Reproductive Biology of *Triatoma brasiliensis* (Hemiptera, Triatominae) during the Imaginal Molt

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Abstract. The triatomines are vectors of the protozoan *Trypanosoma cruzi*, etiologic agent of Chagas disease. These insects are sexually active after the imaginal molt. Some aspects have been studied in *Triatoma brasiliensis* during the imaginal molt, such as autogeny in virgin females and the relationship between blood ingestion by fifth instar nymph and the realization of the imaginal molt. Thus, to aid in the understanding of reproductive biology and developmental physiology of these vectors, this article analyzes the spermatogenesis of *T. brasiliensis* during the imaginal molt. The analysis of the seminiferous tubules from males in the fifth instar during imaginal molt has demonstrated that *T. brasiliensis* has only a few spermatids and a plentiful quantity of sperm. Thus, we suggest that during imaginal molt the cell division is disrupted aiming to reduce energy costs and the differentiation into sperm is stimulated to ensure the paternity of the adult male.

Chagas disease is a potentially life-threatening illness caused by the protozoan parasite *Trypanosoma cruzi* and transmitted to humans by contact with feces of triatomine bugs, known as “kissing bugs.”¹ These vectors have a typical hemimetabolous life cycle, from eggs through five nymphal instars (N1, N2, N3, N4, and N5) to adult males and females. The transition from the fifth instar nymph to adult is named imaginal molt. During this process it occurs some corporal changes, such as the emergence of wings,² exocrine glands (metasternal and Brindley’s glands)^{3,4} and development of the reproductive system.^{5–8}

Some aspects have been studied in *Triatoma brasiliensis* Neiva, 1911 during the imaginal molt, such as autogeny in virgin females⁹ and the relationship between blood ingestion by N5 and the realization of the imaginal molt.¹⁰ This triatomine species is the most important Chagas disease vector in the Brazilian northeast.^{11,12} Thus, to aid in the understanding of the reproductive biology and developmental physiology of these vectors, this article analyzes the spermatogenesis of *T. brasiliensis* during the imaginal molt.

Five males in the fifth instar nymphs of *T. brasiliensis* were isolated and during imaginal molt their testicles were removed and fixed in methanol: acetic acid (3:1). They had been assigned by the “Triatominae Insectarium” within the Department of Biological Sciences, in the College of Pharmaceutical Sciences, at São Paulo State University’s “Júlio de Mesquita Filho,” Araraquara campus. The colony was formed from *T. brasiliensis* collected in intradomiciliary region of the municipality Olho d’Água, State of Paraíba, Brazil in the day April 17, 2008.

Seminiferous tubules were first shredded, smashed, and the microscope slides were set in liquid nitrogen. They were then stained with the lacto-acetic orcein cytogenetic technique.^{13,14} On the basis of the analysis of slides, it was observed that the N5 nymphs, during imaginal molt, have only one of the phases of spermatogenesis, that is, the spermiogenesis. This is repre-

sented by the presence of spermatids (Figure 1A–C) and sperm (Figure 1D).

Spermatogenesis is the process by which sperms are produced in the seminiferous tubules. It consists of three different phases: spermatocytogenesis, which is a phase of multiplication; meiosis, which is the division phase; and spermiogenesis, which is the differentiation phase.¹⁵

Perez and others,¹⁶ reported that in some cases fifth instar nymph have mature gonads. Mello and collaborators,¹⁷ analyzed fifth instar nymph of *Triatoma infestans* and observed the presence of spermatogonia, spermatocytes (metaphase), spermatids, and sperms. However, during imaginal molt of *T. brasiliensis* there are only a few spermatids and a plentiful quantity of sperm were observed, and we suggest that during imaginal molt, the cell division is disrupted aiming to reduce energy costs, and the differentiation into sperm is stimulated to ensure the paternity of the adult male.

There are some offensive mechanisms that increase the chances to ensure the paternity, such as the characteristics of the genitalia,¹⁸ the seminal fluid,¹⁹ and the courtship behavior.²⁰ Taking it into account, we suggest that the excessive

FIGURE 1. Spermiogenesis in *Triatoma brasiliensis*. Note the elongation of spermatids (A–C) and sperm (D). Bar: 10 μ m.

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increase of sperms during imaginal molt also increase the chances for the paternity.

Thus, we suggest that during the imaginal molt *T. brasiliensis* showed changes in the reproductive biology of development and physiology to decrease the energy cost, ensuring that the molt occur and mainly to increase the chance of paternity in adults. These results provide important information for understanding the biology of this important vector of the Chagas disease. However, we highlight that new species and a larger number of triatomines should be analyzed to characterize whether this phenomenon occurs in all species of Triatominae subfamily.

Received June 1, 2015. Accepted for publication October 12, 2015.

Published online January 19, 2016.

Financial support: The study was supported by Fundação de Amparo à Pesquisa do Estado de São Paulo (process numbers 2013/19764-0 - FAPESP, Brazil) and Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq, Brazil).

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