

***Linguatula serrata* (PENTASTOMIDA: LINGUATULIDAE) INFECTION IN DOG, ROMANIA: A CASE REPORT**

Mariana IONIȚĂ, Ioan Liviu MITREA

University of Agronomic Sciences and Veterinary Medicine of Bucharest,
Faculty of Veterinary Medicine, 105 Spl. Independentei, 050097, Bucharest, Romania

Corresponding author e-mail: ionitamary@yahoo.com

Abstract

Linguatula serrata (Pentastomida: order Porocephalida, family Linguatulidae) is a cosmopolitan parasite inhabiting as adults the nasal passages and frontal sinuses of wild and domestic canids (dogs, foxes), which serve as definitive hosts. Cattle, sheep, goats, camels, rabbits, and other animals serve as intermediate hosts, in which fully developed nymphs, the parasitic stage infective for carnivores, are found encysted mainly in the mesenteric lymph nodes, lungs, liver, or serous membranes. Although man is accidental/aberrant host, the reports of human infection with this parasite, as visceral or nasopharyngeal ("Halzoun" or "Marrara syndrome") linguatulosi is not uncommon, particularly in the Middle East where high infection rates are registered. Here we report a case of *Linguatula serrata* infection in a dog rescued from a suburban area, in southern Romania. The dog was an approximately 6-months-old male of mixed breed which had a history of free-roaming life and which had been rescued by the dog owner in late November, 2012. Several months later, on March 2013, about few days after a treatment with a macrocyclic lactone (ivermectine), the dog had expelled by sneezing several worm-like parasites. The parasite specimens were morphologically identified as adults of *L. serrata*. The epidemiological aspects of linguatulosi and potential risks of public health and veterinary concern are discussed.

Key words: *Linguatula serrata*, dog, Romania.

INTRODUCTION

Linguatula serrata is a cosmopolitan parasitic species of the phylum Pentastomida (order Porocephalida, family Linguatulidae).

The Phylum Pentastomida comprises a group of obligatory endoparasites of the respiratory tract and other organs / body cavities of tetrapod (particularly reptiles) vertebrates (Soulsby, 1982). Most pentastomids have an indirect life cycle: reptiles, amphibians and mammals, also fish or insects, serve as intermediate hosts in which the primary larvae develop through several molts to the infective stage (nymphs) in different organs and associated lymph nodes. The definitive hosts - wild and domestic carnivorous become infected by eating tissues from the intermediate hosts containing encysted infective stages (Christoffersen and De Assis, 2013).

L. serrata, commonly called tongue worm, inhabits as adults the nasal passages and frontal sinuses of wild and domestic canids (dogs, foxes), which serve as definitive hosts. Various

mammalian herbivores, such as cattle, sheep, goats, camels, rabbits serve as intermediate host, in which fully developed nymphs, the parasitic stage infective for carnivores, are found encysted in the lymph nodes, liver, lungs, serous membranes (Riley, 1986).

Although man is accidental host, the reports of human infection with this parasite is not uncommon, particularly in the Middle East (Yagi et al., 1996; Siavashi et al., 2002) where high infection rates in dogs are registered. (Oryan et al., 2008).

Humans become infected either by ingesting the eggs of parasite, resulting encapsulated larvae in internal organs, causing *visceral linguatulosi* (Tappe and Büttner, 2009), or eating infective nymphs contained in raw or undercooked viscera of infected intermediate hosts, causing *nasopharyngeal linguatulosi* (Yagi et al., 1996; Siavashi et al., 2002).

Here we report a case of *L. serrata* infection in a dog rescued from a suburban area, in Southern Romania.

MATERIALS AND METHODS

A male dog, mixed breed, of approximately 6-months-old, with a history of free-ranging life had been rescued by the dog owner from a suburban area, outside of Bucharest (Southern Romania), in late November 2012. Several months later, on March, 2013, the dog was presented in a veterinary clinic for consultation, due to a persistent nasal pruritus and skin lesions (depilation) observed on the head (around the mouth, nose, and eyes). Subsequently to the clinical examination, the dog was diagnosed with sarcoptic mange and treated by the vet with a macrocyclic lactone (ivermectine), as the dog owner recalled.

About several days after the treatment, the dog had expelled by sneezing several worm-like parasites and the dog owner asked the authors for help with its identification.

The parasite specimens (n=4) were preserved in formalin and subjected for examination and species identification, using morphological keys (Soulsby, 1982; Taylor et al., 2007).

Additionally, the owner was asked to bring also faecal samples from the dog for parasitological examination. Faecal samples were analysed as routinely for parasitic stages using flotation and sedimentation methods.

RESULTS AND DISCUSSIONS

At the clinical examination, the dog presented no any clinical signs, but minor skin lesions, such as depilation was still present around the nose and the mouth.

Morphological examination of the parasites revealed specific features of adult *L. serrata* (Soulsby, 1982; Taylor et al., 2007):

- the body whitish, transparent, elongate, with a tongue-like shape, slightly convex, and ventrally flattened, with a rounded anterior and pointed (narrow) posterior end; length from ~4 cm to 5 cm (Figure 1);
- the cuticle showed rings and spicules (Figure 2A);
- on the anterior, ventral side were noticed curved hooks with sharp tips (Figure 2B).

All four specimens were females.

The fecal examination was negative for parasitic stages, including for *L. serrata* eggs.



Figure 1. *Linguatula serrata*: macroscopical view

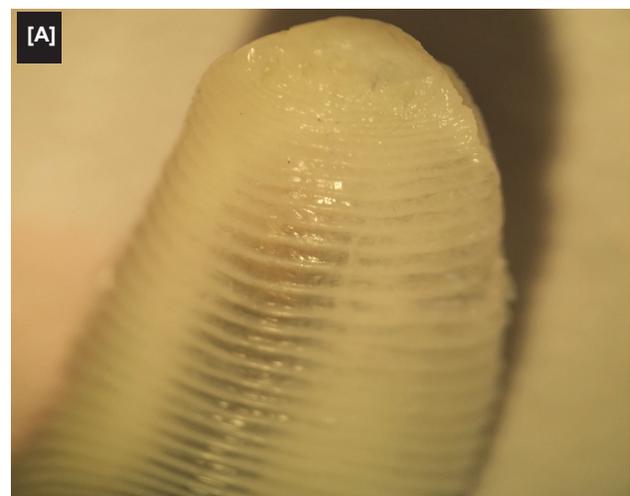


Figure 2A. *Linguatula serrata*: cuticle with rings and spicules (by stereomicroscopy)

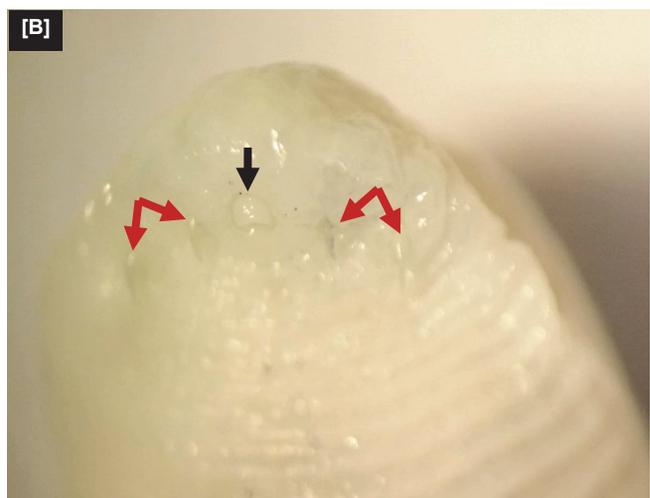


Figure 2B. *Linguatula serrata*: [B] ventral anterior end: mouth (black arrow); 4 hooks (double red arrows) (by stereomicroscopy)

Here we report a case of adult *L. serrata* infection in a dog with a history of a free-roaming live and then rescued by the dog owner. Considering the free-roaming life history of the dog (stray dog rescued from a suburban area), it is assumed that the infection was by eating infected viscera very likely from animals found dead on the field; as well, the dog might had been fed with infected animal viscera.

In favour of this assumption, the life cycle of *L. serrata* will be briefly described.

Dogs are the typical definitive hosts of *L. serrata*, while a wide range of mammals act as intermediate hosts; of them, herbivores, mainly ruminants such as cattle, sheep, goats, camels, are frequent the best hosts for the nymphal stage development of the parasite, causing visceral linguatulososis (Riley, 1986).

The adults are large parasites, ranging in length from 1.8-2 cm in males, and from 3 to 13 cm in females (Taylor et al., 2007). They firmly attach to the mucosa of the nasal passages, causing nasal obstruction and chronic rhinitis (nasal discharge, sneezing) (Mitrea, 2011; Bonagura and Twedt, 2013). Females excrete per day thousands embryonated eggs (Mehlborn, 2008). The eggs have an ovoid shape, a brownish to yellowish colour, and measure about 70x90 µm (Taylor et al., 2007).

The eggs are expelled by the definitive host (dog) either with nasal secretions (by coughing or sneezing) or in the faeces. Eggs, ingested by the herbivorous intermediate host, accidentally by humans, pass into gut where they hatch; then, the larvae migrate to the mesenteric lymph nodes and different viscera (lung, liver, etc.) where, after a number of moults (lasting up to five - six months), reach to nymphal stage. The nymphs encyst, become encapsulated, and may stay alive in the intermediate host for at least two to three years (Soulsby, 1982).

In the intermediate host, nymphal stages grow up to 6 mm; they have four hooks, mouth, annular rings, and spines (Riley, 1986).

The definitive host becomes infected by consuming the infected viscera from intermediate hosts (Soulsby, 1982).

Following ingestion, the nymphs migrate to the nasal passages where the final moult occur and reach maturity within six-seven

months; their longevity is about 15 months (Taylor et al., 2007).

Therefore, in this report, the absence of the parasite eggs from the dog faeces might be explained by the fact that the parasites had not reached the reproduction maturity, since the age of the dog was about 5-6 months.

The geographical range of *L. serrata* is almost global, but predominantly prevalent in warm tropical, and subtropical regions, where high infection rates are registered. Prevalence studies of *L. serrata* in different herbivorous have reported high infection rates in goats (50.75%), sheep (42.69%), cattle (36.62%), and buffaloes (26.6%), in North West of Iran (Rezaei et al., 2011); 10% in sheep in Turkey (Aldemir et al., 2014).

Similar studies showed that 37.45% of client owned dogs in Nigeria were infected with *L. serrata* (Oluwasina et al., 2014), and from 27.83% to 76.2% of dogs in different parts of Iran (Rezaei et al., 2011; Oryan et al., 2008). The close contact between dogs and livestock explains the greater rates of infection in intermediate hosts (herbivorous, mainly ruminants) (Rezaei et al., 2011).

It is known that also close contact to *L. serrata* infected dogs and their secretions predispose humans to infection. As mentioned before, man might serve as accidental intermediate hosts (visceral linguatulososis), when ingesting the eggs (Tappe and Büttner, 2009). Intraocular infections, caused by *L. serrata* tongue worm, even extremely rare, have been described, including in Europe, such as one from Portugal and one, recently from Austria (Koehsler et al., 2011).

Humans can also serve as aberrant final hosts (nasopharyngeal linguatulososis) after ingesting raw or under-cooked viscera (liver, lungs, trachea) of infected intermediate hosts. The nasopharyngeal linguatulososis appears to be prevalent throughout the Middle East, where it is known as "Halzoun syndrome" (Siavashi et al., 2002) or as "Marrara" in Sudan. It is stated that, in some areas of Sudan, up to 20% of the population might be affected (Yagi et al., 1996). These syndromes are associated with some popular, local or traditional dishes prepared from raw offal/meat.

In Romania, there are some reports on the visceral linguatulososis in ruminants. High prevalence rates for *L. serrata* nymphs

infection in the mesenteric lymph nodes of slaughtered domestic ruminants from Transylvania region have been reported in goats (up to 60.5%), cattle (47.4%), sheep (40.7%), and buffaloes (25.5%) (Negrea et al., 2010).

However, in dogs, only sporadic clinical cases, or accidental findings during of necropsy are reported (Dulceanu et al., 1996; Negrea, 2008). Therefore, the overall prevalence of *L. serrata* in Romanian dogs is very likely to be underestimated.

Considering the medical history of the dog in the present case, it may be assumed that the parasites were expelled subsequently to the ivermectin (a systemic macrocyclic lactone) treatment.

However, when searching in the literature, information is scarce about treatment of linguatulosis.

Usually, physical/surgical removal of the parasites is recommended for heavily infected dogs. Although, the sneezing may also provoke expelling of the worms, systemic insecticides could be also considered (Taylor et al., 2007; Bonagura and Twedt, 2013).

In this respect, a field study showed that ivermectin is an effective agent against a related species, *Linguatula arctica*, in reindeer, and possibly against other pentastomids because of their similar arthropodal nerve system (Haugerud et al., 1993).

However, treatment of cattle, sheep or other livestock with parasiticides against tongue worms is usually not practiced, as they cause no economic damage (Taylor et al., 2007).

Therefore, management of linguatulosis relies mostly in preventative measures. Prevalence studies on *L. serrata* infection in the definitive (dogs) and intermediate hosts (especially ruminant animals) are of epidemiological relevance, and could represent a basis for developing and applying control program and measurements.

Moreover, these data and further investigations are necessary to be able not only to estimate the risks in the both endemic and non-endemic areas, but also to avoid an introduction of parasites, as it was reported for imported dogs (Gjerde, 2013) and to help of preventive measures.

CONCLUSIONS

This case report indicates that dogs with free-roaming life (i.e. stray dogs), having access to infected animal offal, have a higher risk for *L. serrata* infection. Subsequently, an infected dog become a potential source of infection and pose public health and veterinary concern, mainly in endemic areas.

REFERENCES

- Aldemir O.S., Aydenizöz M., Ateşoğlu Ö., 2014. Parasitological and pathological investigations on *Linguatula serrata* nymphs in mesenteric lymph nodes in sheep in Konya Region in Turkey. Turkish J. Agric., Food Science and Techn., 2(5): p. 224-227.
- Bonagura J.D., Twedt D.C., 2013. Kirk's current veterinary therapy XV. Saunders Elsevier, U.S.A.
- Christoffersen M.L., DeAssis J.E., 2013. A systematic monograph of the recent Pentastomida, with a compilation of their hosts. Zoologische Mededelingen, 87: p. 1-206.
- Dulceanu N., Polcovnicu C., Solcan Gh., Hritcu L., 1996. Observatii privind morfologia speciei *Linguatula serrata*, Frohlich 1789. Revista Română de Medicina Veterinara 6(4): p. 467-474.
- Gjerde B., 2013. Phylogenetic position of *Linguatula arctica* and *Linguatula serrata* (Pentastomida) as inferred from the nuclear 18S rRNA gene and the mitochondrial cytochrome c oxidase subunit I gene. Parasitology Research. 112(10): p. 3517-3525.
- Haugerud R., Nilssen Arne C., Rognmo Arne, 1993. On the efficacy of ivermectine against the reindeer sinus worm *Linguatula arctica* (Pentastomida), with a review on ivermectin treatment in reindeer. Rangifer, 13(3): p. 157-162.
- Koehsler M., Walochnik J., Georgopoulos M., Prunte C., Boeckeler W., Auer H., Barisani Asenbauer T., 2011. *Linguatula serrata* tongue worm in human eye, Austria. Emerg Infect Diseases, 17(5): p. 870-872.
- Mehlhorn H., 2007. Encyclopedic Reference of Parasitology (2nd Edition). Heidelberg, Springer-Verlag.
- Mitreă I.L., 2011. Parasitology and Parasitic Diseases (Romanian language). Ed. Ceres, Bucharest.
- Negrea O., Raducu C., Miresan V., Marchis Z., Miclaus V., Chirila F., Rotar A., 2010. Aspects regarding epizootic metalinguatulosis in main domestic ruminant species. Lucrari Stiintifice Medicina Veterinara, USAMV Iasi, 53, 12(4): p. 1106-1110.
- Negrea O., 2008. Contributions regarding the pathogenic role of *Linguatula serrata* adult forms at rhino-sinus mucosa level in dog. Scientia Parasitologica, 1: p. 112-114.
- Oluwasina O.S., ThankGod O.E., Augustine O.O., Gimba F.I., 2014. *Linguatula serrata* (Porocephalida: Linguatulidae) infection among clientowned dogs in Jalingo, Northeastern Nigeria: prevalence and public health implications. J. Parasitol Res., ID 916120, <http://dx.doi.org/10.1155/2014/916120>.
- Oryan A., Sadjjadi S.M., Mehrabani D., Rezaei M., 2008. The status of *Linguatula serrata* infection of

- stray dogs in Shiraz, Iran. *Comparative Clinical Pathology*, 17, p. 55-60.
- Rezaei F., Tavassoli M., Mahmoudian A., 2011. Prevalence of *Linguatula serrata* infection among dogs (definitive host) and domestic ruminants (intermediate host) in the Northwest of Iran. *Veterinari Medicina*, 56, (11): p. 561-567.
- Riley J., 1986. The biology of Pentastomids. *Advanced in Parasitology*, 25: p. 45-128.
- Siavashi M.R., Assmat M., Vatankhah A., 2002. Nasopharyngeal pentastomiasis (Halzoun): report of three cases. *Iranian Journal of Medical Sciences*, 27: p. 191-192.
- Soulsby E.J.L., 1982. *Helminths, Arthropods, and Protozoa of domesticated animals* (7th Edition). London, Bailliere Tindall.
- Sousefaro B., Pinhao R.C., 1964. An isolated case of ocular parasitosis caused by *Linguatula serrata*. *Journal da Sociedade Cienc Med Lisb.*, 128: p. 401-420.
- Tappe D., Buttner D.W., 2009. Diagnosis of human visceral pentastomiasis. *PLoS Negl Trop Diseases*, 5: e320 10.1371/journal.pntd.0000320.
- Taylor M.A., Coop R.L., Wall R.L., 2007. *Veterinary Parasitology*. 3rd Edition, Blackwell Publishing Company, 402 p.
- Yagi H., el Bahari S., Mohamed H.A., Ahmed el-R.S., Mustafa B., Mahmoud M., Saad M.B., Sulaiman S.M., Hassan A.M., 1996. The Marrara syndrome: a hypersensitivity reaction of the upper respiratory tract and bucco-pharyngeal mucosa to nymphs of *Linguatula serrata*. *Acta Tropica*, 62(3): p. 127-134.