

Nosema Points (author unknown)

Genetically, *N. ceranae* appears to be cousin to *N. apis*, rather than sibling. Evidence presented separately by Geoff Williams and Judy Chen indicate that *ceranae* is more closely related to *N. bombi* (from bumblebees) or *N. vespula* (from wasps and some other insects), which helps explain why the European honey bee lacks resistance to it, and suggesting that it may spread to other bees.

Don't expect to diagnose nosema infections without a microscope--Chen and the Higes team both found that *ceranae* infection **does not** produce dysentery, swollen abdomens, a white gut, nor "crawlers" (although I find a few infected crawlers in *my* yards).

Higes and Meana explained that the pathogenesis of *ceranae* infection in a colony progresses through four stages:

Asymptomatic--the infection builds slowly the first year, goes unnoticed, but can be detected microscopically in foragers.

Replacement--The bees rally by rearing more brood, even through winter.

False Recovery-- This may occur the second summer, during which the colony rebounds somewhat. However, in this phase the infection starts to move into the house bees.

Depopulation and Collapse--Finally, the bees "lose ventricular function" (they can no longer digest food), stop eating (*and* stop taking medicated syrup, or pollen supplement), and simply starve to death in the midst of plenty. Most adults die far from the hive, leaving only a handful of young bees and the queen.

Colonies can collapse either during summer or winter, but the character of the infection differs. During cold season collapse, most bees are infected, and spore counts exceed 10 million spores per bee. Contrarily, under warm season breakdown, less than half the bees are infected, and spore counts are generally much lower. Forager bees just die in the field, and the colony shows no symptoms other than dwindling away.

Treatments

Hundreds of compounds have been tested to control nosema in honeybees (Moffet, et al 1969; Pernal 2008 Conf)--few have found to be effective. The only registered treatment for nosema in North America is fumagillin, a natural extract from the fungus *Aspergillus fumigatus*. Fumagillin has a long history of successful use against *N. apis*. Higes (2006) demonstrated that it is also effective against *N. ceranae*. It does not kill the spores of either species, but can greatly reduce spore production, and the overall infection rate within the colony. Fumagillin has traditionally been recommended for application in fall and/or spring for *N. apis*, but this recommendation may need to be revised for *ceranae*

The sole supplier of fumagillin in North America is the Canadian company Medivet, and their product is named Fumagilin-B (see CHC 2005 for more info). The general strategy for using fumagillin is to feed it in heavy syrup so that the bees store it as "honey" above the brood nest, so that they will later eat their way up into it, and thus dose themselves for an extended period of time. According to Medivet owner Willy Baumgartner, once fumagillin is mixed into syrup, there is a fairly rapid loss of potency, so it should not be stored for long periods. However, after the bees process it into "honey," it retains considerable potency (Furgala & Gochnauer 1969). Kochansky and Nasr (2003) found that fumagillin can tolerate some exposure to sunlight, although others suggest using opaque feeder jars (Meana 2008 Conf).