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[Full Table of Content](#)



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Miss A. D. Betts

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HISTORY OF OUR KNOWLEDGE OF BROOD DISEASES

By Miss ANNIE D. BETTS, B.Sc.

(Editor, *The Bee World*)

ALTHOUGH man has kept bees for thousands of years, and probably robbed the nests of wild bees for hundreds of thousands of years before that, and although bees most likely suffered then from all the diseases that trouble them now, yet it is only quite recently that beekeepers have learned to distinguish clearly between the various diseases, particularly those of the brood.

This may seem surprising, but there is good reason for it. Before the days of moveable frames there were two main systems of bee management. In by far the greater part of the ancient world the beekeeper did not kill his bees to take their honey. He drove them away from it with smoke, and cut out combs at certain times of the year, not disturbing the brood nest more than he could help, so that he did not often inspect the brood. This was the method of beekeeping in use in Greece and Rome. In those warm climates the wax moth multiplies very quickly.

It would at once attack any diseased and weak stock, and would soon eat up all the signs of disease ; so that when the beekeeper came to clean out the remains he would think that the stock had died of wax moth attack.

In consequence we find that all the classical writers on beekeeping mention the wax moth as one of the worst plagues of the apiary, and are very vague indeed about brood diseases. Aristotle writes of a disease which causes a bad smell in the hive, but it is not clear whether this affected the bees or the brood. Columella, a Spaniard who settled in Italy and was one of the most practical of the Latin writers on bees, mentions a disease which brings about decay of the combs, but it seems to have been an attack by mould, consequent on serious loss of adult bees in bad weather—so that the remainder could not keep the combs dry and the brood warm—rather than an infectious disease. Pliny passes over the brood diseases in a single sentence. Of the two he mentions, one is of course wax moth ! The other he does not describe. It may or may not have been a brood disease.

It is interesting to notice how this tendency to mix up brood diseases with the ravages of the wax moth has persisted into recent

times. About a hundred years ago, French beekeepers, seeing the webs of the wax moth hanging from the combs in stocks dead from brood disease, called such cases *loque* (rags). This word is still the name for the foul brood disease in France.

The other ancient system of beekeeping is the swarming system. In it the bees are encouraged to swarm early and often ; then after the flow, the very heavy and very light stocks are killed and their contents taken as surplus ; while the medium-heavy ones are wintered. This, of course, is the method our own forefathers used, at any rate since the Saxon invasion, which also brought in the straw skep. In this system the beekeeper inspects a large number of brood nests every autumn, and he might be expected to notice the remains of disease when such was present. Yet early English writers on bees either do not mention diseases, or merely quote the classics. There is good reason for this too.

This system of beekeeping was beautifully calculated to keep brood diseases in check. The light stocks would include all that were badly diseased. The heavy stocks would include all those that had robbed out diseased colonies and so acquired much more than their natural store of honey. All these were sulphured and their contents removed from the apiary ; so that only the slightly diseased stocks and those that had acquired some, but not much, infected honey by robbing, would remain to carry the disease over to next season. The mediaeval British beekeeper, in consequence, was not interested in brood diseases. His method of management dealt with them automatically—especially with the ropy variety of foul brood. The only references to diseases therefore deal with diseases of adult bees, or attribute losses of stocks to the badness of the season.

We know, however, that brood diseases occurred. That great bee-man, the Rev. Charles Butler, writing in the early seventeenth century, is—quite unconsciously—rather amusing on this subject. He says : “ In the pleasures of their life the Bees are so moderate, that perfect temperance seemeth to rest only in them : whereby they enjoy such a sound constitution of body, that their whole life is subject to no sickness at all.” Two pages further on he remarks that they might live indefinitely long, “ if the rottenness of their combs, the hardness of their honey, and *the abundance of noisome stopping* ” would allow them to remain in their hives. In other words, if they did not constantly get foul brood, as is plain from another passage, in which he explains what he means by “ noisome stopping.” He thought that it was pollen which had gone bad from being kept too long. “ After a while it corrupteth : and of sweet becometh the sourest, and the most unsavoury of all things, both to taste and smell.” He describes how such a stock is robbed out, either in August or (if the beekeeper’s care saves it then), next February, as soon as bees can fly. He also describes how infected stocks swarm persistently. There seems very little doubt that foul brood, probably the ropy type, was rampant in Hampshire 300 years ago ;

BROOD DISEASES OF BEES

21

but the system of beekeeping kept it in check, so that it caused only slight loss, and a honey crop was secured in spite of it.

As in England, the Continental writers before the middle of the sixteenth century mostly quoted the classics when mentioning diseases. In 1568, however, Nickol Jacob, a Silesian beekeeper, published a book in which he advises treating brood diseases by starving the bees and cutting out the affected combs. He has thus a good claim to be considered the inventor of the "shaking" treatment for foul brood.

In 1604 Johannes Colerus, a German author, published a "Perpetual Calendar," in which he mentions beekeeping. He knew that the brood was attacked by a disease which caused it to putrefy; and calls this *faule Bruth* (decayed brood). This is, of course, the origin of the modern German name *Faulbrut* and our *Foul Brood* (which is really a mistranslation).

Schirach, the famous Saxon beekeeper, about 1770, also writes of *faule Brut*, and recommends the same cure as Jacob—starvation and cutting out of combs.

Della Rocca, in 1790, describes a bad outbreak, apparently of ropy foul brood, in the island of Syra in the Aegean Sea. The disease was spread all over the island by the unwise practice of the beekeepers, who put out their diseased combs in the open for the bees to clean up.

It was not until well into the nineteenth century that a few beekeepers began to suspect that there was more than one disease of the foul brood type. Dzierzon, the discoverer of parthenogenesis, knew that there were two varieties. He lost nearly all his bees from the ropy disease on one occasion, no doubt because, pleased with his new invention of movable bars, he did what unwise beginners do still—moved combs from one stock to another without thinking about diseases. Doolittle and D. A. Jones, in U.S.A. in the early 'eighties, and our own countryman, S. Simmins, in 1887, also realised that there were two varieties of foul brood.

The causes of the brood diseases were, however, not yet known. Few beekeepers had microscopes; and even the best microscopes of that date were not very satisfactory for examining such objects as bacteria. In Germany, moreover, brood diseases were much confused with *Nosema*, which was as prevalent there then as it is now, and was believed to be due to a fungus. It was not until 1874 that Cohn and Eidan found a bacillus in diseased brood and suggested that it was the cause of the disease. Bacteriology was then a very young science indeed, and was still in its infancy when Cheshire and Cheyne published their paper on *Bacillus alvei* in 1885.

Cheyne's description of *Bacillus alvei* is excellent; he had, it seems, no time to test its pathogenicity for brood, and left that work to Cheshire, who was unfortunately too easily satisfied that he had proved it to be the cause of the disease. All subsequent experiments, with few and very doubtful exceptions, have tended to show that

BROOD DISEASES OF BEES

Bacillus alvei is not the cause of any brood disease—though, as you will hear from Dr. Tarr, it may possibly be a stage of the life-history of a disease organism.

It was not until the early years of the present century, around 1905, that real proof of the bacterial nature of the foul brood diseases and of the existence of more than one variety of them, was given. This was the work, not of one man, but of three, working independently of one another. Burri in Switzerland, Maassen in Germany, and White in the United States, almost simultaneously found a new bacillus in ropy cases of foul brood. Burri failed to cultivate it, but Maassen and White succeeded. White gave the first technical description of it, and the name by which it has since been known—*Bacillus larvae*. Gradually, since then, the other brood diseases have been disentangled and studied—a process by no means yet complete, as we know.

There have thus been four stages in the history of our knowledge of the brood diseases. In the first, from classical times to the sixteenth century, these diseases were little understood, and their effects were confused with that of wax moth attack. In the second period, from the sixteenth to late nineteenth centuries, the existence of brood disease was realised, and the starvation treatment discovered; but nothing was known as to the cause of disease. Then came a period of some thirty years (1874-1904), when the bacterial origin of brood disease was suspected, but not completely proved. Finally, the fourth stage, in which we now are, of increasingly accurate knowledge of the various diseases and of their causes.