

POSTER PRESENTATION

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Emerging alveolar echinococcosis (AE) in humans and high prevalence of *Echinococcus multilocularis* in foxes and raccoon dogs in Lithuania

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Summary

The presence of the most important definitive and intermediate hosts suggests that conditions for the live cycle of *E. multilocularis* are favorable in Lithuania. While the main rodent hosts have not been investigated systematically in Lithuania, *E. multilocularis* has already been identified in one of 5 muskrats (*Ondatra zibethicus*) captured in the Šilutė district. The high prevalence of *E. multilocularis* in red foxes and raccoon dogs as well as a notable increase of AE in humans document that *E. multilocularis* is of emerging concern in Lithuania. The human AE cases were recorded from many parts of the country suggesting that the whole territory of Lithuania should be considered as an endemic area for *E. multilocularis*. Considering the long prepatent period of AE in humans we suggest that this zoonosis is present in the area investigated for at least a few decades.

Introduction

Echinococcus multilocularis is a small tapeworm exploiting mainly wild animals with the red fox (*Vulpes vulpes*) being the crucial definitive host in Europe [1]. Dogs and raccoon dogs are also highly susceptible definitive hosts of *E. multilocularis*, while reproduction of this parasite is significantly lower in cats as shown by experimental infections [2]. Humans may get infected by uptake of eggs, and the tumor-like growth of the metacestode stage mainly in the liver may lead to a serious disease – alveolar echinococcosis (AE).

Although a rare disease, the numbers of AE cases have increased in endemic areas in Central Europe [3]. AE is of considerable public health importance because of its high lethality if untreated and high treatment costs [4].

The known central-European endemic area of *E. multilocularis* has expanded during the 1990s especially to the North and East [5], and the parasite was recently reported in the Baltic and neighboring regions i.e. Poland [6], Belarus [7] and Estonia [8]. The presence of the most important definitive and intermediate hosts [9] suggests that conditions for the live cycle of *E. multilocularis* are therefore favorable in Lithuania. While these main rodent hosts have not been investigated systematically in Lithuania, *E. multilocularis* has already been identified in one of 5 muskrats (*Ondatra zibethicus*) captured in the Šilutė district [10]. The high prevalence of *E. multilocularis* in red foxes and raccoon dogs as well as a notable increase of AE in humans was also recently documented [11,12].

Human infection

In the early eighties, sporadic cases of cystic echinococcosis caused by the larval stage of *E. granulosus* were diagnosed in humans in Lithuania. However, during the last decades, the diagnostic techniques have improved and the incidence of human AE has risen to considerable levels, with an increasing concern among the human population and the health authorities.

From 1997 to July 2008, 96 AE cases have been diagnosed at the State Hospital for Tuberculosis and Infectious Diseases in cooperation with the Santariškių Clinic (Vilnius University). Eighty-one percent of AE patients were farmers or persons involved in agricultural activities.

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Most of the patients (59%) owned dogs. The AE cases were recorded from many parts of the country suggesting that the whole territory of Lithuania should be considered as an endemic area [11,12].

Animal infection

The helminth fauna of carnivores from Lithuania was investigated in earlier studies, but no record was made on *E. multilocularis* [13,14]. The methods used in these studies are not well documented but the reported findings of *E. granulosus* as well as other small helminths in dogs and wolves indicate that *E. multilocularis* would most probably have been detected in the 122 foxes investigated, at least if highly prevalent at that time.

In neighboring Poland, *E. multilocularis* in red foxes was recorded for the first time in the Gdansk region in 1995 [6] which is close to the Lithuanian border. Interestingly, the parasite's prevalence in red foxes (35%) in the southern part of Lithuania [11] is comparable to the one (34.5%) reported from Poland [15]. However, based on these limited data, it remains unclear whether the East Baltic region is a newly established endemic area of an extending distribution to the eastern part of Europe, or just a hitherto unnoticed one.

In Lithuania, *E. multilocularis* was detected in 158 (58.7%, 95% CI 50.2%–64.1%) of 269 red foxes examined. It was present in foxes from most tested localities with the highest prevalence of 62.3% (CI 49.0–74.4%) being observed in the Kaunas district. Mean worm burden was 1309 (1–20,924) worms per fox in this district [11]. It was found that 17% of the infected adult red foxes were harboring heavy infections (>1000 worms per animal) while none of the juvenile foxes were heavily infected. This finding differs from other studies suggesting that juvenile foxes play a more important role in the life cycle of *E. multilocularis* [16,17]. However, our result may be biased by the low number of juvenile foxes investigated. The high prevalence (58.7%) of *E. multilocularis* in red foxes in the examined areas suggests that these animals may play the most important role in the zoonotic transmission of this tapeworm in Lithuania.

The raccoon dog is a highly susceptible definitive host for *E. multilocularis* [2] and there are reports on infected animals from Germany [18], Poland [19] and Lithuania [11]. However, the prevalence of *E. multilocularis* in raccoon dogs is relatively low in these countries when compared to those of the red foxes (2.7%, 8% and 10%, respectively). Further, the significance of the raccoon dogs regarding the transmission of *E. multilocularis* to the intermediate host population is poorly understood.

In addition to the morphological detection of *E. multilocularis* in one of 5 muskrats (*Ondatra zibethicus*)

captured in the Šilutė district of Lithuania [10], infertile and calcified metacestodes of *E. multilocularis* were identified by PCR in 0.4% (3/685) of pigs, and 2 of 240 examined dogs (0.8%) from the same area excreted *E. multilocularis* eggs [20] as characterised by multiplex PCR using primers specific for *E. granulosus*, *E. multilocularis* and *Taenia* spp. according to Trachsel et al. [21].

Conclusions

The identification of AE in pigs and of *E. multilocularis* in dogs demonstrates that transmission of *E. multilocularis* is occurring in the rural environment in close vicinity to the human population. Red foxes may be considered as the most important species for transmission of *E. multilocularis* to humans while the respective epidemiological importance of rural dogs and raccoon dogs is still unknown and deserves further studies.

The high number of human AE cases and the high prevalence of *E. multilocularis* in definitive wild hosts as well as its presence in pigs and dogs document that *E. multilocularis* is of emerging concern in Lithuania. Considering the long prepatent period of AE in humans we suggest that this zoonosis is present in the area investigated for at least a few decades.

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