Sarcoptes scabiei var. canis, an ectoparasite from the family Sarcoptidae, causes scabies in dogs. Mites are spread by direct contact with an infested dog or fox and may also be transmitted by fomites. The females of the species burrow through the stratum corneum and lay eggs. The hatched larvae then burrow to the skin’s surface. The mites normally live for 17 to 21 days and primarily inhabit the ventrum, elbows, hocks, and ear margins. Scabies mite infestations are nonseasonal and lead to a severely pruritic disease. This disease process causes a complex hypersensitivity process that involves both humoral and cell-mediated immune responses.

Scabies mites are contagious and can cause disease in other animal species and humans. However, they are host species specific, so they usually do not complete their life cycles on the aberrant host. Lesions on humans from canine scabies usually last for approximately 2 weeks. The lesions can remain longer if many mites have been transmitted or if repeated contact with an infested dog occurs. Few cases of sarcoptic mange in cats caused by S. scabiei infection have been reported. Most cases of scabies in cats are caused by infection with Notoedres cati. Thus, this article focuses only on sarcoptic mange in dogs.

**Diagnostic Criteria**

**Historical Information**

- **Gender Predisposition**
  - None known.

- **Age Predisposition**
  - None known. However, puppies may be at higher risk because of contact with siblings.

- **Breed Predisposition**
  - Sarcoptic mange is contagious, so any breed may develop clinical signs.

- **Owner Observations**
  - Intense, nonseasonal pruritus.

- Scratching is most commonly focused on the ventrum, ear pinnae, elbows, and hocks. Pruritus may affect all body surfaces but generally not the dorsum.

- The owner may note that other animals or people in the household also have pruritus.

- Pruritus may be noted to be more severe in warm environments.

**Other Historical Considerations/Predispositions**

- Corticosteroid treatment has often been given to these patients with variable results, although it generally provides some relief. It is important to remember that if a dog is taking both corticosteroids and scabicidal treatment, it may be difficult to judge the effects of the scabicidal treatment.

- Possible contact with affected animals.

- Dogs that are allowed to roam unsupervised, dogs that have visited boarding kennels or grooming facilities, or dogs that have been in shelters may be exposed.

- Previously infected dogs that come into contact with infected animals may become reinfested.

**Physical Examination Findings**

- The areas listed under Owner Observations are most often affected.
  - Alopecia.
  - Initial skin lesions: Erythematous papules and crusting; excoriations.
  - Patients with chronic scabies may have hyperpigmentation, hyperkeratosis, and lichenification of the affected areas.

- Lesions initially involve regions with less hair but may spread. The dorsum is not usually affected.

- Generalized lymphadenopathy may be present.

- Pruritus may be observed.

- Lesions localized to one body area can occur but are atypical. Areas that may be affected include the paws, head or pinnae, abdomen, flank, and lumbar region.
Laboratory Findings

- Few aberrations in blood parameters are found in dogs affected with scabies. It has been shown that in advanced infection (up to 8 weeks), the average total white blood cell (WBC) count and neutrophil and eosinophil values are slightly above normal ranges; however, these values are not significant. Hemoglobin, hematocrit, and red blood cell levels slowly decrease and total WBC and neutrophil counts increase. Significant differences in these values have been noted between infested and uninfested dogs between 2 and 8 weeks of infection.
- Studies of dogs infected for longer than 8 weeks have not been conducted, so whether further changes in blood parameters occur is unknown.

Other Diagnostic Findings

- Multiple superficial skin scrapings should be performed on papules and crusts over the elbow, hock, pinnae, and ventrum. As little as 20% of skin scrapings from affected dogs may show scabies mites or eggs. However, immunocompromised dogs may develop very large populations of mites, or so-called “Norwegian scabies.”
- A helpful test to perform if there is suspicion of scabies is the pinnal–pedal reflex test. This test is performed by scratching the edge of the pinna. The test result is positive if the ipsilateral leg makes a scratching movement. This test has been found to have a high specificity (93.8%) and a relatively high sensitivity (81.8%). Other allergic diseases such as atopy and food allergy may also be associated with this response.
- Histopathology
  - Histopathology rarely yields mites or eggs. The best way to obtain mites is by taking multiple samples from active lesions such as papules.
  - If scabies mites or eggs are present in the body area, they will also be seen in the keratin or superficial cell layers of the epidermis. Eosinophils may be found around the mites.
  - Early in infestation, few histopathologic changes are present.
  - In lesions of more chronic duration or mite-associated lesions, spongiosis (intercellular edema) may be present. Epidermal lesions without mites are similar to the lesions found in patients with chronic allergic dermatitis. Parakeratotic hyperkeratosis is often present. Perivascular–interstitial eosinophilic dermatitis may be present. The inflammation is less severe in samples without mites. Small areas of edema, exocytosis, necrosis, and degeneration may also be seen in the epidermis.
  - In the cases of Norwegian scabies, many mites in thick crusts may be present.
- Fecal flotation may yield ingested mites or eggs.
- ELISAs that measure immunoglobulins to mite antigens are available and have a specificity of 89.5% to 96% and a sensitivity of 83% to 92%. (To the author’s knowledge, these tests are not available in North America.)
- Indirect diagnosis may be made based on resolution of signs after treatment.
- Surface cytology should be performed as well. Malassezia dermatitis and secondary pyoderma are often present.

Summary of Diagnostic Criteria

- Confirmation of sarcoptic mange is made by seeing at least one egg or mite.
- A dog with clinical signs suspicious of scabies should be treated because skin scrapings seldom yield mites. Often the diagnosis is confirmed indirectly as a resolution of clinical signs upon treatment for scabies.

Diagnostic Differentials

- Atopy is diagnosed based on the patient’s history, physical examination, exclusion of other differential diagnoses, and serum allergy test or intradermal test results.
- Food allergy is ruled out based on a negative response to an 8- to 12-week food trial with a novel protein or hydrolyzed diet.
- Flea allergy is diagnosed based on history and clinical findings. A positive intradermal test result may confirm a type I hypersensitivity response to flea antigen but does not identify a type IV hypersensitivity response unless evaluated 48 to 72 hours later. Serum allergy tests may be helpful, but false-negative results may occur. Flea allergy can also be ruled out by appropriate aggressive flea control.
- Bacterial or yeast pyoderma can be ruled out based on negative surface cytology results. Pyoderma may also be secondary to other disease processes such as allergic skin diseases, endocrinopathies, and other parasitic diseases such as demodicosis.

Treatment Recommendations

Initial Treatment
In rare cases, scabies may spontaneously resolve; however, treatment is always indicated.

Topical Nonsystemic Scabicide Agents
Before using a topical nonsystemic scabicide agent, certain steps should be followed:
- Dense haircoats should be clipped.
• Systemic treatment for any associated secondary infections should be initiated.
• Appropriate bathing should be used to help remove crusts and may help with any secondary infections. Benzoyl peroxide is a good choice because of its antibacterial properties and keratolytic effects. Sulfur-based shampoos are keratolytic but are not potent antibacterial agents; they may help with pruritus. An antipruritic rinse may also be beneficial.
• All contact dogs, the home environment, and pet bedding should be treated using an acaricidal treatment containing permethrin.

Topical Parasiticides
Any of the following treatments should be applied until the patient's pruritus is greatly decreased or eliminated. This usually takes 4 to 6 weeks of treatment.
• Lime sulfur (Lymdy, DVM Pharmaceuticals): 2.5% lime sulfur dip is licensed to be used weekly as a scabicideal treatment. It is poured over the patient and not rinsed off. An added advantage of this product is its antipruritic effects. $
• Amitraz (Mitaban, Pharmacia Animal Health): In the United States, it is recommended to apply amitraz as a 0.025% sponge-on solution every 14 days. One to three treatments are usually needed. $
• Fipronil spray (Frontline, Merial): The 0.25% solution can be applied by pump spray at 3 ml/kg three times every 3 weeks for three treatments in puppies. Adult dogs should receive it once weekly for 2 weeks at 6 ml/kg. It is generally recommended to use this product for early infestations or when other products are contraindicated. This product is registered by the Environmental Protection Agency and is not labeled as a scabicideal treatment. $
• Imidacloprid 10%/moxidectin 2.5% spot-on (Advantage Multi, Bayer Animal Health): This should be given as two treatments 4 weeks apart. The dose is determined by the weight of the animal and is indicated on the package. The minimum dose is 1.1 mg/lb of moxidectin. $
• Selamectin (Revolution, Pfizer Animal Health): This approved monthly spot-on treatment is given for 2 months and is reported to result in total eradication of mites. The dose is determined by the weight of the animal and is indicated on the package. Some veterinarians recommend that this product be used every 2 weeks for three treatments. This treatment differs from the other topical parasiticides. The minimum dose is 2.7 mg/lb. $

Alternative/Optional Treatments/Therapy
Oral or injectable therapy may be used. As with the topical formulations, these treatments usually need to be administered for 4 to 6 weeks and until pruritus is greatly decreased or eliminated.
• Ivermectin (1% Ivermectin, Merial): 0.2 to 0.4 mg/kg SC q2wk for two to three doses or 0.2–0.4 mg/kg/wk PO for three doses $
• Milbemycin oxime (Interceptor, Novartis): 2 mg/kg PO every 7 to 14 days for two to three doses. $
• Moxidectin (Cydectin, Fort Dodge Animal Health): 0.2–0.25 mg/kg PO or SC weekly for 3 to 6 weeks. $
• Doramectin (Dectomax, Pfizer Animal Health): One dose at 0.2 mg/kg SC or IM is reported to be effective. However, with all of the other treatments available, this is not a typical standard of care in the United States. $

Supportive Treatment
• Lime sulfur dip is beneficial as an antipruritic agent regardless of concurrent treatment. It should be used as discussed above. $
• Oral prednisolone or methylprednisolone can be administered at antiinflammatory dosages at the initiation of scabicideal treatment to help with pruritus. It should be used for only 2 to 3 days. Results vary. $
• Other topical antipruritic agents can be beneficial. Examples include shampoos containing colloidal oatmeal and shampoos or sprays containing a steroid. If used, topical steroid treatment should not be continued for more than 2 to 3 days. It is important that the pet is not bathed immediately after application of a topical scabicide. $

Patient Monitoring
• Skin scrapings should be obtained monthly after initiation of treatment, and surface cytology should be checked to ensure that no secondary infection has developed. $
• Veterinarians prescribing ivermectin, amitraz, or PO or SC moxidectin should check with the client to ensure that no adverse side effects have developed. This is discussed on page 10.

Home Management
• The owner should treat the household and pet's bedding with an appropriate acaricidal treatment such as permethrin. However, practitioners should remember that permethrin is toxic to cats. Discarding all potential fomites is another option.
• Owners treating their pets with some of the aforementioned medications should look for certain side effects.
  — Ivermectin: Ataxia, tremors, mydriasis, salivation, depression. In severe cases, coma and death may occur.
  — Amitraz: CNS depression, bradycardia, and mydriasis.
Moxidectin SC or PO: Urticaria, angioedema, erythema, and ataxia.

Milestones/Recovery Time Frames
Response to therapy generally takes 4 to 6 weeks.

Treatment Contraindications
- Selamectin: Only dogs 6 weeks of age and older may receive this treatment.
- Amitraz should not be used in Chihuahuas, pregnant or nursing bitches, and puppies younger than 3 months of age.
- Fipronil spray should not be applied on dogs younger than 8 weeks of age.
- Imidacloprid 10%/moxidectin 2.5% spot-on should be used in dogs that are at least 7 weeks of age and that weigh at least 3 lb.
- Ivermectin and doramectin should not be used in collies, Australian shepherds, Old English sheepdogs, Shetland sheepdogs, and herding breed crosses because these breeds are predisposed to a mutation in P glycoprotein responsible for pumping drugs and toxins out of the central nervous system.
- Milbemycin oxime is well tolerated by most of the breeds susceptible to ivermectin toxicity; however, some animals are found to be sensitive at higher dosages.
- Appropriate age ranges have not been established for all of the above products because the only systemic medication labeled for treatment of scabies is selamectin. The age range recommendations that are listed above are based on the conditions for which the products are licensed.

PROGNOSIS

Favorable Criteria
Prognosis is generally excellent if appropriate treatment is given. The veterinarian and owner should see a dramatic decrease in pruritus and improvement of skin lesions. No superficial skin scrapes should be present.

Unfavorable Criteria
If the animal’s pruritus remains severe, lesions are still prominent, or mites are present, either longer treatment times or a switch to another medication may be needed.

RECOMMENDED READING