

## BRIEF COMMUNICATION

### NATURAL INFECTION OF *Deroceras laeve* (MOLLUSCA: GASTROPODA) WITH METASTRONGYLID LARVAE IN A TRANSMISSION FOCUS OF ABDOMINAL ANGIOSTRONGYLIASIS

Rafael Lucyk MAURER(1), Carlos GRAEFF-TEIXEIRA(1), José Willibaldo THOMÉ(2), Luís Antônio CHIARADIA(3), Hiroko SUGAYA(4) & Kentaro YOSHIMURA(4)

#### SUMMARY

*Angiostrongylus costaricensis* is a nematode parasitic of rodents. Man may become infected by ingestion of the third stage larvae produced within the intermediate hosts, usually slugs from the family Veronicellidae. An epidemiological study carried out in a locality in southern Brazil (western Santa Catarina State) where these slugs are a crop pest and an important vector for *A. costaricensis* has documented for the first time the natural infection of *Deroceras laeve* with metastrongylid larvae. This small limacid slug is frequently found amid the folds of vegetable leaves and may be inadvertently ingested. Therefore *D. laeve* may have an important role in transmission of *A. costaricensis* to man.

**KEYWORDS:** Metastrongyloidea; *Angiostrongylus costaricensis*; *Deroceras* sp; Limacidae; Veronicellidae.

In 1993, *Sarasinula linguaeformis* (Semper, 1885) was identified as a crop pest at the locality of Linha Cambucica, Nova Itaberaba, State of Santa Catarina, Brazil (27° 00' 00" S; 53° 10' 00" W)<sup>6</sup>. Five years later, the affected area was estimated to extend for 1,000 hectares where approximately 65 peasant families lived. In 1999, a parasitological examination was performed and 86% of the slugs were found infected with *Angiostrongylus costaricensis* Morera and Céspedes, 1971 a parasitic nematode usually living inside mesenteric arteries of wild rodents<sup>4,5</sup>. The rodents eliminate first stage larvae (L1) in feces, and molluscs ingest them or are infected by penetration through the tegument to produce the infective third stage larvae (L3)<sup>8</sup>. The most important intermediate hosts are slugs from the family Veronicellidae<sup>7</sup>. Human infection may lead to abdominal disease of varied severity<sup>2</sup>.

A longitudinal prevalence study on molluscs and a seroepidemiological survey on the human population began in August 2000. A diurnal search for molluscs was conducted at places indicated by the local residents at three sites: CES (grassy and garden areas next to the Community's Church), MPS (the surroundings of Mr. M.P. house) and DPS (the surroundings of Mr. D.P. house). A nocturnal passive search at a crop field next to DPS was also undertaken resulting in a very small number of molluscs that were pooled together with DPS for examination. In the laboratory the molluscs were eviscerated and had their body minced and incubated at 37 °C for 2 hours, with a 0.03 % (w/v) Pepsin (Sigma, Saint Louis, USA – P7125) in 0.7 % (v/v) hydrochloric acid solution. The preparation was left in Baermann funnels for a minimum of 1 hour

and larvae were identified as metastrongylid by demonstration of a sub-terminal notch. A total of 465 molluscs identified by external morphology as *Deroceras laeve* (Müller, 1774) – an introduced European species, *Bradybaena similaris* (Férussac, 1821) – an introduced Asiatic species, *Phyllocaulis variegatus* (Semper 1885) and *S. linguaeformis* were examined and the results are shown in Table 1.

*S. linguaeformis* is the predominant species and presented with the highest prevalence (1.5%). The prevalence of 86% detected in a

**Table 1**

Absolute numbers of positive identification (p) and total examined (t) and prevalence (%) of metastrongylid larvae in terrestrial molluscs collected in August 2000, at Linha Cambucica, Municipality of Nova Itaberaba, Santa Catarina, Brazil

|                                 | Site 1<br>CES                    | Site 2<br>MPS     | Site 3<br>DPS    | Total             |
|---------------------------------|----------------------------------|-------------------|------------------|-------------------|
| <i>Deroceras laeve</i>          | 0 <sup>p</sup> / 21 <sup>t</sup> | 1 / 9             | 0 / 6            | 1 / 36            |
| <i>Bradybaena similaris</i>     | 0 / 11                           | 0                 | 0                | 0 / 11            |
| <i>Phyllocaulis variegatus</i>  | 0 / 6                            | 1 / 5             | 0 / 8            | 1 / 19            |
| <i>Sarasinula linguaeformis</i> | 1 / 139<br>(0.7%)                | 4 / 243<br>(1.6%) | 1 / 17<br>(5.8%) | 6 / 399<br>(1.5%) |

(1) Laboratório de Parasitologia Molecular do Instituto de Pesquisas Biomédicas e Laboratório de Biologia Parasitária, Faculdade de Biociências da PUCRS, Porto Alegre, RS, Brasil.

(2) Laboratório de Malacologia da Faculdade de Biociências da PUCRS, Porto Alegre, RS, Brasil.

(3) Centro de Pesquisas para Pequenas Propriedades, EPAGRI, Chapecó, SC, Brasil

(4) Department of Parasitology, Akita University School of Medicine, Akita 010-8543, Japan

**Correspondence to:** Dr. Carlos Graeff-Teixeira, Laboratório de Parasitologia Molecular, Instituto de Pesquisas Biomédicas, PUCRS, Av Ipiranga 6690, 90610-000 Porto Alegre, RS, Brasil; email: graeteix@pucrs.br

preliminary evaluation in May 1999 was much higher than that now reported herein. This may result from the seasonal variation of transmission already detected with the human infection<sup>2</sup>.

*Deroceras reticulatum* (Müller, 1774) and *D. laeve* have been identified as intermediate hosts for another metastrongylid worm producing human disease: *Angiostrongylus cantonensis*<sup>1</sup>. The relative lack of specificity of metastrongylid parasites for their intermediate hosts has also been previously noticed<sup>8</sup>. The few metastrongylid larvae found in the present study were dead what prevented their definitive identification as *A. costaricensis*, through experimental infection of rodents and recovery of adult worms. But the site was previously confirmed to be a focus with active transmission of *A. costaricensis*<sup>4</sup>. In several other foci in southern Brazil *Deroceras* sp. was not found infected with *A. costaricensis*<sup>3</sup>. These small limacid slugs may have an important role in transmission of abdominal angiostrongyliasis to man, since they may remain between the folds of vegetable leaves and be inadvertently ingested.

## RESUMO

### **Infecção natural de *Deroceras laeve* com larvas de metastrongilídeos em um foco de transmissão da angiostrongilíase abdominal**

*Angiostrongylus costaricensis* é um nematódeo parasita de roedores. O homem pode se infectar pela ingestão da larva de terceiro estágio produzida nos hospedeiros intermediários, geralmente lesmas da família Veronicellidae. Em estudo epidemiológico em curso numa localidade no sul do Brasil (oeste do Estado de Santa Catarina) onde aquelas lesmas constituem praga agrícola e importantes vetores do *A. costaricensis*, documentou-se pela primeira vez a infecção natural de *Deroceras laeve* com larvas de metastrongilídeos. Este pequeno limacídeo é frequentemente encontrado entre as dobras de folhas de verduras e pode ser ingerido inadvertidamente. É possível que tenha um papel importante na transmissão de *A. costaricensis* para o homem.

## ACKNOWLEDGEMENTS

Financial support: PUCRS, CNPq, FAPERGS, Prefeitura Nova Itaberaba, EPAGRI and from the Government of Japan (Monbushu).

## REFERENCES

1. ALICATA, J.E - Biology and distribution of the rat lungworm, *Angiostrongylus cantonensis*, and its relationship to eosinophilic meningoencephalitis and other neurological disorders of man and animals. **Advanc. Parasit.**, 3: 223-248, 1965.
2. GRAEFF-TEIXEIRA, C.; CAMILLO-COURA, L. & LENZI, H.L. - Clinical and epidemiological aspects of abdominal angiostrongyliasis in southern Brazil. **Rev. Inst. Med. trop. S. Paulo**, 33: 373-378, 1991.
3. GRAEFF-TEIXEIRA, C.; THIENGO, S.C.; THOMÉ, J.W. *et al.* - On the diversity of mollusc intermediate hosts of *Angiostrongylus costaricensis* Morera & Céspedes, 1971 in southern Brazil. **Mem. Inst. Oswaldo Cruz**, 88: 487-489, 1993.
4. LAITANO, A.C.; GENRO J.P.; FONTOURA, R. *et al.* - Report on the occurrence of *Angiostrongylus costaricensis* in southern Brazil, in a new intermediate host from the genus *Sarasinula* (Veronicellidae, Gastropoda). **Rev. Soc. bras. Med. trop.**, 34: 95-97, 2001.
5. MORERA, P. - Life history and redescription of *Angiostrongylus costaricensis* Morera and Céspedes, 1971. **Amer. J. trop. Med. Hyg.**, 22: 613-621, 1973.
6. MORO, L. & HEMP, S. - Ocorrência de lesmas na região Oeste de Santa Catarina. In: CONGRESSO LATINO-AMERICANO DE MALACOLOGIA, 2., Porto Alegre, 1995. **Resumos**, p. 106.
7. RAMBO, P.R.; AGOSTINI, A.A. & GRAEFF-TEIXEIRA, C. - Abdominal angiostrongylosis in southern Brazil. Prevalence and parasitic burden in mollusc intermediate hosts from eighteen endemic foci. **Mem. Inst. Oswaldo Cruz**, 92: 9-14, 1997.
8. THIENGO, S.C. - Mode of infection of *Sarasinula marginata* (Mollusca) with larvae of *Angiostrongylus costaricensis* (Nematoda). **Mem. Inst. Oswaldo Cruz**, 91: 277-278, 1996.

Received: 5 April 2001

Accepted: 5 November 2001