

secretary, but other work came up which interfered with the carrying out of this experiment, and consequently it had to be postponed until next year. However, I was able to perform one experiment which throws some light on the subject. Mr. Hottermaun, the secretary of your Union, sent me several pounds of very fine wax, such as is used for the manufacture of comb foundation. I cultivated the bacillus alvei upon agar jelly until I had a large quantity of the bacilli containing spores; this was carefully scraped off the jelly and dried, first in the air and then over sulphuric acid. The resulting greyish mass was pulverized with a sterilized pestle and mortar and finally mixed thoroughly with the melted wax, kept at a temperature sufficiently low to prevent the immediate destruction of the spores by heat. By this means an enormous number of spores were introduced into the wax. After stirring the wax for some time in order to insure a proper mixing, it was allowed to cool. This, as you all know, takes some time, when dealing with a considerable quantity. During the cooling I was careful not to disturb the wax.

After it had solidified I set out to discover if I could again obtain my bacillus from the infected wax. If it could germinate in the nutrient media it certainly would in the bees, and that point was to a certain extent settled. Now I obtained the following results:—

From the upper layers of the infected wax I was unable to obtain cultures of the bacillus alvei, either by melting the wax in the nutrient jellies, or by allowing particles of the unmelted wax to fall on the surface of these jellies.

From the under layers, however, the results were different; particles of wax placed on nutrient agar in an oven kept at 90° F. became surrounded in twenty-four hours with a luxuriant growth of bacillus alvei. When the wax was melted into the agar or into beef tea I also obtained the bacillus, consequently it looks as if the mere fact of enveloping the spores with a film of wax was not sufficient to prevent germination. I confess I cannot under-

stand how a spore could germinate when surrounded with a film of wax. Spores in germinating require moisture, and if a spore is completely imbedded in wax, it cannot obtain sufficient moisture to germinate; I would rather believe, therefore, that in this particular experiment the spores had not each an envelope of wax, but that many of them were partially free from the wax. Now, if this was the case in my experiment, where I endeavored to make the incorporation of the spores in the wax as thorough as possible, I certainly think it may frequently be the case when foul broody wax is used, and no particular precautions taken. That even when spores are thoroughly surrounded by wax they may not be freed occasionally by the workers, is a point which requires further elucidation, and upon which I intend to try some experiments next year.

In looking through the bee journals, however, I find it everywhere maintained by foundation-makers that they never knew of a case of foul brood originating from foul broody wax; and I have yet to discover a well authenticated case where this has occurred. What explanation can we offer of this wide spread opinion?

I explained to you above that I was unable to cultivate bacillus alvei from the upper layer of the infected wax. Your secretary also sent me a small specimen of wax which he stated he knew to be from foul broody comb. This I examined repeatedly for foul brood, but was unable to obtain it only once. I think we must look to the physical conditions for an explanation of the freedom from infection through comb foundation. The difference in the specific gravity of the bacteria and of melted wax is so great that throughout the process of manufacture the bacteria tend to fall to the bottom. The first refining of the wax must of course remove the greater quantity, and the vast majority of the remainder will settle to the bottom during the process of foundation manufacture. But that the simple process of mixing the infected material with the melted wax is not sufficient to prevent germination, I think, is shown by the results