

## Diagnosis of canine demodicosis

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**Abstract.** This paper briefly reviews the dermatological diagnosis, the examination of skin scrapings, as well as the interpretations of some molecular methods. The aim of the paper is to assess the value of the diagnosis methods and to establish whether correlating the results may lead to a rigorous diagnosis in canine demodicosis.

**Keywords:** *Demodex canis*; demodicosis; diagnosis.

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Canine demodicosis is a skin disease of dogs, produced by mites of genus *Demodex*, parasitic in the pilosebaceous follicles. It frequently becomes pustular due to bacterial complications. The diagnosis of canine demodicosis is achieved with respect to the general principles of a diagnostic dermatology.

### Anamnesis

This first step of the diagnosis should lead to the formulation of hypotheses before the clinical examination. A careful anamnesis should consider epidemiologic data (breed, sex, age), circumstance of disease installation, way of life and microclimate conditions. Information regarding previous conditions, treatments or presence of aggravating factors are also important.

Receptivity of dogs to demodicosis is influenced by numerous intrinsic factors including: hereditary predisposition, alteration of skin's structure and biochemistry,

immunological disorders, hormonal status, breed, hair length, age. Extrinsic predisposing factors include alimentation, fitness, presence stress factors, other diseases or pathogens etc. Their joint action of these factors increase the receptivity to demodicosis, as well as its outbreak and evolution (Deepa et al., 2005). Age is highly important in the epidemiology of the disease. Demodicosis typically occurs in young dogs, with the clinical onset, generally between three months and one year. In dogs older than one year, cases tend to become occasional. Most of the cases (64.97%) occur before the age of one year (Rabdea, 2005). However, demodicosis has been diagnosed in dogs as young as five weeks or old ones (14 years old) (Rabdea, 2005). Some data suggest correlations between the age of dogs and the clinical form of the disease (Scott et al., 1995).

### Clinical examination

Clinical examination of dogs represents an essential stage of the diagnosis. Being a severe

cutaneous disease, canine demodicosis, has different clinical aspects: dry or festering, localized or generalized. The clinical diagnosis requires the detection of gross cutaneous lesions, their distribution as well as the identification of possible correlations of other symptoms and the epidemiological factors (Mahato et al., 2005; Scott et al., 1995; Gortel, 2006).

### Direct microscopic examination

The confirmation of diagnosis is established by the laboratory examination of the cutaneous scrapings. The mite is most commonly found in the pilosebaceous follicles but its presence has also been recorded in lymph nodes, blood, urine, feces or different parenchymatous organs. Nevertheless, *Demodex* mites are considered to be naturally symbiotic in the skin of apparently healthy dogs (Cosoroabă, 2000; Dărăbuș et al., 2006). The most rapid and simple diagnosis method available to any clinician is the microscopic examination of cutaneous scrapings. This procedure allows the identification of all developmental stages of the mite: eggs, larvae, nymphs and adults. In many cases, the cutaneous scraping must be done from several spots before excluding a positive demodicosis diagnosis.

*Demodex canis* is the most widespread species of the genus *Demodex* and, therefore, the most closely studied. Several morphological forms of *D. canis* are known. Some forms are considered "short" (Chesney, 1999) and others "large" (Hillier and Desch, 2002). However, specific identification of *Demodex* mites is not always possible. Some authors have used scanning electron microscopy (SEM) examination of the mites *Demodex* (Jing et al., 2005). Using SEM, Japanese authors (Tamura et al., 2001) showed the existence of a new species of *Demodex* in dogs with characteristic short opisthosoma and an obtuse end. Additionally, the fourth coxisternal plate was rectangular and a band-like segmental plate was noticed between the fourth coxisternal plate and the opisthosoma.

### Histopathology

Examination of cutaneous biopsies collected from the lesions enhances the results of the

clinical and direct microscopic diagnosis. The histopathological examination may confirm the direct microscopic diagnosis. However, histopathology may diagnose demodicosis when there is clinical suspicion but the direct microscopy is negative. Histological examination of samples may also give the clinician an answer on the immune status of the patient. For instance, if the mites are numerous, the cellular response is minimal or absent, eosinophils are absent, and furunculosis occurs, the dog is severely immunosuppressed, with high probability (Caswell et al., 1997; Chakrabarti and Misra, 1978).

### Immunological tests

The existence of cellular immunodeficiency in dogs with demodicosis continues to be a controversial issue. Krawiec and Gaafar (1980) endorsed the theory regarding the existence of a factor ( $\alpha$ - $\beta$  globulin) in the serum of infected dog. This factor is responsible for the immunosuppression of T lymphocytes. On the contrary, other studies state that immunosuppression is not the cause, but the effect of generalized demodicosis. When the mite starts to proliferate, it induces the secretion a humoral factor which suppresses the immune response against the parasite, thus allowing its proliferation (Ginel, 1996).

Recent studies on the function of T lymphocytes and their involvement in the immune response of dogs with clinical disease, provide an explanation to the cellular reactions which occur in demodicosis (Fukata et al., 2005). They highlighted the importance of these cells in the outbreak and development of the disease. Furthermore, the evaluation of cytokine messenger RNA expression in mononuclear cells from the peripheral blood of dogs with demodicosis was performed using RT-PCR and semi-quantitative PCR (Tani et al., 2002). Results of PCR analysis suggest that the IL-5 might be a useful marker of the clinical course in demodicosis (Tani et al., 2002). Also, increased TGF- $\beta$  mRNA expression might be a key factor for revealing the difference in the mechanism of onset between localized and GD (Tani et al., 2002).

## Other laboratory test

Some authors brought to attention the importance of hematological and biochemical investigations for the assessment of the evolution of canine demodicosis (Bhosale et al., 2000). In puppies diagnosed with demodicosis they found slight anemia, increase of the amount of white cells, hyperglobulinemia, hypothyroidism, decrease in the levels of blood sugar, calcium, and phosphorous, as well as a slight decrease of iron, copper, and zinc in the hair and serum. In adults, these regular clinical tests may lead to determining other underlying causes for demodicosis. Dimri et al. (2008) found a low sanguine level of zinc and copper in dogs diagnosed with demodicosis and suggested the supplementation of the specific treatment with antioxidants. This suggestion is also supported by results which show a significant decrease of oxidative indices in both forms of clinical evolution (Rabdea, 2005). However, other studies found no significant alterations of the hematological and biochemical constants in dogs with demodicosis (Jani et al., 2004). Based on earlier observations of Plechner (1979), Reedy and Garfield (1991) arguably tried to establish a connection between demodicosis and hypothyroidism.

## Molecular approaches

The exploration of the pathophysiology of *Demodex* infection by molecular biology represents an attractive issue for researchers. Unfortunately, the absence of a specific antigen of *D. canis*, as well as the uncertainty regarding the experimental transmission of the disease delays many answers regarding demodicosis (Yang et al., 2004).

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