

## CONTROL OF AMERICAN FOULBROOD BY USING ALTERNATIVELY ERADICATION METHOD AND ARTIFICIAL SWARMS

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### Introduction

American Foulbrood (AFB) is one of the most threatening epidemic brood diseases in honey bee colonies. This disease is caused by the pathogen *Paenibacillus larvae larvae*. According to the common animal health law in Germany the outbreak of AFB has to be reported to veterinarian service. The veterinarian has to decide about eradication of bee colonies, cleaning and disinfection as well as inspection of the bee colonies in the neighbourhood.

A bee colony is regarded as to be diseased when larvae show clinical symptoms as sunken cappings, open cappings, diseased larvae, positive stretch test and scales. To insure effective curing and preventing of further spreading of the epidemic it is of great importance not only to kill diseased colonies but also to get rid of the highly infective spores.

### Method

During the last 9 years we have done a lot of research work in the field of curing and preventing AFB. One mayor focus was on the distribution of spores of *Paenibacillus larvae larvae*.

Samples of honey and food supply of bee colonies were collected from a tremendous number of beekeepers. Honey, pollen, wax, larvae and adult bees were collected before, during and after curing treatments in cases of American Foulbrood.

All these different samples were bacteriological analyzed. Bacteriological differential diagnosis and determination of quantity of spores were carried out by incubation of sample solutions, which has been heated 6 min. at 90 °C, on Columbian sheep blood agar, followed by catalase and "Plagemann" tests.

### Results

The investigations show that *Paenibacillus larvae larvae* is not ubiquitous in bee colonies. Only roundabout 10% of apiaries are contaminated with spores. All diseased larvae are highly contaminated with spores. The quantity of spores is tremendous high in the scales. But there are also spores in healthy larvae, on the body and in the digestive system of adult bees as well in food supply (honey and pollen).

The spores are also distributed from diseased colonies to non-diseased colonies of the same apiary as well as to other apiaries. In non diseased colonies you can find the spores in the food supply mainly transferred from diseased colonies by robbing bees.

The analysis of honey samples, which were harvested some years before the outbreak of AFB, supplied clear evidence that colonies can already be contaminated with spores 2 to 3 years before the detection of clinical symptoms.

These results in mind there is the question for a successful curing. There are two ways, one is eradication the other is artificial swarm method. In both cases all brood combs have to be destroyed because these combs are highly infectious. Also all equipment has to be cleaned and disinfected with caustic soda (soda lye). The difference between eradication and artificial swarm method is the treatment of the adult bees. By the method of artificial swarm you can save adult bees and reform a new colony from these bees. Artificial swarm method means to build a swarm of all adult bees. There has be a starvation phase of this swarm. During 1,5 to 2 days of starvation the bee are grooming each other and by the way cleaning their bodies from spores. After starvation you will find all spores of AFB in the rectum of the bees. The spores will be deposited outside the hive with the faeces. Because in most cases of AFB most of the colonies of the apiary are more or less weak two or up to three colonies should be united to one strong swarm resp. colony.

If there is an outbreak of AFB in an apiary seldom all colonies are diseased. It is not necessary to kill all colonies of the apiary because healthy colonies only with contaminated food supply can easily be saved. Stamping out diseased colonies and taking no notice of healthy colonies is also the wrong way. Because food supplies in these healthy colonies are probably already contaminated with spores. The infection can go on.

The recommendation is artificial swarm method of all colonies instead of stamping out. Stamping out besides artificial swarm method is only necessary if there are extremely diseased colonies within an apiary.

Since several years food samples were collected close to the brood nest out of colonies which had been cured by artificial swarm method. In bacteriological analyses of these samples no AFB spores were found. This point out that artificial swarm method combined with destroying brood combs and cleaning of all equipment is a good way to get rid of the spores and disease of AFB.

For sure very important is also to have a look within the suspicious area. Eradication or artificial swarm will only be successful if an survey of all other apiaries in the neighbourhood will be done. The survey is important to find all other diseased colonies and by bacteriological analyses of food supply also all contaminated but still not diseased colonies.

To avoid AFB for the future good beekeeping practice is necessary. That means always ensure to have strong bee colonies by annual renovation of colonies, replace old combs with new foundations, take care of good food supply, look for good hygienic behaviour of the bees and use these information for selection in queen breeding. Because the pathogen *Paenibacillus larvae larvae* is not ubiquitous and contaminations of spores can be uncovered by bacteriological analyses there is a possibility to detect developing AFB cases much earlier in time before clinical symptoms appear. Bacteriological analysis of honey for spore contamination is an efficient prophylactic measure against AFB.

### **Conclusion**

In Germany controlling American Foulbrood without medical treatments is successful since several decades. Since several years in the northern part of Germany American Foulbrood has been controlled successfully by artificial swarm method. The advantage is that the adult bees can be saved and used for the building of new colonies. To avoid a repeated outbreak of AFB cleaning of equipment, survey of a suspicious area and good beekeeping practice are necessary.