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Previous volumes (2010-2015): 250 € / year (4 issues)
Acarologia, CBGP, CS 30016, 34988 MONTFERRIER-sur-LEZ Cedex, France

The digitalization of Acarologia papers prior to 2000 was supported by Agropolis Fondation under the reference ID 1500-024 through the «Investissements d’avenir» programme (Labex Agro: ANR-10-LABX-0001-01)

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IN VITRO DEVELOPMENT OF RAILLIETIA AURIS (LEIDY)
(ACARINA: MESOSTIGMATA) 1

BY A. H. DA FONSECA 2 and J. L. H. FACCINI 3

ABSTRACT. — Field-collected and in vitro-reared larvae of Raillietia auris (Leidy) completed life cycles in 4-5 days at 30 ± 1°C and 80-90 % R. H. The developmental series of egg, larva, protonymph, deutonymph, and adults (male and female) were completed without feeding. Motility and survival of teneral adults are discussed in relation to host-to-host transmission.

RESUMO. Larvas de Raillietia auris (Leidy) coletadas de bovinos e eclodidas in vitro evoluiram até adulto, sem se alimentarem, em 4-5 dias a 30 ± 1°C e 80-90 % H. R. Os estágios de ovo, larva, protonífa, deutonífa e adulto (macho e fêmea) estão presentes no ciclo, in vitro. Mobilidade e período de sobrevivência dos adultos jovens são discutidos em relação a transmissão entre hospedeiros.

ÉLEVAGE CYCLE VITAL STADE DE DISPERSION RAILLIETIA AURIS

Four of the five species of Raillietia Trouessart are parasites of the external ear canal of ruminants. R. auris (Leidy) is a cosmopolitan parasite of cattle; R. caprae Quintero, Bassols, and Acevedo occurs in New World and Australian goats and in sheep in Brazil (FONSECA et al., 1983); two species are known from wild African ruminants; and the fifth species is restricted to the Australian wombat.

Biologies of Raillietia species are poorly known. Life history observations of natural infestations always include eggs, larvae, and adults (males and females); the presence of nymphal instars is controversial. MENZIES (1957), NUNES et al. (1975), and OLIVEIRA (1978) reported field-collected nymphs; in a recent survey including 12,726 specimens of R. auris collected from 297 cattle from northern to southern Brazil, nymphs were never discovered (FONSECA, unpubl.).

In collections from natural infestation of the

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closely related halarachnine parasites of respiratory tracts of mammals, nymphs are rare or absent (Kim, 1980; Kim et al., 1980; Fay and Furman, 1982). In vitro rearing of field-collected larvae of *Pneumonyssus simicola* Banks and species of *Orthohalarachne* Newell have yielded proto- and deutonymphs when kept submerged in physiological saline (Hull, 1956; Furman and Smith, 1973; Furman et al., 1974).

Attempts to culture *R. auris* submersed in saline and on gauze soaked with saline have failed. However, mites maintained in “dry” test tubes plugged with saline-moistened cotton were successfully reared; the results are reported herein.

**MATERIALS AND METHODS**

Specimens of *R. auris* were obtained by washing the ear canals of recently slaughtered cattle with physiological saline. Sixty ml of saline was introduced deep in the canals using a 20 ml disposable syringe with a 10 cm intramammary needle. Washings containing mites, cerumen, and debris were poured in glass containers (commercial baby food jars), allowed to settle, and the supernatants discarded. Closed jars were transported from the field partially immersed in warm tap water. In the laboratory, 10 larvae or 10 females were transferred to 30 x 200 ml test tubes which were then plugged with hydrophilic cotton moistened in physiological saline and placed in a controlled environment (30 ± 1°C and 80-90% R. H.). Twenty-three tubes of larvae (N = 230) and 10 tubes of females (N = 100) were prepared; daily observations were made with a dissecting microscope.

**RESULTS**

Only 16 larvae were produced by the 100 females placed in test tubes whereas at the beginning of the life cycle studies, there were 230 larvae in test tubes from field-collected materials. In both tests, all individuals developed in the normal sequence, that is, protonymph, deutonymph, and male or female. The progression from larva to adult which required about 5 days was without food. In comparing the success rate of the two tests, 230 larvae produced 208 adults (90%); the 16 larvae produced 13 adults (80%).

All immature stages were short with none over 2 days. Survival of the adults reared from field-collected larvae appeared to be longer (X = 14 days, Range = 2-32 days, N = 208) that those reared from larvae eclosed in the laboratory (X = 10 days, Range = 2-24 days, N = 13). Teneral adults were more active than any of the immature stages.

This is the first successful in vitro culturing of a *Raillietia* species. Nymphal instars were determined by the number of setae on the palp trochanter (1 in PN, 2 in DN) and by the pairs of sternal setae (3 in PN, 4 in DN) (see Figs. 1-4).

**DISCUSSION**

The capacity of *R. auris* for completing the life cycle in vitro without feeding is intriguing. Field-collected and in vitro eclosed larvae are able to progress to the adult stage equally well, without food. However, in comparing larvae from the two sources, those taken from the ears of cattle appear to have fed (large, gut filled with white and opaque material); lab-reared larvae are small and translucent.

The acceleration of the life cycle with reduced feeding have evolved in several parasitic Mesostigmata. Furman (1966) listed three developmental feeding patterns for these mites. A fourth pattern may be: feeding larva, nonfeeding proto-and deutonymphs, and feeding adults. Examples of the latter pattern might be *Pneumonyssus simicola*, *Orthohalarachne attenuata* (Banks), and *O. diminuata* (Doetchmann) (Furman and Smith, 1973; Furman et al., 1974), and *R. auris*. Until the nymphal instars are field collected, the fourth pattern can only be suggested.

The failure of *R. auris* to develop in an aqueous medium may reflect an adaptation to a less humid environment, the ear canal of mammals, in contrast to the environment of the para-
sentic halarachnines in the respiratory tracts of seals and monkeys. The morphology of the peritremata of the Mesostigmata appear to support this idea; in parasites of respiratory tracts of both birds and mammals peritremata are short or absent while those of *R. auris* extend to the level of coxae I (as seen in ectoparasitic Mesostigmata).

Survival and motility are important factors for transmission in parasites. The dispersal stages of the ear mite of cattle and lung mites are probably different. In contrasting the ear mite with halarachnines (based on *in vitro* culturing), the teneral adults of the ear mites are the longest and most active stage of the life cycles; in halarachnines the larvae are the only active or the most active stage (FURMAN and SMITH, 1973; FURMAN et al., 1974).

REFERENCES


