

PRELIMINARY INVESTIGATIONS ON TRANSMISSION AND LIFE CYCLE OF THE EAR MITES OF THE GENUS *RAILLIETIA* TROUESSART (ACARI: GAMASIDA) PARASITES OF CATTLE

ARLINDO LUIS DA COSTA; RÔMULO CERQUEIRA LEITE\* & JOÃO LUIZ HORACIO FACCINI\*\*

EMBRAPA-UEPAE, Caixa Postal 392, 69990-900, Rio Branco, AC, Brasil \*Escola de Veterinária, UFMG, Caixa Postal 576, 31161-970 Belo Horizonte, MG, Brasil \*\*Departamento de Biologia Animal, UFRRJ, km 47 da antiga Rio-São Paulo, 23851-970 Seropédica, RJ, Brasil

*The life cycle of ear mites of the genus Raillietia Trouessart consists of egg, larva, proto- and deutonymph and adult. The proto- and deutonymph are free living, non feeding instars. The teneral adult is the transfer stage. The minimum period required for completion of the life cycle is approximately eight days.*

Key words: *Raillietia* – ear mites – cattle – life cycle

Cattle is the host for two synhospitalic species of *Raillietia* Trouessart, *R. auris* (Leidy) and *R. flechtmanni* Faccini, Leite and Costa in Brazil. Data on host parasite relationships is limited and refers only to *R. auris*. Available biological information shows that the stages of egg, larva and adult have always been collected from naturally infested hosts (Fonseca & Faccini, 1985; Leite, 1989; Costa, 1990); the occurrence of nymphs have been reported in few cases (Menzies, 1957; Nunes et al., 1975; Oliveira, 1978). *In vitro* studies of the life cycle have revealed the presence of the proto- and deutonymph (Fonseca & Faccini, 1985).

Concerning the mode of transmission, two hypotheses have been put forward. Radovsky (1985), based on field collected data, has inferred the larva as a probable transfer stage between hosts since it is the most active and suitable stage for locomotion outside the host. However, Fonseca & Faccini (1985) have hypothesized the teneral adult – adult before feeding and mating, to be the transfer stage. According to them the teneral adult is most active than the larva and has the longest survival time of the life cycle.

#### MATERIALS AND METHODS

Calves used in these experiments were either of Nelore or Guzera (*Bos indicus*) breeds over six months of age. These breeds have been chosen because of the prevalence and the intensity of

infestation are higher in comparison with others breeds of cattle in Brazil (Leite, 1989). In the course of the experiments all calves were kept on pastures to avoid interference with husbandry practices of the farm; beef cattle of zebu type are never housed in Brazil. All calves have their ear canals flushed with water 24 h prior experimental infestation to make sure they were negative for ear mites (Leite et al., 1989).

Mites were obtained by *in vitro* rearing of field collected larvae according Fonseca & Faccini (1985).

Experimental infestation was accomplished by brushing off mites from a vial either into the ear canal or on the poll, after calves have been properly secured.

Identification of mites has not gone beyond genus level due to impossibility of recognizing live developmental stages of both species. Sex has not been determined as well due to impossibility of sorting out the fast moving teneral adults.

*Experiment 1* – Twelve calves were infested with approximately 20 teneral adults in each ear canal (40 mites per calf). Calves were sequentially examined, one at a time, at 12 h interval so that the first and last examinations were done, respectively, 12 h and 240 h (10 days) post infestation. Eight calves were used as control with two calves being examined at 36 h (1 1/2 days) interval. Three additional calves were infested as above (12 mites per calf) and examined 240 h (10 days) post infestation. Two calves were used as control.

TABLE

Results of experimental infestation of cattle with species of *Raillietia* Trouessart

Place	No. calves infested	Hours post infestation	Stages recovered
Ear canal (40 mites/host)	05	12 to 36	57 teneral adults
	02	72 to 84	9 males, 24 females
	05	96 to 144	18 males, 60 females
(12 mites/host)	03	240	26 larvae, 4 eggs
Poll			males, females, eggs larvae <sup>a</sup>
(12 mites/host)	02	72	males, females <sup>a</sup>

a: number not determined.

*Experiment 2* – Two calves were infested with 12 teneral adults on the poll and examined 72 h (three days) post infestation. Two calves were used as control.

*Experiment 3* – Approximately 150 heads of beef cattle of Zebu type (Nelore and Guzera) were left to stay overnight in a paddock. A sample of pasture of approximately 1 kg was taken on and around the “sleeping” place at 5:00 AM of the next day. A total of ten samples were taken at seven days interval and processed as follow: each sample was clipped to about 1/3 high of the pasture floor and immediately placed into plastic bags. In the laboratory, samples were washed in water with detergent in plastic containers. After a settling period of 2 h, the supernatant was poured off, the residue filtered through a sieve of 250 µm. Mites were examined under a phase contrast microscope for life stages identification.

#### RESULTS

All infested calves in the Experiments 1 and 2 had mites in their ear canals by the time of examination as shown in Table. Only adult mites were seen from 12 to 84 h (3 1/2 days) post infestation. During this period a steady increase in size and colour change from translucent to white opaque have been observed, suggesting that mites have fed. Eggs, larvae and engorged females and males were always seen from 96 to 240 h (4 to 10 days) post infestation. Nymphs were never seen in any of the infested calves.

The two infested calves in Experiment 2 had only adult mites in their ear canals 72 h (3 days) post infestation.

All control calves in both Experiments 1 and 2 were negative.

In Experiment 3, five out of ten samples (50%) were positive for mites. Two samples have yielded three teneral adults, two samples yielded three adult females and one sample yielded one protonymph encased in a larval exuvia.

#### DISCUSSION

Results of Experiments 1 and 2 have clearly shown that the teneral adult of the ear mites of the genus *Raillietia* are able to crawl into the ear canals, feed and mate, so that the life cycle can progress to the next generation. These data strongly support the hypothesis posed by Fonseca & Faccini (1985). In their *in vitro* studies they have also shown that all immature stages were short lived with none over two days. If one accepts that *in vitro* and *in vivo* life cycle of mites of the genus *Raillietia* are similar, the protonymph would be expected to appear in Experiment 1 from 96 h (4 days) post infestation. Absence of nymphs in Experiment 1, collection of one protonymph encased in a larval exuvia from pastures in Experiment 3 and absence of nymphs in recent extensive surveys of ear mites in cattle in Brazil (Fonseca & Faccini, 1985; Leite, 1989; Costa, 1990) strengthen the case in favor of the existence of free living, non feeding proto- and deutonymphs. A tentative digrammatic representation of the life cycle of the species of *Raillietia* that parasitize cattle is shown in the Figure. The teneral adult is the dispersal stage. After seeking a new host the teneral adults crawl into the ear canal, feed, mate and female oviposits. Eclosion of larvae occur in the

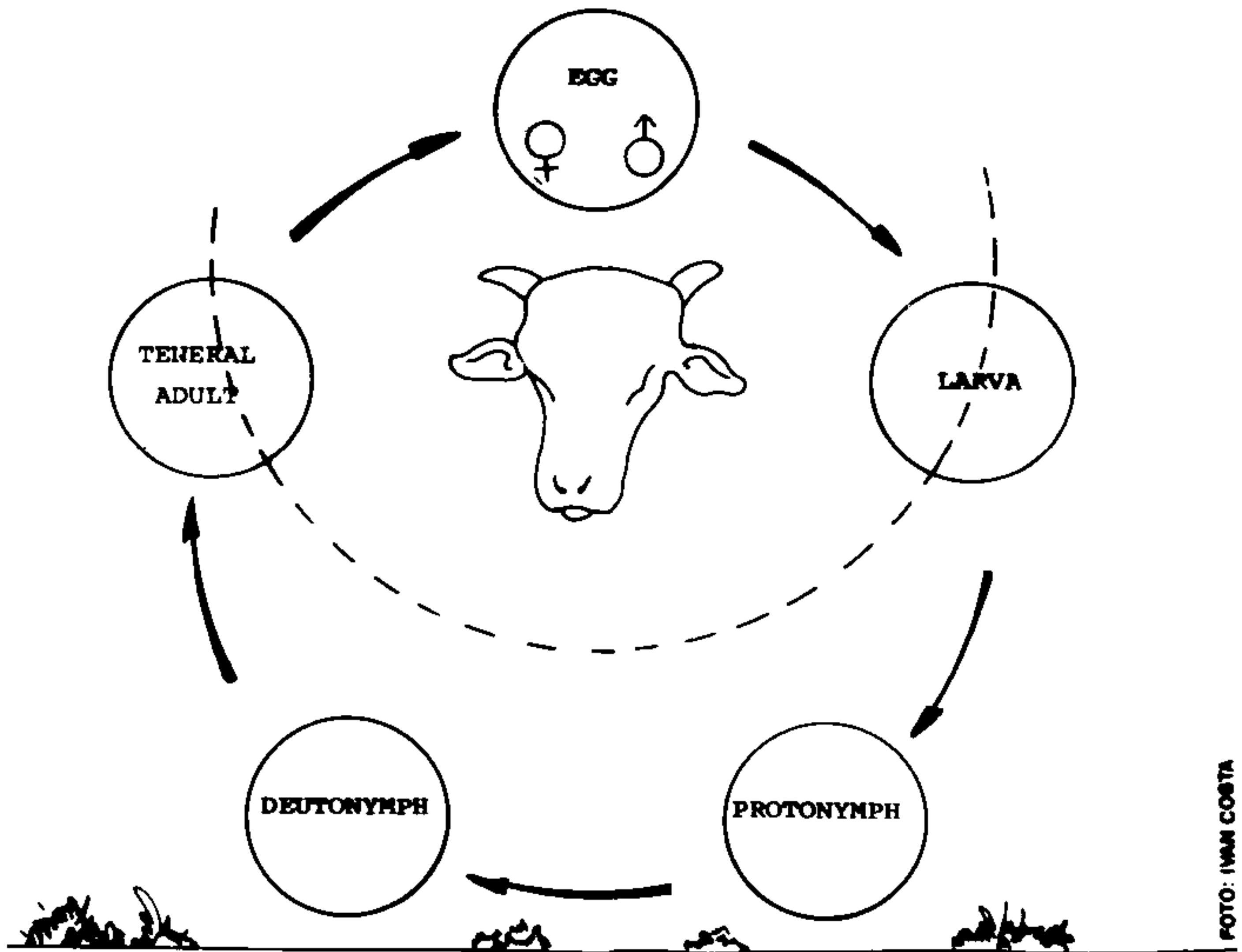


FOTO: IVAN COSTA

Diagrammatic representation of the life cycle of species of *Raillietia* Trouessart parasites of the ear canals of cattle. Dashed line divides the parasitic from free living phases of the life cycle.

ear canal. After feeding the larvae leave the host for molting to protonymph in the environment. The minimum period required from infestation with teneral adult to eclosion of larva was 96 h (4 days) as observed in Experiment 1. If we add four to five days required for *in vitro* progress from larva to teneral adult (Fonseca & Faccini, 1985), the minimum period required for the life cycle of the ear mites of cattle to be completed might be estimated in eight days.

Early reports of nymphs in naturally infested cattle should be viewed as a probable misidentification of both nymphs and the teneral adults.

Absence of mites in all control calves discard any possibility of an accidental contamination in the course of Experiments 1 and 2, despite of both infested and free calves being kept on the same pastures.

Collection of three adult females from pastures in Experiment 3 is apparently a puzzle situation. Although the morphology of adult

mites is not suitable for locomotion outside the host as already pointed out by Radovsky (1985), one might speculate that dislodgment of some specimens due to crowding might occur in highly infested hosts. Adult mites have also been seen by one of the authors (RCL) crawling off the ear canals of heavily infested dead hosts.

#### ACKNOWLEDGEMENTS

To Dr Renato A. Cardilho, Meat Inspector at The Nilópolis Abattoir, State of Rio de Janeiro for the use of abattoir facilities and to Dr João B. Pinto, Head of The Dept. of Animal Production, UFRRJ for assistance in examining the animals.

#### REFERENCES

- COSTA, A. L., 1990. *Alguns aspectos bioecológicos de Raillietia Trouessart, 1902 (Acari: Gamasida) principal agente da Otocariase dos bovinos*. D. Thesis, UFRRJ, 73 p.
- FONSECA, A. H. & FACCINI, J. L. H., 1985. *In vitro* development of *Raillietia auris* (Leidy, 1872)

- (Acarina: Mesostigmata). *Acarologia*, 26: 211-214.
- LEITE, R. C., 1989. *Raillietiose Bovina* D Sc. Thesis, UFRRJ, 24 p.
- LEITE, R. C.; FACCINI, J. L. H. & COSTA, A. L., 1989. Avaliação de uma técnica *in vivo* para medir a infestação por ácaros do gênero *Raillietia* Trouessart (Acari) em bovinos. *Mem. Inst. Oswaldo Cruz*, Rio de Janeiro, vol. 84, supl. IV, 309-311.
- MENZIES, G. C., 1957. The cattle ear mite *Raillietia auris* (Leidy, 1872) in Texas. *J. Parasitol.*, 43: 200.
- NUNES, I. J.; MARTINS JR., W.; NUNES, V. A. & LEITE, R. C., 1975. Ocorrência de *Raillietia auris* (Leidy, 1872) Trouessart, 1902 (Acari: Mesostigmata) em bovinos da região geo-econômica de Brasília, DF., *Arq. Esc. Vet. UFMG*, Belo Horizonte, 27: 375-383.
- OLIVEIRA, G. P., 1978. *Raillietia auris* (Leidy, 1872) Trouessart, 1902 (Acari: Mesostigmata) em bovinos do Estado de São Paulo. *Arq. Esc. Vet. UFMG*, Belo Horizonte, 30: 307-310.
- RADOVSKY, F. J., 1985. Evolution of Mammalian Mesostigmatid Mites, p. 441-504. In K. C. Kim, ed., *Coevolution of Parasitic Arthropods and Mammals*, John Willy & Sons, NY, USA.

#### NOTE ADDED IN PROOF

Research conducted since the submission of this paper has shown that all eggs laid *in vitro* are infertile. However, when females give birth to a full developed larva the life cycle proceeds to the next stage. Based on these data and on observations on many females containing full developed larvae in natural infestations, one may conclude that the species of *Raillietia* which parasitize cattle are larviparous.