

"BIORATIONAL" MATERIALS USED TO CONTROL MOSQUITOES IN ORANGE COUNTY

The Orange County Vector Control District (OCVCD) routinely applies "biorational" pesticides countywide to control mosquitoes. The term "biorational" relates to the application of naturally occurring mosquito pathogens and predators in a manner that provides effective mosquito control with the least amount of impact on the environment. Currently, OCVCD uses several biorationals including two microorganisms, *Bacillus thuringiensis israelensis* (Bti) and *Bacillus sphaericus* plus an insect growth regulator methoprene.

Bacillus thuringiensis israelensis* and *Bacillus sphaericus

Both of these microorganisms produce natural metabolic by-products that are toxic to mosquitoes, but show no toxic effects on organisms other than aquatic midges and buffalo gnats. The latter two groups of aquatic flies are considered pests, particularly buffalo gnats that are well-known for their painful bites and human blood-feeding habits.

The protein toxins produced by these two bacteria control mosquitoes by destroying (rupturing) the gut of the larva (wiggler). Once ingested, death usually follows quickly within 24 hours or sooner under ideal conditions. Unlike *B. sphaericus*, which remains in the water and regenerates from the corpses of dead mosquito larvae, Bti is short-lived and only effective for one generation of control. Under

suitable conditions, *B. sphaericus* can remain effective for several generations and even longer.

Recent studies have indicated that when Bti and *B. sphaericus* are mixed together, an overall enhancement in control is achieved. Together, the Bti reduces natural resistance to *B. sphaericus* and at the same time extends the effective period of one application from 10 days to over 3 weeks. Unlike Bti, which is least effective in polluted water, *B. sphaericus* is unaffected by organics and, therefore, preferred for controlling mosquitoes like the Southern House Mosquito (*Culex quinquefasciatus*), which breeds throughout Orange County in foul water situations (storm drains, catch basins, etc.).

Methoprene (Altosid[®])

Methoprene is the active juvenile hormone mimic and functional insect growth regulator (IGR) in Altosid[®] products. This product acts as a "natural hormone" of insects and effectively retards the complete development of the life cycle of the mosquito. Simply, the IGR kills by preventing the larva from transforming to the pupa (stage between the larva and adult) and/or the adult from emerging from the pupa. Methoprene is formulated in ways to provide both short and long-term control by using one-time application mixtures or slow-release treatments using granules and briquettes.

