Introduction

Trichinellosis is a meat-borne parasitic zoonosis caused by the consumption of raw or undercooked meat harbouring nematode larvae belonging to the genus *Trichinella* (OIE, 2008). The disease is known to affect thousands of human beings each year with a mortality rate of about 0.2% (Pozio, 2007). In humans the symptoms of trichinellosis include fever, nausea, diarrhoea, muscle weakness, joint pain, facial oedema, peri-orbital oedema and death in severe cases. Genus *Trichinella* consists of 12 taxa, of which eight have been given the status of 'species'; while remaining four designated as genotypes (Gottstein et al., 2009). Trichinellosis has a wide host range including several species of mammals, reptiles and avian species. It occurs worldwide and *Trichinella* has been recovered from domestic cat, civet cat, rodents, domestic pigs and humans in India (Maplestone and Bhaduri, 1942, Kalapesi and Rao, 1954, Parmeter et al., 1967, Niphadkar, 1973, Niphadkar et al., 1979, Alipuria et al., 1996). Previous surveys in slaughtered pigs revealed prevalence of 0.4-0.6% in India (Niphadkar et al., 1979, Pethe, 1991). Nevertheless, information on ecology, host range, geographical distribution and prevalence of trichinellosis in domestic and wild animals requires to be further explored in Indian context. It is also interesting to note that several human case reports and one well defined trichinellosis outbreak has been reported in India (Alipuria et al., 1996, Sethi et al., 2010). Considering the public health significance of trichinellosis and its potential human transmission through consumption of raw/undercooked pork, the present survey was undertaken to elucidate the prevalence of trichinellosis in slaughtered pigs and wild animals.

Materials and Methods

Domestic pigs brought from different locations of Maharashtra (Dhule, Jalgaon, Parbhani and Nashik districts) and neighbouring Gujarat states and slaughtered at Deonar municipal abattoir, Mumbai were inspected for presence of *Trichinella* larvae. A total of 432 pig diaphragmatic tissues screened at slaughter, three carcasses were found to harbour *Trichinella* larvae (prevalence rate = 0.69%). Detailed literature survey revealed two reports of *Trichinella* infection in domestic pigs from India and it is for the third occasion, the pork samples revealed *Trichinella* leading to third report of trichinellosis in domestic pigs in India. However, none of the wild animal samples examined in the present survey revealed any *Trichinella* larvae.

Keywords: Abattoir, India, prevalence, swine, trichinellosis, wild animals
(n=3) from Bannerghatta Biological Park, Bengaluru, Karnataka with permission. The diaphragm samples were placed in insulated bags and brought under refrigeration to the laboratory for processing using OIE method (OIE, 2008).

Five gram diaphragm sample from each pig was minced with 10 ml of 0.55% HCl solution for 3 sec. To this partially minced meat, 0.5 g pepsin was added and the meat was chopped for an additional 3-5 sec till the digested sample assumed the consistency of pureed baby food. The minced meat was then transferred into a 250 ml capacity glass beaker containing magnetic stir bar. The mincing jar was rinsed with 20 ml of 0.55% HCl solution to remove meat particles adhering to the inner surface and lid, which was then transferred to glass beaker. The remaining 120 ml of 0.55% HCl solution was then added to the beaker to make the proportion of meat to digestive solution as 1:30. The beaker was covered with an aluminium foil and kept on a magnetic stirrer cum hot plate at 45°C with continuous stirring for 30 min. The period of digestion was extended to another 5-10 min if the digestion of sample was found insufficient which was evident by presence of undigested chunks of muscle.

Within 5 min after digestion, contents of the beaker were filtered through a sieve in to a 250 ml capacity separatory funnel. The mixture was allowed to settle for 30 min and at the end 40 ml of the sediment was collected into a 100 ml beaker. The beaker was left undisturbed for 10 min to allow proper settling of the sediment at the bottom. Thirty milliliter of the supernatant was siphoned out leaving the 10 ml sediment to the bottom. The 10 ml sediment was then transferred to a glass petri dish and observed under stereomicroscope for the presence of *Trichinella* muscle stage larvae (OIE, 2008).

**Results and Discussion**

**Prevalence of trichinellosis in domestic pigs**

Of the total 432 porcine diaphragm samples examined, 3 pig carcasses (1 male and 2 female) were found to harbour larvae of *Trichinella* indicating the prevalence of 0.69%. The average larval load was found to be 9.8 (male), 4.4 (female) and 4.0 (female) larvae per gram (LPG) in positive samples. Upon retrospective enquiry, the origin of infected pigs was found to be Chalisgaon Tehsil of Jalgaon district (Maharashtra state) and the pigs were found to be grown under scavenging system. As far as we are aware, this is the third and most recent report of trichinellosis in domestic pigs in India almost after two decades since the last report (Pethe, 1991). The previous two reports of trichinellosis in domestic pigs were also from the same abattoir i.e. Deonar abattoir, Mumbai (Niphadkar et al., 1979, Pethe, 1991).

The morphological and morphometric characterization revealed typical morphology of larvae of *Trichinella* *i.e.* comma, curve and tightly coiled shape; length of each larva ranged from 0.92 to 0.97 mm, while width between 20 and 22 µm (Fig. 1 and 2). These observations were in corroboration with Niphadkar et al. (1979) and Pethe (1991).

Trichinellosis is an established parasitic zoonosis known since ancient times. Several species of wild and domestic animals are susceptible to *Trichinella*. However,
pigs act as major source of infection to humans. Detection of *Trichinella* larvae in domestic pigs in the present survey has once again affirmed the existence of domestic life cycle in India. However, epidemiology of trichinellosis with special reference to its transmission cycles in nature requires to be established. *Trichinellae* could circulate through domestic, syn-anthropic and sylvatic transmission cycles; and its detection in scavenging pigs could suggest possible involvement of rodents in the transmission cycle (through garbage and dead rodents). Further studies are warranted to establish epidemiology of transmission in nature.

Further, 0.69% prevalence of trichinellosis in domestic pigs is mere reflection of a tip of an iceberg owing to lack of intense survey, small sample size used for screening, absence of clinical manifestations in affected animals and lack of gross lesions in carcasses observed at post-mortem inspection. Although studies carried out elsewhere in the world revealed less than 1% prevalence in domestic pigs (Kimsey and Adams, 1955, Zimmermann et al., 1956, Zimmermann and Zinter, 1971, Hugh-Jones et al., 1985, Schad et al., 1985, Gamble et al., 1999), yet keeping Indian subcontinent in view elaborate studies comprising large sample size from different parts of the country are required so as to establish the prevalence status at national level.

Though, several species of wild animals are incriminated as reservoirs as well as source of human infection with *Trichinella*, none of the diaphragmatic tissue sample from 6 wild animals (three each from tiger and bear) investigated in the present study showed presence of *Trichinella* larvae. However, *Trichinella* has been detected in wild animals viz., civet cat, hedgehogs and large felids in India (Kalapesi and Rao, 1954; Prakash and Sharma, 1955; Singh, 2000). It is an interesting and alarming note that the source of first human trichinellosis outbreak that took place in Uttarakhand, India was from wild boar meat (Sethi et al., 2010). Although, wild animals are not the major source of human trichinellosis in India; their involvement in perpetuation of life cycle in nature should not be overlooked. The recent human trichinellosis outbreak in Uttarakhand is an example to realize the role of wild animals in spread of zoonoses in general and trichinellosis in particular.

Zoontic trichinellosis remain largely un-recognized in India. The paucity of information on epidemiology with respect to reservoirs, lack of strict meat inspection practices, inadequate cooking of meat and finally lack of awareness in physicians are few among the several factors contributing to the incidence of trichinellosis. Keeping in view, the economic, zoontic and food safety aspects of trichinellosis, good farm practices, strict post-mortem inspection of pork and game meat, avoidance of consumption of raw or semi-cooked pork, thorough cooking of meat, effective freezing of pork (-15°C for not less than 3 weeks) and public awareness programs are recommended.

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**References**


Prakash, I. and Sharma, S.C. 1955. Nematodes and hedgehog...


