

# Ringworm

## What Kind of Infection is it?

Ringworm is the common name for the skin infection caused by a certain group of fungi; it is not caused by a worm at all. The fungi feed upon the dead cells of skin and hair causing, in people, a classic round, red lesion with a ring of scale around the edges and normal recovering skin in the center. Because the ring of irritated, itchy skin looked like a worm, the infection was erroneously named. The fungi responsible are called dermatophytes, meaning plants that live on the skin, thus the more correct term for ringworm is dermatophytosis. The characteristic ring appearance is primarily seen in humans. In animals, ringworm frequently looks like a dry, grey, scaly patch but can also mimic any other skin lesion and have any appearance.

## Where Would my Pet Pick up this Infection?

The spores of dermatophyte fungi are extremely hardy in the environment; they can live for years. All it takes is skin contact with a spore to cause infection; however, the skin must be abraded (irritated, as in an abrasion) as the fungus cannot infect healthy intact skin. This means that freshly shaved, scraped, or scratched skin is especially vulnerable. Infected animals are continuously dropping spore-covered hairs when infected hairs break off into the environment. Some animals are carriers, who never show signs of skin irritation themselves but can infect others readily. A carrier might be subclinically infected, which means their skin is infected but shows no visible lesions. Ringworm patients undergoing treatment commonly fit in this category towards the end of their care; the skin is still dropping spores but the visible signs of infection have cleared up. A carrier can also carry the spores on their fur without being infected, much as an inanimate object might have spores on its surface incidentally. In this situation, the spores can be easily washed away. There is no obvious way to distinguish between these two types of carrier state. There are several species of dermatophyte fungi. Different species of fungi come from different kinds of animals or even from soil; determining the ringworm species can help determine the source of the fungal infection.

## Can I get this Infection?

Yes, ringworm is contagious to people; however, some people are at greater risk than others. The fungus takes advantage of skin in people with reduced immune capacity. This puts young animals and children, elderly people and pets, those who are HIV-positive, people on chemotherapy or taking medication after transfusion or organ transplant, and highly stressed people and animals at high risk. In general, if you do not already have ringworm at the time your pet is diagnosed, you probably will not get it. Keep in mind that skin must be abraded to become infected.

## How does the Doctor know this is Really Ringworm?

In some cases, we know for sure that dermatophyte fungi are present while in other cases we are only highly suspicious. Lesions on animal skin are rarely the classic ring-shaped as in people (in fact, in animals, lesions are often not even itchy) thus some testing is usually necessary as we will describe.

### *Wood's Light (Fluorescence)*

*Microsporium canis*, the most common ringworm fungus, will fluoresce apple green in approximately 50% of cases. Fluorescence is an easy test to perform and may provide a strong clue that there are dermatophytes on the skin. Further testing is usually needed, however, to absolutely confirm diagnosis.

### *Microscopic Examination*

Your veterinarian may wish to examine some hairs for microscopic spores. If spores can be seen on damaged hairs then the diagnosis of ringworm is confirmed; however, as spores are difficult to see, many veterinarians skip this step.

### *Fungal Culture*

Here, some hairs and skin scales are placed on a specific culture medium in an attempt to grow one of the ringworm fungi. The advantage of this test is that it not only can confirm ringworm but it can tell which species of fungus it is. Knowing the identity of the fungus may help determine the source of infection. The disadvantage, however, is that fungi require at least 10 days to grow out.

Also, this is the only test that is helpful in determining if animal is an asymptomatic carrier. The other tests require an apparent skin lesion to test. A pet with no apparent lesions can be combed over its whole body, and the fur and skin that are removed can be cultured. Carrier animals are usually cats living with several other cats.

## Biopsy

Sometimes the lesions on the skin are so uncharacteristic that a skin biopsy is necessary to obtain a diagnosis. Fungal spores are quite clear in these samples and the diagnosis may be ruled in or out. Depending on the outcome of preliminary tests, your veterinarian may begin ringworm treatment right away or postpone it until after more definitive results are available.

## Treatment

Commitment is the key to success, especially if you have more than one pet. Infected animals are constantly shedding spores into the environment (your house), thus disinfection is just as important as treatment of the affected pet. The infected pet will require isolation while the environment is disinfected and should not be allowed back into the clean area until a culture is negative. Ideally all pets should be cultured and isolated until they have been deemed clear of infection at which point they can be allowed back into the clean area.

Infected pets generally require oral medication, which may be supplemented with topical treatment (dipping, lotion, or both). Very localized lesions might get away with topical treatment only.

### *Oral Medication for Infected Pets*

There are primarily two medications being used to treat ringworm: Griseofulvin and Itraconazole. Both medications are relatively expensive, must be given with food, and have significant potential to cause birth defects in pregnant pets. Treatment with either medication typically is continued for 1 to 2 months and should not be discontinued until the pet cultures negative. Stopping when the pet simply looks well visually frequently leads to recurrence of the disease.

### *Griseofulvin*

**Griseofulvin** must be given with a fatty meal in order for an effective dose to be absorbed by the pet. Persian cats and young kittens are felt to be sensitive to its side effects, which usually are limited to nausea but can include liver disease and

serious white blood cell changes. Cats infected with the [feline immunodeficiency virus](#) commonly develop life-threatening blood cell changes and should never be exposed to this medication. Despite the side effects, which can be severe for some individuals, griseofulvin is still the traditional medication for the treatment of ringworm and is usually somewhat less expensive than itraconazole.

#### *Itraconazole*

This medication is highly effective in the treatment of ringworm but is available in capsules far too large to be useful to most small animals. This means that a [compounding pharmacy](#) must custom make [itraconazol](#) into a more useful size. Nausea is a potential side effect for this medication but probably the main reason it is passed by in favor of griseofulvin is expense. On the average, cats treated with itraconazole and nothing else were able to achieve cure two weeks sooner than cats treated with griseofulvin.

#### *Terbinafine - Worth Mentioning*

[Terbinafine](#) is a newer antifungal on the scene and seems to be effective against ringworm fungi. It is, however, expensive relative to the other medications and likely does not offer an advantage.

#### *Lufenuron (Programi $\frac{1}{2}$ ) -Worth Mentioning*

Lufenuron is a flea control product that is given to the pet orally or by injection. The flea drinks the lufenuron in the pet's blood and then becomes unable to make chitin, the material composing the insect's exoskeleton. This is not a problem for the flea as it already has its exoskeleton but it is a problem for any eggs laid by the flea as the larvae inside will not have the chitin egg-tooth they need to break out of the shell. Further, larvae that consume flea dirt containing lufenuron will not be able to pupate. The flea life cycle becomes highly compromised by introducing lufenuron into the system and since mammals do not make or need chitin, there is no effect on the pet.

It turns out that many fungi, including dermatophytes, have chitin in their cell walls. This led to a great deal of research as to whether lufenuron could prevent ringworm or might facilitate recovery from it. Doses far greater than those used for flea control are needed and some published studies show good efficacy while others have shown no effect. This treatment remains controversial as to whether or not it actually works but it certainly is not harmful.

Lufenuron is the flea-sterilizing ingredient in both Programi $\frac{1}{2}$  and Sentineli $\frac{1}{2}$ .

#### **Topical Treatment for Infected Pets**

Both the above medications work by inhibiting fungal reproduction rather than by directly killing the fungus. This is fine from the pet's perspective as either medication should be able to clear the fungus without further therapy; however, we also would like to reduce contamination of the environment. This means actually killing the fungus that is on the pet so that the hairs dropped will not be infectious. Killing the fungus on the pet means topical therapy. For many years cats with ringworm lesions were shaved to allow for easier topical treatment. We now know that shaving may be spreading the fungus, thus shaving is not always recommended (depending on the number of cats in the home and the length of the hair).

#### *Lime Sulfur Dip*

Dips are recommended twice a week and can be performed either by the hospital or at home. If you attempt this kind of dipping at home, you should expect:

- Lime sulfur will stain clothing and jewelry
- Lime sulfur will cause temporary yellowing of white fur
- Lime sulfur smells strongly of rotten eggs.

The dip is mixed according to the label instructions and is not rinsed off at the end of the bath. The pet should be towel dried. Shampooing is not necessary.

#### *Miconazole-Chlorhexidine Rinse*

Miconazole (an antifungal) and chlorhexidine (a disinfectant) synergize each other when combating ringworm. They are available as a combination rinse as well as shampoo. The rinse, which is allowed to dry on the pet, is effective in killing ringworm spores although in the field lime sulfur seemed associated with faster cure.

#### *Environmental Treatment*

The problem with decontaminating the environment is that few products are effective. Bleach diluted 1:10 will kill 80% of fungal spores with one application and any surface that can be bleached should be bleached. Vigorous vacuuming and steam cleaning of carpets will help remove spores and, of course, vacuum bags should be discarded. To reduce environmental contamination, infected cats should be confined to one room until they have cultured negative. The rest of the house can be disinfected during this confinement period. Cultures of the pet are done monthly during the course of treatment.

The following specific recommendations for environmental disinfection come from the Dermatology Department at the University of Wisconsin School of Veterinary Medicine. This cleaning protocol should be used on the room where the affected individuals are being housed:

- The hairs and skin particles from the infected individual literally forms the dust and dirt around the house and are the basis for reinfection. The single most important aspect of environmental disinfection is vacuuming. Target areas should receive good suction for at least 10 minutes and hard surfaces should be cleaned with a Swiffer or similar product. (Many people like to use an inexpensive vacuum that can simply be thrown out when the ringworm episode is over.)
- Affected animals should be confined to one room which should be cleaned twice a week.
- Areas that have been contaminated should be cleaned with soap and water and rinsed with water. This process is performed three times at least three times weekly. For carpeting, a steam cleaner can be used. The steam is not hot enough to kill ringworm spores but should help clean the dirt and remove the contaminated particles.
- After the triple cleaning with soap and water, a 1:10 solution of bleach should be used on surfaces that are bleachable. The surface should stay wet for a total of 10 minutes to kill the ringworm spores. Bleach will not kill spores in dirt so it is important that the surface be properly cleaned before it is bleached.

To determine if an area has been properly decontaminated, use the following process: Using a piece of Swiffer cloth on the area to be tested, dust for 5 minutes or until the Swiffer cloth is dirty. Place the Swiffer cloth in a plastic bag and bring to your vet's office for culturing.

Once a cat culture is negative and is removed from the contaminated room, decontamination should be achieved in 1 to 3 cleanings.

The ringworm fungus can remain infective in the environment up to 18 months, maybe longer.

### **Identifying Carriers**

When there is a pet with ringworm in the home, all other pets should be tested. A carrier of ringworm is one that is infected but not showing lesions (usually this will be the pet that has been on treatment for a while and appears visually to be cured but in fact is still infected) or one that is simply carrying the fungus on its fur in the same way an inanimate object might have fungal spores on its surface. Both types of carriers must be identified as they are both capable of spreading the infection.

The MacKenzie Toothbrush Test is the best approach to the pet with no obvious lesions. Here the pet is combed with a clean toothbrush and the hair that comes off is cultured for ringworm. This allows sampling of the whole cat when no lesions are visible either with the naked eye or with the Wood's lamp.

### **Will Ringworm go Away by Itself?**

There have been several studies that showed this fungal infection should eventually resolve on its own. Typically, this takes 4 months, a long time in a home environment for contamination to be occurring continuously. I recommend treatment for this infection rather than waiting for it to go away.

### **What to Change if the Outbreak Seems to go on Forever (as in more than 100 Days)**

After a couple of months of medication and dipping, the outbreak is generally over. If the outbreak is still going strong, then it is time to look for corners that may have been cut and holes in the program that need patching:

- If the pet was not shaved, this may be the time to do a full body shave.
- If one is using visual lesions as the endpoint for treatment, it is important to change to fungal culture as the standard.
- Dipping is labor intensive and people tend not to do it twice a week as is optimal. Twice a week dipping should be instituted if there is trouble eradicating the infection.
- The environment must be properly decontaminated and this includes not just identification but confinement of affected pets. If infected pets are not confined, they will contaminate the environment and keep getting re-infected.
- Consider whether the pet has a defective immune system. If the pet has a second disease, it must be controlled if the pet is to recover.
- Generic itraconazole does not have the same bioavailability as the brand name. This means, in short, that it does not work as well. Changing to a brand name may make a big difference.
- Lastly, it is important to consider that the diagnosis may be wrong if only visualization was used to make the diagnosis. Proper testing as outlined above is crucial to the diagnosis of dermatophytosis. A biopsy may be needed.

If you become infected, contact your doctor to receive treatment. Veterinarians are not able to make recommendations for human disease or infection, even if the infection came from a pet.