

Prevalence of *Linguatula serrata* nymphs in one-humped camel (*Camelus dromedarius*) in southeast of Iran

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Abstract. One-humped camel (*Camelus dromedarius*) is an important multipurpose popular local animal species of Iran, and more than 200,000 dromedary camels live in the arid and semiarid deserts of eastern provinces of the country. *Linguatula serrata* one of the main parasitic zoonoses, inhabits the respiratory system of canines which are its definitive hosts. Humans can be infected with this parasite by consuming raw glandular material of infected intermediate hosts (camel, sheep, cattle, goat, etc.). In this study, a total of 210 camels (128 males, 82 females) of different ages were examined from March 2009 to March 2010 for *L. serrata* of which 34 (16.2%) were found to be infective. The mesenteric lymph nodes of all these animals were infected with *L. serrata* nymphs and the mediastinal lymph nodes of 4 (1.9%) out of 210 camels were also infected. No significant difference ($p>0.05$) was found between the infected male and female animals, the infection rate increased with age ($p<0.01$).

Keywords: *Linguatula serrata* nymphs; one-humped camel; Iran.

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Introduction

One-humped camel (*Camelus dromedarius*) is an important multipurpose popular local animal of Iran, and more than 200,000 dromedary camels live in the arid and semiarid deserts of eastern provinces of the country (Mowlavi et al., 1997; Rahbari and Bazargani, 1995). Despite the general reputation for hardiness and resilience, camels are, however, vulnerable to many infections (Wernery et al.,

2004) including parasites (Bukachi et al., 2003; Mohammed et al., 2007).

Linguatula serrata, a tongue shaped parasite, lightly convex dorsally and flattened ventrally (Soulsby, 1982) inhabits the respiratory system of canines which are its definitive hosts. Eggs containing larvae are discharged into the environment by nasopharyngeal secretions and are ingested by grazing herbivores including in which the infective nymphal stage

develops in mainly mesenteric lymph nodes sometimes in other organs (e.g. liver, lung). Larval or nymphal infection is usually asymptomatic in herbivores. Ingestion of *L. serrata* nymphs with infected raw liver or lymph nodes of intermediate hosts can cause halzoun or marrara (maraca) syndrome in humans, often characterized by inflammation of the upper respiratory tract, swelling of the sub maxillary and cervical lymph nodes and occasionally abscess formation in the eyes or ears (Khalil, 1976; Yagi et al., 1996). This parasitic infection has also been reported in humans in Iran (Sadjjadi et al., 1998; Siavashi et al., 2002; Anaraki Mohammadi et al., 2008) with clinical signs of nasopharyngeal symptoms including sneezing, coughing and nasal discharge following consumption of barbecued liver (Kabab). Maleky (2001) described linguatulosis caused by *L. serrata* in the throat of a 28-year-old woman from Tehran, Iran. Consuming raw or under-cooked liver is not unusual in some part of Iran particularly in pregnant women. 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 studies have been conducted on the prevalence rate of *L. serrata* in dogs (Dincer, 1982; Tavassoli et al., 2000; Meshgi and Asgarian, 2003; Oryan et al., 2008), sheep (Shekarforoush et al., 2004; Tavassoli et al., 2007), goats (Razavi et al., 2004; Nourollahi Fard et al., 2010) and camels (Wahba et al., 1997; Tajik et al., 2007; Shakerian et al., 2008; Haddadzadeh et al., 2009). Since there is no report of this parasitic infection in camels of Kerman, the aim of this study was to determine the infection rate of *L. serrata* nymphs in mesenteric and mediastinal lymph nodes of camels slaughtered at the local slaughterhouse of Kerman Iran.

Materials and methods

The study was conducted in Kerman area, Kerman province, Iran. Kerman is located at 30°17'13"N and 57°04'09"E in southeastern Iran. The mean elevation of the city is about 1755 m above sea level. Kerman city has a hot and arid climate and the average annual rainfall is 135 mm. Because it is located close to the Kavir-e lut, Kerman has hot summers.

Between March 2009 and March 2010, 210 camels, 128 males and 82s female, grouped in three age groups (<5, 5-10, >10 years old) were selected randomly at the Kerman slaughterhouse. The mesenteric and mediastinal lymph nodes of the slaughtered animals were examined grossly for the presence of nymphal stage of *L. serrata*. Samples were cut into small pieces and immersed in physiological saline (0.9% NaCl) solution and left for 5-6 hours to allow nymphs to come out from 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 grams of pepsin and 25 ml hydrochloric acid in 1000 ml distilled water, and incubated at 37°C for 24 h (Razavi et al., 2004). The computer software, SPSS Version 9.0 for Windows (SPSS Inc., Chicago, IL, USA) was used for analysis. To compare relative frequency of infection between different groups of lymph nodes Chi-square tests was used.

Results

Thirty-four out of 210 camels (16.2%) were infected with nymphs of *L. serrata*. Twenty-one out of 128 males (16.4%) and thirteen out of 82 females (15.8%) were found to be positive (table 1). All of the infected camels had nymphs in their mesenteric lymph nodes. Four camels (1.9%) also had nymphs in their mediastinal lymph nodes. The mean number of parasites in mesenteric and mediastinal lymph nodes was 13 and 2, respectively. The infection rate increased has significantly higher in camels between 5 and 10 years old ($p < 0.01$), but no significant difference was observed between males and females ($p > 0.05$).

Table 1. The prevalence of *L. serrata* nymphs in camels slaughtered at Kerman slaughterhouse

	Age (years)			Gender	
	<5	5-10	>10	Female	Male
No. of camels	92	79	41	82	128
No. (%) of infected	21 (16.4%)	23 (25.5%)	1 (2.4%)	13 (15.9%)	21 (16.4%)

Discussion

Linguatulosus poses veterinary and public health importance in the world including Iran. As intermediate hosts, one-humped or two-humped camels, like other ruminants, play an important role in the life cycle of *L. serrata*. Also as the camels are mostly kept freely in the pastures, they are very susceptible in persistence of infection and its dissemination (Tajik et al., 2007). The prevalence rate of *L. serrata* in dogs is 76.5% and 62.2% in Shiraz and Shahrekord, Iran, respectively (Meshgi and Asgarian, 2003; Oryan et al., 2008). Close contact between dogs and the intermediate host plays an important role in transmission of *L. serrata* in this area. Several studies have been conducted to determine the prevalence of linguatulosus in ruminants in Iran and other countries. The prevalence rate was 29.9% in goats in Shiraz, Iran (Razavi et al., 2004), 44% in cattle in Urmia slaughterhouse, Iran (Tajik et al., 2007), 49.1% in goats slaughtered in Kerman, Iran (Nourollahi Fard et al., 2010) and 19% in cattle of India (Ravindran et al., 2008).

In this study, 16.2% and 1.9% of the camels had *L. serrata* nymphs in mesenteric and mediastinal lymph nodes, respectively. Wahba et al. (1997) reported that *L. serrata* nymphs were found in the lymph nodes of 3 camels. In another study, 12.5% of camels in Shiraz were infected with nymphal stage of *L. serrata* (Oryan et al., 1993). The occurrence of *L. serrata* nymphs in the left lobe of lung of a two-humped male camel was previously reported in Tabriz, Iran (Haddadzadeh et al., 2009). In another study with slaughtered camels, Tajik et al. (2007) showed that mesenteric lymph nodes, the lungs and the liver were infected with *L. serrata* nymphs of 75%, 29.7% and 30.4% of animals, respectively. Shakerian et al. (2008) reported that mesenteric lymph nodes (21%) and liver (4.5%) were infected with the infective stage of these parasites in Najaf Abad, Iran. The prevalence of the infection in camels may be influenced by many factors such as the geographic and climatic changes which affect the survival of the parasite eggs. Apparently, high prevalence rate of infection in Kerman province may be due to of the suitable climatic parameters for the parasite that enhance the survival of its eggs in vegetables, fruits, and

water resources. The prevalence rate (16.2%) of infection in lymph nodes should be considered as a risk factor for human being infection.

In this study no significant difference ($p>0.05$) was observed between the infected female and male camels. The infection rate increased with the age of animals ($p<0.01$) that may be due to the re-infection of animals and lack of the protective immunity.

The prevalence rate of mediastinal lymph nodes was significantly ($p<0.01$) lower than that of mesenteric lymph nodes. It is explained with the development of *L. serrata* in the intermediate hosts.

The high prevalence of infection observed in ruminants is of concern owing to the zoonotic nature of the parasite and the risk of infection to humans and other animals. Because of the veterinary and medical importance of linguatulosus, we suggest that further investigations about the epidemiology of linguatulosus in both carnivores and herbivores be conducted in this area.

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