

**MINISTRY OF AGRICULTURE  
RESEARCH AND DEVELOPMENT DIVISION**

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**AMERICAN FOULBROOD DISEASE**

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**INTRODUCTION**

American Foulbrood Disease (AFB) is the world's worst brood disease of bees. It is caused by a spore forming bacteria, *Bacillus larvae*. The disease is highly contagious and the spores of the bacteria which cause it are very persistent. They can survive on contaminated equipment for up to 40 years and still cause an infection. AFB is capable of killing a hive and destroying entire apiaries. There have been six recognized outbreaks of the disease in Jamaica since 1918. The worst was in 1943 and the most recent was in 1989. Efforts to eradicate the disease are still continuing. If these are successful, Jamaica will continue to enjoy the distinction of being one of the few countries where AFB is not endemic. It will also allow the country to capitalize fully on the foreign exchange earning potential from the export of honey, queen bees and other hive products.

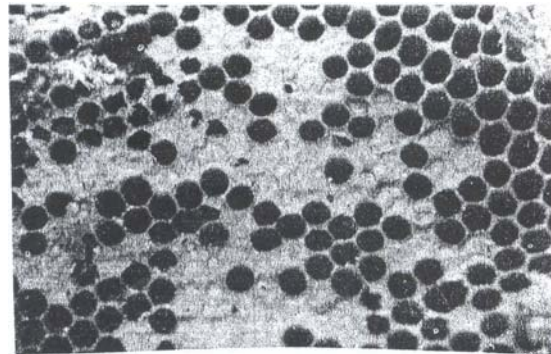
**SYMPTOMS**

AFB kills bee larvae and pupae after the cells are sealed. Even in a well managed apiary with strong hives the disease may be present for several months before it is noticed. The first sign of AFB is the weakening of a hive, for no apparent reason, despite the beekeeper's best efforts to strengthen it. Close examination of the combs will show:

1. A scattered brood pattern.
2. The face of the comb appear wet or greasy, rather than the normal dry state.
3. Sealed worker brood cells with sunken cappings. Normally they are slightly raised.
4. Ragged holes torn in many of the sunken cell cappings as the bees attempt to clean up the disease. See *Figure 1*.
5. Dead larvae in the cells with sunken cappings, with or without the holes tom in them. These larvae will be cream, yellow or brown in colour, depending on how long the larvae have been killed.
6. The dead larvae are stretched full length on the floor of the cells, appearing in a "melted down" state by the time they have turned brown in colour.
7. Tough dark brown to black scales sticking to the floor of the cells. These are the remains of the dead larvae and pupae. It is very difficult to remove them without destroying the cells.



**Figure 1.** Worker brood cells with sunken cappings and holes torn in them as bees attempt to clean up AFB.

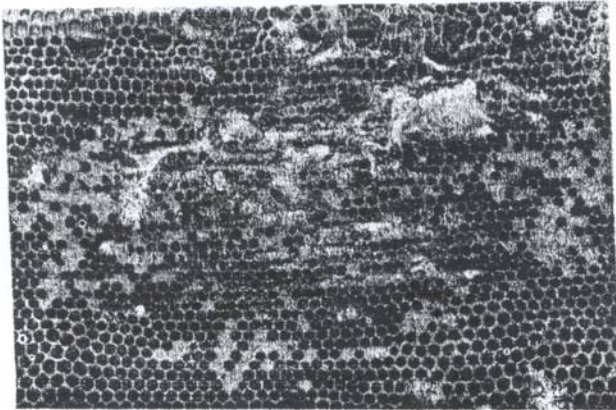


**Figure 2.** Pupa killed by AFB with tongue sticking out towards roof of cell.

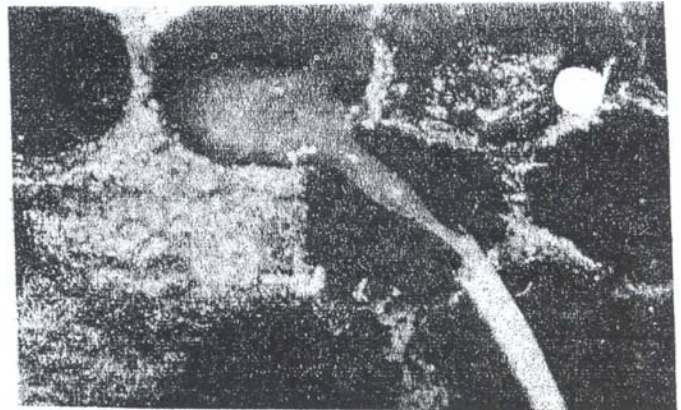
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Death rarely occurs after the pupa is formed. Infected pupae are killed before they change colour. These dead pupae are found lying on their backs, heads towards the opening of the cells and tongue sticking out towards the roof of the cell. See **Figure 2**. Even after the body has shrivelled completely the tongue can usually be seen sticking out in this characteristic fashion. In the very advanced stage, a typical strong, offensive, foul smelling odour is given off from the diseased hive. An experienced inspector or beekeeper who is familiar with AFB can usually detect its presence by this characteristic smell, while the odour is still faint.



*Figure 3. Wax Moth to AFB infected comb*



*Figure 4a. The Pus Test for AFB*

## TESTS FOR AFB

Conditions other than AFB can cause anyone of the above symptoms to appear. However, if more than two of them appear together then it is more than likely that the disease is present. There are two simple tests which may be done by the average beekeeper to verify the presence of AFB. Regardless of the results of these tests the Chief Plant Protection Officer of the Ministry of Agriculture must be contacted immediately if the presence of the disease suspected.



*Figure 4b. The pus test for AFB*

**1. The Pus Test:** Insert a small piece of stick, about the size of a match stick into a cell containing a dead larva that has melted down to the brown stage. Twist the stick around in the cell then pull it out slowly. If the larva was killed by AFB, the remains will adhere to the stick like ropy pus. **See Figure 4a, b.** This pus stretches for about 2.5 - 3 cm before it snaps back on to the comb.

**2. The Holst Milk Test:** Place a scale or the remains of a dead larva, at the brown melted down stage, in a glass vial with 5 ml (one teaspoon) of whole milk. Shake the contents of the vial gently and let it stand. If the larva was killed by AFB, the milk will become clear within 15 minutes.

# SPREAD OF AFB

This disease is not endemic to Jamaica; therefore, outbreaks occur only whenever contaminated bees, beekeeping equipment, honey, pollen or other hive products are brought into the island and become accessible to bees. Once present in the country the disease is spread from one place to the other by any of several means. These include:

1. Movement of diseased hives.
2. Using contaminated hive tools, gloves, smokers, frames or other equipment.
3. Sharing equipment, especially honey extractors, which have been used to work diseased apiaries.
4. The sale of contaminated honey to which bees will have access later.
5. The activity of robber bees.

Within an apiary the beekeeper is most responsible for the spread of the disease from hive to hive, either when he shifts around equipment during routine operations or when his carelessness causes the bees to start robbing.

# CONTROL OF AFB

In places where AFB is endemic and beekeepers have no option but to live with the disease, it is popular to treat infected hives with antibiotics. These drugs are expensive and costly to use. Moreover, they do not kill the bacteria. Therefore, the disease will reappear whenever the treatment is stopped. Colonies treated with antibiotics could still be a source of infection. Other colonies that are untreated, up to 6 km away could still become infected. These are among the reasons why the authorities in Jamaica still believe that the only acceptable solution to AFB is to promptly destroy diseased hives by burning. Experience has shown that if the disease is detected early in an apiary, using this approach, most of the hives will be saved.

Each beekeeper can help to prevent the introduction and spread of AFB by observing the following:

1. Do not import bees, used equipment or hive products.
2. Inform the Chief Plant Protection Officer, the Chief Plant Quarantine Produce Inspector of the Ministry of Agriculture and/or the Customs Department of the Ministry of Trade and Industry of any importation of bees, used equipment or hive products. Be vigilant to ensure that something is done.
3. Do not move bees, used equipment or hive products into within or out of any prescribed area without the expressed permission of the Chief Plant Protection Officer, whenever a quarantine or ban on the movement of bees is in place.
4. Do not keep your bees in 'turned down boxes' (hives without moveable combs) or in any condition which make inspection of the brood difficult or impossible.
5. Do not allow hives to dwindle without finding out the cause
6. Do not transfer equipment to and from weakened hives if there is any doubt as to the cause of the weakening.
7. Avoid sharing beekeeping equipment.
8. If an extractor must be borrowed, make sure that all traces of honey, wax and propolis are removed before using it.
9. Have competent and authorized officers of the Ministry of Agriculture verify the health of all apiaries before buying or selling
10. **NEVER** attempt to hide or experiment with suspicious colonies or to deal with AFB by yourself. Such practices endanger your entire apiary and your neighbour's, as well as the entire beekeeping industry. Inform the Ministry of Agriculture.

# AFB AND THE LAW

Beekeepers and/or their agents are required to register their apiaries on or before January 31<sup>st</sup> each year, or within 30 days after new apiaries are established. No fee is charged for registration. In addition to the owner's name and address the registration information must include the:

- (i) number of apiaries,
- (ii) exact location of each apiary, and
- (iii) number of hives in each apiary.

This information should be sent to The Chief Plant Protection Officer, Ministry of Agriculture. Among other things, it allows inspectors to quickly locate and inspect all apiaries in an area in the event that AFB or any other exotic disease or pest of bees is discovered.

In addition to the requirements regarding registration, the laws governing beekeeping in Jamaica covers the importation of bees and beekeeping effects, hive construction, inspection of apiaries, movement of bees, destruction of bees and equipment for disease control and notification about the presence of pests and diseases in apiaries. Offences under these laws are punishable by fines and or imprisonment, upon conviction.

## ADDITIONAL READING

Bailey, L. 1963. Infectious Diseases of the Honey-bee.  
London. Land Books. 176 pp.

Gochnauer, T.A., Furgala, B. and Shimanuki, H. 1975. Diseases and Enemies of the Honey Bee. Chapter XXI. 615-662. In The Hive and the Honey Bee. Dadant & Sons. Ed. Hamilton, Illinois. DadaDt & Sons. 740 pp.

Murray, R.C. 1990. American Foulbrood Disease in Jamaica: FACTS. Old Harbour, Jamaica. Plant Protection Division, Ministry of Agriculture. 8 pp.

Reid, A.L. 1949. American Foul Brood and other Brood Diseases and Pests of Bees. Circular No. 26. Department of Agriculture, Jamaica. 9 pp.

Root, A.I. 1983. The ABC and XYZ of Bee Culture. 39th ed.  
Medina, Ohio. A.I. Root Company. 712 pp.

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## CONTACT:

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