Diseases of Bees in New Zealand

BEE diseases may be divided into two groups—those which affect bees in the larval or pupal stage, called brood diseases, and those affecting adult bees. Brood diseases include American foul-brood (the most serious of bee diseases in New Zealand) and sac brood, and diseases of adult bees include *Nosema apis, Malpighamoeba mellifica prell,* and Isle of Wight or acarine disease. They are the subject of this article by T. Palmer-Jones, Research Officer, Department of Agriculture Animal Research Station, Wallaceville.

The vegetative stage of *Bacillus larvae*, 1000 times natural size.

AMERICAN FOUL-BROOD is a brood disease caused by a bacterium, *Bacillus larvae,* which attacks both worker and drone brood, usually in the pre-pupal stage. Thanks to the system of registration and inspection of hives in New Zealand, foul-brood is under control, but it is still the most serious of bee diseases. Only rarely is a laboratory test necessary—if brood has become dried up and the characteristic physical appearance, ropiness, and odour are not evident. Normally Apiary Instructors and experienced beekeepers can recognise the disease.

When conditions become unsuitable for bacterial growth, such as after the death and complete breakdown of the larva on which the bacterium feeds, it changes from the vegetative or growing stage to the spore or dormant stage. These spores are resistant to changes in temperature and humidity and do not require food; they remain alive until they encounter a fresh host and so infect a new hive.

When diseased brood reaches the stage of drying in which it becomes scale-like the spores are present in enormous numbers. The highly-resistant spores are the cause of the difficulty always experienced in attempting to eradicate American foul-brood by methods other than gassing the bees with a cyanide compound and burning them and the infected equipment. However, boiling for 30 minutes can be depended on to destroy the virulence of spores of *B. larvae* under any ordinary conditions.

The disease is spread by robbing, transferring equipment, and exposure of honey containing spores.

Control Methods

Resistant stocks: Bees less than normally liable to infection with American foul-brood have been bred with success in the United States of America. However, the resistance of these colonies is not a true resistance, but depends on the greater speed and efficiency of these bees in removing diseased and dead larvae, so preventing *Bacillus larvae* from obtaining a hold on the colony.

Sulphathiazole has been found to help bees to combat the growing stage of *B. larvae,* but it has no effect on the spores. Hence, if a hive is treated, all the stored honey which may contain spores must be removed before the medicated syrup is fed or reinfection may occur. A treated hive must be watched carefully, as the disease may recur. In New Zealand, which has a low incidence of infection, burning is safer and treatment with sulphathiazole is not encouraged. In some States of the U.S.A. infection is very widespread and burning of diseased hives would cause serious economic loss. The main points against the use of sulphathiazole may be summarised as follows:—

In some cases queen bees have been adversely affected by the drug.

There is some risk that the drug may reach extracted honey. Though it would be unlikely to be present in amounts sufficient to make the honey unsuitable for human consumption, such honey could hardly be sold as a pure natural food.

Amateur beekeepers are likely to experiment with the drug carelessly, so spreading foul-brood to the detriment of commercial apiarists.

A strain of *B. larvae* resistant to sulphathiazole may appear.

In the U.S.A. some apiarists are now forced to feed all their hives with the drug to keep down the disease, the spores of which have become distributed throughout their apiaries.

The British authorities have officially banned the use of sulphathiazole because of the risks involved. There appears no doubt that, if it were used in New Zealand in its present stage of development, the sulphathiazole treatment would lead to a spread of American foul-brood which would be disastrous for the beekeeping industry.

Diagnosis

The method used for the diagnosis of *B. larvae* at the Animal Research Station, Wallaceville, is briefly as follows:—

A water mount of suspected material is examined for spores. This is only a confirmatory test, as other types of spore may resemble *B. larvae.*

The suspected material is boiled for 1½ minutes in water, so killing less heat-resistant bacteria.

The boiled material is used to inoculate special media. *B. larvae* will not grow on the ordinary laboratory media.

If growth occurs, the organism is stained and examined for the typical gram positive rods of *B. larvae.*

As a check the organism obtained is used to inoculate ordinary media. If the organism is *B. larvae,* it will not grow.

B. larvae has the power of reducing nitrates to nitrites, and this test is applied for additional confirmation.

Sac Brood

A disease caused by a virus, sac brood affects only brood, causing it to die and assume a sac-like appearance.

An outbreak in Canterbury was investigated by the author in 1941. Though it caused much loss of hive strength in some apiaries, the outbreak was not a serious threat. Occasionally infected hives are reported in various parts of New Zealand, but the disease is now uncommon. No method of treatment is known.

Diagnosis depends on the sac-like appearance and absence of bacteria in the diseased brood.

Nosema apis

A severe outbreak of *Nosema apis,* a disease of adult bees, was experienced in New Zealand in 1946-47, cases occurring throughout both islands.

Nosema apis is a parasitic, spore-forming member of the protozoa—microscopic, single-celled animals. The spores are more or less oval, about 2/10,000in. long and half as wide. Bacteria are roughly 1/25,000in. in diameter.

Life Cycle

When *Nosema* spores reach the stomach of a bee they shed their