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Arizona Veterinary Specialists' News

September 2017

DERMATOPHYTOSIS: REVIEW OF DIAGNOSIS AND TREATMENT

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Dermatology for Animals

Dr. Lockwood started her residency with Dermatology for Animals in 2014. During that time period she has focused on advancing her knowledge in dermatology through working closely with her mentors (Drs. Schick and Lewis) and numerous clinical studies including her research on cyclosporine use in felines.

Dr. Lockwood completed her residency in July of 2017 and will be taking her board certification exam later this year. Dermatology for Animals is privileged to have Dr. Lockwood as part of our team. She is compassionate, well-rounded and excited about caring for the skin of her patients.

Dermatophytosis is a superficial fungal infection of keratinized skin most commonly caused by Microsporum canis, Microsporum gypseum, and Trichophyton mentagrophytes in canine and feline patients[1,2,3,4,5]. Dermatophytosis more often affects at-risk populations, which include young age (puppies and kittens less than 1 year of age), lifestyle (hunting dogs etc.), free-roaming animals, and animals in warm locations[2,5]. Dogs and cats that are immunocompetent can develop self-limiting infections that will resolve with time, though with immunosuppressed patients opportunistic infections often require treatment[1,6,4]. Due to the zoonotic potential, an accurate and rapid diagnosis of dermatophytosis is imperative in suspected cases.

There is no gold standard for the diagnosis of dermatophytosis, though multiple diagnostic tests are available. Many tests are complementary to each other for confirmation and identification of dermatophytic disease. Testing that can be performed in-clinic to help diagnose dermatophytosis including trichogram, cytology, Wood's lamp exam, culture, and histopathology. Trichogram, cytology, and Wood's lamp examination are useful in-house diagnostic test to aid in the diagnosis of dermatophytosis. (See Fig 1).

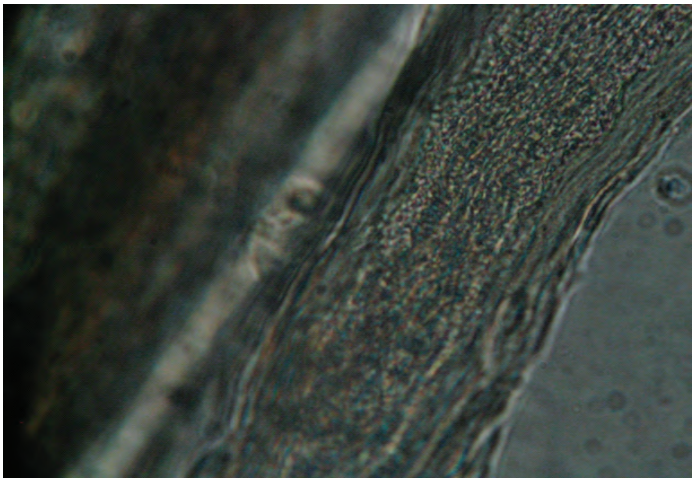

Figure 1: Hair shaft at 40X exhibiting ectothrix hyphae and chains of arthrospores

Suspicious lesions also identify the best area for collection of culture and/or biopsy samples. Once an area or lesion is identified the Mackenzie toothbrush technique is used for sample collection. To perform this, a new toothbrush is used to firmly brush over the non-affected haired areas first, then subsequently

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rubbed over the affected areas including the alopecic skin, hair, crusts and scale. The toothbrush bristles are then gently embedded into the culture medium, though not too deep to displace the media. A sterile hemostat can be used to retrieve any remaining hairs from the bristles of the toothbrush and added to the culture medium. Studies have shown culture plates can be stored between 25-30°C, in light or dark settings, and still have accurate growth of dermatophyte colonies[7,8]. It is imperative to check and document the culture plates on a daily basis for growth and color change. Color change alone with any type of growth on the culture plate does not indicate a dermatophyte colony[9]. The colonies on the plate must be consistent with dermatophyte growth which is pale to white fuzzy colonies and concurrently have red color change on the culture plate[5,10,11] (Figure 2).

Figure 2: Example of Trichopyton species with more rapid growing saprophyte (Alternaria species). If not observed daily, the contaminant will overgrow the more slowly growing dermatophyte.

Identification of the specific species of dermatophyte present on the culture medium requires microscopic evaluation of the macroconidia. Identification of the dermatophyte species provides knowledge regarding prognosis, zoonosis, and contagiousness. In general, Trichophyton species require longer systemic therapy. Biopsy and histopathology were mentioned earlier for diagnosis of dermatophytosis. Biopsy is not always a necessary step, but will often help aid in diagnosis especially if a fungal kerion, pseudomycetoma, or mycetoma is present. If biopsy is performed, fugal hyphae are often identified with special stains such as periodic acid Schiff (PAS) and Grocott methenamine silver (GMS). More recently, polymerase chain reaction (PCR)[12,13,14] has shown to aid in the diagnosis of dermatophytosis. Though still new, polymerase chain reaction for the diagnosis of dermatophytosis appears to be easy and quick, with results available typically in 3 working days (much faster than culture). It is important to understand PCR testing, as with other diagnostic tests, helps confirm diagnosis and can still result in false positive or negative results. PCR testing may be positive in cases that are not actively infected, but are fomites for dead fungal organisms[5]. Collection method for the PCR testing plays an active role in accurate testing as well; ensuring the best lesions and hair samples are selected to reduce false negative results. It is strongly recommended to always perform a fungal culture in addition to PCR testing when suspicious of dermatophyte infection. At Dermatology for Animals, we have had several false negative PCR test, but positive cultures, which is why it is recommended to perform both tests.

Treatment choices for dermatophytosis are dependent on the extent of the lesions, age of the patient, safety of therapy, and owners' financial limitations. Options include oral and topical antifungal treatments. Combination therapy, oral and topical antifungal treatments, is often used for more wide-spread infections; treatment of focal lesions can be accomplished with directed topical therapy alone[1,15]. Topical therapies include lime sulfur, enilconazole, miconazole/chlorhexidine combinations, terbinafine, ketoconazole, climbazole, and accelerated hydrogen peroxide formulations[2,15]. Chlorhexidine alone has been shown to be ineffective. The most common and most

effective option for topical therapy is lime sulfur, miconazole/chlorhexidine combination, or enilconazole[5]. Topical applications and/or bathing should be performed at least twice weekly for effective treatment. Unfortunately, enilconazole is not readily available in the United States and lime sulfur applications can be malodorous and difficult for clients. Several products are available that contain miconazole and chlorhexidine that are available, cost effective, and easy for client application. Climbazole is a newer "azole" option which has gained in popularity for topical treatment.

Environmental cleaning is essential for control of dermatophytosis. Clients should be instructed to perform a hard clean of surfaces; this entails removal of hair, debris, and any other organic material. After a hard clean the area should be disinfected with products that contain accelerated hydrogen peroxide, sodium hypochlorite, quaternary ammonium, or lactic acid. Accelerated hydrogen peroxide is one of the more popular, effective, yet gentle products and are available over the counter. Cleaning the environment should occur at least weekly. Any surfaces that can be washed should be washed in hot water with detergent.

Systemic therapies for dermatophytosis are often used with wide spread or generalized infections. Medications include itraconazole, fluconazole, ketoconazole, terbinafine, and griseofulvin. The most effective medications for treatment of dermatophytosis are itraconazole (5mg/kg/d) and terbinafine (30mg/kg/d)[5,16]. Compounded itraconazole is strongly discouraged due to significant variability in efficacy[17,18] and should not be used for the treatment of dermatophytosis infections. Fortunately a commercial liquid formulation of itraconazole is now available and labeled for cats, which we also use in small dogs. Ketoconazole and fluconazole can be used for treatment of dermatophytosis, though based on studies seem to be less effective, and ketoconazole may come with higher risk of adverse effects such as liver toxicity[1,5]. On a similar note griseofulvin can be efficacious for treatment of dermatophytosis, though carries the potential for more side effects comparatively to itraconazole and terbinafine, is more expensive, more toxic, and therefore rarely used today. The most commonly occurring side effect of antifungal treatment is hepatopathy[19]. Monitoring for changes in liver values can be assessed with routine blood work prior to treatment and during the treatment period on a monthly basis. Treatment with systemic medications should always be coupled with topical therapies as this facilitates reaching resolution of disease.

Reaching a cure for dermatophytosis can be a long process, generally a minimum of 3 months of treatment for most cases (and longer for Trichophyton). Therapy can be discontinued after infection is cleared; this is determined by confirmation of two consecutive negative fungal cultures or more recently negative PCR samples, one month apart. These results should be coupled with resolution of clinical signs in the patient. If clinical signs are still present and diagnostic testing is negative, further investigation for other disease processes is recommended. On the other hand, if negative samples are not achieved, yet clinical signs have resolved further evaluation of the environment and possible fomite carriage could be playing a role in recurrent positive sample results. This situation can be seen frequently in long-haired cats. Once two consecutive negative samples (culture or PCR) are achieved therapy can be discontinued. Close monitoring for any relapse of clinical signs is important once medications are discontinued.

Dermatophytosis can be difficult to diagnose and even more cumbersome to treat. For more information regarding dermatophytosis please reference the Clinical Consensus Guidelines of the World Association for Veterinary Dermatology titled Diagnosis and treatment of dermatophytosis in dogs and cats written by Karen Moriello,

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Kimberly Coyner, Susan Paterson, and Bernard Mignon, published in Veterinary Dermatology in 2017 volume 28.

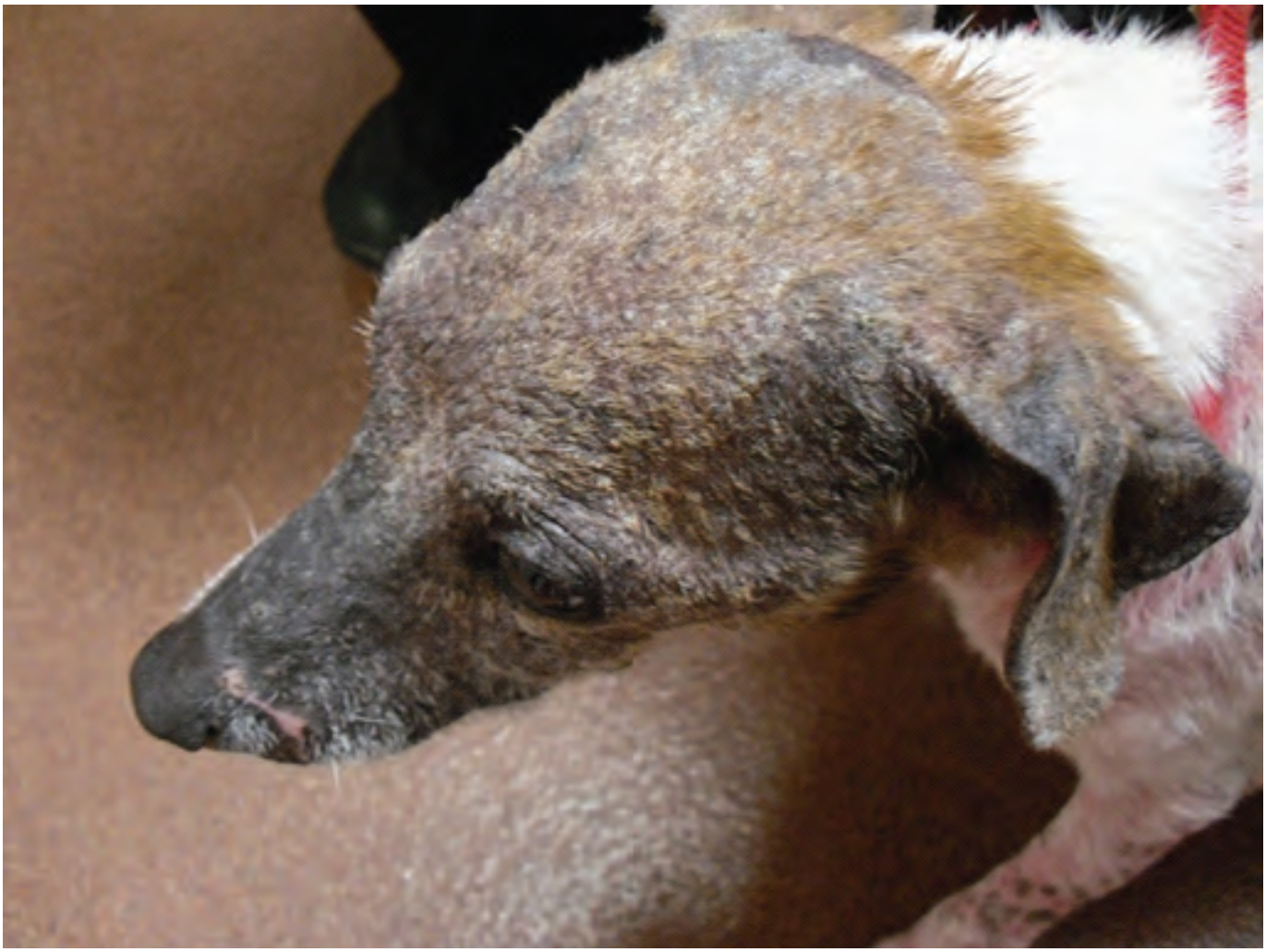

Figure 3: Example of a patient with dermatophytosis but misdiagnosed as having Atopic Dermatitis. Cytopoint© and Apoquel© had both been prescribed therapies (due to significant pruritus), with no success.

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