

PREVALENCE OF *Linguatula serrata* NYMPHS IN ONE-HUMPED CAMEL IN SOUTHEAST OF IRAN

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ABSTRACT

In this study, a total of 210 camels (128 male, 82 female) of different ages were examined from March 2009 to March 2010 for *L. Serrata*. 34 out of 210 (16.19%) camels were found positive for *L. Serrata*. The mesenteric lymph nodes in 34 camels out of 210 (16.19%) and the mediastinal lymph nodes of 4 camels out of 210 (1.90%) were infected by *L. serrata* nymphs. Although there was no significant difference in the infection rate between male and female ($P>0.05$), but the infection rate increased with age ($P<0.01$). Prevalence of *L. serrata* nymphs in males and females and different seasons was not significantly different ($P>0.05$).

Key words: Camel, Iran, kerman, *Linguatula serrata*

Linguatula serrata is a cosmopolitan parasite. The adult stage occurs in the nasal and respiratory passages of canids. The eggs are expelled from the respiratory passages of the final host and, when swallowed by a suitable herbivorous animal, larvae reach the mesenteric and mediastinal lymph nodes, liver and lung, in which development to the infective nymphal stage occurs. This parasite has also been reported in humans in Iran (Sadjadi *et al*, 1998) with clinical signs of nasopharyngeal symptoms including sneezing, coughing and nasal discharge following consumption of barbecued liver (Kabab). 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; Tajick *et al*, 2007; Shakerian *et al*, 2008; Haddadzadeh *et al*, 2009).

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 Kerman slaughterhouse, Kerman, Iran.

Materials and Methods

During March 2009 to March 2010, 210 camels, 128 male and 82 female in three age groups (<5, 5-10, >10 years old) were selected randomly at the Kerman slaughterhouse, Kerman province, southeast of Iran.

For this study, mesenteric and mediastinal lymph nodes were examined grossly for the presence of 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 hours to allow nymphs to come out from tissue. Recovered nymphs were flattened, dehydrated in ascending grades of ethyl alcohol and cleared in cresol before examining under a stereomicroscope. 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).

Statistical analysis

The computer software, SPSS Version 9.0 for Windows (SPSS Inc., Chicago, IL, USA) was used for analysis. Chi-square test was used to compare relative frequency of infection between different groups of lymph nodes.

Results

The prevalence of *L. serrata* nymphs recorded is summarised in table 1. Thirty-four out of 210 (16.19%) camels were infected with nymph stages of *L. Serrata*. Twenty-one out of 128 males (16.40%) and thirteen out of 82 females (15.85%) were found to be positive. Thirty-four out of 210 (16.19%) camels had nymphs in their mesenteric lymph nodes. Four

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out of 210 (1.90%) camels had nymphs in their mediastinal lymph nodes. The results showed a higher infection rate of mesenteric lymph nodes compared with that of mediastinal lymph nodes ($P < 0.01$). The infection rate increased with age ($P < 0.01$), but no significant difference was observed between males and females ($P > 0.05$). There was no significant difference in the infection rate of different seasons ($P > 0.05$) (Table 2).

The maximum and minimum numbers of parasites in mesenteric lymph nodes were 23 and 1, respectively, and for mediastinal lymph nodes 6 and 1, respectively.

Discussion

Linguatulosus has veterinary and public health importance in the world including Iran. As intermediate host, one-humped or two-humped camel, like the other ruminants, may play a vital role in the life cycle of *L. serrata*. The camels are mostly kept freely in the pastures, hence are very susceptible in persistence of infection and its dissemination (Tajik *et al*, 2007). Prevalence of 76.5% and 62.2% was reported in dogs in Shiraz and Shahrekord, Iran, respectively (Oryan *et al*, 2007; Meshgi and Asgarian, 2003). Close contact between dogs and the intermediate host plays an important role in transmission of *L. serrata* in this area. The prevalence rates of 29.9% in goats in Shiraz, Iran (Razavi *et al*, 2004), 44% in cattle in Urmia slaughterhouse, Iran (Tajik *et al*, 2006), 49.1% in goats slaughtered in Kerman, Iran (Nouroollahi Fard *et al*, 2010) and 19% in cattle of India (Ravindran *et al*, 2008) have been reported.

In this study, 16.19% of examined camels had

L. serrata nymphs in mesenteric lymph nodes and 1.9% of camels had nymphs in their mediastinal lymph nodes. Wahba *et al* (1997) diagnosed *L. serrata* nymphs in the lymph nodes of 3 camels. In another study, 12.5% of examined camels in Shiraz were infected with nymphal stage of *L. serrata* (Oryan *et al*, 1993). *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).

Tajik *et al* (2007) showed that mesenteric lymph nodes of 75% camels, 29.7% of lungs and 30.4% of livers of camels were infected with *L. serrata* nymphs. Shakerian *et al* (2008) reported that *L. serrata* nymphs were seen in 21% mesenteric lymph nodes and 4.5% livers of camels. The infection rates in these results different to those observed in the present study. This points to the geographic and climatic changes which affect the survival of the parasite eggs. Apparently, high prevalence rate of infection in this area due to climatic change 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 16.19% 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 human in some countries such as Iran (Sadjadi *et al*, 1998; Maleky, 2001).

Although, the prevalence of *L. serrata* in camels of Kerman is high, it seems that the camels have little role in epidemiology of linguatulosus in comparison with sheep and goats. In this study no significant difference was observed between females and males in the infection rate of *L. serrata* nymphs ($P >$

Table 1. The prevalence of *L. serrata* nymphs in camels slaughtered at Kerman slaughterhouse, in different sexes and age groups.

Age groups (years)	Male				Female				Total
	No. of camels	No. of infected camel (%)	No. of infected mesenteric LNs (%)	No. of infected mediastinal	No. of camels	No. of infected camel (%)	No. of infected mesenteric LNs (%)	No. of infected mediastinal LNs (%)	
<5	27	1(3.7)	1(3.7)	0 (0.0)	14	0(0.0)	0(0.0)	0(0.0)	41
5-10	54	7(12.96)	7(12.96)	1(1.85)	25	3(12.00)	3(12.00)	0(0.0)	79
>10	48	13(27.08)	13(27.08)	2(4.16)	43	10(23.25)	10(23.25)	1(2.32)	90
Total	128	21(16.40)	21(16.40)	3(2.34)	82	13(15.85)	13(15.85)	1(1.21)	210

Table 2. The prevalence of *Linguatula serrata* nymphs in camels slaughtered at Kerman slaughterhouse in different seasons.

Seasons	Spring	Summer	Autumn	Winter
No. of camels	51	32	69	58
No. of infected camel (%)	6 (11.76)	6 (18.75)	14(20.28)	8 (13.79)

0.05). Therefore, it seems that the sex of examined animals has no effect on infection by *L. serrata* but the infection rate increased with age ($P < 0.01$). The nymphs develop in about 5–6 months, according to the lower prevalence in the younger groups. The prevalence of *L. serrata* nymphs in different seasons was not significantly different ($P > 0.05$).

According to this study, 16.19% of mesenteric lymph nodes and 1.9% of the mediastinal lymph nodes had *L. serrata*. The prevalence rate of mediastinal lymph nodes was lower than that of mesenteric lymph nodes ($P < 0.01$). According to the life cycle of *L. serrata*, mesenteric lymph nodes, these are located in the way of portal circulation before the other organs, hence the infection rate of these are higher than other organs. Larval or nymphal infection is asymptomatic in herbivores. 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, cattle and camels. Ingestion of *L. serrata* nymphs can cause halzoun or marrara (maraca) syndrome that is often characterised 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 *et al*, 1976; Yagi *et al*, 1996). Sporadic incidence of halzoun in humans has also been reported in Iran (Maleky, 2001).

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.

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Angiotensin I-converting enzyme inhibitory peptides in skim milk fermented with *Lactobacillus helveticus* 130B4 from camel milk in Inner Mongolia, China.

Fermented camel milk is the main traditionally fermented dairy food for desert nomads. The beneficial effects of fermented camel milk, which include the prevention of such diseases and conditions as gastroenteritis, tuberculosis and hypertension, have been demonstrated experimentally.

Angiotensin I-converting enzyme (ACE) is a dipeptidyl carboxypeptidase associated with the regulation of blood pressure. ACE inhibition results in a lowering of blood pressure. Lactic acid bacteria are known to produce ACE inhibitors during fermentation. ACE inhibitory activity was observed in fermented milk containing *Lactobacillus helveticus* 130B4, a strain isolated from traditionally fermented camel milk. The peptide that inhibited ACE was purified from the fermented milk by reverse-phase high-performance liquid chromatography. The peptide that inhibited ACE was purified from the fermented milk by reverse-phase high-performance liquid chromatography. The fermented milk prepared with *Lactobacillus helveticus* 130B4 contained an ACE inhibitory peptide. This fermented milk was expected to have anti-hypertensive effect after ingestion because the peptide was stable to digestive protease and heat treatment *in vitro*.

(Source: Shuang quan, Harutoshi Tsuda and Taku Miyamoto (2008). **Journal of the Science of Food and Agriculture** 88(15) 2688-2692)
