

Biological Control of Ticks

Ticks have relatively few natural enemies, but the use of predators, parasites, and pathogens has been examined for tick control. Tick predation is difficult to document and observations are sporadic. Most arthropod predators are non-specific, opportunistic feeders and probably have little impact on ticks. Anecdotal reports suggested that guinea-fowl or chickens may consume ticks and impact local tick abundance. However, there is no good evidence to support this, and turkey foraging was not found to reduce the local density of adult ticks. A minute parasitic wasp, *Ixodiphagus hookeri*, parasitizes blacklegged ticks in a few geographically isolated tracts in New England with superabundant deer and tick populations. However, my studies indicate that the usefulness of this wasp to control *I. scapularis* is very limited. The wasp disappears at deer and tick densities typical of most mainland areas. Insect parasitic nematodes have been studied as possible biological control agents. Engorged female *I. scapularis* are susceptible to certain types of nematodes, but these nematodes are too sensitive to the colder autumn temperatures when the ticks are present.

The application of insect pathogenic fungi, however, is a promising approach for controlling ticks. Several fungi, such as *Beauveria bassiana* and *Metarhizium anisopliae* have been shown to be pathogenic to *I. scapularis* in the laboratory and field. A perimeter treatment of existing commercial formulations of the fungus *Beauveria bassiana* and *Metarhizium anisopliae* at residential sites has been shown to control *I. scapularis* in small experimental trials. *Metarhizium* is a naturally occurring soil fungus that is considered nonpathogenic to mammals. The fungus infects host insects (and ticks) when conidia (spores) attach to the host cuticle, germinate, penetrate the cuticle and hyphae (filaments) grow. *Metarhizium* also produces insect toxic secondary metabolites. The green muscardine fungus *M. anisopliae* Strain 52 is being developed as a tick control biopesticide by Novozymes Biologicals Inc., Salem, VA. Additional residential trials with this fungus in Connecticut and New Jersey in 2007 provided good control of nymphal *I. scapularis* and a limited launch under the Tick-Ex™ label is anticipated in 2008. A granular product is also under development. This fungus poses minimal risk to non-target organisms and does not harm many beneficial insects such as honey bees, green lacewings, lady beetles, parasitic Hymenoptera or earthworms at rates used. The *Metarhizium* spores, applied like a traditional pesticide, may become an option in future tick management programs and could readily meet organic standards.