

# An Update on the Therapy of Canine Demodicosis

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**Abstract:** Canine demodicosis, a disease caused by a proliferation of *Demodex* mites, typically leads to alopecia, comedones, follicular papules and pustules, scaling, and crusting. It may be treated with either amitraz rinses or macrocyclic lactones. Amitraz rinse is approved for application every 2 weeks at a concentration of 0.025%. Higher concentrations and more frequent applications increase the success rate but also increase the risk for adverse effects. Ivermectin is used at 0.3 to 0.6 mg/kg/d PO and moxidectin at 0.2 to 0.5 mg/kg/d PO. Both drugs may cause adverse neurologic effects in sensitive dogs. Milbemycin oxime at 1 to 2 mg/kg/d PO is a safer treatment option. A weekly spot-on combination of 2.5% moxidectin and 10% imidacloprid is recommended for milder forms of the disease.

Canine demodicosis is a disease regularly seen in small animal practice. It is caused by a pathologic proliferation of *Demodex* mites. These mites are part of the normal skin fauna and are transmitted from bitch to puppies in the first few days after birth. They predominantly live in hair follicles. Under certain circumstances, the mite population increases dramatically, leading to clinical signs of disease.<sup>1</sup> A reported predisposing factor for such an increase in mite numbers in young dogs is endoparasitism.<sup>2</sup> Other factors that have been discussed, but not proven by statistical evaluation of well-performed studies, are malnutrition and (in dogs with adult-onset demodicosis) neoplasia, immunosuppressive therapy, and hormonal diseases such as hypothyroidism and hyperadrenocorticism.<sup>1</sup> A genetic basis has been postulated in demodicosis of juvenile onset due to prominent breed predispositions, high frequency of disease in puppies from affected parents, and successful decrease of prevalence in kennels where affected dogs were excluded from breeding.<sup>3</sup> For this reason, breeding dogs affected by generalized demodicosis is not recommended.

Demodicosis is frequently differentiated into a localized and a generalized form, although definitions of localized demodicosis vary tremendously. In most dogs with the localized form, spontaneous remission occurs, and mite-specific therapy is not needed. How many dogs with generalized demodicosis experience spontaneous remission is not known. International practice guidelines for the treatment of canine demodicosis, recently written by an international group of dermatologists and supported by societies, academies, and colleges of veterinary dermatology in North America, Australia, Europe, and Asia, recommend neutering any dog that is treated

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with mite-specific therapy.<sup>4</sup> This allows a clear recommendation to owners and breeders and avoids the need to differentiate juvenile from adult-onset or localized from generalized demodicosis as a basis for breeding recommendations.

## Clinical Signs

Demodicosis can present with a variety of clinical signs. Most commonly, focal alopecia, erythema, and scaling are the first signs (FIGURE 1), often appearing on the distal limbs and the face.<sup>3</sup> Comedones, follicular papules and pustules, and, later in the disease, severe crusting and ulceration may be noted (FIGURE 2). Oily or greasy skin may be the only clinical sign in some dogs. Lymphadenopathy and systemic signs such as fever and anorexia may occur. Typically, more severe demodicosis is associated with a secondary bacterial folliculitis or even cellulitis.

## Diagnosis

Diagnosis is rapidly and reliably confirmed by finding mites on deep skin scrapings<sup>5</sup> (FIGURE 3). Care should be taken to scrape



**Figure 1.** Alopecia, erythema, and comedones on the neck of a beagle with demodicosis.



**Figure 2.** Erythema, alopecia, focal erosion, and exudation with severe crusting on the trunk of a do-khyi with generalized demodicosis.



**Figure 3.** *Demodex* mites in a skin scraping.

until capillary bleeding occurs to ensure that sufficient depth has been obtained to recover the mites. More than one mite on a skin scraping is diagnostic for demodicosis. Trichograms may be an alternative to deep skin scrapings. For a trichogram, a large number of hairs is plucked and placed in a drop of mineral oil on a slide. This test is of particular value for lesions in areas where skin scrapings are more difficult to perform, such as periocular, perioral, or pedal locations. Microscopic evaluation of skin scrapings and trichograms at low power is sufficient to detect the *Demodex* mites. In very rare cases, when it is difficult to obtain sufficient depth with skin scrapings, a biopsy may be needed to confirm the diagnosis. This is more typical in patients with thicker skin (e.g., cases of severe scarring, shar-peis).

## Treatment

Many different treatment options for demodicosis have been reported and reviewed. The therapies listed here and in **TABLE 1** are limited to macrocyclic lactones and amitraz, which have been shown to be effective in a number of case series. A number of other medications have been evaluated for canine demodicosis, but they either were not efficacious or had unacceptable adverse effects.<sup>1,6</sup>

## General Principles

Dogs with milder forms of demodicosis may simply be monitored and treated with an antimicrobial shampoo to avoid secondary bacterial infections. When mite-specific therapy is considered necessary, dogs should be reevaluated every month, and clinical findings, as well as numbers and stages of mites on skin scrapings,

should be compared with those of the previous visit. As long as clinically recognizable improvement is seen, treatment is continued, ideally until 4 weeks past the second negative monthly skin scraping to minimize the chance of recurrence.<sup>1</sup> If no improvement is seen after 4 to 8 weeks of therapy, then a change of the treatment protocol is recommended.

Dogs with generalized demodicosis that require therapy to resolve the condition should not be bred and should be spayed or neutered.

Almost all dogs with generalized demodicosis have a secondary bacterial infection and should be treated with weekly antibacterial shampoos. If topical acaricides are used, patients should be dried after shampooing and before acaricide application to avoid diluting the concentration of the acaricides. Additional systemic antibiotic therapy may be needed. Ideally, culture and sensitivity testing results are obtained before the administration of systemic antibiotics. Culture and sensitivity testing is particularly important if cytology reveals rod-shaped bacteria or persistent coccoid bacteria, suggesting the possibility of a methicillin-resistant staphylococcal infection.

## Amitraz

Amitraz is approved as a rinse for the treatment of canine demodicosis in the United States. The therapy success rate increases with the concentration and frequency of the rinse. The approved concentration is 0.025% every other week, but treatment protocols that involve either washing alternate halves of the dog daily<sup>7</sup> or weekly treatment with amitraz in concentrations of 1.25%<sup>8</sup> have been reported. The latter protocol required injectable and oral  $\alpha_2$ -antagonists for 3 days after each treatment (atipamezol 0.1 mg/kg IM once and yohimbine 0.1 mg/kg PO once daily for 3 days) to counteract the systemic adverse effects seen with such therapy. Such intensive protocols should be reserved for dogs that do not respond to routine acaricidal therapy or to the alternative therapies described below. When dogs with a medium-to-long

**Table 1. Treatment Options for Canine Demodicosis**

Drug	Dosage	Adverse Effects	Comments
Amitraz	Rinsing every 2 weeks in a concentration of 0.025%	Hyperglycemia, bradycardia, depression, sleepiness, polydipsia and polyuria, vomiting and diarrhea	Clipping of all dogs with medium or long haircoat recommended.
Ivermectin <sup>a</sup>	0.3–0.6 mg/kg/d PO	Lethargy, tremors, mydriasis, ataxia, coma, death	Use with caution in herding breeds. Gradual dose increase from 0.05 mg/kg on day 1 to final dose on day 4.
Moxidectin (spot-on in combination with imidacloprid) <sup>a</sup>	Spot-on containing 10% moxidectin weekly	Local inflammation	Clipping a small area for ideal application recommended in dogs with medium or long haircoat.
Moxidectin (oral) <sup>a</sup>	0.2–0.5 mg/kg/d PO	Lethargy, tremors, mydriasis, ataxia, coma, death	Use with caution in herding breeds. Gradual dose increase from 0.05 mg/kg on day 1 to final dose on day 4.
Milbemycin oxime <sup>a</sup>	1–2 mg/kg/d PO	Lethargy, ataxia	Rare adverse effects only with high doses.

<sup>a</sup>Off-label usage in the United States.

haircoat are treated with amitraz rinses, whole-body clips greatly facilitate treatment and increase the chance of success.

Dogs should be rinsed in well-ventilated areas. The solution should be carefully worked into the skin with a sponge, and the animals should be air dried. The rinsing person (owner or technician) should avoid contact with and inhalation of the amitraz as much as possible. Dogs should not get wet between rinses. This may be difficult in some seasons and climates. More frequent treatment, at least of distal limbs, may be needed if walking through snow or puddles cannot be avoided. The success rate of amitraz therapy seems to be lower in adult dogs. Adverse effects of amitraz rinses include hyperglycemia, bradycardia, depression, sleepiness, polydipsia and polyuria, vomiting, and diarrhea.<sup>1,3</sup>

**Ivermectin**

Ivermectin as a weekly injection has not been associated with good success rates. However, ivermectin given orally at a dose of 0.3 to 0.6 mg/kg/d was satisfactory in a number of published studies.<sup>1</sup> As with all macrocyclic lactones, ivermectin can cause severe neurologic adverse effects, from lethargy, tremors, mydriasis, and ataxia up to coma and death in sensitive individuals. For this reason, it is strongly recommended to start with a dose of 0.05 to 0.1 mg/kg and increase the dose to 0.3 to 0.6 mg/kg in the first 4 days.<sup>9</sup> Sensitive dogs show mild adverse effects, such as lethargy, tremors, and ataxia, at low doses. To avoid serious complications, ivermectin should be discontinued in these dogs. Typically, sensitivity at low doses and early in the course of treatment is associated with a mutation of the ABCB1-1Δ (MDR1-1Δ) gene, seen most frequently in collies and other herding breeds (although other breeds may occasionally be affected).<sup>10</sup> Testing herding breeds before ivermectin therapy may be sensible to identify individuals with the MDR-1 gene mutation. Neurologic adverse effects have also been reported in dogs with a normal MDR-1 gene.<sup>11</sup> In these cases, adverse effects occur later in the course of therapy, are typically less severe, occur in many different breeds, and may respond to a reduction of the ivermectin dose.

**Moxidectin**

Moxidectin is another macrocyclic lactone that has been reported as successful in treating canine demodicosis when given orally at a dosage of 0.2 to 0.5 mg/kg/d.<sup>1</sup> Adverse effects seen are similar to those observed with ivermectin therapy, and a similar gradual dose increase over the first few days of therapy seems to be prudent. Moxidectin is also available in a spot-on formulation in combination with imidacloprid (10% and 2.5%, respectively) and has been approved as a weekly treatment for canine demodicosis in Europe. Studies showed a higher success rate with weekly than with monthly application<sup>12</sup> and a better success rate with mildly to moderately affected dogs.<sup>13</sup>

**Milbemycin Oxime**

Milbemycin oxime is approved as a heartworm preventive but was an efficacious therapy for canine demodicosis in a number of studies when administered orally at dosages from 0.5 to 2 mg/kg/d.<sup>1</sup> Higher dosages (1 to 2 mg/kg/d) lead to better success rates,<sup>14</sup> and adult dogs seem to show a less favorable response.<sup>1</sup> Milbemycin oxime is tolerated better than other macrocyclic lactones, with a lesser likelihood of adverse effects, although mild neurologic signs have been seen in a small number of dogs treated with high doses of this medication.<sup>1,4</sup>

**Clinical Pearls**

- Trichograms may be used in areas where deep skin scrapings are difficult and (if positive) may be diagnostic, rendering scrapings unnecessary.
- When one mite is found on a skin scraping, three more areas should be scraped. If no more mites are detected, the one mite was most likely not causing disease. If more mites are identified, the dog has demodicosis.
- Aggressive therapy with antimicrobial shampoos once or twice weekly may be a substitute for systemic antibiotic therapy in many dogs.
- The bitter taste of ivermectin may be masked by diluting the medication with fruit syrup or ice cream.

## Doramectin

Doramectin, administered orally or subcutaneously at 0.6 mg/kg/wk, has also been reported to be efficacious in treating demodicosis.<sup>15,16</sup> However, the number of dogs evaluated is smaller than that treated with other macrocyclic lactones; thus, it is more difficult to judge the success rate of, and frequency of adverse effects with, this treatment.

## Combination Therapy

Combinations of an oral macrocyclic lactone and topical amitraz may be successful in dogs that do not respond to single therapeutic agents.

## Long-Term Management

Some dogs respond to therapy clinically but never have negative skin scrapings. In these dogs, lifelong therapy with an oral macrocyclic lactone 2 days/week, spot-on moxidectin weekly, or amitraz rinses monthly may prevent recurrence of clinical disease. In other patients, demodicosis recurs a few weeks to months after successful therapy has been discontinued. In two-thirds of these dogs, one more course of treatment is curative. However, for most dogs, demodicosis has a good prognosis, as long as underlying diseases are recognized and treated appropriately.

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