Surveillance of alveolar echinococcosis and control of Echinococcus multilocularis in Switzerland

Summary / Zusammenfassung
Fox population densities strongly increased in Switzerland in the 1990ies, possibly due to the successful rabies vaccination campaigns which eliminated a main cause of mortality of foxes, and foxes started to colonize urban habitats. The IPZ is involved in parasitological and epidemiological investigations of this phenomenon in the framework of an interdisciplinary project (Integrated Fox Project IFP). It was shown that E. multilocularis is present in urban habitats, and especially in urban peripheries an extraordinarily high environmental contamination with parasite eggs was recorded (Stieger et al. 2002, Fischer et al. 2005, Reperant et al. 2007). In these areas, high urban fox densities overlap with the habitat of the most susceptible intermediate hosts Arvicola terrestris and Microtus arvalis that live on meadows and pastures (Deplazes et al. 2004, Hegglin et al. 2007). It could be demonstrated that E. multilocularis profits from high fox densities sustained in urban settings by a high supply of anthropogenic food (Contesse et al. 2004) and that in the transition zone from urban to rural habitats extraordinary high prevalences can be detected in both the fox populations (Hegglin et al. 2007) and the intermediate hosts (Stieger et al. 2002, Burlet et al. 2011). Thus the force of infection is highest in the urban periphery (Lewis et al. 2014).

E. multilocularis is a widespread and common parasite in red fox populations north of the Alps and the adjacent lowlands. South of the Alps, the parasite has been recorded only occasionally. Climatic conditions that adversely affect the survival of E. multilocularis eggs and the lack of suitable intermediate hosts are thought to be the primary causes limiting the parasite distribution. In the Canton Grisons, local prevalences in foxes varied significantly between 0 and 40% and correlated with the predation rate on voles by foxes. Our results suggest that the life cycle of E. multilocularis in the Alps is confined to mainly small scale hot spots which may persist for decades. This could explain why some human cases of alveolar echinococcosis were recorded in endemic areas whereas no such cases were registered in areas free of E. multilocularis (Tanner et al., 2006). The existence of such stable foci has been confirmed by an ongoing study in the Canton Ticino of southern Switzerland, where the parasite has been regularly confirmed in the North of the Canton and did not spread further south during more the 20 years. The endemic area corresponded with the distribution of the vole Microtus arvalis but not with the distributions of five other vole species, giving evidence that this vole species plays a key role in the maintenance of the parasite life cycle in this region.

The actual epidemiological situation gave reason for a retrospective study on the incidence of human alveolar echinococcosis (AE) in Switzerland. As hypothesised, the incidence has increased and was 2.6 times higher between 2001 and 2005 than in the 1990ies. This increase correlates with the general increase and the urbanisation of the Swiss fox populations (Schweiger et al., 2007). On the other hand, survival analysis revealed a strongly improved prognosis for AE patients over the last 30 years. Mean life expectancy of patients was reduced by 18.2 and 21.3 years for men and women, respectively, in 1970ies whereas these values were 3.5 and 2.6 years in 2005 (Torgerson et al., 2008). The better survival and the higher incidence caused a steady increase of the prevalence. The actual annual burden of disease in Switzerland is approximately 77.6 DALY’s and yearly costs amount to approximately €108,762 per patient or a total of € 2.0 million (Torgerson et al., 2008).

In experimental field studies, the feasibility of E. multilocularis control were tested in urban peripheries. The monthly delivery of Praziquantel-containing baits in six areas of 1 km2 and one 2 km2 area for two years successfully reduced the contamination of defined small urban patches
with a high E. multilocularis egg contamination to a very low level (Hegglin et al. 2003). A follow-up study revealed also a significant effect when anthelmintic baits were delivered in 3-months intervals only. However, the effect was much less pronounced. Furthermore it was demonstrated that 2 years after finishing a baiting campaign, the infection pressure had returned to the same level as before baiting started (Hegglin and Deplazes, 2008).

Eradication of the parasite is unlikely and long-term baiting campaigns are actually the most effective tool to significantly lower the infection pressure with parasite eggs. As it has been shown that intermediate hosts get more frequently infected during winter season, it can be assumed that reducing the infection pressure on intermediate host by the delivery of anthelmintic baits for foxes is more effective during this season than during the rest of the year (Burlet et al. 2011). Regarding the long latency of 5-15 years of alveolar echinococcosis, such measures can only be cost effective if they are pursued for several decades and concentrate on restricted areas which are most relevant for the transmission of alveolar echinococcosis such as highly endemic areas in densely populated zones (Hegglin and Deplazes, 2013).

Considering the high reproduction of E. multilocularis in domestic dogs which live in close contact to humans, a monthly deworming scheme for domestic dogs with access to rodents is likely to be of high importance. This holds true if only low prevalences in domestic dogs are recorded, as high densities of these pets can easily outweigh low infections rates. Thus, in central Europe their estimated contribution to environmental contamination with E. multilocularis eggs ranges between 4% and 19% (Hegglin & Deplazes 2013).

For the planning of locally adapted information campaigns, a survey of public knowledge about the risk and the prevention of alveolar echinococcosis was carried out in the Czech Republic, France, Germany and Switzerland (Hegglin et al. 2008). Fewer people had heard of E. multilocularis in the Czech Republic (14%) and France (18%) compared to Germany (63%) and Switzerland (70%). In France, only 17% of the interviewees who knew the parasite felt reasonably informed in contrast to other countries where the corresponding percentages ranged from 54 to 60%. Promising measures such as deworming dogs were frequently not recognized as prevention options. These results and the actual epidemiological circumstances of AE call for proactive information programs.

Current investigations focus on the transmission potential of common European rodents. In the framework of a European Research program, we investigate the occurrence, frequency and development stages of E. multilocularis in natural occurring rodent populations of different regions.

Publications / Publikationen


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