

# Detection of *Leishmania* spp. and associated inflammation in ocular-associated smooth and striated muscles in dogs with patent leishmaniosis

Carolina Naranjo,\* Dolors Fondevila,† Marta Leiva,‡ Xavier Roura§ and Teresa Peña‡

\*Department of Pathobiological Sciences, School of Veterinary Medicine, 2015 Linden Drive, Madison, 53706 WI, USA, †Facultat de Veterinària, Departament de Medicina i Cirurgia Animals, Universitat Autònoma de Barcelona, Barcelona, Spain, ‡Servei d'Oftalmologia Veterinària, Facultat de Veterinària, Departament de Medicina i Cirurgia Animals, Universitat Autònoma de Barcelona, Barcelona, Spain, §Servei de Medicina Interna de Petits Animals, Hospital Clínic Veterinari, Universitat Autònoma de Barcelona, Barcelona, Spain

Address communications to:

T. Peña

Tel.: +34 93 581 1944

Fax: +34 93 581 3824

e-mail: teresa.pena@uab.cat

## Abstract

**Objective** Canine leishmaniosis is a disease characterized by the wide distribution of the parasite throughout the tissues of the host. The purpose of this study was to describe the presence of *Leishmania* spp. and associated inflammation in ocular-associated muscles of dogs with patent leishmaniosis.

**Procedures** Smooth muscles (iris dilator muscle, iris sphincter muscle, ciliary muscle, Müller muscle, smooth muscle of the periorbita and smooth muscle of the nictitating membrane) and striated muscles (orbicularis oculi muscle, obliquus dorsalis muscle and dorsal rectus muscle) were evaluated. Routine staining with hematoxylin and eosin and immunohistochemistry to detect *Leishmania* spp. were performed on tissue sections.

**Results** Granulomatous inflammation was seen surrounding muscular fibers and was composed mainly of macrophages with scattered lymphocytes and plasma cells. This infiltrate could be seen in 52/473 (10.99%) samples of smooth muscle and 36/142 (25.35%) samples of striated muscle. Parasites were detected in 43/473 (9.09%) samples of smooth muscle and in 28/142 (19.71%) samples of striated muscle.

**Conclusions** To the authors' knowledge, this is the first report assessing the presence of *Leishmania* spp. and associated infiltrate in intraocular, extraocular and adnexal smooth and striated muscles. The inflammation present in those muscles could contribute to clinical signs already described, such as blepharitis, uveitis, and orbital cellulitis.

**Key Words:** dog, extraocular muscles, eye, immunohistochemistry, intraocular muscles, *Leishmania* spp.

## INTRODUCTION

Canine leishmaniosis is a protozoan disease endemic in the Mediterranean area caused by *Leishmania infantum*.<sup>1</sup> It is always a systemic disease and, as a result, the parasite has been found in many tissues. Due to this wide distribution in the host, clinical signs are variable.<sup>1,2</sup> Masticatory muscle atrophy has been reported to occur in 24.7% of dogs affected by leishmaniosis.<sup>3</sup> Muscle atrophy was first attributed to the catabolic nature of the disease but recent studies have confirmed the presence of granulomatous inflammation with intrahistiocytic *Leishmania* amastigotes in skeletal muscle, including temporal, cranial tibial, and biceps femoris muscles.<sup>4,5</sup>

To the authors' knowledge, no study has reported either clinical signs or histopathologic lesions related to intraocular, extraocular or adnexal smooth and striated muscles involvement in dogs with leishmaniosis. This is the first description of granulomatous myositis of eye-associated muscles due to the presence of *Leishmania* organisms.

## MATERIAL AND METHODS

Samples from 77 dogs (154 eyes and/or adnexal structures) were obtained for this study. Dogs were enrolled in a study on ocular and periocular leishmaniosis that has been carried out during 4 years.<sup>6,7</sup> Dogs that died or were euthanized at