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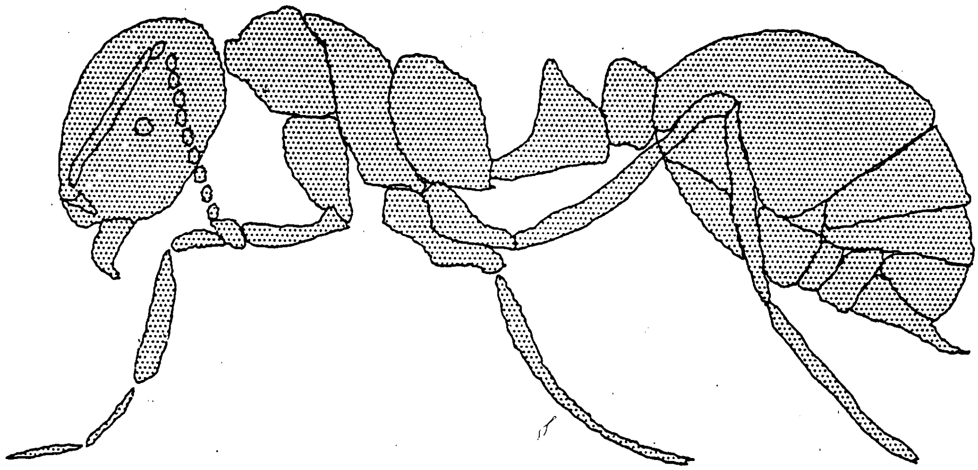

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FIRE ANT BIOLOGICAL CONTROL STUDIES IN THE U.S. WITH *THELOHANIA SOLENOPSAE* AND *SOLENOPSIS DAGUERREI*

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The microsporidium, *Thelohania solenopsae,* (Microsporida: Thelohaniidae) an obligate intracellular pathogen was discovered by Allen and Buren in 1974 in alcohol-preserved specimens of *Solenopsis invicta* collected in Mato Grosso, Brazil, in 1973. It was also found infecting colonies of the black imported fire ant, *Solenopsis richteri*, in Argentina and is one of the most common pathogens in fire ants in Brazil and Argentina. In 1996, during a survey for pathogens in polygyne field-collected colonies in the U.S., we discovered a microsporidium in workers of *S. invicta* found along a roadside (US 441) by Payne's Prairie 8 km south of Gainesville, Florida. This microsporidian species isolated from *S. invicta* in Florida was determined to be dimorphic with features similar to those described for *T. solenopsae*. In addition to the morphological data, the sequence of the 16s rRNA gene of the Florida microsporidium was determined. Sequence comparisons of the 16s rRNA genes of *T. solenopsae* and the microsporidium found in *S. invicta* populations in Florida were almost identical. Therefore, as indicated by this species diagnostics, we have the first evidence of *T. solenopsae* infection in *S. invicta* in the U.S. Following this discovery, a total of 379 colonies was excavated in north central Florida and 86 (23%) of these were infected. We also examined polygynous colonies from several other sites in the southern U.S. and found additional infections at Hurley, MS, the site from which polygynous colonies were first reported in the U.S., Gulfport, MS and Thorndale, TX . In addition, other ant species were also examined: *S. geminata*, *Dorymyrmex bureni*, *Pheidole metallescens*, *Pheidole moerens*, *Camponotus floridanus*, *Trachymyrmex septentrionalis*, and *Brachymyrmex depilis*; all were negative for the microsporidium. Previously, we found only polygynous *S. invicta* colonies to be infected with *T. solenopsae*, however, we recently found a monogyne colony site in Florida with the infection. Also, we have surveyed much fewer monogyne sites than polygyne areas. The detrimental effects of this pathogen on *S. invicta* field colonies in the U.S. are not known at present but of the original 30 field-collected colonies that were infected and returned to the laboratory, all were completely without brood and had only a few workers and queens remaining after 12 months. This is in contrast to healthy field-collected colonies that have not only survived in our laboratory for several years without loss of brood but have increased in size. We also found *T. solenopsae* infected colonies from newly-mated queens that we had collected in 1994 around Gainesville, FL. These colonies were being maintained in our laboratory and were the oldest *S. invicta* colonies we had in the lab rearing rooms. The infected colonies where in very poor condition and most of them contained the large binucleated spores of *T. solenopsae*. Some of the other data that we have obtained on *T. solenopsae* in the U.S. is the percent of infection rates of queens (31%), workers (72%), larvae (54%) and colonies (23%). Finally, queens in infected colonies weighed 50% less than queens in noninfected colonies.

The presence of the parasitic ant, *Solenopsis daguerrei,* in fire ant colonies has detrimental effects on colony growth and the proportion of sexual reproductives produced in the colony. *S. daguerrei* queens enter fire ant colonies and attach themselves to the mother queen. Previous studies have demonstrated that this parasite inhibits the fire ant mother queen and her egg production, thus causing the ant colony to collapse and eventually die out. Some of the data we have collected on these parasitic ants are as follows. GC analyses was conducted on *S. daguerrei* collected in Brazil and Argentina and no differences were observed in the cuticular hydrocarbon patterns between the two collections. Thus, based on cuticular hydrocarbon patterns, *S. daguerrei* in Brazil and Argentina are the same species. *S. daguerrei* colonies from Brazil and Argentina have been maintained for over 9 months in the quarantine laboratory which is something that has never been done before. These colonies are still alive and surviving. If parasitized fire ant colonies are disturbed, it appears to have a detrimental effect on *S. daguerrei* production and survival in the colony. It is unknown whether *S. daguerrei* must yoke a fire ant queen in order to lay eggs however, *S. daguerrei* queens yoke and unyoke fire ant queens and do not need to be attached continuously to the fire ant queen to survive. Preliminary hosts specificity tests indicate that *S. daguerrei* is at least genus specific and in South America, they were found parasitizing only *S. invicta* and *S. richteri*. When *S. daguerrei* populations occur in large numbers in a fire ant colony, a corresponding reduction in fire ant workers occurs. *S. daguerrei* mate on the surface and then fly if conditions are right but they are very weak fliers. *S. daguerrei* cannot live on their own and must have fire ant workers to tend them. *S. daguerrei* females outnumber males in lab colony situations which is similar to the situation in the field in South America.