

Allergic dermatitis by *Dirofilaria repens* in a dog: clinical picture and treatment

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Abstract Adult stages of *Dirofilaria repens* (Nematoda, Filarioidea) reside in the subcutaneous tissues of the definitive or occasional host as dogs, other animals, and humans, and it is transmitted by mosquitoes. Canine infections with adults and circulating larvae of *D. repens* are often considered asymptomatic, although in some cases, the parasite causes subcutaneous nodules, diffused dermatitis, skin lesions, and itching. This report provides a complete clinical description of an unusual case of allergic diffused dermatitis caused by *D. repens* in a naturally infected dog and its successful treatment with the use of a spot-on solution containing imidacloprid 10%/moxidectin 2.5%. The dog presented multiple pustules and alopecic areas with lichenification, hyperpigmentation, and erythematous scaling margins without pruritus. Histological examination was compatible with allergic dermatitis. After being unsuccessfully managed for suspected food hypersensitivity, with a significantly worsening of the lesions, a Knott's analysis detected nematode larvae in the blood. Morphological and molecular identification showed them to be *D. repens*. The dog was then treated with a single administration of a spot-

on formulation containing imidacloprid 10%/moxidectin 2.5%, and the dermatological signs completely resolved within 2 months after treatment. The dog showed no recurrence of the lesions, and no circulating microfilariae were found upon microscopic and molecular examination for six consecutive months after treatment. This report indicates the apparent primary role of *D. repens* in causing hypersensitivity-like skin disease without pruritus in a dog. It also confirms, as recently shown elsewhere, the efficacy of imidacloprid 10%/moxidectin 2.5% in the treatment of dermatitis caused by *D. repens*.

Introduction

Adult stages of *Dirofilaria repens* (Nematoda, Filarioidea) reside in the subcutaneous tissues of the definitive or occasional host represented by dogs, other animals, and humans, and it is transmitted by mosquitoes (Otranto et al. 2009).

Attention is currently focused on the clinical impact of this parasite in veterinary practice as well as in public health and on improving treatment and control. Dogs infected with subcutaneous adults and circulating first-stage microfilaria larvae (i.e., mf) of *D. repens* are often considered asymptomatic, although in some cases, the parasite causes subcutaneous nodules, diffused dermatitis, skin lesions, and pruritus (Hargis et al. 1999).

Allergic reactions due to mf sensitization have also been reported (Hargis et al. 1999), but descriptions of allergic-mediated clinical pictures in dogs infected with *D. repens* are scanty.

Recently, the efficacy of the antiparasitic spot-on formulation containing imidacloprid 10%/moxidectin 2.5% (IM; Advocate®; Bayer HealthCare) was evaluated in the microfilaricidal treatment of natural canine infection by *D. repens*

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using both consecutive monthly treatments and single application (Fok et al. 2010; Hellmann et al. 2011; Traversa et al. 2011). This report aims to describe a case of allergic diffused non-pruritic dermatitis caused by *D. repens* in a naturally infected dog and its successful treatment with IM.

Case history

A 10-year-old male mixed breed dog was presented with a 15-day history of multiple non-pruritic cutaneous lesions. No previous history of skin diseases was reported. The dog received regular antiparasitic control with fipronil/(S)-methoprene (Frontline® Combo; Merial Italia S.p.a.) and vaccination. Dermatologic examination revealed several circular areas (diameter from 0.5 to 3 cm) of alopecia with lichenification, hyperpigmentation, and erythematous and scaling margins, and some pustules on the inner thighs, ventral thorax, and abdomen, and sacral area (Fig. 1). The dog was negative for mites, dermatophytes, yeast, tick-borne diseases, and leishmaniasis. Initial treatment consisted of amoxicillin/clavulanic acid (Clavobay; Bayer) 25 mg/kg orally twice daily for three weeks for suspected bacterial folliculitis.

Because of the failure of the antibiotic treatment, skin biopsies were collected for histopathological examination. Histology showed an eosinophil-rich dermatitis compatible with food, contact and flea allergy, and sarcoptic mange. Based on these findings, the dog was treated with an elimination diet (d/d Hills®, salmon and rice).

After 40 days of elimination diet, the dog was re-examined, and the lesions were found to be significantly worsened and spread to other areas of the body (Fig. 2). No



Fig. 2 Dermatological signs of the dog with cutaneous dirofilariosis. Worsening of the cutaneous lesions after restricted diet. Alopecia, lichenification, and hyperpigmentation

pruritus was reported. Rerunning of dermatological diagnostic tests detected no abnormalities. Routine examination of blood smears for complete blood counts showed the presence of blood-circulating mf. Therefore, modified Knott's technique to identify mf on the basis of differential morphometric and morphological features of canine filariae (Lindsey 1965; Hahn 1994) was used, and a microfilaremia by *D. repens* of 490 mf/ml was assessed. A blood sample and a single paraffin-embedded skin biopsy were subjected to PCRs specific for the mitochondrial gene *cox1* of canine filariae (Casiraghi et al. 2006). The sequence from amplicons produced for both the blood and the skin showed 100% homology with each other and 99.8% with the *D. repens* sequence registered under the GenBank™ accession number DQ358814.1.



Fig. 1 Dermatological signs of a dog infected with *D. repens* at first presentation. Patches with hyperpigmentation and erythematous and scaling margins in the inguinal area are visible. Some pustules are also present



Fig. 3 Resolution of cutaneous dirofilariosis 30 days after treatment. Skin area displayed in Fig.1 showing clinical improvement

Furthermore, on additional skin biopsies the histological picture worsened, with eosinophil infiltrate more marked than previously found. Based on these findings, a presumptive diagnosis of *D. repens*-caused dermatitis was made, and the dog was treated with a single administration of IM.

One month later, there was a slight improvement in the lesions (Fig. 3), and after a further month, the dermatological signs had completely resolved. The dog was evaluated every 4 weeks for 6 months. No recurrence was noted, and blood samples collected and examined monthly for circulating mf were negative.

Discussion

Most filarial infections in dogs and cats are caused by *Dirofilaria immitis* and *D. repens*. Filariae *Dipetalonema* species (e.g., *Dipetalonema dracunculoides*, *Dipetalonema reconditum*, and *Dipetalonema grassii*) are parasites that infect pets less frequently (Pantchev et al. 2011; Tarello 2011).

Nodular lesions and other non-specific skin changes such as pruritic papulo-crostous dermatitis have been associated with filarial infections of the dog and cat, including heartworm (Hargis et al. 1999; Tarello 2011), and with *D. repens* in particular (Kamalu 1991; Bredal et al. 1998; Tarello 2002).

Dermatitis in subcutaneous dirofilariosis is likely to be related to a hypersensitivity reaction (Mozos et al. 1992), but it is not clear whether the parasite induced the dermatitis or if the lesions are coincidental damage in some pre-existing skin disease. Since the clinical signs of *Dirofilaria*-caused infections are similar to those of dermatitis caused by other filariae, the nematode may be the primary etiological agent (Scott et al. 2001).

There is some evidence suggesting that some clinical conditions, especially tick-borne diseases and leishmaniosis, may favor the onset of the disease caused by *D. repens* (Cazelles and Montagner 1995; Harrus et al. 1999; Tarello 2002). All these infections can be associated with cutaneous lesions, raising the question of the possible involvement of other bacteria and protozoa in the development of lesions (Tarello 2002). Our dog showed no sign of co-infections, indicating that the presence of other pathogens is not necessary for clinically relevant skin lesions in dogs infected with *D. repens*.

Regarding the clinical findings, the distribution and type of lesions were consistent with those previously described (Tarello 2002; Traversa et al. 2011). Tarello (2002) reported a *Dirofilaria*-caused dermatitis in 28 dogs associated with pruritus in all the subjects. In our case, pruritus was not reported by the owner and there were no self-induced skin lesions. The reasons for the absence of pruritus are not clear, but this finding shows that pruritus is not probably crucial for a presumptive diagnosis of *Dirofilaria*-caused dermatitis.

This report indicates the apparent primary role of *D. repens* in causing hypersensitivity-like skin diseases without pruritus in a dog. It also confirms, as recently shown elsewhere, the efficacy of IM in the treatment of dermatitis caused by *D. repens* (Hellmann et al. 2011; Traversa et al. 2011).

In conclusion, given the impact *Dirofilaria* infection may have in causing dermatopathies in canine patient and the zoonotic potential of this nematode, it should be included in the differential diagnosis of canine hypersensitivity skin diseases. In this view, a single administration of the spot-on solution containing IM can be a primary choice to treat the infection and, by interrupting the life cycle of the nematode, leading to clinical recovery and reducing the risk of infected blood, which is of central importance for veterinary and public health.

Conflict of interest One of the authors is employed by Bayer Animal Health, Milan, Italy.

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References

- Bredal WP, Gjerde B, Eberhard ML, Aleksandersen M, Wilhelmsen DK, Mansfield LS (1998) Adult *Dirofilaria repens* in subcutaneous granuloma on the chest in a dog. J Small Anim Pract 39:595–597. doi:10.1111/j.1748-5827.1998.tb03715.x
- Casiraghi M, Mazzocchi C, Mortarino M, Ottina E, Genchi C (2006) A simple molecular method for discriminating common filarial nematodes of dogs (*Canis familiaris*). Vet Parasitol 141:368–372. doi:10.1016/j.vetpar.2006.06.006
- Cazelles C, Montagner C (1995) Deux cas de filariose cutanée associée à une leishmaniose. Point Vét 27:343–345
- Fok E, Jacsó O, Szebeni Z, Györffy A, Sükösd L, Lukács Z, Schaper R (2010) Elimination of *Dirofilaria* (syn. Noctiella) *repens* microfilariae in dogs with monthly treatments of moxidectin 2.5%/imidacloprid 10% (Advocate, Bayer) spot-on. Parasitol Res 106:1141–1149. doi:10.1007/s00436-010-1783-4
- Hahn NE (1994) Parasites of the blood. In: Sloss MW, Kemp RL, Zajac AM (eds) Veterinary clinical parasitology, 6th edn. Iowa State University Press, Ames, pp 107–108
- Hargis AM, Lewis TP, Duclos DD, Loeffler DG, Rausch RL (1999) Dermatitis associated with microfilariae (Filarioidea) in 10 dogs. Vet Dermat 10:95–107. doi:10.1046/j.1365-3164.1999.00136.x
- Harrus S, Harmelin S, Favia A (1999) *Dirofilaria repens* infection in a dog in Israel. AmJTrop Med Hyg 61:639–641
- Hellmann K, Heine J, Braun G, Paran-Dobesova R, Svobodova V (2011) Evaluation of the therapeutic and preventive efficacy of 2.5% moxidectin/10% imidacloprid (Advocate®, Bayer Animal Health) in dogs naturally infected or at risk of natural infection by *Dirofilaria repens*. Parasitol Res 109:S77–S86. doi:10.1007/s00436-011-2404-6
- Kamalu BP (1991) Canine filariasis caused by *Dirofilaria repens* in southeastern Nigeria. Vet Parasitol 40:335–338. doi:10.1016/0304-4017(91)90113-A
- Lindsey LR (1965) Identification of canine microfilariae. J Am Vet Med Assoc 146:1106–1114

- Mozos E, Ginel PJ, Lopez R, Carrasco L, De Las Mulas JM, Molleda JM (1992) Cutaneous lesions associated with canine heartworm infection. *Vet Dermat* 3:191–196. doi:[10.1111/j.1365-3164.1992.tb00171.x](https://doi.org/10.1111/j.1365-3164.1992.tb00171.x)
- Otranto D, Capelli G, Genchi C (2009) Changing distribution patterns of canine vector borne diseases in Italy: leishmaniosis vs. dirofilariosis. *Parasit Vectors* 2(Suppl 1):S2. doi:[10.1186/1756-3305-2-S1-S2](https://doi.org/10.1186/1756-3305-2-S1-S2)
- Pantchev N, Etzold M, Dauschies A, Dyachenko V (2011) Diagnosis of imported canine filarial infections in Germany 2008–2010. *Parasitol Res* 109:S61–S76. doi:[10.1007/s00436-011-2403-7](https://doi.org/10.1007/s00436-011-2403-7)
- Scott DW, Miller WH, Griffin CE (2001) Parasitic skin diseases. In: Muller GH, Kirk RW (eds) *Small animal dermatology*, 6th edn. Saunders, Philadelphia, pp 423–516
- Tarello W (2002) Cutaneous lesions in dogs with *Dirofilaria* (Nochtiella) *repens* infestation and concurrent tick-borne transmitted diseases. *Vet Dermat* 13:267–274. doi:[10.1046/j.1365-3164.2002.00305.x](https://doi.org/10.1046/j.1365-3164.2002.00305.x)
- Tarello W (2011) Clinical aspects of dermatitis associated with *Dirofilaria repens* in pets: a review of 100 canine and 31 feline cases (1990–2010) and report of a new case imported from Italy to Dubai. *J Parasitol Res* 2011:578385. doi:[10.1155/2011/578385](https://doi.org/10.1155/2011/578385)
- Traversa D, Aste G, Di Cesare A, Paoletti B, Di Tommaso M, Di Giulio E, Pampurini F, Tunesi C, Boari A (2011) Efficacy of a single administration of a spot-on solution containing imidacloprid 10%/moxidectin 2.5% in eliminating *Dirofilaria repens* microfilariae in naturally infected dogs. *Vet Parasitol* 179:107–112. doi:[10.1016/j.vetpar.2011.02.018](https://doi.org/10.1016/j.vetpar.2011.02.018)