time course of lethal septicemias caused by *in vivo* infections by *Steinernema carpocapsae*/*Xenorhabdus nematophilus*. Photomicrographic results, using both Brightfield and flourescent microscopy, indicate progressive changes in bacterial shape and size, intracellular replication of bacteria in insect plasmatocytes, and tissue nodulization, in hemolymph samples taken at 20-48 hours post-infection in 2 hour intervals from infected *Galleria*. Additional hemolymph samples were further examined at days 3-10 post-infection in 24 hour intervals, and patterns of bacterial growth and metabolic inactivity and/or death were observed using the flourescent dye, BacTLight, which detects changes in cell membrane integrity. In a parallel study, analysis of secretory products including antibacterial agents, and antifungal agents were performed on cultures of *Xenorhabdus nematophilus* species grown in Trypticase soy broth at 30°C under aerobic and anaerobic conditions. Zones of inhibition from sterile filter disks saturated with stationary phase supernatents were obtained from cultures grown aerobically, as well as anaerobically, and demonstrate significant antifungal and antibacterial activity against a selected group of target fungi and bacteria, respectively. Secretory product synthesis appears to coincide with the 40-48 hour interval of an *in vivo* infection.

Thursday, POSTER BP27

The *Bacillus thuringiensis* delta-endotoxin: expression, crystallisation and activity.

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The delta-endotoxin of *Bacillus thuringiensis* is produced as a protoxin and packaged into a crystalline inclusion within the bacterial cell. We have investigated the role of toxin crystallisation and activation in the toxic mechanism. Implications for resistance management will be considered.

Friday, 8:00 SYMPOSIUM

The Imported Fire Ant: History, Impact, and Control

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Since its introduction into the United States over 65 years ago, the red imported fire ant, *Solenopsis invicta*, presently infests more than 310 million acres in eleven states and Puerto Rico. More recently, colonies have been found in New Mexico, Arizona, California, and Virginia.

This ant has had a substantial impact in the U.S. on humans, agriculture, wildlife and other organisms in the environment, and has caused damage to roads, electrical equipment, roofing materials, and telephone junction boxes. The most serious problem caused by this ant is its stinging of humans which in some cases, has caused serious injuries and even death of hypersensitive individuals.

Imported fire ants are an increasing urban and public health problem in the infested states due to a concurrent rise in both human and fire ant populations. This fact assures an increasing chance of contact between the two. These confrontations will result in the demand for additional measures to manage this pest. This will require control in a variety of situations and habitats, and their suppression or elimination will depend on integrated management techniques.

Control of the fire ant today consists mainly of the use of chemicals. Two approaches are used: (1) application of contact insecticides to individual mounds and (2) broadcast treatments with toxic baits. Contact insecticides to individual mounds are advantageous in that they act quickly (a few hours or days), the chemical is applied directly on the target (mound), and they only affect the fire ant. The disadvantages are that the queens often escape treatment so complete elimination of the colony does not occur, small mounds are not seen and therefore not treated, and treatments of large areas are more labor intensive. The advantages of broadcast bait treatments are that they are more economical because they are less labor intensive, larger areas can be treated quickly, and small unseen colonies are also eliminated. The disadvantages are that the baits are relatively slow-acting (requiring several weeks), treatments can be greatly effected by weather conditions, and baits are not specific to fire ants and can harm nontarget ant species.

Fire ant populations in the U.S. are ca. 5 times higher than in their native range. It is believed that the unusually high densities of fire ants found in the United States are partly the result of escape from the numerous natural enemies left behind in South America. Therefore, the use of natural enemies (biological control) could have excellent potential for providing a long term and environmentally sound fire ant control tactic that is applicable to a broad range of areas and habitats. Biological control can reduce the reliance on pesticides by slowing or eliminating reinfestations, protect and conserve ecosystem quality and improve biodiversity by reducing fire ant dominance thereby encouraging the reestablishment of native ants and other arthropods.

Friday, 9:00

The effects of the *egt* gene on baculovirus fitness in the cabbage looper (*Trichoplusia ni*)

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The *egt* gene is an 'auxiliary' gene of baculoviruses. Such genes do not appear to be necessary for viral replication in cell culture, but have other functions which must provide a selective advantage at the organism level. The *egt* gene encodes an enzyme, ecdysteroid UDP-glucosyltransferase (EGT), which catalyses the conjugation of insect moulting hormones (ecdysteroids) with UDP-sugars. Its most obvious function would appear to be the suppression of host moulting and arresting development. However, it is not clear how this might act to increase the fitness of baculoviruses. Early work has indicated that larvae infected with an *egt* deletion mutant die significantly quicker than those infected with the wild-type virus and produce a lower yield of virus. However, these insects were not infected by the normal oral route. If this effect is general, however, the wild-type virus could be gaining a selective advantage by producing a greater number of progeny, although this effect would be moderated by the increased length of time taken for the host to make the virus available to conspecifics. Hence, some sort of trade-off must exist between these two parameters. We have found that deleting the *egt* gene significantly reduces the time to death in second, fourth and fifth instar *Trichoplusia ni* larvae whereas yield is only affected in fourth and fifth instar larvae. Thus, the effect of *egt* on yield appears to be moderated with age, whereas speed of kill is not.

Tuesday, 8:00 SYMPOSIUM

Bacillus thuringiensis mosquitocidal toxins and their role in insecticide resistance

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Bacterial control of mosquitoes is based upon the toxin proteins produced by two bacteria, *Bacillus thuringiensis israelensis* or *Bacillus sphaericus*. These two materials are currently used in mosquito control programs in several parts of the world and their use is expected to increase. Consequently, mosquito control practitioners are concerned about the risk for developing insecticide resistance because there are few alternative materials which can provide a similar level of activity and environmental safety. To-date, no documented cases of field resistance have been reported to *B. thuringiensis israelensis*, however, several cases of resistance have occurred in mosquitoes toward *B. sphaericus*.