Occurrence of *Linguatula serrata* nymphs in cattle slaughtered in Tabriz, Iran

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Abstract The *Linguatula serrata* is a tongue-shaped parasite that infects carnivores or insectivorous reptile as final and herbivores as intermediate host. The aim of this study was to evaluate the prevalence of nymphal stages of *L. serrata* in mesenteric nodes (MLN) and mediastinal lymph nodes of cattle slaughtered in Tabriz slaughterhouse, North West of Iran. Mesenteric and mediastinal lymph nodes of 640 cattle of different sex and age were inspected. A digestion method was applied for investigation of samples revealing an infection prevalence of 18.9 %. The MLNs in 97 cattle out of 640 (15.1 %) and the mediastinal lymph nodes in 47 cattle out of 640 (7.3 %) were infected by *L. serrata* nymphs. The results showed infection rate of mesenteric lymph nodes higher than mediastinal mesenteric lymph nodes ($P < 0.05$). The infection rate increased with age ($P < 0.05$). Although a significant difference seen in the infection rate between male and female but it was not significant at the same age groups of male and female ($P > 0.05$). In addition, there was a significant difference in the infection rate of different seasons ($P < 0.05$). Linguatulosis occurs as an endemic zoonosis in the northwest of Iran and has an active transmission life cycle.

Keywords Cattle · *Linguatula serrata* · Iran · Prevalence · Tabriz

Introduction

The phylum pentastomida consists of about 100 species of endoparasites of the respiratory tract of vertebrates. Its importance in veterinary and human medicine is the two families' linguatulidae and procephalidae of which species of the genus *Linguatula* and *Armillifer* are zoonotic parasites. *Linguatula serrata* Frohlich, 1789 is a zoonotic parasite causing visceral and nasopharyngeal linguatulosi or 'Halazoun Syndrome' in humans. *L. serrata* is tongue shaped, lightly convex dorsally and flattened ventrally. Males measure 1.8–2 cm, while females measure 8–13 cm in length. Adults inhabit the canine respiratory system as final hosts. The eggs are expelled from the respiratory passages of the canine and, when swallowed by an intermediate host, the larva reaches the mesenteric and mediastinal lymph nodes, liver, and other organs, in which it develops to the infective nymphal stage. The final host becomes infected by eating the infected viscera of intermediate hosts (Soulsby 1982). This parasite has also been reported in humans in Iran (Anaraki et al. 2008; Siavashi et al. 2002; Sadjadi et al. 1998) with clinical signs of nasopharyngeal symptoms including sneezing, coughing and nasal discharge following consumption of barbecued liver. Maleky (2001) described linguatulosi caused by *L. serrata* in the throat of a 28-year-old woman from Tehran, Iran. Consuming raw or under-cooked liver is not usual in some part of Iran particularly in women of childbearing age. It is thought among some women, that consumption of raw or undercooked liver is helpful for growth of the fetus because of its high content of iron and vitamins. Several

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studies have been conducted on the prevalence rate of *L. serrata* in dogs (Tavassoli et al. 2007; Meshgi and Asgarian 2003), camels (Oryan et al. 1993; Shakerian et al. 2008; Haddadzadeh et al. 2009), buffaloes (Tajik et al. 2008), sheep (Shekarforoush et al. 2004; Tavassoli et al. 2007) and goats (Saiyari et al. 1996; Razavi et al. 2004). Human infection with *L. serrata* has been reported from different parts of the world including tropical regions of North and South America, Europe, Asia, Africa and Australia (Riley et al. 1985).

There are also some reports of the infection from different regions of Iran (Siavashi et al. 2002; Maleky 2001), the objective of this study was to determine the prevalence rate of *L. serrata* nymphs in MLNs and mediastinal cattle that were processed in the Tabriz, slaughterhouse.

Materials and methods

During September 2010 to September 2011, 640 cattle (358 male and 282 female) in three age groups (<2, 2–4 and >4 years old) were selected randomly at the Tabriz slaughterhouse. Mediastinal and mesenteric lymph nodes were examined for nymphal stage of *L. serrata*. Samples were cut into small pieces and immersed in normal saline (0.9 % NaCl) solution and left for 5–6 h to allow nymphs to come out from the tissue. Recovered nymphs were flattened, dehydrated in ascending grades of ethyl alcohol and cleared in creosote before examining under a stereomicroscope. Then, the negative samples were digested in 200 ml of digestion solution containing 5 g of pepsin and 25 ml hydrochloric acid in 1,000 ml distilled water, and incubated at 37 °C for 24 h (Razavi et al. 2004).

The statistical analysis was performed by using SPSS software version 16 (SPSS, Inc, Chicago, IL). The Chi square test was used to check the differences between the percentages. The data were analyzed using Chi squared test.

Results

The prevalence rate of *L. serrata* nymphs in mediastinal and mesenteric lymph nodes of 640 cattle slaughtered at Tabriz slaughterhouse, in different sex and age groups and different seasons are summarized in Table 1. One hundred twenty (18.9 %) cattle were infected with nymph stages of *L. serrata*. Fifty eight of 358 males (16.2 %) and 63 out of 282 females (22.3 %) were been positive. Ninety seven of 640 (15.1 %) cattle had nymphs in their mesenteric lymph nodes. Forty seven out of 640 (7.3 %) cattle had nymphs in their mediastinal lymph nodes. The results showed an infection rate of mesenteric lymph nodes higher

mediastinal mesenteric lymph nodes ($P < 0.05$). The infection rate increased with age ($P < 0.05$). Although a significant difference in the infection rate was observed between male and female but it was not significant at the same age groups of male and female ($P > 0.05$). In addition, there was a significant difference in the infection rate of different seasons ($P < 0.05$).

Discussion

Although the parasite is cosmopolitan, it is mainly seen in tropical and subtropical areas. Infections with *L. serrata* in human cases have been reported from Africa, South America, Southeast Asia and the Middle East (Beaver et al. 1984; El-Hassan et al. 1991; Lazo et al. 1999; Siavashi et al. 2002). Several studies have been conducted on the prevalence of *L. serrata* in dogs (Tavassoli et al. 2007; Meshgi and Asgarian 2003; Oryan et al. 2008), camels (Oryan et al. 1993; Shakerian et al. 2008; Haddadzadeh et al. 2009), buffaloes (Tajik et al. 2008), goats (Saiyari et al. 1996; Razavi et al. 2004) and sheep (Shekarforoush et al. 2004; Tavassoli et al. 2007). The prevalence rates of 44 % in cattle in Urmia slaughterhouse, Iran (Tajik et al. 2006), 19 % in cattle of India (Ravindran et al. 2008), 29.9 % in goats in Shiraz, Iran (Razavi et al. 2004), have been reported from different countries. In the current survey, the prevalence rate of 18.9 % was observed in cattle. This probably indicates a regional difference in distribution of parasite. Apparently, high prevalence rate of infection in this area are a manifestation of climatic parameters that enhance survival of parasite eggs in vegetables, fruits, and water resources, and possibly, the suitable temperature and humidity play important roles in the epidemiology of this infection.

The prevalence rate of 18.9 % infection in lymph nodes should be considered as an important risk factor for human being infection. Larval and nymphal stages of *L. serrata* have been recorded from humans in some countries such as Iran (Sadjadi et al. 1998; Maleky 2001). Although, the prevalence of *L. serrata* in cattle of Tabriz is high, it seems that the cattle has little role in epidemiology of linguatulozosis in comparison with sheep and goats.

It was significant difference seen in the infection rate between male and female but it was not significant at the same age groups of male and female ($P > 0.05$). The infection rate increased with age ($P < 0.05$). The nymphs develop in about 5–6 months, according to the lower prevalence in the younger groups.

Based on this study, 15.1 % of MLN and 7.3 % of the mediastinal lymph nodes had *L. serrata*. The prevalence rate of mediastinal lymph nodes was lower than that of MLN. According to the life cycle of *L. serrata*, mesenteric

Table 1 The prevalence of *Linguatula serrata* in nymphs of cattle slaughtered at Tabriz, Iran

	Age (years)			Gender		Seasons			
	<2	2–4	>4	Male	Female	Spring	Summer	Autumn	Winter
No. of cattle	315	172	153	358	282	160	160	160	160
No. of infected cattle (%)	38 (12.06)	29 (16.86)	54 (35.29)	58 (16.20)	63 (22.34)	28 (17.5)	33 (20.62)	39 (24.37)	21 (13.12)

lymph nodes, located in the way of portal circulation before the other organs so the infection rate of these are higher than other organs.

The prevalence of *L. serrata* nymphs in different seasons was significantly different ($P < 0.05$)

Human infection is as the result of ingestion of third stage larvae of *L. serrata* found in raw liver or lymph nodes of sheep, goats and cattle. Ingestion of *L. serrata* nymphs can cause Halzoun or Marrara syndrome that is often characterized by inflammation of the upper respiratory tract, swelling of the submaxillary and cervical lymph nodes and occasionally abscess formation in the eyes or ears (Khalil 1976; Yagi et al. 1996). Sporadic incidence of Halzoun in humans has also been reported in Iran (Maleky 2001). It was not clear but it seems that close contact between dogs and sheep throughout a year and geographical limitations caused it. In this area, because of the regular migration of tribes with their herds and dogs which they feed uncooked offal may contribute to the infection and spread of infection over the area. There is continuous contact between sheep and goats with final host. The results of this study support the impression that Tabriz is an endemic region for linguatulosis and due to zoonotic nature of the parasite and the risk of infection to humans and other animals preventive procedures are necessary for braking the cycle of the parasite.

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