Ann. Parasitol. Hum. Comp.,
1990, *65*, Suppl. I : 79-82.

Key-words: Parasitic zoonoses. South America.
Mots-clés : Zoonoses parasitaires. Amérique du Sud.

PARASITIC ZOONOSES: SELECTIVE REVIEW OF SOME DISEASES IN SOUTH AMERICA

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SUMMARY

Selected parasitic zoonoses which occurs in South America are discussed with emphasis on epidemiology, diagnosis and control of echinococcosis, taeniosis/cysticercosis and lagochilascariosis.

RÉSUMÉ : **Zoonoses parasitaires : révision sélective des plus importantes maladies de l'Amérique du Sud.**

L'exposé insiste sur l'épidémiologie, le diagnostic et la prophylaxie des principales zoonoses parasitaires sévissant en Amérique du Sud. L'échinoccocose-hydatidose, le complexe teniasis-cysticercose et la lagochilascariose sont plus spécialement considérés.

INTRODUCTION

Parasitic zoonoses are defined as infections caused by protozoa, helminths and arthropods which are naturally transmitted between vertebrate animals and man. Certain parasitic zoonoses represent a serious threat to humans and are responsible for substantial losses in animal production, like echinococcosis and taeniosis/cysticercosis. Other parasitic zoonoses, such as South American trypanosomosis, leishmaniosis, schistosomosis and filariosis which affect millions of people living in tropical areas are usually neglected as of economic importance in veterinary medicine. Increased importance of certain parasitic zoonoses are related to the acquired immunodeficiency syndrome (AIDS) of man. In the 13th WAAVP Conference in East Berlin, Eckert (1989) proposed the subdivision of parasitic zoonoses into « AIDS-related parasitic zoonoses » and « other parasitic zoonoses ». More than sixty parasitic zoonoses have been reported in the literature (WHO, 1979, Steele, 1982). This article selectively reviews the most recent developments of some parasitic zoonoses which occurs in South America, with main emphasis in echinococcosis.

ECHINOCOCCOSIS

Three species of *Echinococcus rudophi,* 1801 are recognized in Latin America: *E. granulosus* (Batch, 1786); *E. oligarthrus* (Diesing, 1863) and *E. vogeli* Rauch and Bernstein, 1972. *E. multilocularis* Leuckart, 1863 geografic distribution is limited to the Northern Hemisphere (Rausch, 1967).

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E. granulosus have as definitive hosts carnivores and is adapteded to domestic dogs and a large number of domestic and sylvatic animals as intermediate hosts. The metacestode forms in the intermediate hosts is refered as hydatid cysts. It is a major public health problem and cause significant economic losses. In regions of North America and Eurasia the definitive host are wolves and intermediate hosts are wild ungulates, mainly moose and wild reindeer, and are not infective to domestic ungulates (Cameron, 1960). It is suggested that this is the original life cycle of *E. granulosus* in nature (Rausch, 1967).

The life cycle of *E. granulosus* in domestic animals are commonly refered as the pastoral form and includes the transmittion among dog/sheep, dog/cattle, dog/swine, and dog/horse. In Ireland, Great Britain and Western Europe, strains of *E. granulosus* recovered from the dog/horse cycle has been found to be morphologically and biologically different from those collected from the dog/sheep cycle (Hatch and Smyth, 1975; Thompson and Smyth, 1975; Williams and Sweatman, 1963). Also in U. S. S. R. differences have been demonstrated between cestodes recovered from the dog/sheep cycle and the dog/swine cycle and they were noninfective between both intermediate hosts (Kuznetsov *et al.,* 1977; Zenkov, 1971). In a recent study of hydatic disease in urban areas of Western Australia, cysts found in grey kangoroos were well developed and most contained protoscoleces, and the cysts found in fetal pigs were degenered, small, rarely contained fluid and produced an intensive host response. It is suggested that the parasite was introduced recently to Western Australia by domestic dogs used for pig hunting (Thompson *et al.,* 1988).

The life cycle in South America includes the tipical pas-

toral form with domestic dogs/sheep/cattle/swine. Foxes of the genus *Dusicyon* are highly susceptible to experimental infections and have been found naturally infected in Argentina (Blood and Lelijveld, 1969; Schantz *et al.*, 1972, 1975, 1976). The prevalence of echinococcosis is higher in Uruguay, Argentina, Chile, Bolivia, Central Peru, and southern Brazil. During the years of 1962 and 1971 the human infection rate for rural residents in Uruguay, was 123.0 per 100,000 (Purriel *et al.*, 1974). Recent reports on the prevalence of echinococcosis in South America showed a significant decrease in the percentage of infection in dogs and sheep in areas where control programs are in progress. In the province of Rio Negro —Argentina after ten years (1978-1988), the infection rate of dogs dropped from 41 % to 3 %, and hydatic cysts in sheep and man from 61 % to 12 % and 1.45 % to 0.35 %, respectively (Larrieu *et al.*, 1989). In Chile a control program was initiated in 1982, in the provinces of Aysen, Coyhaique, General Carrera and Capitán Prat. The percentage of infection after six years showed a decrease of 80 % to 36.1 % in sheep, 54 % to 6.5 % in dogs, and 79.9 to 45.1 cases per 100,000 in the population (Ogueta, 1989; Ogueta *et al.*, 1989). In the State of Rio Grande do Sul-southern Brazil, the prevalence of hydatidosis in cattle and sheep from 1978 to 1983, was 30.8 % and 26.2 %. The estimated economic impact based only on liver losses is about 5 millions de dollars. A recent projection for the year 2003 during Federal Inspection data showed that the infection rate in sheep will decrease to 11.04 %, but the expected rate for cattle will increase to 50.7 % (Costa *et al.*, 1989). A serious economic and human health problem can be expected in Brazil in the coming years related to the dispersion of *E. granulosus* into the extensive cattle beef areas in the Central and Central west regions where more than 50 million head of cattle are grazed. An increase in the infection rate of dogs and cattle within the « pantanal region », the temporary swamps areas of Brazil, one of the most populated areas of wildlife animals in the earth, can also bring some new epidemiological implications in the transmission of *E. granulosus.*

E. oligarthrus was described by Diesing in 1863 and wild felids are definitive hosts in Latin America: the cougar, *Felis concolor;* the jaguar, *F. onca;* the pampas cat, *F. colocolo;* the jaguarundi, *F. yagouaroundi;* the Geoffroy's cat, *F. geoffroyi.* This specie develops in domestic cats but do not reach maturity in dogs (Sousa and Thatcher, 1969). The agouti *(Dasyprocta punctata)* has been confirmed as intermediate host by experimental transmission to domestic cat in Panama (Sousa, 1970). On the basis of cyst morphology and size of hook from protoscolex, others intermediate hosts were identified in Latin America. *D. ogouti* in Brazil and spiny rat *(Proechimys panamensis)* in Panama (Sousa, 1970), *P. pialis* in Colombia (Thatcher, 1972), *D. rubrata* in Venezuela (Sousa and Thatcher, 1969), and *Microcavia australis* in Argentina (Schantz and Colli, 1973). No human infection caused by *E. oligarthrus* has been confirmed by artificial infection of domestic cat.

E. vogeli —Description of *E. vogeli* by Rausch and Bernstein in 1972 it is recent if we compare with the other species of *Echinococcus: E. granulosus; E. multilocularis* and *E. oligarthrus.* The definitive host a bush dog, *Speothos venaticus* was described in Ecuador and the major intermediate host the paca *Cuniculus paca,* although agoutis and spiney rats have been found infected (D'Alessandro *et al.*, 1979; Rausch *et al.;* 1978). For this specie, domestic dogs are adequate host but cats are not susceptible. Live cysts recovered from two Colombian patients were fed to dogs and *E. vogeli* was recovered (D'Alessandro *et al.*, 1979). The previous reports of polycystic form of human hydatid disease described in Panama, Ecuador, Colombia and Venezuela were considered to be caused by *E. vogeli* (D'Alessandro *et al.*, 1979). The primary localization of cysts is the liver and produces relatively large vesicles brood capsules and numerous protoscolices (Schantz, 1982). The occurrence of *E. vogeli* polycystic echinococcosis in man in the Amazon region in Brazil —State of one was confirmed recently with the description of seven cases (Heneghelli, 1989). Another recent case of polycistic infection caused by *E. vogeli* was confirmed by the morphology of the hooks of protoscolex in a person from the Central region of Brazil— State of Goiás (Paço *et al.;* 1989). The results of treatment with albendazole were considered very good in 3 out of 5 patient infected with *E. vogeli* hydatic cysts (Meneghelli, 1989).

Diagnostic of human echinococcosis in South America includes radiologic and immunodiagnostic methods (Purriel *et al.*, 1974; Ramirez *et al.*, 1971). Recent advances in the serodiagnosis of helminthic zoonosis have been review by Schantz (1987). A highly antigenic polypeptide fragment of the recombinant *E. multilocularis* antigen II/3 was produced in *Escherichia coli.* The sensitivity of this enzyme-linked immunosorbent assay was 90 % in 88 patients with polycistic chinococcosis and had a specificity of 99 % among 220 patients with various helmintic infections (Muller *et al.*, 1989). Chemotherapy of cystic echinococcosis in man is in progress with the use of mebendazole, albendazole and praziquantel. The cure rate varies from person to person, but recent reports from China, Bulgaria and Argentina showed that the treatment with albendazole were useful in most of the patients (Ping-Li *et al.*, 1989; Todorov *et al.*, 1989; Martino *et al.*, 1989). The anthelmintic of choice for treatment of infected dogs with *E. granulosus* still praziquantel which is highly effective in a single oral or intramuscular dose of 5 mg/kg body weight, and completely eliminates all juvenile and adult strobilae.

Taeniosis/Cysticercosis

Taenia solium Linnaeus, 1758 and *T. saginata* Goeze, 1782 are obligatory associated with man as their definitive

host and pigs and cattle as intermediate hosts. They are unique zoonoses and have been classified as « Euzoonoses » (Garnham, 1958). In the case of *T. solium* man also can be infected by the larval stage, cysticercus. Larval stages of other species which have domestic dog as definitive host and sheep as primary intermediate host like *T. multiceps* Leske, 1780 and *T. hydatigena* Pallas, 1766 can also infect man.

T. solium is endemic in most of the developing countries. A survey conducted in Latin America in 1977 showed swine cysticercosis in over 1 % of pigs slaughtered in Brazil, Honduras, Guatemala, Costa Rica, Nicaragua Peru and El Savador (Schenone and Letonja, 1977). Today the percentage of cysticercosis in Brazil it is around 0.15 % of the pigs slaughtered in veterinary inspected abattoirs (Nunes, 1986). However it does not means that the risc of contamination decreased significantly in rural areas were pigs are still kept around houses and grow freely. Diagnostic of cerebral cysticercosis by computerized tomography is now widely used and it is a useful method to evaluate the results of chemotherapy. Mebendazole, praziquantel and albendazole have been used in treatment of human cysticercosis.

T. saginata is widespread in most cattle breeding countries in the world. Transmission of this parasite depend more on the human habit of eating raw or semiraw beef dishes. The rate of bovine cysticercosis during the last years in veterinary inspected abattoirs in Brazil is around 5 %.

Control of human taeniosis/cysticercosis by development of vaccines it is a promising alternative in the coming years by vaccination of intermediate hosts (Lloyd, 1987).

Several parasitic zoonoses important in South America which occurs in other parts of the world but were not covered in this article are for example: trichinellosis, toxocarosis *(Larva migrans),* dirofilariosis, strongyloidosis, fasciolosis, schistosomosis, toxoplasmosis, sarcocystosis, giardiosis, leishmaniosis and trypanosomosis, as well as, those opportunistic infections in AIDS patients which can cause seven diseases like pneumocystosis, cryptosporidiosis, microsporidiosis and encephalitozoonosis.

The number of cases of human lagochilascariosis is increasing in Latin America. There are 62 cases reported, 46 from Brazil and a lethality rate of 6.5 % (Fraiha *et al.,* 1989). Parasitic tumoral lesions are frequent in the neck or the ear regions with presence of adult nematodes, as well as eggs and larval stages. *Lagochilascaris minor* was described by Leiper in 1909, from two human cases in Trinidad. All the other cases have been confirmed as caused also by *L. minor.* Lagochilascariosis in domestic cat and dog are similar regarding development of tumoral lesions, abscess and presence or adult parasites. However, two species have been found in both cats and dogs, *L. minor* and *L. major* Leiper, 1910. The original description of *L. major* is from intestine of an african lion, *Felis leo sabakiensis.* The hypothetical life cycle of *T. minor* includes wild felids as definitive host and man, domestic cats and dogs as accidental hosts (Sprent, 1971; Fraiha *et al.,* 1989). Egs of *L. minor* hatches spontaneously in water at room temperature without presence of digestive enzymes. Based on these facts there are several questions that can be asked, like: Why does *L. minor* goes thru full development in accidental hosts? Why the infection in cats which are probable related to definitive hosts produce tumoral lesions like in man? Does *L. minor* needs an intermediate host to develop in the intestine of definitive host? If infections are caused by ingestion of free larval in water, do they go thru hepatic-pulmonary tract before migration to the neck region or do they penetrate the oral mucosa? Eighty years have gone since description of *L. minor* from man in Trinidad and we still have many basic questions. Research in parasitic zoonoses like echinococcosis and taeniosis have now more than two centuries and we still have a lot to find out to benefit of mankind.

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