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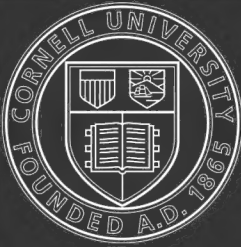
FOUL BROOD.

BY C. D. SMITH and J. M. RANKIN.

AGRICULTURAL COLLEGE, MICHIGAN

1901

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Grayling, Crawford County, 80 acres deeded.
South Haven, Van Buren County, 10 acres rented; 5 acres deeded.
Chatham, Alger County, 160 acres deeded.

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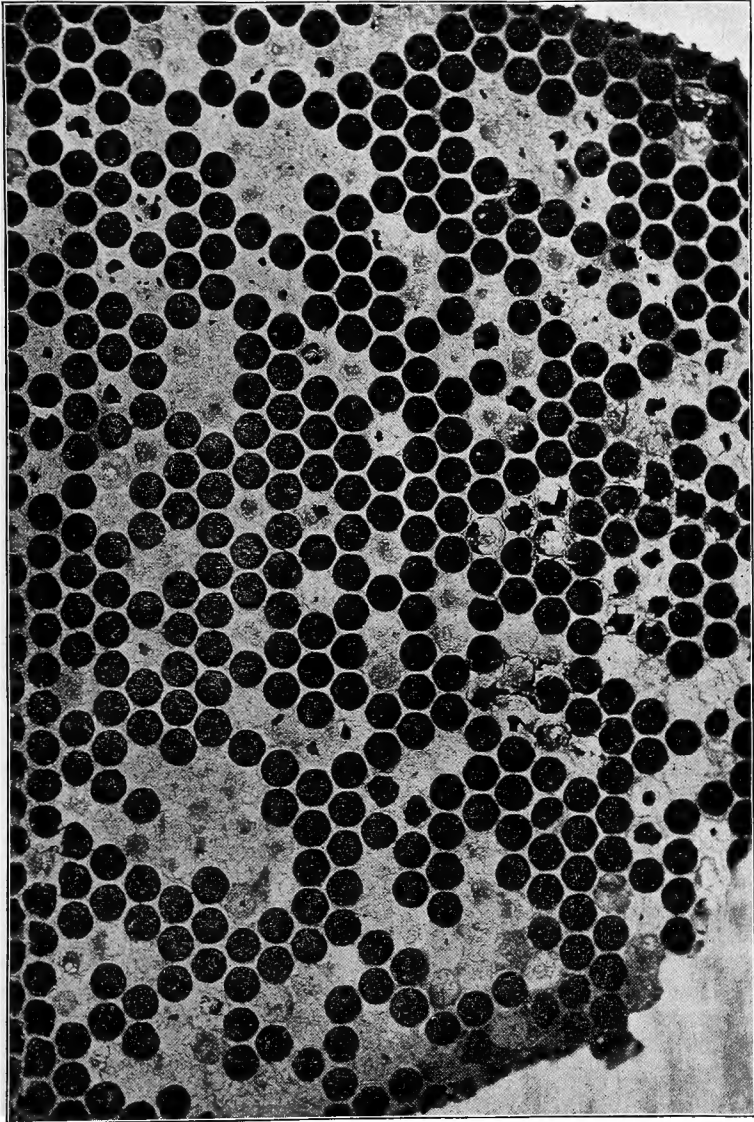
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FOUL BROOD.



SECTION OF COMB INFECTED WITH FOUL BROOD.

Foul brood is a disease of bees common in all parts of the State of Michigan and one which is fast ruining a most pleasant and profitable industry. It spreads through an apiary, affecting the strongest as well as the weakest colonies, because it is one of those malignant and contagious diseases due to the presence of a germ called by the scientists bacillus alvei. Adult bees are supposed to be beyond the reach of this germ, and the disease is therefore confined to larvæ between the ages of one and ten days. Just how this young larva becomes affected is not definitely known. It may be through contagion from the diseased comb or brood which contagion is brought to the young larvæ by the nurse bees, but in all probability the germ is introduced with the food. It has been said that foul brood develops from chilled or starved brood. This has been proven beyond a doubt not to be true. Since it is a germ disease it cannot develop when the germ which causes it is not present. On the other hand, the disease is so highly infectious that one drop of infected honey may ruin a whole apiary.

SYMPTOMS.

The first apparent evidence of the presence of the disease manifests itself in the behavior of the bees which do not seem to possess their usual activity but have a lazy, indolent manner. There is apt to be some litter in the entrance of the hive as though the bees were loath to "clean house." A few bees may fan at the entrance. After the disease is well advanced a foul smell resembling melting glue may be detected without removing the cover even, and at some little distance from the hive.

On removing the cover an examination of an infected colony reveals the following peculiarities: The brood is not compact, but scattered. The empty cells, those not containing brood, may contain a dry scale in the bottom. The cappings over the dead larvæ are depressed slightly and darker than the healthy ones. There is often a hole in the center of the cap. Many larvæ, however, die before the cell is sealed.

If the examination is made when the disease is just beginning, the affected larvæ are no longer curled up, but either lie extended in the cell or are moving about unnaturally. As the disease progresses they lose their plump appearance, become flabby and finally die.

As decomposition begins the larvæ at first take on a yellowish appearance, and later turn brown. If a toothpick is inserted into the dead larva at this time and later and is slowly drawn out it will show a long, ropy tenacious string, which upon breaking, when drawn out to its fullest extent, flies back into the cell. This ropy, putrid mass slowly dries down and adheres to the bottom of the cell, forming a small scale. The bees seem reluctant to remove these dead larvæ, instead of hastening their removal as they do in other instances when larvæ die. Or it may be that the dead larvæ adhere so firmly to the cell that it is impossible for the bees to remove them. Whatever the cause may be, when the larvæ are killed by this disease they are not removed.

As a result of the disease the colony becomes weakened since the brood fails to hatch, and soon dwindles down to such an extent that it is utterly defenseless and is then liable to be robbed. As soon as

the robbing begins the disease is transferred to other colonies, and unless the bee-keeper is watchful the whole apiary becomes infected.

It has been said "a bee-keeper who does not discover foul brood before his nostrils remind him that something is wrong is no man to treat the disease." It would be more proper to say that a bee-keeper who does not discover that something is wrong before his nostrils tell him of the presence of foul brood is no man to treat the disease, for foul brood is often found in the apiary of an owner who was not acquainted with it, but who after having been instructed as to its nature and treatment has effected a complete cure. Dr. Howard says, "I regard the use of any and all drugs in the treatment of foul brood as a useless waste of time and material, wholly ineffectual, inviting ruin and total loss of bees. Any method which has not for its object the entire removal of all infectious material beyond the reach of bees and brood will prove detrimental and destructive and surely encourages the recurrence of the disease."

The one method that has given the most universal satisfaction is recommended by Canada's inspector of apiaries, William McEvoy. His method is given below in his own words:

MC EVOY TREATMENT.

"In the honey season, when the bees are gathering freely, remove the combs in the evening, and shake the bees into their own hives; give them frames with comb foundation starters and let them build comb for four days. The bees will make the starters into comb during the four days and store the diseased honey in them, which they took with them from the old comb. Then in the evening of the fourth day take out the new combs and give them comb foundations to work out, and then the cure will be complete. By this method of treatment all the diseased honey is removed from the bees before the full sheets of foundation are worked out. All the old foul brood combs must be burned or made into wax after they are removed from the hives, and all the new combs made out of the starters during the four days must be burned or made into wax, on account of the diseased honey that would be stored in them. All the curing or treating of diseased colonies should be done in the evening, so as not to have any robbing done or cause any of the bees from the diseased colonies to mix and go with bees of sound colonies. By doing all the work in the evening it gives the bees a chance to settle down nicely before morning and then there is no confusion or trouble. This same method of curing colonies of foul brood can be carried on at any time from May to October, when the bees are not getting any honey by feeding plenty of sugar syrup in the evenings to take the place of honey flow. It will start the bees robbing and spread the disease to work with foul brood colonies in warm days when the bees are not gathering honey, and for that reason all work must be done in the evenings, when no bees are flying. When the diseased colonies are weak in bees, put the bees of two, three or four colonies together, so as to get a good sized swarm to start the cure with, as it does not pay to spend time fussing with little weak colonies.

"When the bees are not gathering honey, any apiary can be cured of foul brood by removing the diseased combs in the evening, and giving

the bees frames with comb foundation starters on. Then also in the evening feed the bees plenty of sugar syrup, and they will draw out the foundation and store the diseased honey which they took with them from the old combs; in the fourth evening remove the new combs made out of the starters and give the bees full sheets of comb foundation and feed plenty of sugar syrup each evening until every colony is in first-class order. Make the syrup out of granulated sugar and put one pound of water to every two pounds of sugar and then bring it to a boil. As previously stated, all the old combs must be burned or made into wax when removed from the hive, and so must all the new combs made during the four days. No colony is cured of foul brood by the use of any drug. All the old combs must be removed from every diseased colony and the hive got away from the bees before the brood rearing is commenced in the new clean combs."

N. E. France, inspector of apiaries of Wisconsin, says, "All the difference from the McEvoy treatment that I practice, I dig a deep pit on level ground near diseased apiary, and after getting a fire in the pit, such diseased combs, frames, etc., as are to be burned, are burned in this pit in the evening and the fresh earth from the pit returned to cover all from sight. If diseased combs with honey in are burned on surface of soil there is great danger the melted honey will run on the soil and in the morning the robber bees will be busy taking home the diseased honey.

"Also I cage the queen while bees are on the six or eight strips of comb foundation, to prevent any swarming or deserting."

The equipment necessary for the McEvoy treatment is a large canvas or sheet, a broad pail partly filled with the corrosive sublimate solution, a sponge or rag, a bee brush similar to a Cogshall, a screw driver, or some other tool for prying the frame loose, and a set of frames containing only starters of foundation. The only time of day suited to the treatment is toward evening, when the bees have ceased flying to and from the fields. A bright moonlight night answers the purpose if many colonies are to be treated, though the bees are perhaps more easily handled just at dusk than in the moonlight. At this time we have little to fear from robbers or from infected bees flying to healthy colonies.

The method of procedure is about as follows:

Spread the canvas over the old stand, place the hive on the canvas. Gently shake the bees off the old combs into the hive, and brush all the bees of the old combs into the hive body. Remove the hive from the canvas, which should be gathered up by the corners in order to allow the bees to be shaken from it into the hive; then add the frames of foundation starters. Be sure that every bee is secured and placed in the hive for a single escaping bee might fly to a neighboring hive and infect the colony.

During the whole operation care must be exercised to prevent robbing. Before the work is done, all scattering drops of honey must be removed by washing with the corrosive sublimate and all bits of comb must be picked up. Never let one drop of honey get away to infect other colonies.

When you have a set of combs partly full of honey, it seems a sin to destroy them but unless you have upwards of ten colonies to treat, it

will not pay to try to save an ounce of honey or wax. If you are a careful person you may make the combs into wax, and the honey may be saved by adding a little water and keeping it at the boiling point for two hours.

The old hive bodies may be scraped, the scrapings burned, and the inside painted with kerosene and set on fire. When it gets to burning well, throw in about two tablespoonfuls of water and clap on the cover. The water will be turned to steam and this will scald the inside of the hive.

If this operation be performed with sufficient care, the colony will be free from the disease, but it will require close attention and the best of care because of the tender condition in which the bees will be after the severe treatment, and the discouragement following the loss of all their brood. This treatment may be used at any time during the summer but preferably when honey is coming in, as the danger from robbing is then at a minimum.

There are doubtless many instances where a mild case of foul brood is taken for chilled brood, and it is possible that a case of foul brood may appear in a mild form early in the spring, and then disappear as the summer opens, only to reappear later in the season. It is possible that this state of things is due to the fact that the honey in the cells is infected with the germs, and when the spring honey begins to come in freely, it is used to feed the brood, which spring honey, being free from germs, is eaten by the brood, with impunity until the combs become full of healthy brood and the dead larvæ nearly disappear.

Perhaps the most favorable condition for the spread of the disease occurs when it becomes present in the yard of the bee-keeper who does not examine his colonies frequently. A colony becomes weakened from the failure of the brood to mature and the keeper may not know that anything is wrong with the colony. Soon the honey flow stops and robbing commences. Weak colonies are attacked first and in this way honey from this weak, diseased colony is taken to nearly every hive in the yard and especially to the stronger ones with disastrous results.

The extractor is an important factor in spreading the disease. A case of extracted combs, taken from a diseased colony, and after extraction put back into half a dozen different hives, may bring infection to each one of them.

In the winter of 1898-9 the bees were wintered in a cellar at the station. They were tiered up in the cellar in alternate rows with the bottoms of the hives removed. A diseased colony was placed among the healthy ones and marked. During the winter the bees did not remain quiet but ran out from the hives to quite an extent. In the spring the four hives, which had wintered in direct contact with the diseased one, were also diseased.

This shows that wintering the colonies in cellars with the bottom boards of the hives removed, may also assist in spreading the disease.

Another way in which the apiary may become infected is by the carelessness of the owner. Combs, partly filled with honey or brood are left lying on the top of the hive "for the bees to clean up." The waste from the wax extractor is thrown out where the bees can have access to it. A hive in which the colony has died is not at once taken out of the reach of the bees, but allowed to stand in the yard and the entrance of

the bees not fully prevented. This is wrong. Even if there were no danger from disease, the hive should be closed as soon as the colony is dead, and the refuse from the wax extractor burned, never leaving it where the bees can get at it. Such carelessness encourages robbing and is an important factor in the spread of the disease. The extractor need not be discarded nor the practice of cellar wintering, but every bee-keeper should make himself acquainted with the disease, keep a vigilant watch, and stamp it out as soon as it appears. To leave one diseased colony in an apiary may mean the total ruin of all the other colonies. Even one drop of infected honey, if left where the bees have access to it, may mean the infection of the whole apiary. The owner must then take extreme precautions to prevent the entrance of the disease. He must even go to the trouble of rendering his hands, and whatever tools he uses, antiseptic by washing them in a three per cent solution of carbolic acid, which would be about four teaspoonfuls to a gallon of water. Or a solution of corrosive sublimate, using one-eighth ounce of the drug to one gallon of water. Right here it should be remembered that corrosive sublimate is a deadly poison, and one that must be handled with great caution. A very small amount spilled on the honey or comb intended for use will convert it into a violent poison. The disease may be transmitted to a healthy stock simply by the operator handling the frames of the healthy one after he has been examining a diseased colony. It is impossible to be too careful. For the man who does not wish to take the above precautions, the best method of procedure for him to rid his apiary of the disease is to burn all infected colonies and apparatus.

The following is the Michigan statute, which was passed at the 1901 session of the legislature. It provides for an inspector for the suppression of the disease in Michigan.

We are indebted for much of the subject matter of this bulletin to N. E. France, Inspector of Apiaries of Wisconsin, William McEvoy, Inspector of Apiaries of Canada, and to Prof. F. C. Harrison of Guelph.

The People of the State of Michigan enact:

Section 1. The Dairy and Food Commissioner upon receipt of a certified copy of the record of the Michigan State Bee-keepers Association, by the secretary of said association, showing that a majority of the members of said association recommended the appointment of an inspector of apiaries, shall appoint a State Inspector of Apiaries. Said inspector shall be responsible to the Dairy and Food Commissioner and shall comply with such rules and regulations as the Dairy and Food Commissioner shall from time to time prescribe for the carrying out of the work of said State inspector.

Sec. 2. The Dairy and Food Commissioner shall, when notified in writing by the owner of an apiary or by three disinterested taxpayers in the vicinity of the apiary, cause the inspector to examine such apiaries as are reported and all others in the same locality not reported, and ascertain whether or not the disease known as foul brood or other contagious disease exists in such apiaries, and if satisfied of the existence of

foul brood, he shall give the owner or care-taker of the diseased apiaries full instructions how to treat said case as in the inspector's judgment seems best.

Sec. 3. The inspector who shall be the sole judge may visit all diseased apiaries a second time and if need be burn all colonies of bees and combs that may be found not cured of foul brood or other contagious diseases.

Sec. 4. If the owner of a diseased apiary, honey or appliances shall knowingly or wilfully sell, barter, or give away any bees, honey or appliances, or expose other bees to the danger of said disease or refuse to allow said inspector to inspect such apiary, honey or appliances, said owners shall on conviction before a justice of the peace, be liable to a fine of not less than fifty dollars nor more than one hundred dollars, or not less than one month's imprisonment in the county jail, nor more than two months' imprisonment.

Sec. 5. In addition to such individual reports as are required under this act by the Inspector of Apiaries, he shall make an annual report to the Dairy and Food Commissioner, giving the number of the apiaries visited, the number of diseased apiaries found, the number of colonies treated, also the number of colonies destroyed by fire, and an itemized account of his transportation expenses with affidavit annexed thereto.

Sec. 6. There is hereby appropriated out of any moneys in the State treasury not otherwise appropriated a sum not exceeding five hundred dollars per year for the suppression of foul brood among bees in Michigan. The inspector shall receive three dollars per day and actual transportation expenses for actual time served, which sum shall not exceed the money hereby appropriated, to be paid by the State Treasurer upon warrants drawn by the Auditor General and approved by the Dairy and Food Commissioner.

Sec. 7. Act number one hundred forty-one of the Public Acts of eighteen hundred eighty-one, being sections fifty-six hundred sixty-three, fifty-six hundred sixty-four, fifty-six hundred sixty-five, fifty-six hundred sixty-six, fifty-six hundred sixty-seven, fifty-six hundred sixty-eight, fifty-six hundred sixty-nine and fifty-six hundred seventy of the Compiled Laws of eighteen hundred ninety-seven, is hereby repealed.

This act is ordered to take immediate effect.

J. M. RANKIN,
Apiarist.
C. D. SMITH,
Director.

Agricultural College, Mich., June 4, 1901.

