

CH-87-2 Animal Reservoirs of Leishmania in different ecological situations and their importance in the epidemiology of the disease.

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INTRODUCTION

Leishmaniasis in man is a disease caused by different species of Leishmania which produce lesions in either the skin or viscera. In areas of the world where the complete life cycle of a Leishmania has been discovered the primary source of infection is practically always a wild mammal and not man. An important feature of the leishmanial infections in these wild animals is that they are non pathogenic infections that in no way threaten the life of their host. The leishmaniases are therefore a group of zoonotic diseases in which the mammalian host is the key factor in the epidemiology. For instance there may be a large vector population, but if infected reservoirs are not present then there is no risk of disease. It is the interaction of vector and reservoir ecology that determines the epidemiological pattern.

The terms PRIMARY and SECONDARY reservoir are often used in the literature, but unfortunately not always correctly. PRIMARY reservoir refers to the mammalian host of a parasite that is responsible for the maintenance of infection in the wild. It

does not mean the animal which serves as a source of infection for the sand flies that bite man. Such an animal may be the PRIMARY reservoir, but it could also be the SECONDARY reservoir. A SECONDARY reservoir is an animal that is infected, but incapable of maintaining the enzootic cycle indefinitely. Dogs are often considered by some workers to be primary reservoirs of visceral leishmaniasis, but they are not. Firstly because the primary source of infection of a dog population is a wild canid and secondly the high pathogenicity would in the end eliminate the dog and thus the infection.

VISCERAL LEISHMANIASIS.

The primary reservoirs of the two parasites causing visceral leishmaniasis in the mediterranean region (L.(L.) infantum) and in Latin America (L.(L.) chagasi) are foxes. Although these are rather shy animals they often invade farms and houses situated in rural or suburban areas in search of food. If such foxes are infected they serve as a source of infection for any peridomestic sand fly. Once such sand fly populations become infected they can either transmit the infection directly to man or to another animal, such as a dog. When dogs become infected they are secondary reservoirs that amplify the infection. They become sick and eventually die, but for a number of months they are the prime source of infection to peridomestic sand flies and thus to man. In rural areas where there are no dogs man may still become infected, but in this case from the bite of sand flies that have fed on contaminated foxes.

In Italy and the Sudan wild rodents are possibly the primary reservoir while in India the primary reservoir of L.(L.) donovani is considered to be man himself. In the later case though it still remains to be explained how the parasite survives during interepidemic periods. Is it in a wild animal or in man himself - in the form of post-kala azar dermal leishmaniasis (PKDL)?

CUTANEOUS LEISHMANIASIS.

Cutaneous leishmaniasis is caused by a greater variety of Leishmania species belonging to the subgenera Leishmania and Viannia. Again where the complete life cycle has been discovered the primary reservoir is a wild mammal. The reservoir host of L.(L.) major throughout central Asia is the rodent Rhombomys opimus while in the middle east the primary reservoir is a closely related burrowing rodent called Psammomys obesus. In areas of Africa, Asia and India other genera of rodents are involved.

In the New World parasites of the mexicana complex are found in many different mammals, but their primary reservoir is rodents. Proechimys species have been shown to be the principal reservoirs of L.(L.) amazonensis throughout most of the Amazon region.

Parasites of the subgenus Viannia only occur in the Americas and so far their primary reservoirs have been shown to be edentates. For instance the primary reservoirs of L.(V.) panamensis and L.(V.) guyanensis are two-toed sloths (Choloepus spp.) Secondary hosts of this subgenus include marsupials and

rodents. The primary reservoir of L.(V.) braziliensis, which occurs in many countries, is at present unknown.

THE CONTROL OF LEISHMANIASIS VIA THE RESERVOIR

Control of either the primary or secondary reservoir may be indicated depending on the epidemiological situation. Thus elimination of the dog in parts of the Mediterranean region, Latin America and China has efficiently reduced the incidence of visceral leishmaniasis in man. However, in time dog populations become infected again from wild canids.

Relatively small ecological changes may either increase or lower rodent populations. For instance R.opimus lives in colonies that are housed in burrows which can be destroyed by deep ploughing. Although not all the rodents are killed the disruption of the colony prevents recolonization for up to 5 years. P.obesus live in burrows that have several openings, but not in such well developed colonies. The holes are normally near to small bushes, called the salt bush Atriplex halimus, that are an essential food source. Removal of this bush eliminates the rodent.

Control of cutaneous leishmaniasis in the New World by attacking reservoirs has so far not been attempted. It has been thought that the destruction of the forest would perhaps destroy the reservoirs and consequently transmission to man would be reduced. Some mammals, such as rodents, are very resilient and may even adapt to completely different types of forests. This has in fact occurred in the Amazon region where Proechimys has adapted to timber plantations and L.(L.) amazonensis transmission

now occurs amongst these rodents in the plantations. Similarly infections of L.(V.) braziliensis are occurring in man in rural areas where the native forest has been eliminated or greatly reduced. This suggests that the primary reservoir has adapted to new habitats or secondary reservoirs are playing an increasingly important role.

THE FUTURE

A better knowledge of reservoir hosts is important because it offers a financially attractive alternative to vector control. Besides this when more is known about the biology of such mammals it will hopefully be possible to predict that an outbreak is about to occur, which is not what is happening at the moment.

RECOMMENDED READING

1. The Leishmaniases - Report of a WHO Expert Committee. WHO Technical Report 701, 1984.
2. Leishmaniasis (K-P Chang & R.S. Bray, eds), Elsevier Science Publishers B.V.(Biomedical Division), Amsterdam, 1985.
3. The Leishmaniases in Biology and Medicine. Volume. I. Biology and Epidemiology (W. Peters and R.Killick-Kendrick, eds), Academic Press, New York & London, 1987.