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Restrictions on Ingestion of Bacteria and Normal Flora of Imported Fire Ant,
ecopsis invicta, Queens: Implications for Bacterial Formicidae Research

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To be effective, formicides must destroy the reproductive capacity (kill or sterilize the queen or queens) of ant colonies. Agents which only kill worker ants do not effectively eliminate colonies, although they may reduce their size temporarily. This requirement is a major obstacle to the development of a microbial formicide, for queens are fed only highly and repeatedly filtered, regurgitated liquids and (possibly) glandular secretions by nurse ants.

The pharangeal filters of worker fire ants remove spheres greater than 0.88 μ in diameter, and bacteria are rarely observed in wet mounts of dissected gut of fire ant queens. Therefore, we examined the gut bacterial flora of field-collected fire ant queens to establish guidelines such as maximum cell size for screening entomogenous bacteria as microbial formicides, and to detect symbiotic bacteria for possible development as a microbial formicide through biotechnology.

A total of 55 S. invicta queens (five from each of 11 polygynous colonies) were examined for the presence of bacteria in the alimentary tract of the gaster, which includes the crop, midgut, and hindgut. No growth occurred on 33 (73.3%) of the 45 specimens plated on Bacto Brain-Heart Infusion Agar (Difco Laboratories, Detroit, Mich., USA) or in nine (90%) of the 10 specimens inoculated into fluid thioglycollate tubes. Thus, the gastric alimentary tracts of 42 (76.4%) of the 55 queens were free of bacteria which could be cultured by the methods used. The characteristics of the bacterial isolates from the remaining 13 queens will be presented. These isolates appear to represent only one very small, slow-growing species.

Cells of Serratia marcescens fed to three small fire ant colonies as a tracer organism were ingested by fourth-instar S. invicta larvae (the only stage which eats solid food). However, none of the 15 queens we examined from these colonies harbored S. marcescens in the gaster. The results of tests in progress on the exclusion of spores of Bacillus thuringiensis and B. sphaericus from the thoracic crop and gastric alimentary tract of fire ant queens will also be reported, and the implications for bacterial formicide research will be discussed.