

Research Note

Infection with *Crenosoma vulpis* lungworm in a dog in the Czech Republic

R. HUSNÍK¹, M. SLOBODA², S. KOVAŘÍKOVÁ¹, B. KOUDELA^{2,3}

¹Small Animal Clinic, Faculty of Veterinary Medicine, University of Veterinary and Pharmaceutical Sciences Brno, Palackého 1/3, 612 42 Brno, Czech Republic, E-mail: husnikr@vfu.cz; ²Department of Parasitology, Faculty of Veterinary Medicine, University of Veterinary and Pharmaceutical Sciences Brno, Palackého 1/3, 612 42 Brno, Czech Republic, E-mail: slobodam@vfu.cz; ³Institute of Parasitology, Biology Centre, Academy of Sciences of the Czech Republic, Branišovská 31, 370 05 České Budějovice, Czech Republic, E-mail: koudelab@vfu.cz

Summary

A one-year-old female Shetland Sheepdog was presented with chronic cough. The patient exhibited tachypnea and moist cough, bronchoscopic examination revealed a hyperaemic trachea and mucopurulent exudate affecting the lower bronchi. Nematode parasites were observed during bronchoscopy and were collected by bronchoalveolar lavage. Microscopic examination of the collected fluid confirmed *C. vulpis* infection; L1 larvae were found in during coproscopy. Although other cases of canine *C. vulpis* infection have been previously recorded in Europe, the case reported herein is the first in a dog from Czech Republic.

Keywords: *Crenosoma vulpis*; fox lungworm; larvoscopy; chronic cough; bronchoscopy

Introduction

Crenosoma vulpis, the fox lungworm, is a metastrongylid nematode residing bronchi, bronchioles and trachea of canids and other carnivores (Bihl & Conboy, 1999) with gastropod intermediate hosts (Wetzel, 1941). It is of endemic incidence in red foxes (*Vulpes vulpes*) population throughout North America and Europe (Sreter *et al.*, 2003; Nevarez *et al.*, 2005; Saeed *et al.*, 2006). Since the first findings in a dog in the UK (Cobb & Fisher, 1992), it was detected in domestic dogs throughout the Europe (Reilly *et al.*, 2000; Unterer *et al.*, 2002; Rinaldi *et al.*, 2007; Taubert *et al.*, 2009) including the countries neighbouring the Czech Republic (Barutzki & Schaper, 2003; 2009; Taubert *et al.*, 2009). Adults are characterized by horizontal cuticular ridges in the anterior part (Bowman, 2000; Rinaldi *et al.*, 2007), females lay eggs that hatch within the respiratory tract. The first stage larvae (200 – 300 µm) are coughed up and swallowed; diagnosis is made coprologically using the Baermann technique. Infections in dogs are nonlethal; the clinical signs are characterized by chronic

bronchitis and bronchiolitis caused by the enlargement and hyperplasia of bronchial glands resulting in chronic cough (Stockdale & Hulland, 1970; Conboy, 2004; Nevarez *et al.*, 2005). This short communication describes the first identification of *C. vulpis* in a dog in the Czech Republic.

Material, methods and results

A one-year-old female Shetland Sheepdog was presented with productive cough and gagging for four weeks. Previous treatment with amoxicillin and clavulanic acid (Synulox, Pfizer) and prednisolone (Prednisolone, Zentiva) had resulted in transient improvement. The patient exhibited tachypnea (36/min) and soft moist cough was elicited by tracheal palpation. At auscultation, the dog had increased lung sounds over the entire lung fields. Hematological evaluation revealed monocytosis (1.547×10^9 monocytes/litre). Plain thoracic radiographs revealed a slight right-sided cardiomegaly and increased opacity of lung field with peribronchial cuffing and diffuse bronchial lung pattern. Bronchoscopic examination revealed a hyperaemic trachea and mucopurulent exudate affecting the lower bronchi; nematode parasites were detected as they were actively moving in bronchi. Bronchoalveolar lavage (BAL) was performed under bronchoscopic guidance. Parasites were visible by naked eye in collected fluid; a total of four adult nematodes was obtained. The cytological evaluation of BAL detected a preponderance of nondegenerate neutrophils (93.5 % in differential cell counts, eosinophils 4.5 %). Bacterial culture showed *Streptococcus* spp. and *Staphylococcus* spp. Detailed microscopic examination of flushed nematodes fixed in 4 % hot formalin confirmed *C. vulpis* infection (Fig. 1). Consequent coprological examination using Baermann method revealed the presence of L1 larvae of *C. vulpis* in faeces; however, they were present in a very low number.

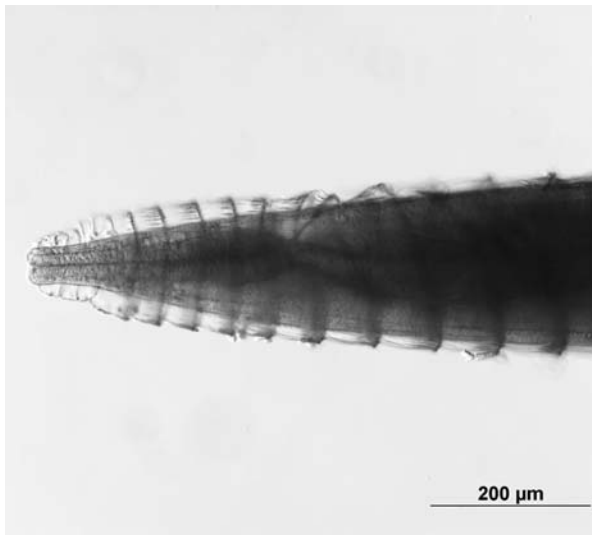


Fig. 1. Detailed view of the anterior part of adult *Crenosoma vulpis*. Note the typical crenated cuticle giving this portion of the body superficially segmented look.

The dog was treated with fenbendazole (50 mg/kg orally once daily for three consecutive days, Panacur; Intervet) administered in combination with doxycycline (5 mg/kg orally twice daily for three weeks, according to the susceptibility test, Ronaxan; Merial). All symptoms disappeared within a week; repeated examinations three weeks later showed no evidence of previous changes and coprological examination was negative.

Discussion

This is the first evidence of autochthonous infection with *C. vulpis* in a dog in the Czech Republic. Larvae are generally not detected by means of using the standard faecal flotation techniques and thus, a huge number of *C. vulpis* infected dogs could be misdiagnosed (Bihl & Conboy, 1999). The Baermann technique is considered a method of choice (Nelson & Sellon, 2005); FLOTAC technique may be another approach to increase the chance of detection (Rinaldi *et al.*, 2007). This case together with the occurrence of *C. vulpis* in countries neighbouring the Czech Republic indicates that infection with *C. vulpis* should be considered a differential diagnosis in dogs with symptoms of respiratory diseases in Central Europe. It shows the necessity of using of larvoscopy in such cases. However, the false negative results of Baermann technique were described in animals infected in a natural way as well (Reilly *et al.*, 2000). Therefore the accurate bronchoscopic examination and thorough evaluation of BAL is essential. Several therapeutic regimens against *C. vulpis* infection are described in literature (Stockdale & Smart, 1975; Cobb & Fisher, 1992; Hoff, 1993; Peterson *et al.*, 1993; McGarry *et al.*, 1995); treatment with fenbendazole suggested by e.g. Peterson *et al.* (1993) or Nelson & Sellon (2005) which was adjusted in our patient showed full therapeutic efficiency.

Acknowledgements

We would like to thank František Moravec for his help during the determination of parasites. The study was supported by the Fund for the Development of Universities and Colleges (FRVS) of the Ministry of Education, Youth and Sports of the Czech Republic - Project No. 1679/2010.

References

- BARUTZKI, D., SCHAPER, R. (2003): Endoparasites in dogs and cats in Germany 1999 – 2002. *Parasitol. Res.*, 90(S3): 148 – 150. DOI: 10.1007/s00436-003-0922-6
- BARUTZKI, D., SCHAPER, R. (2009): Natural infections of *Angiostrongylus vasorum* and *Crenosoma vulpis* in dogs in Germany (2007-2009). *Parasitol. Res.*, 105(S1): 39 – 48. DOI: 10.1007/s00436-009-1494-x
- BIHR, T., CONBOY, G. A. (1999): Lungworm (*Crenosoma vulpis*) infection in dogs on Prince Edward Island. *Can. Vet. J.*, 40(8): 555 – 559
- BOWMAN, D. D. (2000): Respiratory system parasites of the dog and cat (Part II): Trachea and bronchi, and pulmonary vessels. http://www.ivis.org/advances/Parasit_Bowman/ddb_resp2/ivis.pdf
- COBB, M.A., FISHER, M.A. (1992): *Crenosoma vulpis* infection in a dog. *Veterinary Record*, 130(20): 452
- CONBOY, G. (2004): Natural infections of *Crenosoma vulpis* and *Angiostrongylus vasorum* in dogs in Atlantic Canada and their treatment with milbemycin oxime. *Vet. Rec.*, 155(1): 16 – 18
- HOFF, B. (1993): Lungworm (*Crenosoma vulpis*) infection in dogs. *Can. Vet. J.*, 34(2): 123 – 124
- MCGARRY, J. W., MARTIN, M., CHEESEMAN, M. T., PAYNE-JOHNSTON, C. E. (1995): *Crenosoma vulpis*, the fox lungworm in dogs. *Veterinary Record*, 137(11) 271 – 272.
- NELSON, O. L., SELLON, R. K. (2005): Pulmonary parenchymal diseases. In: ETTINGER, S. J., FELDMAN E.C. (Eds) *Textbook of Veterinary Internal Medicine, 5th edn.* USA: Elsevier Saunders, pp. 1239 – 1271
- NEVAREZ, A., LOPEZ, A., CONBOY, G., IRELAND, W., SIMS, D. (2005): Distribution of *Crenosoma vulpis* and *Eucoleus aerophilus* in the lung of free-ranging red foxes (*Vulpes vulpes*). *J. Vet. Diagn. Invest.*, 17(5): 486 – 489
- PETERSON, E. N., BARR, S. C., GOULD, W. J. 3RD, BECK, K. A., BOWMAN, D. D. (1993): Use of fenbendazole for treatment of *Crenosoma vulpis* in a dog. *J. Am. Vet. Med. Assoc.*, 202(9): 1483 – 1484
- REILLY, G. A., MCGARRY, J. W., MARTIN, M., BELFORD, C. (2000): *Crenosoma vulpis*, the fox lungworm in a dog in Ireland. *Vet. Rec.*, 146(26): 764 – 765
- RINALDI, L., CALABRIA, G., CARBONE, S., CARELLA, A., CRINGOLI, G. (2007): *Crenosoma vulpis* in dog: first case report in Italy and use of the FLOTAC technique for copromicroscopic diagnosis. *Parasitol. Res.*, 102(3): 1681 – 1684. DOI: 10.1007/s00436-007-0835-x
- SAEED, I., MADDOX-HYTTEL, C., MONRAD, J., KAPEL, C. M. (2006) Helminths of red foxes (*Vulpes vulpes*) in Den-

mark. *Vet. Parasitol.*, 139(1 – 3): 168 – 179. DOI: 10.1016/j.vetpar.2006.02.015

SRETER, T., SZELL, Z., MARUCCI, G., POZIO, E., VARGA, I. (2003): Extraintestinal nematode infections of red foxes (*Vulpes vulpes*) in Hungary. *Veterinary Parasitology*, 115(4): 329 – 334. DOI: 10.1016/S0304-4017(03)00217-6

STOCKDALE, P. H., HULLAND, T. J. (1970): The pathogenesis route of migration and development of *Crenosoma vulpis* in the dog. *Vet. Pathol.*, 7(1): 28 – 42

STOCKDALE, P. H., SMART, M. E. (1975): Treatment of crenosomiasis in dogs. *Res. Vet. Sci.*, 18(2) 178 – 181

TAUBERT, A., PANTCHEV, N., VRHOVEC, M. G., BAUER, C., HERMOSILLA, C. (2009): Lungworm infections (*Angio-*

strongylus vasorum, *Crenosoma vulpis*, *Aelurostrongylus abstrusus*) in dogs and cats in Germany and Denmark in 2003-2007. *Vet. Parasitol.*, 159(2): 175 – 180. DOI: 10.1016/j.vetpar.2008.10.005

UNTERER, S., DEPLAZES, P., ARNOLD, P., FLUCKIGER, M., REUSCH, C. E., GLAUS, T. M. (2002): Spontaneous *Crenosoma vulpis* infection in 10 dogs: laboratory, radiographic and endoscopic findings. *Schweiz. Arch. Tierheilkd.*, 144(4): 174 – 179

WETZEL, R. (1941): Zum Wir-ParasiteVerhältnis des Fuchslungenwurmes *Crenosoma vulpis*. *Dtsch. Tierarztl. Wochenschr.*, 49: 1 – 2, 28 – 30, 40 – 42

RECEIVED MAY 18, 2010

ACCEPTED NOVEMBER 18, 2010