

## Dermatophytosis (ringworm)

### Features

Dermatophytosis is an infection of hair shafts and stratum corneum caused by keratinophilic fungi. It occurs commonly in dogs and cats, with highest incidences reported in kittens, puppies, immunocompromised animals, and long-haired cats. Persian cats and Yorkshire and Jack Russell terriers appear to be predisposed.

Skin involvement may be localized, multifocal, or generalized. Pruritus, if present, is usually minimal to mild but occasionally may be intense. Lesions usually include areas of circular, irregular, or diffuse alopecia with variable scaling. Remaining hairs may appear stubbled or broken off. Other symptoms in dogs and cats include erythema, papules, crusts, seborrhea, and paronychia or onychodystrophy of one or more digits. Rarely, cats present with miliary dermatitis or dermal nodules (see "Dermatophytic Granulomas and Pseudomycetomas"). Other cutaneous manifestations in dogs include facial folliculitis and furunculosis resembling nasal pyoderma, kerions (acutely developing, alopecic, and exudative nodules) on the limb or face, and truncal dermal nodules (see "Dermatophytic Granulomas and Pseudomycetomas"). Asymptomatic carrier states (subclinical infection) are common in cats, especially among long-haired breeds. Asymptomatic disease, although rare in dogs, has been reported in Yorkshire terriers.

### Top Differentials

#### Dogs

Differentials in dogs include demodicosis and superficial pyoderma. If nodular, neoplasia and acral lick dermatitis should be included.

#### Cats

Differentials in cats include parasites, allergies, and feline psychogenic alopecia.

### Diagnosis

1. Rule out other differentials
2. Ultraviolet (Wood's lamp) examination: hairs fluoresce yellow-green with some *Microsporum canis* strains. This is an easy screening test, but false-negative and false-positive results are common
3. Microscopy (hairs or scales in potassium hydroxide preparation): Search for hair shafts infiltrated with hyphae and arthrospores. Fungal elements are often difficult to find
4. Dermatohistopathology: variable findings may include perifolliculitis, folliculitis, furunculosis, superficial perivascular or interstitial dermatitis, epidermal and follicular orthokeratosis or parakeratosis, or suppurative epidermitis. Fungal hyphae and arthrospores in stratum corneum or hair shafts may be difficult to find without special fungal stains
5. Fungal culture: *Microsporum* or *Trichophyton* spp

### Treatment and Prognosis

1. If the lesion is focal, a wide margin should be clipped around it and topical antifungal medication applied every 12 hours until the lesion resolves. (Some dermatologists believe that clipping is beneficial; others believe that it spreads lesions onto animals and further contaminates the environment.) Effective topicals for localized treatment include the following:
  - 1% terbinafine cream
  - 1% clotrimazole cream, lotion, or solution
  - 2% enilconazole cream
  - 2% ketoconazole cream
  - 1%-2% miconazole cream, spray, or lotion
  - 4% thiabendazole solution
2. If response to localized treatment is poor, the animal should be treated for generalized dermatophytosis.
3. For animals with multifocal or generalized lesions, the entire hair coat should be clipped if the animal is medium- to long-haired. (Some dermatologists believe that clipping is beneficial; others believe that it spreads lesions onto animals and further contaminates the environment.) Topical antifungal rinse or dip should be applied to the entire body one or two times per week (minimum 4-6 weeks) until follow-up fungal culture results are negative. Bathing the animal with a shampoo that contains chlorhexidine and miconazole or ketoconazole immediately preceding the antifungal dip may be helpful. Dogs with generalized dermatophytosis may be cured with topical therapy alone, whereas cats almost always require concurrent systemic therapy. Effective topical antifungal solutions include the following:
  - Enilconazole 0.2% solution
  - Lime sulfur 2%-4% solution
4. For cats with generalized dermatophytosis and dogs that are unresponsive to topical therapy alone, topical therapy for generalized infection should be combined with long-term (minimum 4-6

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weeks) systemic antifungal therapy and continued until 3 to 4 weeks beyond negative follow-up fungal culture results. Effective systemic antifungal drugs include the following:

Microsized griseofulvin at least 50 mg/kg/day PO with fat-containing meal

Ultramicrosized griseofulvin 5-10 mg/kg/day PO with fat-containing meal

Itraconazole (Sporonox) 5-10 mg/kg PO q 24 hours with food

Terbinafine 30-40 mg/kg PO q 24 hours

Ketoconazole 10 mg/kg PO q 24 hours with food

5. Alternatively, itraconazole (Sporonox) pulse therapy has been shown to be effective and should be continued until two consecutive follow-up fungal cultures taken 2 to 4 weeks apart are negative.

**Protocol 1:** The practitioner should give itraconazole (Sporonox) 10 mg/kg PO with food once daily for 1 month, then on an alternate-week regimen (1 week off, 1 week on).

**Protocol 2:** The practitioner should give itraconazole (Sporonox) 10 mg/kg orally with food once daily for 2 weeks, then on 2 consecutive days each week (e.g., every Monday and Tuesday).

6. All infected animals, including asymptomatic carriers, should be identified and treated.
7. Exposed, noninfected cats and dogs should be treated prophylactically with weekly topical antifungal rinse or dip for the duration of treatment of the infected animals.
8. The environment should be thoroughly vacuumed (vacuums may further contaminate the environment) and disinfected.
9. For endemic infections involving multianimal homes, catteries, or animal facilities, treatment should be provided according to the treatment recommendations outlined in Box 4-1.
10. Lufenuron has not demonstrated consistent efficacy in treating or preventing infection.
11. The prognosis is generally good, except for endemically infected multicat households and catteries. Animals with underlying immunosuppressive diseases also have a poorer prognosis for cure. Dermatophytosis is contagious to other animals and to humans.

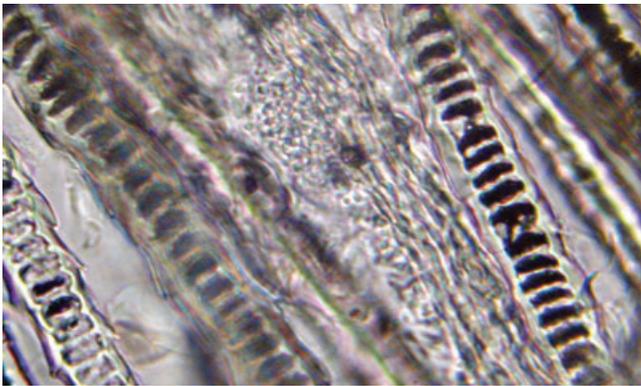
**BOX 4-1****Treating Dermatophytosis in Multianimal Homes, Catteries, and Animal Facilities**

- Culture all animals to determine the extent and location of animal infections.
- Culture the environment (cages, counters, furniture, floors, fans, ventilation units, etc) to map the infected areas to be disinfected.
- Treat all infected animals with systemic antifungals until they have 2 each animal has two negative fungal cultures taken at least 1 month apart.
- Treat all infected and exposed animals with topical 2% to -4% lime sulfur solution every 3- to 7 days to prevent contagion and zoonosis. Continue until all animals have 2 two negative fungal cultures taken at least 1 month apart. Do not clip cats as this contaminates the clippers and facility and worsens the risk of contagion.
- Dispose of all infected infected material. Remove any clutter from animal facilities or other infected areas.
- Clean and disinfect all surface areas every 3 days. Continue until all animals have 2 two negative fungal cultures taken at least 1 month apart. Enilconazole (Clinafarm EC disinfectant, American Scientific Laboratories, Union, NJ) is a very effective environmental disinfectant, but it is licensed only for poultry farm use in the United States. Household chlorine laundry bleach (5% sodium hypochlorite) diluted 1:10 in water, is an effective, inexpensive environmental disinfectant.

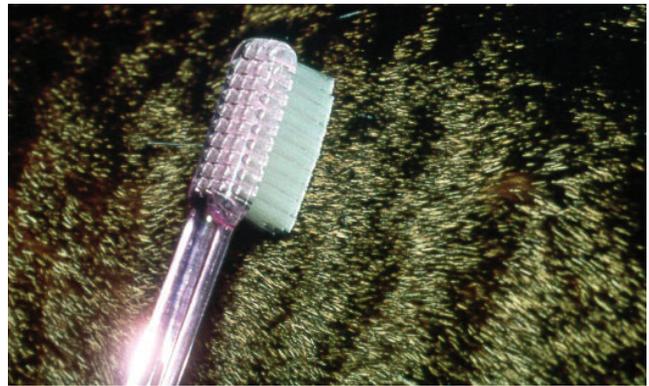
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**FIGURE 4-26 Dermatophytosis.** Focal alopecia and crusting on the muzzle of the cat caused by *Microsporum canis*. (Courtesy of J. MacDonald.)



**FIGURE 4-49 Dermatophytosis.** Microscopic examination of a trichogram demonstrating an infected hair with fungal ectothrix as seen with a 10× objective.



**FIGURE 4-50 Dermatophytosis.** A new toothbrush can be used to collect hairs from a patient without cutaneous lesions (McKinsey's toothbrush technique). The hairs should then be disbursed onto dermatophyte test medium (DTM) culture media.



**FIGURE 4-51 Dermatophytosis.** A folded gauze can be used to wipe the fur of a patient or surface to collect material that can then be disbursed onto DTM culture media. Note the individual learned the importance of wearing gloves when one is dealing with a potential a zoonotic disease.



**FIGURE 4-52 Dermatophytosis.** DTM culture media demonstrating the typical white colony growth that is temporally associated with an immediate red color change.



**FIGURE 4-53 Dermatophytosis.** Close-up of a DTM fungal culture demonstrating the typical white colony growth and red color change. This is suggestive of dermatophytosis, but microscopic identification visualization should be performed to identify *Microsporum canis*.



**FIGURE 4-54 Dermatophytosis.** *Microsporum canis* macroconidia as observed with a 10× objective. Note the pointed ends and six or more divisions.