Echinococcus multilocularis management by fox culling: An inappropriate paradigm

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With the ongoing spread of Echinococcus multilocularis in Europe, sanitary authorities are looking for the most efficient ways of reducing the risk for human populations. Fox culling is one particular tool that has recently shifted from predation control to population health management

During four years, a culling protocol by night shooting from cars was implemented around the city of Nancy

not only did night shooting of foxes fail to decrease the fox population, but it resulted in an increase in E. multilocularis prevalence from 40% to 55% while remaining stable in an adjacent control area

Though no significant change in age structure could be described, an increase in immigration and local recruitment is the best hypothesis for population resilience. The increase in prevalence is therefore considered to be linked to a higher rate of juvenile movement within the culled area shedding highly contaminated faeces. We therefore advocate managers to consider alternative methods such as anthelmintic baiting, which has been proven to be efficient elsewhere, to fight against alveolar echinococcosis.

Also beyond doubt is the obvious link between fox population densities, i.e. Echinococcus multilocularis’ main definitive host in Europe, and the environmental contamination and direct or indirect human exposure to the parasite (Deplazes et al., 2004; Schweiger et al., 2007; Liccioli et al., 2015)

Initially developed for the treatment of E. granulosus in dogs, praziquantel-based anthelmintic compounds showed very high efficiency in killing the adult worms of E. multilocularis in fox intestines.

no effective eradication of E. multilocularis has been described, and infection of the fox populations often recovered to pre-treatment levels within months after the end of bait distributions (Romig et al., 2007).

Raoul et al. (2003) showed that a sudden and strong fox population decrease due to indirect poisoning (as a side effect of small mammal control by anticoagulant rodenticide) led to a drastic decrease of E. multilocularis contamination in fox faeces. However, fox culling (gas, poison, trapping and shooting) had adverse effects on rabies epidemics in the 1990s, with culls either ineffective and unsustainable on a large scale (Morters et al., 2013).

In 2006, the presence of infected foxes within the city of Nancy was detected by Robardet et al. (2008), triggering concern amongst local authorities about possible human exposure. Fox culling having been suggested as a control tool, we implemented the culling program alongside a monitoring protocol to provide evidence-based information on the effectiveness of this method.

Despite the involvement of the hunting and trapping communities and all the legal tools available to reduce fox populations in France, no significant decrease of relative abundance of foxes could be detected in the study area after four years.

strong variations in E. multilocularis prevalence were detected in the culled population resulting in a higher prevalence in the last year, an epidemiological response absent from the adjacent control area.

Predator control in general and red fox management in particular are strongly debated topics (see for example the discussion between Baker et al. (2002),Leader-Williams et al. (2002) andAebischer et al. (2003) concerning a hunting ban on foxes in the United Kingdom)

This apparent stability of fox abundance is probably the result of a rapid compensatory response. Foxes in Europe have indeed a strong spatial structure with one active pair defending its territory (Macdonald and Bacon, 1982; Poulle et al., 1994), eventually supported by subordinate non breeding females (Baker et al., 1998). If an alpha female is killed, a resident subordinate non-breeding female would rapidly replace her or move from an adjacent social group (Iossa et al., 2009), sustaining the local recruitment. The increase of mating success described in the culled area supports this compensatory reproduction. This could in turn explain the decrease in the average of placental scars in the same population as female foxes produce smaller litters in their first mating season (Ruette and Albaret, 2010).