THE FIRE ANT MICROSPORIDIAN PATHOGENS *THELOHANIA SOLENOPSAE* AND *VAIRIMORPHA INVICTAE*: FIELD HOST RANGE, INTRACOLONIAL PREVALENCE, AND DUAL INFECTIONS

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The microsporidium *Thelohania solenopsae* (Microsporida: Thelohaniidae) is a common disease on indigenous populations of fire ants in South America (Allen and S. Guido 1974, Briano et al. 1995c). Its impact on fire ants was studied in Argentina and in the United States (Briano et al. 1995a, 1995b, Briano et al. 1996, Williams et al. 1997, Briano 1999, and Williams et al. 1999). *T. solenopsae* is being evaluated for the biological control of the imported fire ants in the United States (Williams et al. 1999).

Vairimorpha invictae (Microsporida: Burenellidae) is a rarer infection of fire ants in Argentina (Briano et al. 1995c) and nothing has been documented about its actual impact on fire ants.

Field Host Range of *Thelohania solenopsae*

A field host range study of *Thelohania solenopsae* was conducted intermittently from February 1994 to November 1999. Surveys were conducted at 38 preselected sites infected with *T. solenopsae*, in Buenos Aires and Santa Fe Provinces. In each site, 10 baits were placed at 10-m intervals. The baits (open 7-ml glass vial containing a small piece of Vienna sausage) were left on the ground surface for 30-60 minutes and ants collected were preserved in 70% ethanol for disease diagnosis and taxonomic identification. In addition, workers from leaf-cutting ant colonies and other fire ant nests visually detected in the vicinity of the sites were sampled and preserved. In the laboratory, a total of 505 samples was ground up individually and examined under phase-contrast microscopy (400x) for the presence of spore masses of *T. solenopsae*. The ant genera collected/sampled (and sample size) were: *Solenopsis* (351), *Pheidole* (57), *Acromyrmex* (20), *Crematogaster* (15), *Wasmania* (1), *Camponotus* (34), *Prenolepis* (2), *Brachymyrmex* (1), *Linephithema* (13), *Conomyrma* (2) and others undetermined (9). *T. solenopsae* showed high genus-specificity since it was found only in *S. richteri* (26%), *S. invicta* (13%) and *Solenopsis* sp. (17%).

Abundance of *Vairimorpha invictae*

The prevalence of the microsporidium *Vairimorpha invictae* in fire ant colonies in Argentina has generally been much lower than *T. solenopsae*. However, in 1988 certain areas of Buenos Aires Province (Isla Talavera and Saladillo), *V. invictae* infected up to 60% of the colonies of *S. richteri* (Briano et al. 1995c). Within the last decade, it has

Dual infections

Fire ant colonies infected simultaneously with *T. solenopsae* and *V. invictae* were observed for the first time at the SABCL in March 1990 from 2 declining colonies of *S. richteri* and 1 of *S. macdonaghi* maintained under laboratory conditions. After this observation, dual infections were suspected to be highly pathogenic to fire ants, but this assumption has never been documented. Dual infections in fire ant colonies have been rarely found in the field. During the surveys mentioned above, only 7 (0.3%) dual-infected colonies, 3 of *S. invicta* and 4 of *S. richteri*, were found in Santa Fe and Entre Rios Provinces respectively.

The intracolonial prevalence of dual infections was studied in two *S. invicta* colonies collected in Santa Fe. Diagnosis of both diseases was conducted, following the procedures described above for *V. invictae*, in 245 eggs, 54 pupae, 75 workers (20 dead workers), 24 sexual females and 3 queens. Preliminary results showed that dual infections were present in 41% of the pupae, 11% of the workers, 20% of the dead workers, and 4% of the sexuals.

Pilot tests are being conducted at the SABCL to artificially initiate dual infections. In July 1999, several hundreds workers from a queenless colony of *S. invicta*, infected with *V. invictae*, were transferred to a monogyne *S. invicta* colony infected with *T. solenopsae* (test colony). A similar number of workers was transferred to a control colony free of infection. Two months later, the colonies were examined at 3-week intervals by selecting 10-30 workers at random and examining them individually under a phase-contrast microscope for the presence of spore masses. Also, immature stages (n=170) were examined when available by examining fresh Giemsa-stained smears of whole specimens (phase-contrast microscopy 1000x). Results, so far, revealed that: (1) in the test colony, the prevalence of *V. invictae* in the worker caste has increased up to 90% of the workers; (2) workers exclusively infected with *T. solenopsae* were detected at the beginning of the test only in 5 to 10% of the workers; (3) dual infections were present in 10 to 70% of the workers; (4) no signs of infections have been detected in immature ants; (5) in the control colony, only 3.3% of the workers were infected with *V. invictae* in the initial examination and no prevalence of the infection was detected afterward.

Although the mechanisms of worker to worker infection remained unknown, it appeared that workers infected with *T. solenopsae* were more susceptible to infection by *V. invictae* than uninfected workers. However, the fact that immature stages have not become infected makes it uncertain whether *V. invictae* infection will perpetuate within the test colony. This is under further investigation.