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Ultrastructure and morphometry of eggs of *Triatoma rubrovaria* (Blanchard, 1843), *Triatoma carcavalloi* Juberg, Rocha & Lent, 1998 and *Triatoma circummaculata* (Stål, 1859) (Hemiptera-Reduviidae-Triatominae)

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Abstract

This study analyzed the body and the operculum of eggs of *Triatoma rubrovaria*, *T. carcavalloi* and *T. circummaculata*, considered sylvatic species that live in sympatry.*Triatoma rubrovaria* is currently considered the most important vector of *Trypanosoma cruzi* in the rural areas of the state of Rio Grande do Sul, followed by *T.circummaculata*. Significant differences other than morphometry have been observed in the egg structures of the three species using traditional microscopy and scanning electron microscopy. *Triatoma circummaculata* eggs are smaller than those of *T.rubrovaria* and *T. carcavalloi*. The average number of perforations in corionic cells in the egg body is higher for the *T. rubrovaria*. The average number of perforations in the operculum cell is higher in *T. circummaculata*. This is the first morpho-structural description of *T. carcavalloi* eggs. These results widen the concept of these three species and create new subsidies for the entomological monitoring in areas in which these vectors may infest human living quarters.

Key words: Scanning electron microscopy, eggs, Triatominae, *Triatoma rubrovaria*, *Triatoma carcavalloi*, *Triatoma circummaculata*

Introduction

The historic context of Chagas disease in Rio Grande do Sul mentions eleven species recognized as vectors, including *Triatoma infestans* (Klug, 1834), as the main vector of the disease's etiological agent, *Trypanosoma cruzi*. This triatomine has been targeted by control measures and attempts at eradication, according to the campaign of Cone Sul Initiative (Vinhaes & Dias 2000, WHO 2002, Martins *et al.* 2006, Ceballos *et al.* 2011). After eradication measures against *T. infestans* in the state of Rio Grande do Sul, this vector was considered eliminated in June 2006, when the Brazilian Ministry of Health was granted the International Certification of Elimination of Chagas' Disease Transmission for this triatomine by the Pan-American Health Organization (Ferreira & Silva 2006, Schofield *et al.* 2006, Sonoda *et al.* 2010). Barata (1998) mentioned that while the vector is now eliminated, it is still necessary to continue studying these insects, in particular relatively little-known stages including the eggs. According to data obtained by the Brazilian National Health Foundation (Funasa) over the last 20 years during the Chagas Disease Control Program (PCDCH), *Triatoma rubrovaria* (Blanchard, 1843) (Fig.1–1) is now the most commonly captured triatomine in southern Brazil (Almeida *et al.* 2000, 2005). In spite of all efforts to control it, *T. infestans* still occurs in some towns in the northwestern, central, and southern areas of the state (Ruas-Neto & Corseuil 2002, Dias 2007, Sonoda *et al.* 2009).

According to Lent & Wygodzinsky (1979), the geographical distribution of *T. rubrovaria* in Brazil used to be concentrated in the states of Paraná and Rio Grande do Sul, but is currently restricted to the endemic area of

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The *Triatoma* genus presents high variability in the features of the eggs, "both at a macroscopic level as exochorial", characterized by hexagonal cells with indeterminate limiting lines and perforations of variable size and shape. This perforations is typically detected in ten species, including *Triatoma rubrovaria* (Barata, 1995).

This study confirms the general appearance of *T. rubrovaria*, *T. carcavalloi* and *T. circummaculata* eggs as typical for the *Triatoma* genus, and shows the existence of morphologic features which are quite different among the three species. This is the first morphologic and morphometric description of *T.carcavalloi* eggs.

In addition to the size difference among eggs of *T. rubrovaria*, *T. carcavalloi* and *T. circummaculata,* we observed two other morphologic differences among these three species. The number of perforations per egg cell of *T. rubrovaria* is higher than for *T. carcavalloi* and *circummaculata*, and these perforations on the exochorium of eggs and operculum of *T. rubrovaria* and *T. circummaculata* are distributed all over the cells, while in the case of *T. carcavalloi* the perforations are mostly concentrated in the central region of each cell.The texture of the exochorium of the *T. rubrovaria* and *T. carcavalloi* egg and operculum is similar to that of *T. maculata* and *T. brasiliensis*, as reported by Gonçalves *et al.* (1985) and Jurberg *et al.* (1986). The observations on the opercular limiting line of the three species assessed in this study are in accordance with the data obtained by Rosa *et al.* 2000 for *T. rubrovaria* and *T. circummaculata*.

According to Costa *et al.* (1997), different environmental conditions, such as available source of food, temperature and humidity may affect egg morphology directly or indirectly. However, this study did not consider different environmental conditions, as *T.rubrovaria* was found living in sympatry with *T. carcavalloi* and *T. circummaculata*.

Other than the chromatic and morphologic differences between *T. rubrovaria* and *T. carcavalloi* described by Jurberg *et al.* (1998) and of *T. rubrovaria* described by Rosa *et al.* (1999), this study identifies morphologic differences among the eggs that can be used to show that *T. rubrovaria*, *T. carcavalloi* and *T. circummaculata* are distinct species.

These results widen the specific concept of *T. carcavalloi* and provide another means for more specific monitoring of species that invade domiciliary ecotopes during the vector control campaigns run by the Health Agencies in the south of Brazil.

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