Triatoma infestans is More Efficient than *Panstrongylus megistus* in Obtaining Blood Meals on Non Anaesthetized Mice

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We compared the influence of bug density in the capacity of Triatoma infestans *and* Panstrongylus megistus *in obtaining blood meal in non anaesthetized mice. The regression analysis for increase in body weight (mg) versus density (no. of bugs/mouse) showed that in experiments with anaesthetized mice (AM), no correlation was observed. In experiments with non anaesthetized mice (NAM) the weight increase was inversely proportional to density. The regression slope for blood meal size on density was less steep for* T. infestans *than for* P. megistus *(-1.9 and -3.0, respectively). The average weight increase of* P. megistus *nymphs in experiments with AM was higher than for* T. infestans *nymphs; however, in experiments with NAM such results were inverted. Mortality of* P. megistus *was significantly higher than that of* T. infestans *with NAM. However, in experiments with AM very low mortality was observed. Considering the mortality and the slope of regression line on NAM,* T. infestans *is more efficient than* P. megistus *in obtaining blood meal in similar densities, possibly because it caused less irritation of the mice. The better exploitation of blood source of* T. infestans *when compared with* P. megistus *in similar densities, favours the maintenance of a better nutritional status in higher densities. This could explain epidemiological findings in which* T. infestans *not only succeeds in establishing larger colonies but also dislodges* P. megistus *in human dwellings when it is introduced in areas where the latter species prevails.*

Key words: *Triatoma infestans* - *Panstrongylus megistus* - Triatominae - blood meal - non anaesthetized host

Usually the number of triatomine bugs inside humans dwellings is related to the number of persons available as sources of blood, since nutritional status of the bugs depends on the number of insects per host (Schofield 1980a,b). It has been demonstrated that the average amount of blood taken by *Triatoma infestans* and *Pantrongylus megistus* from non anaesthetized hosts is inversely proportional to insect density (Schofield 1982, Piesman et al. 1983). An increase of insect density causes a higher perception of bites suffered by the host, which probably diminishes the blood meal size due to more frequent interruptions in the blood intake (Schofield et al. 1986). Such reduction in blood intake leads to prolonged nymphal development time, reduced egg laying and increased dispersive flight by adult bugs, and together such events act to regulate the insect population density (Schofield 1985).

Both *T. infestans* and *P. megistus* develop large colonies in human dwellings, but *T. infestans* is usually more successful forming larger colonies and prevailing inside human dwellings even in areas originally colonized by *P. megistus* (Schofield 1994). The aim of the present work was to compare the influence of bug density in the capacity of *T. infestans* and *P. megistus* in obtaining blood meals from non anaesthetized mice (NAM).

MATERIALS AND METHODS

Triatomines bugs were reared and maintained in an insectary at 27 ± 2°C and 60-70% relative humidity. For the experiments third instar nymphs obtained from second instars fed on chickens and starved for 29 days were used. Each group of 8, 15, 30 or 45 third instar *T. infestans* or *P. megistus* were placed separately in cages (25,0 x 17,5 x 9,5 cm) to feed on three NAM (for 24 hr at 26-27°C, 12 dark, 12 light) or on three anaesthetized mice (AM) (for 2hr at 26-27°C, light). The Swiss mice (20-25g) were laid on a perforated wooden platform (24,0 x 17,5 x 3,5 cm) fitted over each cage, so that triatomines were able to pass freely through the holes. Such mice had never had previous contact with bugs and were kept under experimental conditions for at least 8 hr in advance. During the experiment, NAM received food and water *ad libitum*. The anaesthetic used was Thionembutal at 4 mg/100g weight. Cages were protected to avoid bug es-

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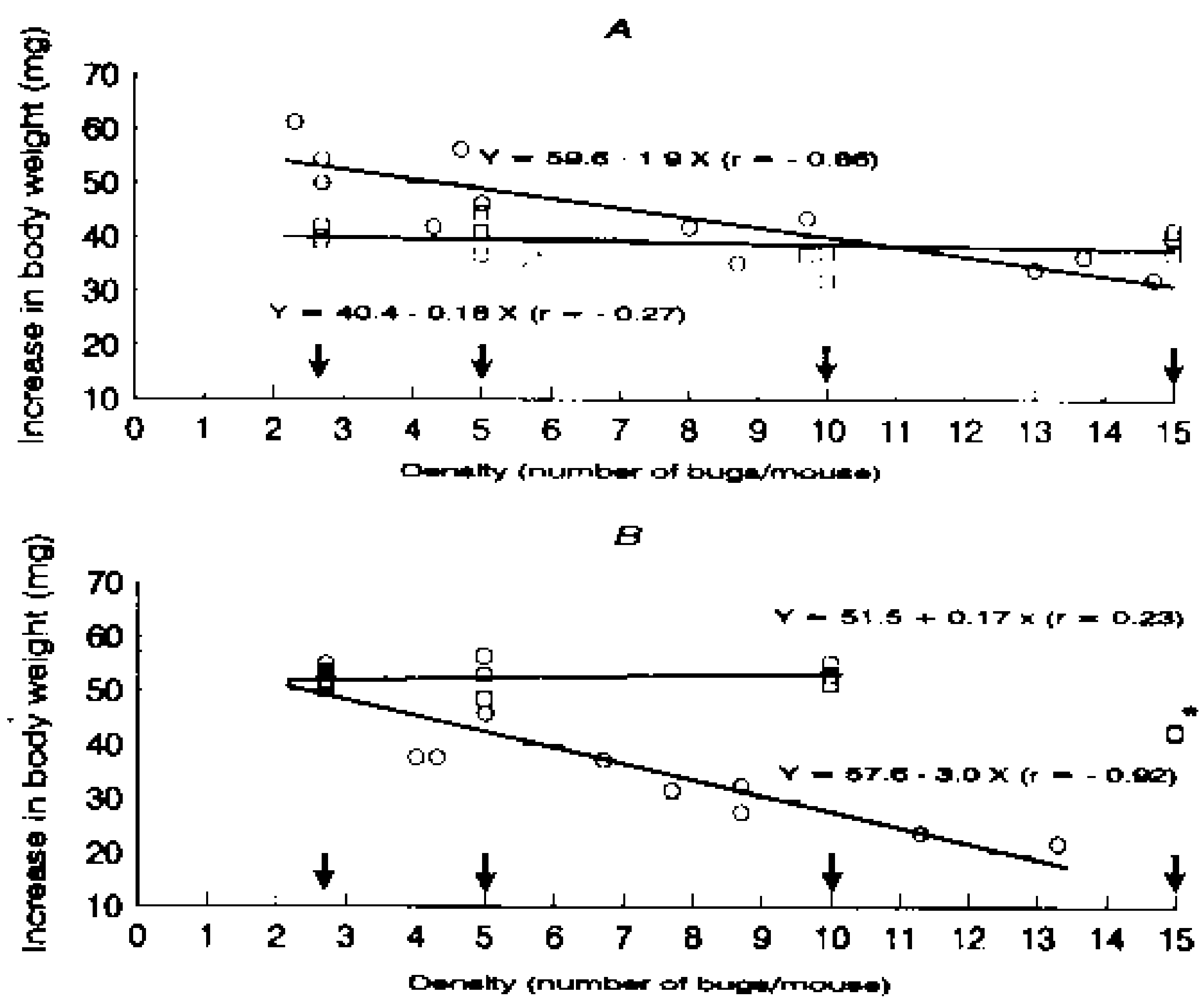
cape. Insect weight was recorded before and after each experiment done in triplicate. Density was worked out based on the number of live bugs remaining in cages at the end of experiment.

RESULTS

The regression analysis for increase in body weight (mg) versus density (number of bugs/mouse) (Fig.) showed that in experiments with anaesthe-tized mice, no correlation was observed between weight increase and density (r = - 0.27 for *T. infestans* and r = 0.23 for *P. megistus*). In experiments with non anaesthetized mice the weight increase was inversely proportional to density (r = - 0.86 for *T. infestans* and r = - 0.92 for *P. megistus*). The regression slope of *T. infestans* weight increase with NAM was less steep that that for *P. megistus* (- 1.9 and - 3.0, respectively) demonstrating that for an increase in density of one triatomine/mouse an estimated loss of average weight gain of 1.9 mg for *T. infestans* and a loss of 3.0 mg for *P. megistus* was observed. The regression slope for *P. megistus* and NAM was always below that obtained with AM. In contrast, the slope for *T. infestans* with NAM was above that for AM up to the density of 11.48 triatomine/mouse (point of intersection). The average weight increase of *P. megistus* nymphs in experiments with AM was higher than for *T. infestans* nymphs, but in experiments with NAM such results were inverted.



Regression line of average weight increase (mg) versus density (no. of triatomine/mouse) obtained with anaesthetized (□) and non anaesthetized (O) mice. *A*: regression lines for *Triatoma infestans B*: regression lines for *Panstrongylus megistus* . Arrows indicate densities at the beginning of experiment.
* Density points at 15 bugs/mouse were excluded from regression line because they were statistically different from the others (ANOVA, p<0.01). This difference is probably due to exhaustion of blood source available for the triatomines.

Mortality rate of triatomines with NAM in same density groups was variable for both *T. infestans* and *P. megistus.* Nevertheless, mortality showed an increasing trend with density for both species, but this trend was not significant for *T. infestans* (Table). Total mortality of *P. megistus* in experiments with NAM was significantly higher (χ^2, p<0.01) than that obtained with *T. infestans* (61 and 26, respectively). In experiments with AM, a very low mortality rate was observed with *T. infestans* (0.3%) and no mortality was observed with *P. megistus.*

TABLE

Mortality of *Triatoma infestans* and *Panstrongylus megistus* observed at different densities (no. of triatomines/mouse) with anaesthetized (AM) or non anaesthetized (NAM) mice

Bugs density (d)	Total no. of bugs	Mortality with AM				Mortality with NAM			
		T. infestans		*P. megistus*		*T. infestans*		*P. megistus*	
		no.	%	no.	%	no.	%	no.	%
2.7	24	0	0	0	0	1(0-1)^a	4.2	0^b	0
5.0	45	0	0	0	0	3(0-2)^a	6.7	5(0-3)^c	11.1
10.0	90	1(0-1)	1.7	0	0	11(1-6)^a	12.2	21(4-10)^d	23.3
15.0	135	0	0	0	0	11(1-6)^a	8.2	35(5-19)^e	25.9
Total	294	1	0.3	0	0	26	8.8	61	20.8

( ) = Range
Fisher's exact test: a = p>0.05; $b \neq d, e$; $c \neq e$

DISCUSSION

The difference in regression line profile between experiments with AM and NAM (Fig.) suggests that the loss of average weight gain with insect density increase observed in experiments with NAM is related to perception of the bug by the mouse. When density is increased, there are more individuals that are able to provoke perception on host with non attenuated sensorial activity.

Insect deaths in the NAM experiments were probably due to mice since it was practically irrelevant in experiments with AM. Mortality was higher with density increase in experiments with *P. megistus*, and although not significantly different with *T. infestans*, it presented higher rates at higher insect densities (Table). Because in experiments with NAM, difference in regression slope and in total mortality between the two species studied were observed, the idea is reinforced that these two parameters reflect, indirectly, the intensity of perception that a given species of triatomine provokes in a non anaesthetized host. Considering these two parameters, *T. infestans* is more efficient than *P. megistus* in obtaining blood meal on NAM, probably because it caused a lower perception on mice, during the process of feeding. This lower perception to *T. infestans* allows a better exploitation of blood source when compared with *P. megistus* in similar densities, favoring the maintenance of a better nutritional status in higher densities. So being, the mechanisms related with density regulation would appear later, which would be of great advantage in a direct competition between these two species. This would explain epidemiological findings in which *T. infestans* not only succeeds in establishing larger colonies but also dislodges *P. megistus* in human dwellings when it is introduced in areas where the latter species prevails (Schofield 1994).

Another implication of the better exploitation of blood resource by *T. infestans* is related with dynamics of defaection and consequently with transmission of *Trypanosoma cruzi*. According to Trumper and Gorla (1991) defaection timing depends both on triatomine species and on the size of blood intake, because bugs with higher blood intake tend to defaecate quicker than bugs that take a small blood meal. It is probable that when compared with *P. megistus*, *T. infestans* presents lower reduction of its vectorial ability with density increase due to a smaller reduction of blood meal size.

Presumably small differences in perception during the process of feeding may not be such an important factor in wild ecotope where triatomines are found in small densities (Forattini 1980). However, in dwellings where very high densities may be observed (Dias & Zeledón 1955, Rabinovich et al. 1979) difference in perception may determine an important modification in exploitation of blood source affecting both populational dynamics and vectorial ability of bugs.

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