RESEARCH NOTE

Feeding and Defecation Patterns of Nymphs of *Triatoma rubrofasciata* (De Geer, 1773) (Hemiptera: Reduviidae), and its Potential Role as Vector for *Trypanosoma cruzi*

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Although *Triatoma rubrofasciata* is occasionally found naturally infected by *Trypanosoma cruzi* (AR da Silva 1983 *Trans R Soc Trop Med Hyg 77*: 568-569, RP Brazil et al. 1985 *Rev Soc Brasil Med Trop*: 257-260) it is not considered an important vector of Chagas disease. It is normally the vector of *Trypanosoma conorhini* which infects *Rattus rattus* since this insect is in close association with the rat. It is found mostly in port cities (H Lent & P Wygodzinsky 1979 *Bull Am Mus Nat Hist 163*: 125-520) and the knowledge on its biology is still scarce.

Aiming at understanding the role of this species in the transmission of Chagas disease, the feeding and defecation patterns of nymphs of each instar were observed.

The eggs and nymphs were separated from a colony maintained in the Laboratory of Biology and Control of Vector Insects, Oswaldo Cruz Institute. As soon as the hatchings occurred, or 5 to 10 days after molting, the nymphs were separated and fed individually on Swiss mouse. The mouse was immobilized in a nylon mosquito net "sandwich", put in a wide glass container, and the nymphs were allowed to search for the food source for a maximum period of 2 hr. The following parameters were observed for all instar nymphs: time spent to begin feeding, duration of feeding, number of interruptions during feeding and number of times that the nymphs eliminated a dark excreta and a clear excreta during and soon after feeding. The data were statistically analyzed by the Kruskal-Wallis one-way test and the Chi-square test (S Siegel 1956 *Nonparametric Statistics for the Behavioral Sciences*, McGraw-Hill, New York, 350 pp).

In all instars more than 70% of the nymphs spent less than 10 min to begin feeding after being placed in the glass container, although some of them, from 1st to 4th, have spent more than 20 min. Among these, the major percentage occurred in the 2nd instar (20%) and the lesser in the 1st (7%). All 5th instar nymphs began feeding before 20 min after being placed in the container. With exception of the 3rd instar, approximately 60% of the nymphs from 1st, 2nd, and 4th instars and 90% from the 5th instar spent more than 15 min feeding. More than 50% of the nymphs from the 1st to the 4th instar and 35% from 5th instar did not interrupt feeding.

Comparing the results for all instars shown in Table I, the statistical analysis was significantly different for the duration of feeding ($H=20.5$, $P<0.05$). The time spent to begin feeding and the number of interruptions during feeding did not show any statistical difference ($H=2.1$, $P>0.05$ and $H=1.3$, $P>0.05$, respectively). However, some discrepancies occurred. In the 2nd instar, one nymph spent 54 min to begin feeding and only 17 min to feed and in the 3rd instar, a nymph spent 39 min to begin and only 11 min to feed.

Table II shows the percentages of nymphs that eliminated the dark and clear excreta during or soon after feeding. The percentages of defecation during feeding were very low (maximum of 5% in the 5th instar) and defecation soon after feeding on or near the host were lower than 10% in all instars. However, approximately 90% of the nymphs from 1st, 2nd and 3rd instars, 100% from 4th instar and 80% from 5th instar eliminated the excreta far from the food source, a long time after having finished feeding. The nymphs more often eliminated a clear excreta during or soon after feeding. The statistical tests did not show any difference among the instars ($c^2=2.1$, $P>0.05$; $c^2=3.4$, $P>0.05$ and $c^2=3.3$, $P>0.05$, respectively); the only statistical difference occurred among those that eliminated a clear excreta after feeding ($c^2=12.4$, $P<0.05$).

According to SF Wood (1951 *J Econ Entomol 44*: 52-54) the successful contaminative transmis-

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TABLE I

Time to begin feeding, duration of feeding and number of interruptions in feeding from nymphs of *Triatoma rubrofasciata*

Instar	No. of nymphs	Time to begin feeding (min)		Duration of feeding (min)		No. of interruptions	
		Min	Max	Min	Max	Min	Max
1st	30	1	27	8	53	0	8
		(7.6 ± 6.7)		(19.9 ± 9.9)		(1.0 ± 1.7)	
2nd	30	1	54	7	26	0	5
		(11.0 ± 11.1)		(16.1 ± 5.6)		(0.9 ± 1.3)	
3rd	22	1	39	2	38	0	6
		(8.6 ± 9.4)		(14.5 ± 9.9)		(0.9 ± 1.4)	
4th	21	1	52	3	64	0	10
		(10.7 ± 13.4)		(19.4 ± 12.8)		(1.5 ± 3.1)	
5th	20	2	19	10	43	0	3
		(7.3 ± 5.0)		(24.9 ± 8.2)		(1.0 ± 0.9)	

Min: minimum; Max: maximum; means and standard deviations are in parenthesis.

TABLE II

Percentages of nymphs of *Triatoma rubrofasciata* that eliminated dark and clear excreta during and soon after feeding

Instar	No. of nymphs	Dark excreta		Clear excreta	
		During (%)	Soon after (%)	During (%)	Soon after (%)
1st	30	3	7	7	0
2nd	30	3	7	13	20
3rd	22	0	9	0	9
4th	21	0	0	0	5
5th	20	5	15	10	5

sion of *T. cruzi* is dependent on several circumstances among them the creation of a bite wound by feeding of the triatomine and its contamination with infective feces or its defecation on or near moist mucous membranes of the host. Then, defecation timing of the triatomine vectors of *T. cruzi* directly affects the transmission possibility of this protozoa to mammal hosts (EV Trumper & De Gorla 1991 *Trans R Soc Trop Med Hyg 85*: 800-802). This fact has led several scientists to study the feeding and defecation patterns of the principal potential vector species of Chagas disease. However, according to J Piesman and IA Sherlock (1983 *Acta Trop 40*: 351-358), other factors like the domiciliary density, the affinity with the host, and the degree of adaptation to the human dwellings are also epidemiologically important for the determination of this potential.

The more time is spent on feeding, the more blood is ingested and better are the chances that the nymphs become infected. It would be expected that nymphs from the 1st and 2nd instars, because of their smaller size, spent less time feeding than those from the 4th and 5th instars. However, the mean time that the nymphs of *T. rubrofasciata* from the 1st instar spent during feeding was similar to that of the 4th instar. All instars spent more than 15 min feeding, except the 3rd instar.

According to HC Bennet-Clark (1971 *J Ins Physiol 8*: 589-592, *apud* VLF Brasileiro 1974 *Rev Brasil Entomol 18*: 43-50) there is a noticeable variability in the duration of feeding among triatomines of the same species. In fact, our results demonstrated a great variability in this parameter: whereas some nymphs fed for almost 1 hr, others spent less than 10 min to complete the engorgement. E Dias (1956 *Mem Inst Oswaldo Cruz 54*: 115-124) observed that the mean time that several species of triatomines spent during feeding varied from 14.2 min to 26.8 min, and that one species is more sensitive to the movements of the host than other. However, this author states that this sensitivity is counterbalanced by the quickness in feeding, since in nature it should not be easy to feed during long periods. In our observations, *T. rubrofasciata* demonstrated that if the mouse moved more, the nymphs tended to interrupt food intake more times and, consequently, it

spent more time feeding. For instance, one nymph of 1st instar made eight interruptions and consequently fed during 53 min. Some of them, after interrupting one or more times, simply did not restart feeding, even after a long period. However, most of the nymphs did not interrupt feeding.

Rhodnius pictipes would be considered a good vector as it was observed that most of them defecate on the host soon after feeding (DS Rocha et al. 1994 *Mem Inst Oswaldo Cruz 89*: 265-270), but this species is still considered sylvatic or peridomiciliated, a factor that decreases its potential as a Chagas disease vector. However, *R. prolixus* is considered an excellent vector since it defecates more times during or soon after feeding, and it is totally adapted to human dwellings in some South-American countries. On the other hand, several other triatomine species are considered poor vectors since they prefer to defecate far from the host. In our observations, *T. rubrofasciata* rarely defecated during feeding and this occurred mostly far from the host, a long time after feeding; so it can be considered a poor vector for *T. cruzi*, although it is close to man and other animals.