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Review

Echinococcosis/hydatidosis: A severe threat in Mediterranean countries

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ABSTRACT

Echinococcosis/hydatidosis is one of the most important parasitic zoonotic diseases in the world. Both cystic hydatidosis (CE) caused by *Echinococcus granulosus* and alveolar echinococcosis (AE) caused by *E. multilocularis* have been reported in several countries of the Mediterranean region (MR). *E. granulosus* has always been present in the MR and is the most common species. This parasite depends on the dog–sheep cycle and is actively transmitted in all pastoral regions where sheep, cattle and camelids predominate. *E. multilocularis* occurs only sporadically in limited areas of France, Serbia and Montenegro, Turkey, Tunisia and Morocco. However recent evidence indicates that it is spreading into other regions of the Mediterranean. Due to the lack of well-documented data, and to the fact that CE is not a notifiable disease in the majority of M countries, the precise incidence and prevalence of CE in humans and animals are not known. Published data suggests that prevalence is rather high in North Africa, Turkey, Greece, and in several regions of Italy and Spain. CE is an increasing public health and socio-economic concern due to the considerable morbidity rates that give rise to high economic losses both in the public health sector and in the livestock industry. Hospitalisation for human CE lasts from 2 weeks to more than 1 month in case of surgery. A number of factors contribute to the increase of prevalence and to the spreading of CE in the MR. These include the diversity of livestock production systems (predominantly extensive, traditional animal husbandry), small, ill-equipped and unsupervised slaughter-houses, illegal and family slaughtering, low public awareness of hydatid diseases, and the high population of stray dogs. Cyprus is the only country where an eradication programme has been successfully implemented. There have been, however, important developments in the last decade in CE epidemiology, in the diagnosis of canine infection, in strain characterisation and in immune strategies against CE in animals. This scientific progress, together with effective health education programmes, will likely improve control programmes and reduce the time required to achieve significant decreases in prevalence or eradication.

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Contents

1. Introduction

Human populations of the Mediterranean region (MR) have always depended on animals as sources of food, transport, labour and companionship. Livestock continue to make an important contribution to most economies because they produce food, provide security, enhance crop production, generate cash income for rural and urban populations, and produce value-added goods which can have multiplier effects and create a need for services. However, numerous species of animals are also sources of viral, bacterial and parasitic diseases transmitted by direct contact or by contaminated food and water. Indeed, the Mediterranean basin is one of the regions where zoonoses are most numerous and widespread (over 200 different zoonoses have been reported from this area). Sheep and goats are traditionally raised for meat and milk production and are the main livestock resource in many countries of the MR. Milk is transformed into typical cheeses and other products which continue to be more greatly appreciated than dairy products derived from cow's milk (Boyazoglu and Hatziminaoglou, 2002).

Cystic echinococcosis (CE) is one of the most important zoonotic diseases in the world and is currently among the five most frequently diagnosed zoonoses in the Mediterranean (along with brucellosis, rabies, leishmaniasis and food-borne zoonotic infections) (Sadjjadi, 2006). CE has been present for centuries in the MCs. Hippocrates mentioned it in Greece in the 4th century B.C. The Italian Rudolphi formally described the genus *Echinococcus* in 1801, and, a century later in France, Devé described the structure of the cyst and the risk of secondary echinococcosis (Houin, 1998). It was only in the middle of the 19th century that alveolar echinococcosis was identified as a disease entity. It took about 100 years until it was undoubtedly clarified and accepted that CE and AE are not caused by a single *Echinococcus* species, but by *E. granulosus* and *E. multilocularis*, respectively.

A number of studies have shown that hydatidosis is an increasing public health and socio-economic concern. It is currently considered an emerging or re-emerging disease and the geographic distribution and extent are greater than previously believed (Thompson and McManus, 2002; Torgerson et al., 2003; Moro and Schantz, 2009).

CE is theoretically an eradicable disease, but numerous factors are involved in the maintenance of the cycle in the MC, including behavioural and cultural factors that are often difficult to regulate or modify.

In this review, the present epidemiological situation of *Echinococcus* sp. infection in dogs and other definitive and intermediate hosts is reviewed, together with its public health and socio-economic impact and the main factors associated with persistence of this disease in the MR.

2. Epidemiology

On a global basis, *E. granulosus* is the most common and widespread species, with endemic foci present on every