ECHINOCOCCOSIS IN SOUTHERN BRAZIL: EFFORTS TOWARD IMPLEMENTATION OF A CONTROL PROGRAM IN SANTANA DO LIVRAMENTO, RIO GRANDE DO SUL

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SUMMARY

This investigation aimed to design a strategy for echinococcosis control in Santana do Livramento county, an endemic area in state of Rio Grande do Sul (Brazil). Fecal samples from 65 dogs were obtained from urban, suburban and rural areas. Purging with Arecoline Bromhidrate (AB) was done to visualize Echinococcus granulosus, and Enzyme Linked Immunosorbent Assay (ELISA) was performed to detect parasite coproantigen. Samples were obtained at the beginning and at the end of treatment with Praziquantel. A third fecal sampling was also done in rural areas four months after the end of treatment. Each dog was treated immediately after the first purging and every 30 days for eight months. In urban and suburban areas no infected dogs were found. In rural areas, first evaluation showed 11.36% and 27.69% of infected dogs by AB and ELISA, respectively. No infected dogs were diagnosed in the second evaluation and in the third evaluation 36.84% and 47.37% infected dogs were identified by AB and ELISA, respectively. Medication program to combat dog infection resulted in successful interruption of parasite transmission, but the project failed to create awareness of the need for dog prophylaxis among rural populations as well as to establish a permanent control program in this municipality.

KEYWORDS: Echinococcus granulosus; Control program; Rio Grande do Sul.

INTRODUCTION

Echinococcosis is a common parasitic disease in the state of Rio Grande do Sul (Brazil), and dogs are the major definitive hosts. The larval form and hydatid cysts are basically found in 25% of cattle and 3% of sheep, but human beings can be accidental hosts (716 cases between 1981-1999 in Rio Grande do Sul)5,10,19. It is caused by the tapeworm Echinococcus granulosus, which has long been recognized as an assembly of various distinct strains and, recently, species21. Despite its major rural distribution, urban areas may also harbor this cestode7. Control programs are widespread in endemic areas and based on strategies that interrupt the parasite’s life-cycle and have a successful result in many countries. These programs are based on: (a) purging dogs with Arecoline Hydrobromide (AB), which besides its reasonable effect on cestode expulsion is also an aid to educating dog owners, since it is possible to actually show the parasite; and (b) dosing, frequently with praziquantel8,14. Both approaches have to be taken with some care, because these treatments have no ovicidal properties and eggs may contaminate the environment20. An example of a successful control program is the Uruguayan model, in which dogs are treated 12 times a year with praziquantel by staff members of the program and AB control is done at random8. In addition, owners receive continuous information about echinococcosis in humans and related problems6.

Santana do Livramento is an endemic region for Echinococcus in Rio Grande do Sul state and the area is on the border with Uruguay.

There is official legislation for Echinococcus control in this community, but unfortunately without effective implementation.

Based on the above situation, the aim of the present study was to carry out an Echinococcus survey in dogs, dosing each individual every month and motivate the beginning of a county commission for echinococcosis control in terms of prevention, education and prophylaxis knowledge in Santana do Livramento county.

MATERIAL AND METHODS

Visits were done on a regular basis from April 2001 to November 2002 in randomly chosen rural properties (farms), a suburban settlement with 400 inhabitants and urban areas/periphery of Santana do Livramento county. All properties were visited once a month for eight months and once again four months after the last praziquantel treatment.

The first evaluation/purging was done on 65 dogs (44 in rural, 11 in suburban and 10 in urban areas). The second was done one month after last treatment in 61 dogs (40 in rural, 11 in suburban and 10 in urban areas). Due to the high number of infected dogs, a third visit was done only in the rural area but only 19 dogs were found four months after the last treatment.

During the first visit, owners were asked about the number of dogs they kept, any kind of parasitological treatment, food sources, and how
they slaughter cattle and sheep at home. An informative explanation about epidemiology, transmission and pathological effects of hydatid disease in man was also done at the time of the first visit and in the following visits.

At the first visit, dogs were purged with Arecoline Bromhydrate (AB) (Sigma-Aldrich, St. Louis, USA) to observe the presence or absence of the parasite. The drug was administered orally in a 1.5% dilution (15 mg of AB/ml distilled water), each dog receiving 3 mg/kg, which is equivalent to 1 ml/5 kg. Drug action began after 20 or 30 minutes. If the first purging failed, a second dose with half of the original concentration was done. Fecal samples were collected from adults (males and females). Parasite presence was observed in mucous feces, directly over a dark plate, diluting the material with water and formalin (v/v)\(^1\),\(^2\). Feces were also diluted (2 g/8 ml of 1% formalin solution) and stored at -80 °C for coproantigen diagnosis.

Each dog was treated with praziquantel regardless of their diagnostic results (Drontac®-Bayer, S. Paulo, Brazil) (5 mg/kg) after first purgation and every 30 days until the 8th month.

For coproantigen diagnostic, an ELISA was performed in the Parasitic Biology Laboratory of the Hygiene Institute (Montevideo-Uruguay) as previously described\(^3\),\(^4\). The cut-off value was determined by calculating the mean optical density (OD) at 492 nm +3 standard deviations.

County public authorities and veterinarians accepted their responsibility to create a local commission for echinococcosis control during the field work until the end of dogs treatment (about eight months). This commission was responsible for registering the canine population, analyzing the reasons for this phenomenon, but the fact must be taken into account to improve the effectiveness of any kind of program to control E. granulosus. A person living in an endemic area has to be instructed about the importance of correct treatment and its impact on hindering transmission to an intermediate host.

In urban areas, there were no dogs infected with E. granulosus. This result was expected because contact with raw viscera is infrequent in urban properties and in the suburban area infection levels were surprising low; only one dog had a positive coproantigen test for E. granulosus, despite the fact that dogs have contact with farms in the neighborhood and wander unrestrained around their home area. It has been previously reported\(^1\) that stray dogs from urban areas of small cities can be infected with this parasite, but possibly due to the small number of suburban dogs analyzed\(^1\) the presence of the parasite was not found. Nevertheless, conditions that favor transmission continue to be present\(^5\) and infection could occur.

On the other hand, rural areas presented a different situation. Detection of the parasite by coproantigen (ELISA) showed better results than analysis by AB purging (Table 2) (p < 0.05). Several studies...
comparing Coproantigen ELISA and Arecoline Bromhidrate purging recommend the use of the former rather than the latter\textsuperscript{23,18,22}. The diagnostic techniques utilized in the present work have various controversial problems. Firstly is the purging efficacy, since only 70\% of dogs react to AB after the first dose and its action may be increased to 78\% after a second dose\textsuperscript{4}, however it is 100\% specific and the parasite is visualized directly\textsuperscript{22}. Cross-reaction between \textit{E. granulosus} and \textit{Taenia hydatigena} may occur in coproantigen diagnostic\textsuperscript{13} and in the first visit \textit{T. hydatigena} was found in three samples, but ELISA was negative for \textit{E. granulosus}, thereby avoiding conflicting results. However, both techniques were used in the present work for complementary results. Despite the low efficacy of AB technique, it has the advantage that through the purging mechanism the parasite remains intact and can be shown to rural people so it has an educational effect\textsuperscript{13}, while ELISA is more appropriate for laboratory or research purposes\textsuperscript{2}.

<table>
<thead>
<tr>
<th>Technique</th>
<th>1st evaluation</th>
<th>2nd evaluation</th>
<th>3rd evaluation</th>
</tr>
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<tbody>
<tr>
<td>Purgung</td>
<td>7.69 (5/44)\textsuperscript{a}</td>
<td>0.00 (0/40)</td>
<td>36.84 (7/19)\textsuperscript{a}</td>
</tr>
<tr>
<td>Coproantigen</td>
<td>27.69 (17/44)\textsuperscript{b}</td>
<td>0.00 (0/40)</td>
<td>47.37 (9/19)\textsuperscript{b}</td>
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Values with different letters in the same column are significantly different (p < 0.05); Values with different letters in the same row are significantly different (p < 0.05)

As expected, 30 days after the last treatment with praziquantel, no infected dogs were found in all studied areas (Table 2). Similarly, dog infection evaluation was performed in Uruguay (1997) to investigate the efficiency of an echinococcosis control program which began in 1992. Infection rates decreased from 10.67\% in 1992 to 0.74\% in 1997, showing the impact of an echinococcosis control program which began in 1992. Consequently, for any kind of control program involving animals to be truly effective, it has to be done on both sides of the geographical/political limit because dogs can freely wander from one country to the other.

It was concluded that a control program with the objective of reducing the impact of echinococcosis in man or animals must be continuous, at least until information about its transmission are clear and fully understood by all the people involved.

**RESUMO**

Equinococo no sul do Brasil: tentativas para implementação de um programa de controle em Santana do Livramento, Rio Grande do Sul

Este trabalho objetivou implementar um programa de controle da equinococose no município de Santana do Livramento, área endêmica no Estado do Rio Grande do Sul (Brasil). Amostras fecais de 65 câes foram coletadas em áreas urbanas, suburbanas e rurais. Para visualizar o \textit{Echinococcus granulosus} foi realizada purgação com Bromhidrato de Arecolina (BA) e para identificar coproantígenos parasitários foi empregado um método imunoenzimático (ELISA). As amostras foram coletadas no começo e ao fim do tratamento com Praziquantel. Nas áreas rurais uma terceira coleta foi feita quatro meses após o fim do tratamento. Cada cão foi tratado no começo e a cada trinta dias durante 8 meses. Nas áreas urbanas e suburbanas nenhum cão parasitado foi identificado. Nas áreas rurais estavam parasitados 11.36\% e 27.69\% dos câes, por BA e ELISA, respectivamente. No terceira avaliação, 36.84\% e 47.37\% dos câes estavam infectados, por BA e ELISA, respectivamente. Observou-se que um programa a base de drogas anti-parasitárias resultou em interrupção eficiente na transmissão parasitária, mas o projeto falhou em criar uma mentalidade consciente nos habitantes da zona rural relacionada a profilaxia, bem como em estabelecer um programa permanente de controle desta parasitose no município.

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**REFERENCES**


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