

PREVALENCE OF *LINGUATULA SERRATA* IN DOMESTIC RUMINANTS IN SOUTH INDIA

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Abstract. *Linguatula serrata* Frohlich, 1789 is an aberrant endoparasite of occasional zoonotic importance in humans. We report the prevalence of encapsulated nymphal stages of *L. serrata* in domestic ruminants surveyed in Wayanad, located in Kerala State, South India. Large and small intestine mesentery were examined from 100 goats, cattle and buffaloes each revealing an infection prevalence of 21, 19, and 8%, respectively. The prevalence of *L. serrata* infection among ruminants is higher than previous reports from India and indicates a strong focus of infection in herbivorous domesticated mammals of South India. The potential importance of these findings to human health is discussed.

INTRODUCTION

Linguatula serrata Frohlich, 1789 commonly known as 'tongue worm' is an aberrant worm-like parasite of occasional zoonotic importance in humans. The Phylum Pentastomida consists of about 100 identified species of linguatulids, all of which are endoparasites of the respiratory tract and other organs/body cavities of tetrapod vertebrates, particularly reptiles. The evolutionary affinities of this unusual group of organisms have continued to confound biologists because of morphological similarities to both annelids and arthropods, and suggestive phylogenetic relationships to Crustacea in the subclass Branchiura (Raff, 1998). Because pentastomes appear to have a generally stronger affinity to arthropods some authors regard this group of organisms as a taxonomic class (Pentastomida) in the Phylum

Arthropoda (Beaver *et al*, 1984). Regardless of its true taxonomic position within the invertebrate realm, there is no mistaking this highly peculiar parasite when recovered from a parasitized host.

The adult parasites typically inhabit the respiratory passages and body passages of birds, reptiles and mammals, wherein females lay eggs that are discharged from the respiratory tract in sputum and mucus. Of mammalian hosts, carnivores commonly serve as definitive hosts for pentastomes that commonly inhabit nasal sinuses and nasopharynx (Khalil, 1970, 1973; Pandey *et al*, 1987; Meshgi and Asgarian, 2003). *Linguatula serrata* in canines (dogs) and humans can lead to nasopharyngeal linguatulosis (pentastomiasis) producing a condition called as *halzoun* or *marrara* syndrome (Khalil and Schacher, 1965). This parasite has also been implicated in visceral organ involvement causing hepatic granuloma in humans (Baird *et al*, 1988) and other organs (Prathap *et al*, 1969). A wide variety of domesticated and wild herbivores can act as intermediate hosts following ingestion of eggs via contaminated food and water. The eggs hatch and larvae emerge in the alimentary

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canal eventually migrating to various internal organs and tissues (eg, mesenteric lymph nodes) transforming into nymphs that become encapsulated (Soulsby, 1982). The occurrence of the parasites in domestic and wild animals used as a food source by humans including cattle, buffaloes, sheep, goats, pigs, has been well documented (Sachs *et al*, 1973; Young, 1975; Khalil, 1976; Saiyari *et al*, 1996; Tavassoli *et al*, 2007). Humans and other carnivores acquire the parasites by ingestion of raw or undercooked viscera of infected animals.

In India, though reports of linguatulosis in canines are few, its prevalence in intermediate ruminant hosts is well documented (Singh *et al*, 1973; Krishna *et al*, 1975; Sivakumar *et al*, 2005). Barring the single report of Muraleedharan and Zaki (1975), the incidence of *L. serrata* in herbivores in South India is practically unknown. We report the prevalence of *L. serrata* nymphs encapsulated in mesenteric tissues of domestic ruminants in Wayanad, Kerala State, in South India.

MATERIALS AND METHODS

Intestinal mesentery were examined following the evisceration and dressing of animals at a municipal slaughter house, located at Kalpetta in Wayanad District. Tissue of 100 malabari breed of goats (*Capra hircus*), cross-bred cattle (*Bos indicus* x *B. taurus*) and water buffaloes (*Bubalus bubalis*) each were inspected for encapsulated pentastome nymphs. Samples were collected from only female cattle and buffaloes while an equal number of male and female goats were examined. Samples were cut into small pieces (approximately 3x3 cm² in size) immersed in normal saline (0.9% NaCl) solution and left undisturbed for 5-6 hours to allow nymphs to emerge from tissue. Recovered nymphs were flattened, dehydrated in ascending grades of ethyl alcohol and cleared in creosote before

examining under low power objective of microscope. The parasites were identified based on Soulsby (1982).

RESULTS

The morphology of the parasites and the site from which they were obtained indicated that they were all nymphs of *L. serrata* (Fig 1). Recovered parasites were grey-white in color, each measuring 4 - 6 mm in length and approximately 1 mm wide (before fixation), annulate/linguiform (tongue-shaped) with obvious external pseudo-segmentation of the body. The anterior end of the body revealed 2 pairs of sickle-shaped binate hooks located on the side of the oral cavity for use in attachment (Fig 2). The outer chitinous cuticle revealed the presence of body rings with minute spines. The posterior end was slightly rounded. Of the 100 goats, cattle, and buffaloes examined the prevalence of visceral linguatulosis was 21, 19, and 8%, respectively. There was no significant difference seen in the infection percentage between sexes in goats.

DISCUSSION

Linguatula serrata is a cosmopolitan species and both larval and nymphal stages have been recorded from humans in Africa, Europe, and the Americas (Beaver *et al*, 1984). Although it has rarely been documented in human in India (Roy and Ganguly, 1940), the common practice of home slaughter of both domestic and wild herbivores may contribute to increased risk of infection wherever this parasite appears relatively common.

Prevalence studies of *L. serrata* in domesticated animals has found the infection global in distribution with a prevalence as high as 43% in Beirut (Khalil and Schacher, 1965), 25% in Egyptian dogs (Khalil, 1973), 8% from a Cairo abattoir (Khalil, 1970). Even higher prevalence rates of 52.5% in sheep in Iran



Fig 1–Nymphs of *Linguatula serrata*.



Fig 2–Nymph of *Linguatula serrata* with wide anterior portion, two pairs of hooks on either side of oral aperture x 100.

(Tavassoli *et al*, 2007) and 72% in certain areas of Britain (Sinclair, 1954) have also been recorded. Linguatulosis in domesticated food animals has not been reported in India for nearly 30 years (1975 - 2005). This is aston-

ishing considering that in India the occurrence of the parasite in domestic animals like cattle (Muraleedharan and Zaki, 1975), goats (Singh *et al*, 1973; Krishna *et al*, 1975) and buffaloes (Sivakumar *et al*, 2005) have been well documented. Moreover, no spatial/temporal comparative study on the prevalence of this parasite among different species of domestic herbivores has been reported.

Muraleedharan and Zaki (1975) found *L. serrata* in 5 out of 42 cattle (11.9%) examined at Bangalore, South India, and Sivakumar *et al* (2005) reported only 2 out of 100 buffaloes infected in Bareilly, North India. Results of our study indicate that the prevalence of *L. serrata* among ruminants is relatively high when compared to previous reports in India and shows a strong focus of infection in herbivores of South India.

Based on this study, it appears that goats and cattle pose a greater risk as intermediate hosts of *L. serrata* followed by buffaloes. The reason for the lower infection rate in water buffalos is not clear but may have to do with differing forage habitat and herbaceous foods compared to cattle and goats. It may reflect differing exposure or proximity to definitive hosts (especially dogs) and resultant parasite eggs shed into the environment. Larval or nymphal infection is typically asymptomatic in herbivores while serving as the most likely and important sources of infection for carnivores and humans. Humans typically acquire the infection by ingestion of infected raw liver or lymph nodes of sheep or goat. Most light infections are asymptomatic and more often become incidental findings upon autopsy or found upon radiographic evidence of calcified nymphal cysts. Ingestion of *L. serrata* nymphs can cause a condition called *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)

considered the syndrome a hypersensitivity reaction of the upper respiratory tract and buccopharyngeal mucosa. Copious nasal and lachrymal discharge, dyspnea and frontal headache are the most common symptoms occurring within minutes to several hours of taking the meal. Symptoms are associated with pain and itching of throat and ears, cough, hemoptysis and sometimes vomiting. Severe bronchial obstruction due to marked edema, abscess formation in the eustachian tubes and facial paralysis due to involvement of facial nerve are also frequent complications associated with the condition (Parija, 1990). Sporadic incidence of halzoun in humans has also been reported in India (Roy and Ganguly, 1940) and nearby 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. Control of halzoun in humans involves (1) awareness of the disease in the community, (2) changing of food habits, and (3) providing clean water for drinking and food preparation to prevent contamination from eggs. Adequate cooking of meat and viscera and drinking properly filtered water will prevent most human infection.

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