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Brief Communication

Trichinella britovi in Domestic Pig – a Case Report

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Trichinellosis is a widespread parasitic disease caused by different genotypes of *Trichinella.* It is common in animals and can spread from its reservoir in wild animals to synanthropic animals, domestic animals and people. Different transmission patterns have been documented (*Campbell* 1988). They range from those in which humans do not play any role to those in which improper human behaviour is the only cause of transmission (*Pozio* 1998, *Casulli et al.* 2001). The infection pressure of the parasite biomass present in sylvatic animals and human malpractice in animal husbandry together can easily favour the transmission of *Trichinella* from the wild to the domestic habitat (*Pozio* 2001). The growing importance of sylvatic species in the persistence and re-emergence of trichinellosis in many regions was emphasized at the 10th International Conference on Trichinellosis (*Dupouy-Camet et al.* 2001). Few cases of finding of *Trichinella britovi* in domestic pigs are known (*Serrano et al.* 1998).

This study deals with a case of pig trichinellosis in Estonia due to *Trichinella britovi* and makes an attempt to elucidate the transmission patterns in the actual case.

At the end of 1994 routine meat inspection diagnosed trichinellosis in 3 hogs of 8-15 months of age from the Lõpe co-operative on the island of Hiiumaa. At the beginning of 1995 trichinellosis was diagnosed in one sow of the age of one year and 8 months on the same farm.

Muscle samples from 2 of these 4 pigs (pig 1-9-month-old sow and pig 2-20-month-old sow) were submitted for thorough investigation at the department of parasitology of the Estonian Agricultural University. The other 2 positive pigs had been burned already. Samples (á 10 grams, except for 5 grams from tip of the tongue) were taken from 11 different muscles (see Table 1) and first investigated by the compressor method. Larvae were collected and counted after artificial digestion of muscle samples (*Miller* 1977). Muscle samples (diaphragm, masseter muscle, temporal muscle and eye muscles) of a cat from the same farm were taken and investigated as well.

ReNa fur-animal farm is situated only about one kilometre from the Lõpe co-operative. 20 blue foxes *(Alopex lagopus)* aged 1-4 years and one mink *(Mustela lutreola)* were investigated with regard to *Trichinella.* Additionally 18 brown rats *(Rattus norvegicus)* caught in the feed preparation unit and adjacent rooms of the same farm were investigated for *Trichinella.* Samples (á 5 grams) were taken from diaphragm, thigh muscles, masseter muscle and temporal muscle. The above-mentioned artificial digestion method was used in case of all investigations.

Because *Trichinella* infection of some farm fur-animals was demonstrated, an investigation of

Table 1. *Trichinella* in different muscles of a 9-month-old (pig 1) and 20-month-old (pig 2) sows, found by artificial digestion method

Muscles	Larvae per gram	
	Pig 1	Pig 2
Masseter muscle *(m. masseter)*	4,0	1,4
Temporal muscle *(m. temporalis)*	–	–
Diaphragm *(diaphragma)*	1,6	2,0
Tip of tongue *(apex linguae)*	1,0	–
Body of tongue *(corpus linguae)*	12,0	2,0
Root of tongue *(radix linguae)*	1,0	–
Gastrocnemius muscle *(m. gastrocnemius)*	–	–
Radial carpal extensor muscle *(m. extensor carpi radialis)*	–	–
Semimembranosus muscle *(m. semimembranosus)*	0,8	0,8
Deep pectoral muscle *(m. pectoralis profundus)*	–	1,2
Brachiocephalic muscle *(m. brachiocephalicus)*	–	–

feed-briquettes was carried out to possibly identify the source of infection. The uncertified briquettes (1,5×1,0 m), imported from Sweden consisted of raw pork leavings (trotters, ears, tongue and cuttings of tissues of little value) and were used as feed for fur-animals. Samples were taken from 190 different places of the 15 briquettes.

Muscle samples from some of the *Trichinella* positive animals: the 9-month-old sow, cat, blue foxes and rats were sent to the Trichinella Reference Centre (TRC, in Rome) by air. The vacuum-packed samples were covered with streptocide and fungicide, but not refrigerated. For identification of *Trichinella* genotypes the random amplified polymorphic DNA analysis (RAPD) was used following the protocol proposed by *Bandi et al.* (1995).

The intensity of *Trichinella* larvae in 11 different muscle groups of each of the 2 pigs is presented in Table 1. *Trichinella* larvae in the muscles of pig 1 were encapsulated, and a capsule in the semimembranosus muscle was observed to be in the early stage of calcification. In muscles of pig 2 all capsules were calcified.

In comparison with pigs, cat muscles were heavily infected with *Trichinella* larvae. There were 95 larvae per gram (LPG) in eye muscles, 90 LPG in masseter muscle, 85 LPG in temporal muscle and 80 LPG in diaphragm.

The prevalence of *Trichinella* infection in blue foxes was 55% (11 of the 20 foxes were infected). From 2 to 19 *Trichinella* LPG were found. The average number of LPG in thigh muscles was 8.3, in masseter muscle 6.0, in temporal muscle 4.0 and in diaphragm 3.6. The mink was not infected.

Two brown rats out of 18 were infected with *Trichinella,* with an average intensity of 50.0 LPG in one and 90.0 LPG in the other rat. Both infected rats were old. Larvae were not found from the muscles of 11 young rats and 5 adults. No *Trichinella* larvae were found in the pork leavings briquettes.

Larvae (12 LPG) from pig 1 were identified as *T. britovi* (TRC code ISS 333), whereas those from the blue foxes and the rats were found to be *T. spiralis* (TRC codes ISS 356-ISS 358 and ISS 359 respectively).

Unfortunately muscle samples from the domestic cat were in a poor condition upon arrival at the Trichinella Reference Centre and no electrophoretically reproducible pattern was observed after RAPD amplification of DNA from the larvae. No data are available on *Trichinella* species previously found in cats.

The results of the present study indicate that in domestic pigs the muscles most heavily infected with *Trichinella* larvae were the tongue

muscle, especially the body of tongue, masseter muscle and diaphragm. Parasite distribution within a host appears to be independent of the genotype of *Trichinella* and predilection sites are primarily determined by host species and secondarily by the age and level of infection (*Kapel* 2000). Thus, in about half of the medium to light infections (0.005-59 LPG) the root of the tongue showed higher larval densities than the crus muscle of the diaphragm (*Serrano et al.* 1999). The calcification of all *Trichinella* capsules in pig 2 indicates that the infection was acquired long before slaughter. In Estonia, this was the first case of finding *T. britovi* in domestic pig and the second case of trichinellosis in domestic pig. The first case of trichinellosis was diagnosed in one hog from Haldreka co-operative, about 30 km from the Lõpe co-operative in Hiiumaa in 1994, but the species of *Trichinella* was not determined. The third case occurred in 1999, when a domestic pig from a private farm on the mainland (Järvamaa County) was infected with *T. spiralis.*

ReNa fur-animal farm is situated only about one kilometre from the Lõpe co-operative. The prevalence of *Trichinella* infection found in blue foxes was high, but the intensity of infection was low. Only 11% of rats were infected, but they had a relatively high infection rate (up to 90 LPG). The infection agent both in blue foxes and rats was identified as *T. spiralis.* During the flaying period at the ReNa farm, pigs in the Lõpe co-operative were fed with boiled fox carcasses. Because *T. spiralis* was registered in blue foxes and rats on Hiiumaa and *T. britovi* was surprisingly found in domestic pig, it seems that in this case the skinned carcasses of blue foxes from the nearby farm were not likely the source of infection for pigs.

We have found *T. britovi* in 2 raccoon dogs *(Nyctereutes procyonoides)* and one red fox *(Vulpes vulpes)* on the island of Hiiumaa (*Pozio et al.* 1998). This sylvatic species of *Trichinella* is considered poorly infective for swine (*Kapel & Gamble* 2000, *Murrell & Brushi* 1994). Hunters frequently offer carcasses of red foxes and other game animals for pig feed but such feed is usually cooked. However, unboiled (undercooked) carcasses used as pig feed might have caused the *T. britovi* infection of swine in Lõpe co-operative.

So far we have identified *T. spiralis* and *T. britovi* on the island of Hiiumaa. The distance between this island and the mainland is about 20 kilometres. Nonetheless, during wintertime the sea between the mainland and the island is frozen and does not represent a barrier for terrestrial mammals. Furthermore, it is easy for carnivorous and omnivorous hosts to "visit" Hiiumaa from the island of Saaremaa, as the shortest distance between the islands is only 6 kilometres. High infection prevalence of *Trichinella* is registered in wolves, lynxes, raccoon dogs and red foxes in Estonia (*Järvis et al.* 2000).

In big slaughterhouses all pigs are investigated for *Trichinella* using artificial digestion method. In 2000 all 193462 pigs slaughtered were *Trichinella* negative. At the same time in small abattoirs the less sensitive compressor method is still allowed. Thus it is possible that light infection is not noticed and *Trichinella* may spread.

Since all genotypes of *Trichinella* pose a threat to human beings, every case of trichinellosis in pigs should be thoroughly investigated. Nevertheless, to the best of our knowledge the main source of *Trichinella* infection for humans in Estonia is game meat, which has not been controlled for *Trichinella.*

In the present case the source of pig infection with *T. britovi* was not identified, despite the investigation of some of the possible routes of transmission via rats and fur-animals from a nearby farm. These were found to carry only *T. spiralis* infection.

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