What's Itching Hollee?

A Case Report of *Sarcoptes scabiei* in a Canine Patient

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Introduction:

Canine scabies is caused by *Sarcoptes scabiei var canis,* a highly transmissible, intensely pruritic, and zoonotic parasitic skin disease. [1,3] Canine sarcoptic acariasis is usually seen in young or immunocompromised dogs. [1] Dogs are believed to become infested after having contact with another infested animal or contaminated areas. [6] In rural areas, dogs can become infested after contacting a dead infested fox or a fox den. [1] Scabies mites are most commonly found on the face, ears, elbows, abdomen, or hocks and typically cause intense, insatiable pruritus. [1] As sarcoptic ascariasis progresses, distinguishing lesions are lichenification and crusting that develop along the margin of the pinnae and advance toward the head. [1]

History and Presentation:

Hollee, an 8-year-old female spayed Yorkshire Terrier, presented to Mississippi State University's College of Veterinary Medicine Dermatology Service on December 6, 2018, for a two-month history of pruritus and alopecia. Hollee first presented to her referring veterinarian on October 15, 2018, for pruritus. Physical exam of Hollee at that time revealed generalized erythema with marked inflammation noted at the rim of the pinnae bilaterally. Treatment included an intramuscular injection of *Depo-Medrol*®, oral *Clavamox*®, and topical *Vetericyn*® spray. On November 15, 2018, the owner called her referring veterinarian to discuss Hollee's continued pruritus. The referring veterinarian at this time elected to begin Hollee on *Apoquel*®, administer amoxicillin, and *Benadryl*® twice daily. On November 26, 2018, the owner reported to the referring veterinarian that Hollee was still not improving and appeared severely pruritic. Hollee returned to her referring veterinarian where physical exam revealed crusting around the rim of the pinnae bilaterally, generalized oily skin and hair coat, and erythema present on the abdominal skin. Treatment included a subcutaneous dexmethasone injection, continue *Apoquel*®, *Simplicef*®, Keto-C shampoo baths three times weekly, and begin a diet of Hill's Science Diet z/d small bites.

On presentation to the MSU-CVM Dermatology Service, Hollee was quiet, alert, and responsive. The owner reported that Hollee was still experiencing severe pruritus and alopecia, with the focal areas being the pinnae and the elbows bilaterally. The owner stated that no recent changes had been made in Hollee's life, except for the use of a new shampoo and dry shampoo in October 2018. The owner stated that Hollee had lived at their residence for her entire life; the previous family that lived there, owned her as an outside dog and elected to leave her when they moved. When the new residents arrived, the current owners, they adopted her and began keeping Hollee indoors. At presentation, Hollee was being fed Hills Science Diet z/d small bites exclusively and had been consuming this since November 26, 2018. Regarding her environment, Hollee lived in a rural area of Mississippi and was a primarily indoor dog. She visited the outdoors only to urinate and defecate. Hollee shared her home with a 2-year-old toddler but no other dogs or cats. For heartworm/flea/tick prevention, Hollee was given Heartgard and Nexgard as prevention, however, the owner stated she was unsure of the last time she gave Hollee Heartgard. Hollee had received Nexgard monthly for the previous two months. At presentation, Hollee was receiving *Apoquel*® once daily and medicated baths with Keto-C shampoo three times weekly.

On physical examination, Hollee was quiet, alert, and responsive, with an ideal body condition score of 4/9. Oral exam revealed normal capillary refill time, but severe dental calculus was noted to be present. Cardiothoracic auscultation was within normal limits with no murmurs noted and normal bronchovesicular sounds in all lung fields. At the medial canthus of the eye, bilaterally, there was clear to white ocular discharge and adhered crusts. Bilaterally, along the margin of the pinnae there was alopecia, crusting, and lichenification. The lateral aspects of the hindlimbs and hind end were matted with underlying erythema of the skin. Epidermal scaling was present along the skin of the dorsal spine. During the appointment, Hollee was observed biting at her hind end and she had a postitive pinnal-pedal reflex. Hollee's prescapular lymph nodes were noted to be enlarged bilaterally, but all other palpable lymph nodes were within normal limits. On the dorsal surface of Hollee's neck, to the right of

midline, there was a small, round, freely moveable, subcutaneous mass. All other physical exam parameters were within normal limits.

Diagnostic Approach and Considerations:

The primary differential diagnoses for Hollee at presentation were scabies, atopy, food allergy, flea allergy, bacterial pyoderma, dermatophytosis, and Malassezia dermatitis. Other differentials included demodicosis due to alopecia and crusts, cheyletiellosis, trombiculosis, Pelodera dermatitis, and ototdectic dermatitis. [2] Scabies is a reasonable differential in any canine patient with nonseasonal intense pruritus, especially when the pruritus does not resolve after treatment with steroids. [1] In affected patients, common historical clues that increase the suspicion of scabies include other dogs in the house affected, exposure to rural areas inhabited by foxes, or wild dogs, frequenting heavily dog populated areas such as dog parks or grooming centers, as well as inconsistent parasitic preventative application or dosing.[1] Another historical clue is if the owner(s) develop a transient, or consistent, pruritic rash.[1] Based on Hollee's history and clinical signs at presentation, several dermatologic diagnostic procedures were warranted such as Wood's lamp examination, dermatophyte (ringworm) culture, Occult Heartworm/Ehrlichia/Lyme/Anaplasma test, microfilaria check, skin cytology, and most importantly, superficial and deep skin scrapings to help determine the cause of Hollee's skin issue. [1, 2] The Occult Heartworm/Ehrlichia/Lyme test and microfilaria check using direct blood smear were warranted since the referring veterinarian's file and owner testament revealed inconsistent administration of heartworm prevention.

On Wood's lamp examination, no areas of fluorescence indicated dermatophytosis. Since this diagnostic test can sometimes result in a false negative, a dermatophyte culture was taken and submitted to the MSU-CVM Microbiology Laboratory. The dermatophyte test medium (DTM) at 4-weeks showed no growth. A blood sample was taken and analyzed using a direct smear to assess for

microfilaria; no microfilaria were observed. Occult Heartworm/Ehrlichia/Lyme/Anaplasma test were all below detectable limits.

Scabies mites can be frustrating when trying to confirm via microscopic visualization. [1,2] False negative scrapings are common. [1,2] Depending on the number of skin scrapings taken, mites may only be observed in 20-50% of affected animals. [1, 2] Multiple skin scrapings are of great diagnostic value not only for determining the presence of the mites, but also for assessing mite burden.[1] Skin scrapings should be done in areas containing yellow crusts and papules, and are most commonly performed on the ears, elbows, and hocks; failure to find mites does not definitively rule-out scabies. [1] Scrapings are done with a dulled 10-blade and the collected material is placed on a slide with mineral oil. [1] Care should be taken to avoid thickened areas as false negative scrapings can occur.[1] Superficial to deep skin scrapings were performed on the left and right pinnae, right elbow, and hind end. The skin scrape of the left ear flap revealed 9 sarcoptic mites and 3 sarcoptic eggs present. The skin scrape of the right ear revealed 15 sarcoptic mites and 3 sarcoptic eggs. Skin scrapes of both the right elbow and hind end revealed 1 sarcoptic mite at each location. Skin cytology, using tape preparations, was performed on the left and right pinna and on the dorsum. On both preparations of the pinnae there were occasional clusters of cocci bacteria and inflammatory cells were noted, however no yeast was noted. On the preparation of the dorsum, few inflammatory cells were noted.

The pinnal-pedal reflex is a nonspecific test for scabies.[1] This test is done by rubbing the margin of the dog's pinna against itself. [1] A positive result is observed if the dog's hind leg begins to attempt to scratch the region of the ear. [1] Studies show varying reliability of the pinnal-pedal response to diagnose canine scabies as some dogs will not display this sign. [1] Approximately 50-90% of dogs infested with scabies will display a positive pinnal-pedal response. [1] Hollee displayed a strong positive pinnal-pedal reflex when the margins of her ears were rubbed together. A positive pinnal-pedal reflex is highly suggestive of sarcoptic acariasis.

Though not done in Hollee's case, histologic examination is rarely conclusive, however, about 50% of biopsies of affected patients have a marked spongiosis and perivascular to interstital eosinophilic dermatitis. [1] The amount of eosinophils present depends on recent glucocorticoid administration. [1] Other suggestive histologic signs of scabies include focal areas of epidermal edema, degeneration, and necrosis. [1]

Pathophysiology:

Sarcoptic acariasis (canine scabies) is a highly transmissible, intensely pruritic, zoonotic parasitic skin disease caused by the *Sarcoptes scabiei var canis.* [1,3] *Sarcoptes scabiei var canis* infestations can transiently occur in humans, however, established infestations have been shown in research settings in other species, suggesting this mite lacks host specificity. [3] Canine scabies has been shown to cause disease in cats, foxes, and humans.[1]

Canine sarcoptic acariasis typically affects young or immunocompromised dogs; often times these dogs frequent densely dog populated areas such as dog parks, doggie day care centers, and grooming facilities. [1] Even veterinary offices can serve as sources of infestation. [1] In more rural areas, dogs can become infested after contacting a dead infested fox or a fox den. [1] Hollee's owner reported that while she was an indoor dog primarily, she loved to be outside. Prior to their ownership of her, she was an outside dog on this property. Hollee had also received two doses of steroid injections from her referring veterinarian as treatment for presumptive allergies. The incubation period for scabies is unknown; in a natural scenario, dogs that become infested typically begin displaying signs of pruritus within a few days and intense pruritus develops 21 to 30 days post-exposure. [1] The ability of a scabies mite to survive off-host depends on relative humidity and temperature; typically, low temperature and high humidity prolong mite survival time with female mites and nymphs able to survive longer compared to male mites and larvae.[1] At room temperature (68°-77°F), all stages can survive for 2 to 6 days.[1] The pruritus is caused by a hypersensitivity to the mite. [1] The intensity of the pruritus is positively

correlated to the amount of mites present; pruritus increases in severity as the mite burden load increases until the patient becomes intensely pruritic virtually all the time. [1]

Copulation between adult mites occurs on the epidermal surface and fertilized female mites burrow into the epidermal layer and lays eggs within the tunnel.[1] The eggs hatch into larvae and tunnel to the surface of the epidermis where they feed. [1] The life cycle can be completed in as little as three weeks. [1] The first clinical lesion that is typically observed is a crusted papule.[1] This lesion will advance in number and distribution. [1] The accompanied pruritus can imitate similar pruritic behavior observed in allergic skin disease, which Hollee had been presumptively diagnosed with and treated for by her referring veterinarian.[1] Unlike allergic pruritus, dogs affected by scabies will display pruritus that escalates rapidly and persists throughout the night, while allergic dogs will often times stop scratching for a few hours a night.[1] Canine patients with advanced scabies often have intense, insatiable pruritus.[1] Pruritus associated with scabies has been observed to be worse after warm water baths.[1]

Sarcoptic mites prefer areas with little to no hair and they are most commonly found on the face, ears, elbows, abdomen, or hocks. [1] A distinguishing lesion of the pinnal pruritus of scabies is that it begins along the margin of the pinnae and progresses toward the head. [1] In most cases of canine scabies, the dorsum is not as commonly affected.[1] Hollee's owner reported she was most pruritic around the ears and elbows and she was constantly pruritic. In patients with advanced scabies, the areas affected are alopecic, erythematous, covered in yellow crusts and excoriations, accompanied by a papular rash.[1] Hollee displayed characteristic clinical signs of advanced scabies infestation with alopecic areas observed on her ears and elbows, accompanied by yellow crusts, excoriations, lichenification, and erythema.

Treatment and Management:

A common treatment for canine scabies is with oral, or injectable avermectin products (commonly ivermectin). [1] Usage of these drugs in patients with multiple-drug resistance gene MDR1, now called the ABCB1-1Δ, is incredibly dangerous. [1] Initial studies showed subcutaneous injectable doses of ivermectin at doses of 0.2-0.4 mg/kg at 14 day intervals for three doses, or orally receiving a dose once weekly for three to four weeks were found to be effective, however this dose is above the toxic level for dogs with the ABCB1-1Δ gene mutation and results in profound neurologic signs. [1] This is also off-label usage of an injectable cattle and pig dewormer.

In patients that are sensitive to high doses of ivermectin, other treatments exist such as milbemycin, selamectin, moxidectin, or doramectin, as well as topical therapies such as lime-sulfur dip. [1] Neurologic side effects seen with these products are rare since the therapeutic dose is below the toxic dose (excluding doramectin). [1] Products such as selamectin (*Revolution®*) and imidacloprid/moxidectin (*Advantage Multi®*) are licensed for the treatment and control of scabies. Selamectin (*Revolution®*) is licensed for the treatment of canine scabies when given every 30 days. [1] Despite being labeled for once monthly application for prevention of canine scabies, approximately 5% of dogs will still have mites present at 30 days. [1] Multiple studies have revealed that selamectin (*Revolution®*) is curative when 2 doses are administered within a 30-day interval (administered at 15-day intervals). [1] In a comparison study evaluating the effectiveness of imidacloprid/moxidectin (*Advantage Multi®*) versus selamectin (*Revolution®*) at treating canine scabies, dogs were separated into two treatment groups and received either selamectin (*Revolution®*) or imidacloprid/moxidectin (*Advantage Multi®*) every 14 days over a period of 64-days.[8] In both treatment groups, after day-22, no scabies mites were found. [8] Topical therapies exist as alternative treatment options, such as 2-4% lime sulfur dips.[1] Lime sulfur is applied on the entire body after the patient's skin has been cleaned and dried thoroughly. Typically, the patient should be allowed to air-dry with the dip left on to dry.[1] Treatment with lime sulfur should be repeated weekly for 4 to 6 weeks.[1]

Present day, the isoxazoline parasiticides such as afoxolaner (*NexGard®*) and fluralaner (*Bravecto®*), have become more commonly used. Studies have been performed for off-label treatment of canine scabies using products containing afoxolaner (*NexGard®*), fluralaner (*Bravecto®*), and sarolaner (*Simparica®*).[3,4,7] In a study evaluating alfoxolaner (*NexGard®*), a minimum dose of 2.5 mg/kg given on days 0 and 28 for off-label treatment of canine scabies was found to reduce mite burden 100% as compared to the control group where ~46% had canine scabies mites at day 28.[3] At the conclusion of this study, dogs in the control group were offered *NexGard®* at 54-days; only one dog from the control group had a mite present at 84-days.[3] Fluralaner (*Bravecto®*) has become more commonly used since it has desirable effects such as less dosing frequency against fleas and ticks; due to its increased use, studies evaluating its effectiveness against sarcoptic ascariasis were warranted. [4] In a study evaluating fluralaner's (*Bravecto®*) efficacy against scabies in dogs naturally infested, dogs were separated into three groups: group 1 was treated on day 0 with 25 mg/kg fluralaner (*Bravecto®*) tablet based on body weight, while group 2 was treated topically with 25 mg/kg fluralaner, and group 3 was a control group that received topical saline.[4] At 4 weeks post treatment, both groups treated with fluralaner (*Bravecto®*) had no mites present on skin scrapings, compared to the control group that still had mites present at that time.[4] In another study evaluating the effectiveness of sarolaner (*Simparica®*) at a target dose of 2-4 mg/kg for the treatment of naturally acquired scabies infestation in dogs, mites were reduced 100% and clinical signs were reduced at only 14 days in the laboratory setting.[7] In the field trial evaluating the effectiveness of sarolaner (*Simparica®*) at 2-4 mg/kg for the treatment of naturally acquired scabies, 11.3% of dogs treated with sarolaner had live mites present at day 30, however no live mites were detected at day 60. [7] Studies of milbemycin (in products such as *Sentinel®, Sentinel Spectrum®*, and *Trifexis®*) have revealed administration can be curative when given at a dose of 2mg/kg orally every 7 or 14 days, for typically three treatments; approximately 25% of dogs affected will require additional treatments. [1] Lotilaner (*Credelio®*) is a novel oral isoxazoline that has not yet been evaluated for its

effectiveness against *Sarcoptes sacbiei var canis*. Regardless of which treatment is chosen, all dogs in the home, and potentially cats, that have close association with the affected dog(s), should be treated beyond the life cycle of 21-days; this is typically a period of 4 to 6 weeks of treatment duration.[1]

Healing of epidermal excoriations, and crusts can be expedited by using antiseborrheic and medicated shampoos to help soften and aid in removal of crusts and debris. [1] Based on treatment employed in any one patient, one or multiple baths may be warranted. [1] In some cases, the addition of Vitamin E can expedite skin healing due to its ability to scavenge free radicals. [5] Some cases may require antipruritic and/or systemic antibiotics and antifungals to provide comfort and treatment for concurrent infections.

Hollee's owner reported that Hollee had been receiving afoxolaner (*NexGard®*) once monthly, however, scabies mites were still present; this may have been attributed to the multiple doses of glucocorticoids Hollee had received as treatment from her referring veterinarian or inappropriate dosing. A study evaluating afoxolaner (*NexGard®*) as treatment for naturally acquired scabies, was used to treat dogs in the control group infested with scabies at 54-days post study initiation.[3] At 84-days, one dog still had scabies mites present. [3] The lack of effectiveness of afoxolaner (*NexGard®*) in Hollee and noted in one dog in the aforementioned study, as well as her level of discomfort, shaped our decision to use ivermectin 1% (*Ivomec®*) cattle and pig injectable orally. Hollee was prescribed 0.06ml ivermectin (0.3 mg/kg dose) orally once weekly for six weeks. Due to the evidence of cocci on skin cytology, Hollee was prescribed Clavamox 62.5 mg/ml (0.5 mls orally every 12 hours) for 20 days (15 mg/kg dose). Finally, Hollee was prescribed Prednisolone 4 mg/ml (0.5 ml orally once daily for 7 days, then give 0.5 ml orally every 48 hours until finished) to aid in decreasing pruritus and inflammation (1 mg/kg dose). A recheck appointment was recommended for Hollee 4 weeks post treatment with MSU-CVM Dermatology department.

Case Outcome:

Hollee did not return for her recheck to MSU-CVM; hopefully this was a result of her resolved pruritus. The client was contacted for follow-up, however, the owner was unable to be contacted.

References:

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