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Research Note

On the longevity of *Schistosoma curassoni*

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Abstract

It is demonstrated that *Schistosoma curassoni*, a parasite of sheep, cattle and goats in parts of West Africa, will live for at least 8 years 5 months in a sheep. The sheep was exposed to 500 cercariae of *S. curassoni* liberated from infected *Bulinus wrighti*. The sheep died of natural causes, and at post-mortem 28 pairs of adult *S. curassoni* were removed from the mesenteric and rectal veins. All female worms were gravid, and eggs were hatched from faeces to produce miracidia. The development of immune responses of the host had apparently little or no effect on the viability of the eggs. Histological studies of the liver, small and large intestines revealed mild pathological symptoms. The longevity of *S. curassoni* is the first record of longevity of schistosomes to be based on worm counts.

There are numerous records in the literature relating to the longevity of schistosomes, primarily human schistosomes. For example, Fulford *et al.* (1995) used a statistical approach to schistosome population dynamics to estimate the life span of *Schistosoma mansoni*, and these authors also list a number of records from the literature for the longevity of *S. mansoni* and *S. haematobium* varying from 1.5 to 10 years and 3.3 to 6 years, respectively. Migrants from endemic areas, removed from transmission foci for a known period of time, have been the subject of several anecdotal reports and periods of as much as 32 years have been recorded for *S. mansoni* (Harris *et al.*, 1984). However, little is known about the longevity of animal schistosomes where accurate worm counts can be determined at necropsy (De Bont & Vercruysse, 1998). This is mainly because, in the natural situation, animals are restricted to transmission foci and reinfection is a confounding factor in determining the longevity of adult schistosomes.

The purpose of this short paper is to present accurate data on the longevity of *S. curassoni* in a natural host in a laboratory situation in Belgium. Vercruysse *et al.* (1984) isolated *S. curassoni* from Senegal and described details of the morphology and biology of the parasite. *Schistosoma curassoni* is a schistosome with terminal spined eggs and therefore belongs to the *S. haematobium* group, and is closely related to the human pathogens, *S. haematobium* and *S. intercalatum* (Southgate *et al.*, 1985). It is a parasite of sheep, goats and cattle in parts of West Africa, especially Senegal and Mali (Rollinson *et al.*, 1990).

A 1-year-old sheep was infected in the Veterinary Faculty, Ghent University, Belgium in November 1993 by exposing the skin of the sheep, which had been previously cleaned 2 h earlier with 70% alcohol, to 500 cercariae of *S. curassoni* liberated from *Bulinus wrighti* for 30 min. Within 45 days post-infection, viable eggs (hatched to release miracidia) could be detected in the faeces of the sheep. Faecal samples were taken annually to confirm the passing of viable eggs, and in the year 2000,

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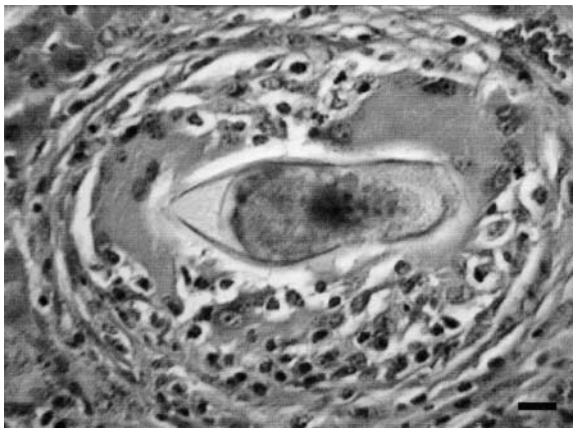

Fig. 1. An egg granuloma of *Schistosoma curassoni* in a portal area of the liver. Scale bar 25 μm.

25 *B. wrighti* snails were exposed to five miracidia per snail to establish infection in laboratory mice. During the total length of the infection, the sheep showed no obvious signs of infection or distress and appeared perfectly normal apart from the passing of schistosome eggs in the faeces. The sheep died of natural causes in April 2002.

At post-mortem, 28 pairs of adult *S. curassoni* were recovered from the mesenteric veins, and more commonly in the veins around the rectum. All female worms were gravid, many miracidia (>100 per 5 g of faeces) were counted after hatching, but no eggs could be detected in the faeces. Samples of the liver, small and large intestine were collected and fixed in a 10% phosphate-buffered formaldehyde solution for 48 h and processed for histology. Samples were embedded in paraffin, sectioned at 10 μm and stained with haematoxylin-eosin (HE) and periodic-acid-Shiff (PAS). There were numerous sections of living eggs scattered throughout the liver. The eggs were localized in the portal areas and were associated with a diffuse, marked infiltration of macrophages, lymphocytes and a scant amount of eosinophils and plasma cells in these areas. There was also granuloma formation in which the living egg was immediately surrounded by multinucleated giant cells which in turn were surrounded by a cuff of epithelioid macrophages and encapsulated by fibrous tissue (fig. 1). Within the portal areas there was a mild proliferation of bile ducts. The liver sinusoids contained scattered neutrophils. The Kupffer cells contained a dark granular to clumped pigment, most consistent with hemosiderine. The lamina propria of the mucosa of the small and large intestine contained an intense inflammatory infiltrate consisting of abundant numbers of lymphocytes and eosinophils and scant numbers of neutrophils and plasma cells.

These data suggest that once a sheep is infected it probably remains infected for the remainder of its life, the longevity of sheep being 10–12 years. The fact that viable eggs were passed for the length of life of the sheep in this experiment indicates that faecal contamination will contribute to the transmission of the parasite throughout the life of the definitive host. This will be of significance in the Sahel region of Africa where transmission foci may be ephemeral, in temporary water bodies snails will become infected from one transmission season to another by infected faecal contamination. Histological examination of the liver, large intestine and rectum somewhat surprisingly demonstrated that egg granuloma were not indicative for a chronic infection, but rather of an acute infection (Vercruysse *et al.*, 1985). Consequently the development of immunity or immune responses of the host had apparently little or no effect on the viability of eggs or indeed the pathological responses. It is likely that the longevity of *S. curassoni* recorded here and the pathological responses observed may be reflected in naturally infected animals.

As far as we are aware this communication represents the first report on the longevity of animal schistosomes, specifically *S. curassoni* in a natural host, a sheep. It is interesting that the period of 8 years 5 months recorded here is much longer than many of the estimates for the longevity of schistosomes which infect humans. Furthermore, it should be recognized that the longevity recorded here may underestimate the true situation in that the period of 8 years 5 months was determined by the longevity of the host rather than that of the parasite. During the whole infection period the sheep appeared in good health. Finally, this is the first record on the longevity of schistosomes based upon worm counts.

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