

# The Molluscicidal Activity of the Latex of *Euphorbia splendens* var. *hislopilii* on *Melanoides tuberculata* (Thiaridae), a Snail Associated with Habitats of *Biomphalaria glabrata* (Planorbidae)

Alexandre Giovanelli, Cesar Luiz Pinto Ayres Coelho da Silva<sup>+</sup>,  
Luisa Medeiros\*, Maurício Carvalho de Vasconcellos

Departamento de Biologia, Instituto Oswaldo Cruz, Av. Brasil 4365, 21045-900 Rio de Janeiro, RJ, Brasil

\*Escola Politécnica de Saúde Joaquim Venâncio-Fiocruz, Rio de Janeiro, RJ, Brasil

*The use of the latex of Euphorbia splendens var. hislopilii was considered as an effective control method for Biomphalaria glabrata in Sumidouro, Rio de Janeiro. However, the appearance and expansion of the snail Melanoides tuberculata since August 1997, with the concomitant reduction of the population of B. glabrata suggest that competitive exclusion might be taking place. Depending on the susceptibility of the thiarid to the E. splendens toxin, the natural control that is occurring could be interrupted by the employment of the latex if the planorbid were less susceptible to the toxin. The aim of this study is to investigate the molluscicidal activity of the latex on M. tuberculata. We used 420 M. tuberculata, from Sumidouro. Fourteen different latex concentrations were tested using World Health Organization general methodology. Probit analysis was used for LD<sub>90</sub> and LD<sub>50</sub> determination. The LD<sub>50</sub> was 3.57 mg/l and LD<sub>90</sub> was 6.22 mg/l. At the highest concentration (10 mg/l) there was no survival. No significant differences among replicas ( $\chi^2 = 8.31$ ; gl = 13;  $p > 0.05$ ) were found. The LD<sub>90</sub> dose for M. tuberculata was 13.8 times greater than that for B. glabrata, so that the molluscicide in the presence of the thiarid may have a synergic effect on reduction of Biomphalaria populations.*

Key words: molluscicide - *Euphorbia splendens* - *Melanoides tuberculata* - *Biomphalaria glabrata* - schistosomiasis

Since 1991 our group has been making an eco-epidemiological study in Sumidouro, Rio de Janeiro, Brazil, to verify the abundance of *Biomphalaria glabrata* (Say, 1818) and its degree of infection with schistosomiasis. The use of latex from *Euphorbia splendens*, which has good molluscicidal action against *Biomphalaria* (Vasconcellos & Schall 1986, Baptista et al. 1992, Mendes et al. 1992, 1997 Schall et al. 1998), was planned as a schistosomiasis control measure in this area. However, in August 1997 the presence of *Melanoides tuberculata* (Muller, 1774) was detected. This snail genus has medical and veteri-

nary interest because some species act as intermediate hosts of pathogenic helminths to man [*Paragonimus* sp., *Clonorchis* sp. (Pessoa & Martins 1982, Kino et al. 1998) and *Centrocestus formosanus* (Pointier 1999)]. Nevertheless this species could be useful in the biological control of planorbids that are intermediate hosts of *Schistosoma mansoni* (Prentice 1983 Pointier & McCullough 1989, Pointier et al. 1989, Gomez et al. 1990, Gomez Perez et al. 1991, Pointier & Guyard 1992, Schlegel et al. 1997), the helminth responsible for schistosomiasis in Brazil.

Since the detection of the *M. tuberculata* population in Sumidouro there has been a severe decline in the *B. glabrata* population concomitant with the *Melanoides* species population growth and expansion indicating a process of competitive exclusion. The use of the toxin from *E. splendens* could therefore have a negative effect on control if it were more toxic towards on *M. tuberculata* than to *B. glabrata*.

The aim of this study was to verify the effects of the latex of *E. splendens* on *M. tuberculata* collected in *B. glabrata* habitats at Porteira Verde valley in Sumidouro.

The authors dedicate this paper in honour of the Oswaldo Cruz Institute, on the occasion of the centenary of its foundation, May 25th 1900.

<sup>+</sup>Corresponding author. Fax:+55-21-560.6474. E-mail: cesarcs@gene.dbbm.fiocruz.br

Received 20 March 2000

Accepted 7 June 2000

## MATERIALS AND METHODS

The latex from *E. splendens* var. *hislopii* NEB [Sin. *Euphorbia milii* Des Moul. Var. *splendens* (Hook.) Ursh & Leandri (Carter 1994)] was extracted from cuts made on the trunk. The plants used were grown in experimental plots located in the Fiocruz campus. One ml of latex was diluted in 9 ml of distilled water. Fourteen different concentrations were prepared following the World Health Organization standard method of 1983 (0; 0.2; 0.4; 0.6; 0.8; 1; 2; 2.5; 3; 3.5; 4; 4.5; 5; 10 mg/l).

Four hundred twenty *M. tuberculata* snails from Sumidouro were used. Shell sizes varied from 16 to 27 mm in length. For each concentration two beakers each with 15 snails (experiment and replicate) were used to complete 30 snails per concentration. Exposure was for 24 h after which the number of snails apparently dead was noted and the solution was replaced by distilled water. After further 24 h, the number of the dead snails was again counted. No food was supplied during the experiment.

Lethal doses for 50% and 90% of the population (LD<sub>50</sub> and LD<sub>90</sub>) were obtained by Probit analysis, using the computer software of Finney (1971). Differences between replicas were verified using the chi-square test.

## RESULTS

After exposure to the molluscicide, many snails had retracted into their shells, especially at the highest concentrations used, and their mobility was reduced. However, after the recovery period many snails returned to normal behaviour.

Concentrations of 2 mg/l or higher triggered intense mucus production but no escape behaviour was observed. Mortality started to occur at concentrations of 2.5 mg/l. The LD<sub>50</sub> was 3.6 mg/l and the LD<sub>90</sub> was 6.2 mg/l. At the highest concentration (10 mg/l) there were no survivors (Fig. 1).

No significant differences were observed between replicas ( $\chi^2 = 8.31$ ; gl = 13;  $p > 0.05$ ).

## DISCUSSION

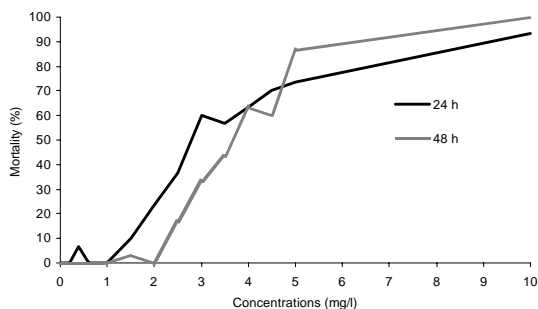
Mkoji et al. (1992) speculated that the use of molluscicide in areas where both *B. pfeifferi* and *M. tuberculata* occur would have negative effects on the control of schistosomiasis. The molluscicide would potentially affect the *M. tuberculata* population causing a diminution of the competitive pressure on the *Biomphalaria* sp. population. As a consequence, an increase in the *Biomphalaria* sp. population would be noted soon after the initial impact of the molluscicide.

However, the results obtained in this study demonstrate that this effect is not to be expected with

the use of the latex of *E. splendens*, at least with the studied populations. The LD<sub>90</sub> of 0.45 mg/l for the *B. glabrata* control (Vasconcellos & Schall 1986) is 13.8 times lower than LD<sub>90</sub> for *M. tuberculata*. Even the dosages used for the control of *B. glabrata* in the field are under the LD<sub>50</sub> encountered for *M. tuberculata* in the present study. So the utilization of the latex of *E. splendens* in areas where both *M. tuberculata* and *B. glabrata* are present, should not reduce the *Melanoides* population and might even have a synergetic effect in reducing the *B. glabrata* population.

The introduction of *M. tuberculata* as a control measure for *Biomphalaria* should be considered with caution (WHO 1984) since *M. tuberculata* is an intermediate host for other parasites especially *Paragonimus* spp. that can affect the human population (Pessoa & Martins 1982). The transmission of paragonomiasis occurs through the ingestion of raw infected crustaceans (a second intermediate host), a habit that is spreading among fishermen and near-shore populations that inhabit the Paraná and Rio Grande rivers (State of São Paulo) in Brazil. The probability of autochthonous cases in these areas is high (Vaz et al. 1986). Besides, the effect of *M. tuberculata* populations on the benthonic macroinvertebrate fauna and on other organisms is very little known in the neotropics.

To complement the results obtained experiments in the field at different times of the year are necessary.



Mortality (%) of *Melanoides tuberculata* after being exposed to the latex of *Euphorbia splendens* (var. *hislopii*) during 24 h, followed by 48 h recovery period in distilled water.

## ACKNOWLEDGEMENTS

To Valdinei Valim for the technical assistance and to Marisa S Soares, from the Biology Department, for the suggestions and criticism. To Dr Eric S Loker, from The University of New Mexico, for the relevant comments and for revision of the English version.

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