

Diagnosing *Demodex* infection

Understand the etiology and forms of demodicosis to help you successfully diagnose the disease in canine patients.



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Most healthy dogs have a small number of *Demodex* mites on their skin. The mites usually are not a problem until they exist in large numbers—and then they can cause a real health care challenge.

Demodicosis is one of the most common skin diseases in dogs, especially puppies. Often referred to as demodectic mange, follicular mange or red mange, demodicosis is an inflammatory parasitic skin disease in which the affected Pet is burdened with larger than normal numbers of *Demodex* mites.¹ To achieve successful outcomes in dogs with this potentially serious condition, you must institute a comprehensive diagnostic program and completely understand the different forms of canine demodicosis.

Mite life cycle

The bitch transmits *Demodex* mites to her pup within days of birth. Mites invade the pup's skin and hair, feeding on cells, sebum and epidermal debris (*Figure 1*, page 23). With extraordinary numbers of mites, this process results in alopecia and erythema.

Demodex canis is a white, oblong mite. The adult females measure 40 by 300 μm and the males measure 40 by 250 μm (see *Figure 2*, page 24). The mite's horseshoe-shaped capitulum has clearly visible mandibles, and its outer cuticula resembles transverse wrinkles. It has four pairs of stumplike legs, each leg ending with two clawlike structures.

D. canis spends all four stages of its life cycle on the skin, residing in hair follicles and, to a lesser extent, sebaceous glands (*Figure 3*, page 25). The developmental cycle starts with the larva hatching from a fusiform egg. The six-legged larva molts and becomes an eight-legged nymph. This nymph, in turn, molts to produce a mite in the final, adult stage (*Figure 4*, page 26). The mite completes this cycle in about three weeks. Mites in all stages can be found in a dog's hair follicles and, potentially, the lymphatic system, bloodstream and other organs. Mites in these extracutaneous locations are dead and have been moved by lymph or blood drainage.¹

Disease etiology

It is not fully understood why some dogs develop demodectic mange while others do

Figure 1: Cross section of canine skin infected with *Demodex* mites. The progression of infection, inflammation and hair loss is shown from left to right.

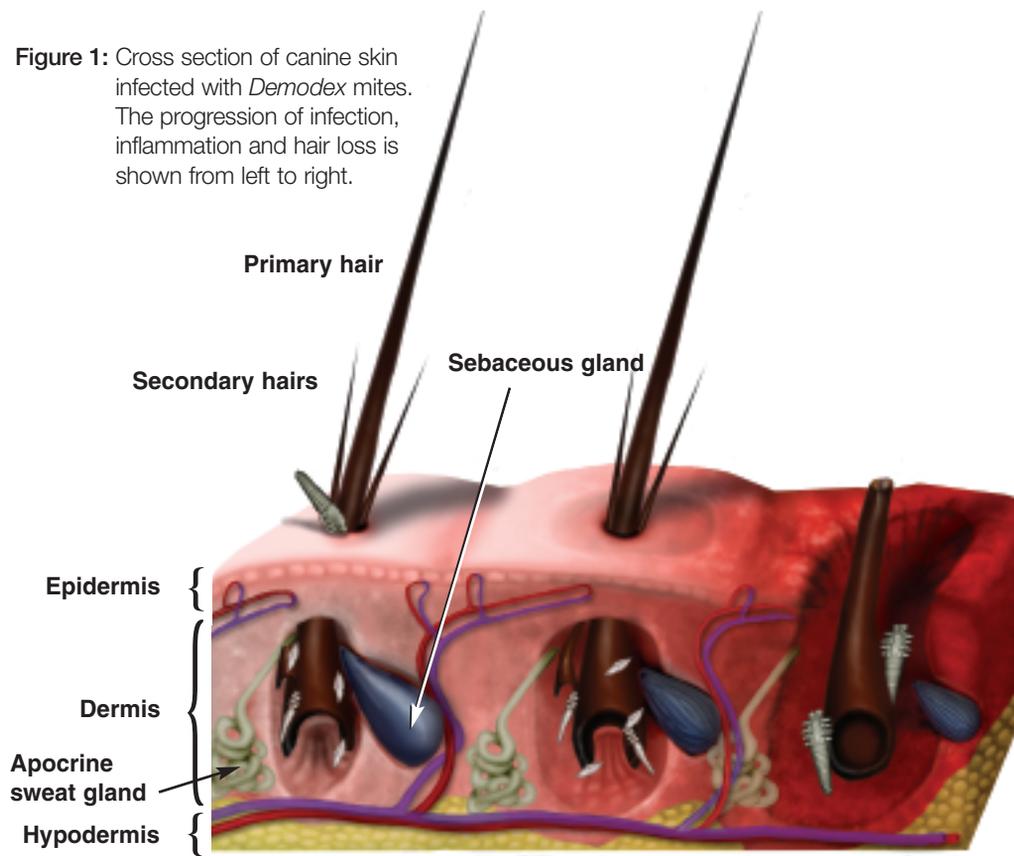


Illustration by Christian Hammer

not, but genetics and immunosuppression play a role. A tendency to develop demodicosis runs in some families, with the same parents producing affected puppies. In such cases, it is recommended that the bitch, sire and their offspring be spayed or neutered.

While all breeds are susceptible to demodicosis, some are at increased risk. Shar Peis are most often reported in the literature as suffering from generalized demodicosis. Longhaired breeds commonly affected include Old English Sheepdogs, West Highland White Terriers, Collies, Afghan Hounds and German Shepherds. Interestingly, this disorder is seemingly rare in Poodles. Commonly affected shorthaired breeds include Staffordshire Terriers, American Pit Bulls, Pugs, Boxers, Dachshunds, Boston Terriers, Chihuahuas, English Bulldogs, Dalmatians, Beagles, Pointers and Doberman Pinschers.

In our practice, American Pit Bulls suffer from generalized demodicosis more often and more seriously than other breeds.

Immunosuppression due to underlying diseases (*e.g.*, diabetes mellitus, hypothyroidism, hyperadrenocorticism) or drug administration (*e.g.*, corticosteroids, chemotherapeutic agents, estrogens) may also increase a dog's risk of developing demodectic mange.

Diagnosis and clinical presentation

It's important to confirm or rule out demodicosis before instituting therapy for other dermatoses. In many cases, I have suspected other diseases such as dermatophytosis in dogs, only to diagnose demodicosis after a careful workup. Making a correct diagnosis begins with distinguishing between the two

Figure 2



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Demodex adult: Adult *Demodex canis* mite and egg. The adult mite is eight-legged.

clinical forms of canine demodicosis: localized and generalized. Disease progression and prognosis are quite different for these forms. Diagnosis is based on signalment and history combined with deep skin scrapings. I find it helps to squeeze the affected site just before scraping to increase the likelihood of finding mites. Scrape three to five areas of the body, including lesions and the lip and interdigital areas. It is normal to find an occasional mite on a dog, but if you find increased numbers at the same time, you can definitively diagnose demodicosis.

Localized and generalized demodicosis can be further subcategorized by age of onset and distribution on the body. A description of the types of the disease follows:

Localized demodicosis typically involves fewer than five lesions usually found on the face, forelimbs and feet. This type of *Demodex* infection often spontaneously resolves over a period of several weeks to months. The affected Pet may have no clinical signs other than well-circumscribed, patchy, localized alopecia. The Pet may also display erythematous, scaly, pruritic, similarly shaped lesions. Although less common, localized demodicosis may manifest as ceruminous otitis externa or pododermatitis.

Generalized demodicosis is characterized by many lesions, often more than 12, across the body. Dogs that present with six to 12 lesions need to be evaluated individually. It is not uncommon for practitioners to diagnose dogs older than 2 years of age with generalized demodicosis. A majority of cases are seen in dogs 2 to 4 years of age with a history of chronic skin disease, and often these dogs had demodicosis as puppies but were undiagnosed.

Clinical presentation of generalized

demodicosis often begins with round areas of alopecia and macule formation progressing to folliculitis. Marked peripheral lymphadenopathy is also typical. Secondary pyoderma forms later and can become severe with edema and plaque formation and hyperpigmentation. Differential diagnoses include superficial pyoderma, dermatophytosis, contact dermatitis, sarcoptic mange, trauma or abrasion, folliculitis, pemphigus and dermatomyositis.¹ Traditionally, generalized demodicosis is subdivided into juvenile onset and adult onset.

Juvenile-onset generalized demodicosis starts in puppies 3 to 18 months old. Lesions as described earlier can lead to severe pyoderma and folliculitis that respond poorly to therapy. If these puppies are left untreated, they can carry the disease into adulthood. In extreme cases, the patient can die from secondary bacterial infection or the client may even request humane euthanasia.

Juvenile-onset generalized demodicosis appears to be linked to immune system dysfunction. Humoral immunity is apparently unaffected, with normal to increased B cell response. Cellular immunity may be affected by T-cell suppression. This raises the question of whether immune system abnormalities are a primary cause or secondary response to the disease state. One study proposed an early hypothesis that juvenile-onset generalized *Demodex* infection results from a hereditary T-cell defect for *D. canis* that induces a humoral substance, in turn causing a generalized T-cell suppression.¹

Interestingly, a later study looked much more closely at a possible T-cell defect. This study investigated interleukin-2 (IL-2) production and IL-2 receptor expression in dogs with juvenile-onset generalized demodicosis. The authors proposed that

Figure 3



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Demodex stages: Magnified image of an adult *Demodex canis*, six-legged larva and spindle-shaped egg.

Figure 4: Life cycle of *Demodex canis*

Mites are transmitted to the nursing pup through direct contact with the infected mother within days of birth.

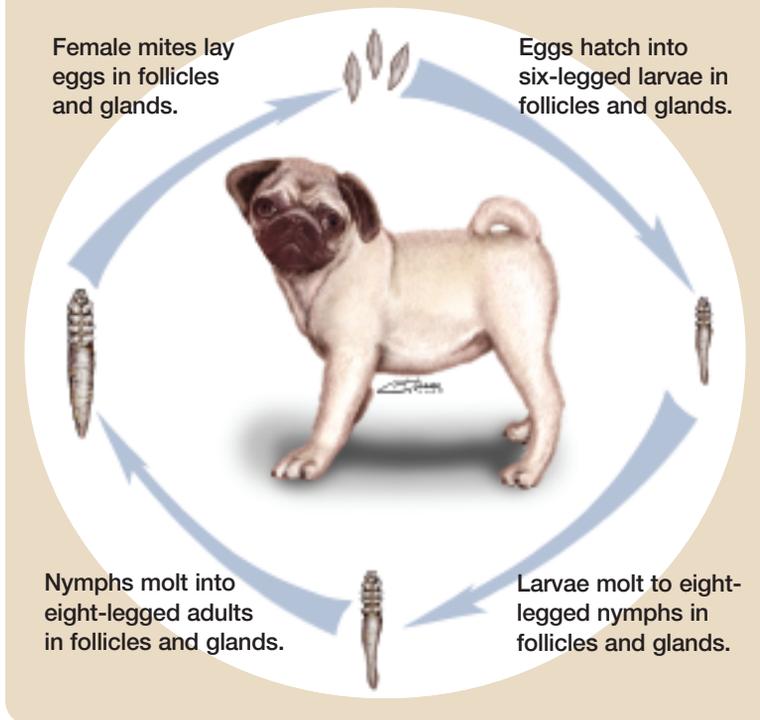


Illustration by
Christian Hammer

affected dogs produce less IL-2 and express fewer IL-2 receptors than normal dogs, suggesting a deficient T-helper cell response.²

This may explain why stressors on the body can aggravate any form of clinical demodicosis. Major surgery, routine vaccination, pregnancy or estrus, and the administration of certain medications affecting the immune system should be avoided until demodicosis is clinically resolved. As previously suggested, Pets with generalized demodicosis should not be bred because offspring may inherit the immune system defect.

Adult-onset generalized demodicosis can develop in dogs 2 to 4 years old, but most of these dogs had undiagnosed demodicosis as puppies. True adult-onset demodicosis occurs in dogs that first experience the disease at 4 years old or older. Although adult-onset demodicosis is not

common, when it does manifest, it can be as serious as the juvenile condition. These dogs do not have a genetic predisposition but develop demodicosis as a result of another illness or immunosuppressive therapy. Conditions associated with adult-onset generalized demodicosis include:

- Treatment with immunosuppressive therapy such as corticosteroids or other chemotherapeutic agents, or treatment for immune-mediated anemia, immune-mediated thrombocytopenia, lymphoma and other malignancies, severe inflammatory bowel disease, severe pemphigus erythematosus or discoid lupus erythematosus and, less commonly, systemic lupus erythematosus
- Endocrine diseases such as diabetes mellitus, hypothyroidism and hyperadrenocorticism
- Malignant neoplasias
- Leishmaniasis.

An aggressive search for these underlying illnesses is always warranted because of their potential seriousness.

Client communication

Client communication and education is imperative when you address any form of demodectic mange because of the numerous misconceptions surrounding this disease. As veterinarians, we must effectively dispel these myths and misconceptions during the client's first visit.

Clients need to understand that this disease is not contagious among Pets or people. There is no need for clients to banish Pets with this form of mange to the garage or outdoors. It is beneficial to explain the disease process so clients gain a solid understanding of the different forms of demodicosis. Also educate them about the diagnostic

process and treatment plan development (see *Treating canine demodicosis*, page 30).

Clients appreciate this comprehensive approach to their Pet's health care. They're also better prepared for potential setbacks that could occur during the treatment process. You must also inform clients that while most cases will resolve, a small percentage of Pets could die from a secondary infection or underlying disease, and some, especially those with adult-onset generalized demodicosis, might require lifelong therapy.

Understanding the various clinical presentations of demodicosis will lead you through logical diagnostic steps and therapy for this very treatable skin disease. Understanding the etiology will, in turn,

allow you to educate your clients, gain their trust, help your patients and even prevent future cases. 🐾

References

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