

Preventative Antibiotic Treatments for Honey Bee Colonies

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Many beekeepers routinely give their colonies prophylactic doses of the antibiotic Terramycin (TM®) to prevent the expression of American foulbrood disease. Is this a sound practice?

Part of a normal beekeeping routine in spring and fall is to give colonies 2-3 dustings of TM mixed in powdered sugar, spaced several days to a week apart. The reasoning for the prophylactic treatments is that American foulbrood spores are present and active in many combs, and if an antibiotic is not supplied, the colony could become infected with this disease. We know that AFB spores remain infective in wax combs for over 30 years and provide a continuous source of re-infection.

The active ingredient in Terramycin is oxytetracycline. The alimentary canal (stomach, intestines) of worker bees contains a diverse array of beneficial bacteria that secrete enzymes that help the bees digest food and maintain normal function. Antibiotics tend to kill the beneficial bacteria during the course of treatment. This occurrence should be familiar to a person who is taking antibiotics. Many times a doctor will recommend eating yogurt during the treatment period to help replace beneficial bacteria. Often, yeasts will grow in an environment free of bacteria. Dr. Martha Gilliam spent many years studying the microscopic organisms in bee guts and claimed that "... yeasts in adult worker honey bees may be indicators of stress condition, since few, if any, yeasts remain viable in the intestines of honey bees not subjected to stress." She defined a stressful condition for bees as when they have been caged, diseased, maintained on deficient diets, or treated with pesticides or antibiotics. Bees that are physiologically or nutritionally stressed may be more susceptible to other diseases such as chalkbrood.

There are other more pressing problems with routine antibiotic use. Overuse of antibiotics can foster the development of resistant bacteria. The livestock industry is faced with this problem on a large scale.

Routine use of antibiotics in the feed of livestock to promote growth may diminish the drugs' power to cure infections in people. For example, a bacteria (campylobacter) in chickens has developed resistance to fluoroquinolone, a recently approved type of antibiotic. People pick up the drug-resistant bacteria when eating chicken. Most healthy people recover from campylobacter without treatment, but people with compromised immune systems may require treatment, and may have trouble finding an antibiotic that will kill the resistant bacteria. Because of problems like this one, the FDA is revising its guidelines for approving new antibiotics and monitoring the effects of old ones to minimize the emergence of bacterial strains that are resistant to antibiotics.

The incidence of *Paenibacillus larvae* (the bacteria that causes AFB) resistant to

Terramycin is suddenly on the rise throughout the US. In the past 3-4 years, many beekeepers are finding that TM is no longer effective in treating AFB because of these resistant bacteria. It is not clear how the resistance began or how widespread it is, but it is clear (at least to me) that continued, routine use of this antibiotic is not a smart idea. Many beekeepers are clamoring for research on new antibiotics. It is true that there are other antibiotics that effectively treat TM-resistant bacteria, but some of these antibiotics are very stable in solution. While humans are not affected by *Paenibacillus larvae* spores in honey, some may have problems with allergies to antibiotics that might be present in honey.

I am concerned about the amount of chemicals we are putting in our bee hives. I think the last thing we need are more antibiotics for bees. What can we do

How Do Bees Become Infected with AFB?

Nurse bees pick up AFB spores when they clean combs and feed the spores to the young larvae in the brood food. The very young larvae, those that have just hatched from an egg within the last 24 hours, are most susceptible, and can be infected by ingesting 10 spores or fewer. Older larvae are more resistant to infection and may ingest millions of spores before they become infected. The spores are swallowed by the young larvae and then germinate in the larval gut. When the larva is capped over with wax, the germinated spores (now in the "rod" stage) pass from the gut into the hemolymph (blood) of the bee and begin to multiply rapidly in the tissues. The larva dies quickly after that, and once again spores form. To the beekeeper's eye, the infected larvae look

normal until they are capped over with wax. When the bacteria passes from the gut into the blood and tissues, the larva dies very quickly and the cell capping may become sunken and greasy looking. Inside the cell, the dead larva turns brown and gooey, and smells rotten.

Even if your colony does not have AFB symptoms, if you give them 2-3 doses of TM, the antibiotic will be distributed among the nurse bees in the colony by trophallaxis (food exchange among adult bees). If the nurse bees are carrying any AFB spores, the TM treatment reduces the chances that the nurse bees will infect young larvae. Antibiotic use is a two edged sword. Its use may be positive in the short term, but may cause other stress that may lead to diseases such as chalkbrood.

instead?

(You knew I would jump on my soap box sometime in this article): We have known for over 50 years that bees bred for hygienic behavior are resistant to AFB. It is easy to select bees for this behavior, and many queen breeders are starting to sell hygienic queens. If beekeepers use bees that demonstrate resistance to AFB, their colonies will not need routine TM use. On occasion, a hygienic colony will become infected with AFB (as will happen! - the degree of their resistance in part depends on whether the queens encountered hygienic drones on their mating flights). In this case, a treatment of TM or other antibiotic might be used. If TM is not effective, I highly recommend you burn the combs in the colony. If it is early in the season, the bees can be shaken into a new box containing foundation (no drawn combs). Cage the queen for a few days, and feed lots of sugar syrup to the bees. After 2-3 days, release the queen. By this time, the spores in the guts of the workers will have passed through the digestive system, and will help diminish the chances that the nurse bees will feed the spores to young larvae.

My opinion is that preventative antibiotic use is not a sound practice anymore. It is important to do take the time to make regular, thorough inspections of the brood chamber to catch colonies with early AFB infections. These colonies can be removed from the apiary before they infect others and placed in a separate apiary where they can be treated and requeened, or burned. I highly recommend that beekeepers consider beginning a routine of replacing the old combs in colonies with new foundation to get rid of those old brood combs that may be full of AFB spores. Consider investing in new foundation and hygienic queens rather than in antibiotics. The immediate costs are not the same, but there may be greater payoffs in the end: healthier bees and a way out of the insidious chemical treadmill.

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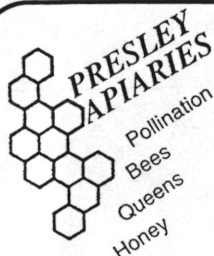
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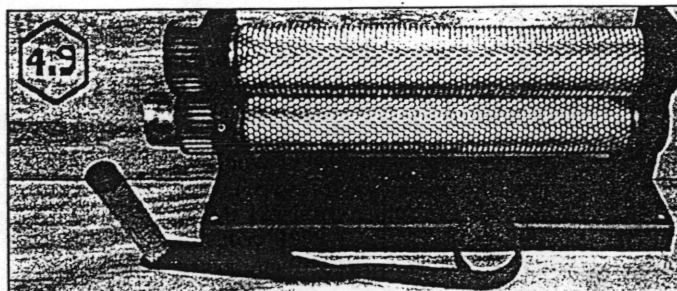
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