Demodex canis is a common, non-contagious, inflammatory parasitic dermatosis characterized by excessive proliferation of the commensal mite Demodex canis within the hair follicles and sebaceous glands. Demodex canis are found in small number in most dogs, but only few animals will develop clinical demodicosis. The etiological agent is not entirely responsible for the pathological process, so demodicosis is a multifactorial disorder where genetic, immunology, cutaneous ecology, environment, bacteriology and parasitology intervene at various degrees.

Canine demodicosis is classified as localized (CLD) or generalized (CGD) according to the extent of the disease, as the course and prognosis of the two types of demodicosis are vastly different. Typically both types of demodicosis start during puppyhood (3 to 18 months), but adult onset demodicosis (AOD) can also occur. The AOD is a generalized demodicosis even more difficult to treat than juvenile demodicosis.

Canine localized demodicosis is a benign disease, and the presence of secondary pyoderma and pruritus is rare. Represents approximately 90% of all cases of canine demodicosis. It is characterized by the presence of less than five circulars alopecic areas with more or less inflamed skin lesions. Most cases resolve spontaneously within 8 weeks. It is not necessary to use acaricidal treatment. Even more, acaricidal treatment should be avoided because generally do not alert course of the CLD, could induce development of resistance and because could mask the eventual progression into a generalized form in predisposed dogs. In approximately 10% of the cases, evolution towards generalized form is unavoidable, whether or not an acarical treatment had been initiated. The treatment of CLD should be conservative.

Canine generalized demodicosis is actually one of the most severe canine skin diseases and one of the most frustrating diseases to treat, and the prognosis is guarded. Euthanasia was common until ten years ago, but veterinarians can offer today alternative available therapies.

CGD is characterized by the presence of five or more alopecic areas, a whole body area being affected or a pododemodicosis involving two or more feet. Although spontaneous resolution of CGD occur in up to 50% of cases in dogs less than 1.5 years, the prognosis for CGD is uncertain. Most cases of CGD involve a secondary bacterial skin infection, which needs administration of systemic antibiotics for several weeks concomitantly with the acaricidial treatment.

Adult onset generalized demodicosis is rare, but when it occurs, it can be a serious problem. AOD appears first time in dogs aged more than 4 years. AOD has been diagnosing in dogs suffering internal disease, endocrine diseases, malignant neoplasia, or treatment with immunosuppressive drugs.

**Diagnosis:** Generalized pyoderma, folliculitis, dermatophytosis, muzzle furunculosis, canine impetigo, contact dermatitis, pemphigus complex, lupus erythematosus and dermatomyositis should be differentate from demodicosis. Adequate skin scraping are mandatory in all cases of canine pyoderma and seborrhea complex. Skin scraping properly made and interpreted can establish the diagnosis of demodicosis. The area of affected skin should be squeezed firmly to extrude the mites from the hair follicles and skin scraping should be deep and extensive. Biopsy may be need to confirm or rule out demodicis in negative skin scrapings taken from Shar pei or from areas of skin with fibrotic lesions and specially in the interdigital region. Biochemical, blood count, urinalysis, thyroid tests and adrenal tests should be performing in adult patients.

**Considerations before treatment.** Demodicosis is more common in purbred dogs and certain breeds (Shar-pei, Great Dane…) but anyone dog could be susceptible. A hereditary predisposition has been observed in some breeding kennels. Then elimination of affected or carrier dogs (both parents and sibling) from the breeding programs greatly reduces or eliminate the incidence of CGD in that population. Age, short hair, poor nutrition, estrus, parturition, stress, endoparasites, and debilitating diseases are other predisposing factors suggested for demodicosis.

**Treatment CLD.** The localized form usually heals spontaneously in two month. It should not to be treated with acaricides. Benzoyl peroxide gel to massage into alopecic areas once a day, rubbing in the direction of the hair growth could be indicated. It is important to check the general health status of the dog in the first visit, paying special attention to diet, endoparasite problems, and vaccination needs. Return visit 4 weeks later permit determine:

a) Any indication of generalized demodicosis such as:
   - lesion spreading, higher mite count, higher ratio immature/adults forms in skin scraping if compare at the beginning.

b) Whether skin scraping show fewer mites, fewer immature forms and several times no live mites.

**Treatment CGD.** Although spontaneous resolution cases have been said to occur in up to 50% of dogs less than 1.5 year, the prognosis for CGD is uncertain. Using treatment currently available over 90% of the generalized cases can be cured. Most cases require administration of bactericidal antibiotics for several weeks (8 or more) concomitantly with more specific treatment against mites.

**Amitraz**. Protocol for its use may vary from country to country. It is applied as a 250-750 ppm solution (0.025%-0.075% of water) to the dogs entire body every week. It is indicated to clip medium and long hair coats prior to treatment and dipping continued to be continued for at least 2 treatments after negative scraping have been obtained. Treatment should be preceded by a shampoo such as benzoyl peroxide applying some hours before in order to remove crust, debris, and bacteria. The amitraz solution should be prepared fresh for each application. Be careful and minimize human exposure. Contact with the dog must be avoided until the coat is dry.

**TREATMENT PROTOCOL**

**CANINE DEMODICOSIS: TREATMENT PROTOCOL**

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When the owner refuse to applied amitraz, or the product is not tolerated by the dog, or is impossible to administer, other options are available today and we used normally in Spain.

**Systemic macrocyclic lactones** (SML) include two groups of molecules: avermectins (ivermectin, doramectin, selamectin, abamectin, and eprinomectin) and milbemycins (milbemicyn oxime, and moxidectin). All of these molecules have similar mode of action.

**Milbemicyn oxime** (Interceptor® Novartis) should be administrate via oral daily (2 mg/kg) during 9-26 weeks (median treatment duration 13 weeks). Using that protocol, the remission rate is 85%. Side effects are uncommon, but transient stupor, ataxia, and trembling have been observed. Side effects resolve after discontinuation of the treatment. Toxicity to daily administration of 2 mg/kg of this compound has not been tested in Collies sensitive to ivermectin. Reactions typical of avermectin toxicity have been observed in 2 of 5 Collies treated with single doses of 5 mg/kg. Then is possible that some Collies sensitive to SML not tolerate high daily dose of milbemicyn oxime. This drug is relatively safe, but expensive.

**Ivermectin** (Heatgard®, Cardotec®, Ivomec®, Equalan® Merial) is effective to treat CGD at oral daily doses of 0.4-0.6 mg/kg during 10-40 weeks (mean treatment 14 weeks). Treatment in all cases should extend one month beyond negative skin scraping. It is effective around 85% of the CGD. It is much less expensive than milbemicyn and easier to administer than amitraz. Ivermectin therapy should be initiated a low doses (0.2 mg/kg) and increase until 0.6 mg/kg. Ivermectin is however potentially toxic and caution is warranted. Idiosyncratic toxicity has been reported in Collies and other herding breeds such as Australian shepherd dogs, Old English sheepdogs, and Shetland sheepdogs and their outcrosses, following a single doses as low as 0.1 mg/kg.

**Moxidectin** (Guardian® Bayer). A cure rate of 89% was obtained following daily oral administration of 0.4 mg/kg. Mean duration of treatment was 20-22 weeks. Information on moxidectin toxicity is limited in dogs. This drug has any real advantage over ivermectin in dogs. Both drugs seem to posses a very wide margin of safety in breeds not at risk, and probable equivalent therapeutic efficacity and cost at similar dosages. But, both drugs offer the same risk for idiosyncratic reactions in Collies when utilized at off-label doses.

**OTHER THERAPEUTIC CONSIDERATIONS**

CGD treatment also needs concurrent systemic antibiotics. Bactericidal antibiotics should be selected because probable immune suppressed state of the dog (cephalexin, fluoroquinolones)

Topical and systemic glucocorticoids are forbidden in demodicosis.

Female dogs should be spayed since demodicosis may worse or relapse during estrus, pregnancy or postpartum.

**REFERENCES**