all kittens in an easy to bleach area for at least two weeks, followed by careful re-inspection for signs of ringworm.
Develop a clear written protocol for handling ringworm, and ensure that staff and foster care providers are familiar with this protocol and the signs of ringworm.

Source: [http://www.sheltermedicine.com/node/56](http://www.sheltermedicine.com/node/56)

© 2010 UC-Davis Koret Shelter Medicine Program