

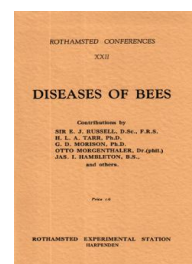
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BROOD AND ADULT BEE DISEASES IN SWITZERLAND

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bei Bern. Director : Professor Dr. R. Burri)

FIRST of all I should like to thank Sir John Russell and the Bee Research Advisory Committee, who invited me to to-day's meeting, for the great honour of being able to speak to you. I know that this honour does not apply to me personally but to my country, and especially to my friend, Dr. Leuenberger, who died in March of this year, and who 28 years ago gave us a foul brood law and, for German-speaking Switzerland, a foul brood insurance, which up to the present has fully stood the test, technically and administratively, and has given beekeepers complete satisfaction. Since the English Beekeepers are also working toward a foul brood law and a foul brood insurance, I shall speak to-day principally about our experience with foul brood and only at the close shall I briefly touch upon our anxieties and our successes with diseases of adult bees.

Time does not permit me to go into detail, and this is not necessary, as Mr. Illingworth, two years ago, has given you an excellent account of bee disease legislation in Switzerland. So I shall emphasize only three points which to me seem important for the success of the Swiss method. I shall be very glad to give information about special points in the discussion.

The first important step was that we were able to convince our government of the economic importance of beekeeping. By so doing, bees were accorded the same legal protection as other domestic animals. Bee diseases were included in the federal animal disease law and now there are government funds for their control as for combating other animal diseases. The federal veterinary office gives yearly about 10,000 fr. for the control of bee diseases; that is to say, mostly for salaries to the bee inspectors for their work among sick colonies. The cantonal governments together give an equal amount for this purpose. The beekeepers do not give any contribution either to the federal government or to the canton. We find that this sacrifice on the part of the government is not too high if we consider the total expenditure for the control of all animal

DISEASES OF BEES

23

diseases. The federal government contributes about 1,000,000 fr. annually for the control of all animal diseases. The contribution for bee diseases (10,000 fr.) is therefore only about 1 per cent.

The second important point is that the beekeepers, in spite of this government aid, have retained full autonomy in the control of bee diseases. Apiculture has its own peculiarities and needs which must be followed if one wants success. It is of little use to be a good veterinarian. To know all the diseases of the other domestic animals does not make one a good bee doctor. The first qualification for our bee inspectors is not that they be good veterinarians or good microscopists, but they they should be good beekeepers. They are trained in special courses for their position as bee inspectors. We can say that in Switzerland the matter is regulated thus: the government gives the money and the beekeepers do the rest. There is a mutual confidence whereby both parties are satisfied.

The government should not be drawn in more than absolutely necessary. For this reason our foul brood insurance is private, that is to say, it is the affair of the beekeepers' society. This requires first of all that beekeepers have a strong central organisation. This condition is fulfilled in Switzerland. Thus it was possible that, with the very small insurance premium of 5 centimes per colony, 100 per cent. of the value of the diseased hive could be paid out as an indemnity. Besides a reserve fund could be created which at present amounts to about 50,000 fr. This sum even enables us to meet unexpected situations.

Each local beekeeper's association has also a special fund for the control of bee diseases; that is to say, chiefly for the sanitary inspection within its territory.

The third important point is absolute certainty of diagnosis. The whole control of a disease is impossible as long as there is confusion in the diagnosis. Our inspectors are not scientists, they might make a mistake in this matter. Anyone who has much to do with bee diseases knows how closely certain diseases and anomalies resemble each other externally. For this reason it is required that all diagnosis be made in the laboratory. The bee division of the Liebefeld Experimental Station performs this task as well as research work on still unknown bee diseases. It was founded by Professor Burri who, in 1904, was the first to give a clear bacteriological differentiation between the two kinds of foul brood. The bee division at Liebefeld (including a department for pollen analysis of honey) gives work at present to six people. Its annual budget is about 50,000 fr. The division is not under the authority of the veterinary office but under that of the agricultural department. Still we do not find these 50,000 fr. disproportionate, since the expenditure of the agricultural department for agricultural experimental stations is about 1½ million francs annually. The expenditure for bees amounts to only the thirtieth part of this total.

With the aid of two Figures I should like to make you better acquainted with our experience with foul brood. The first shows

DISEASES OF BEES

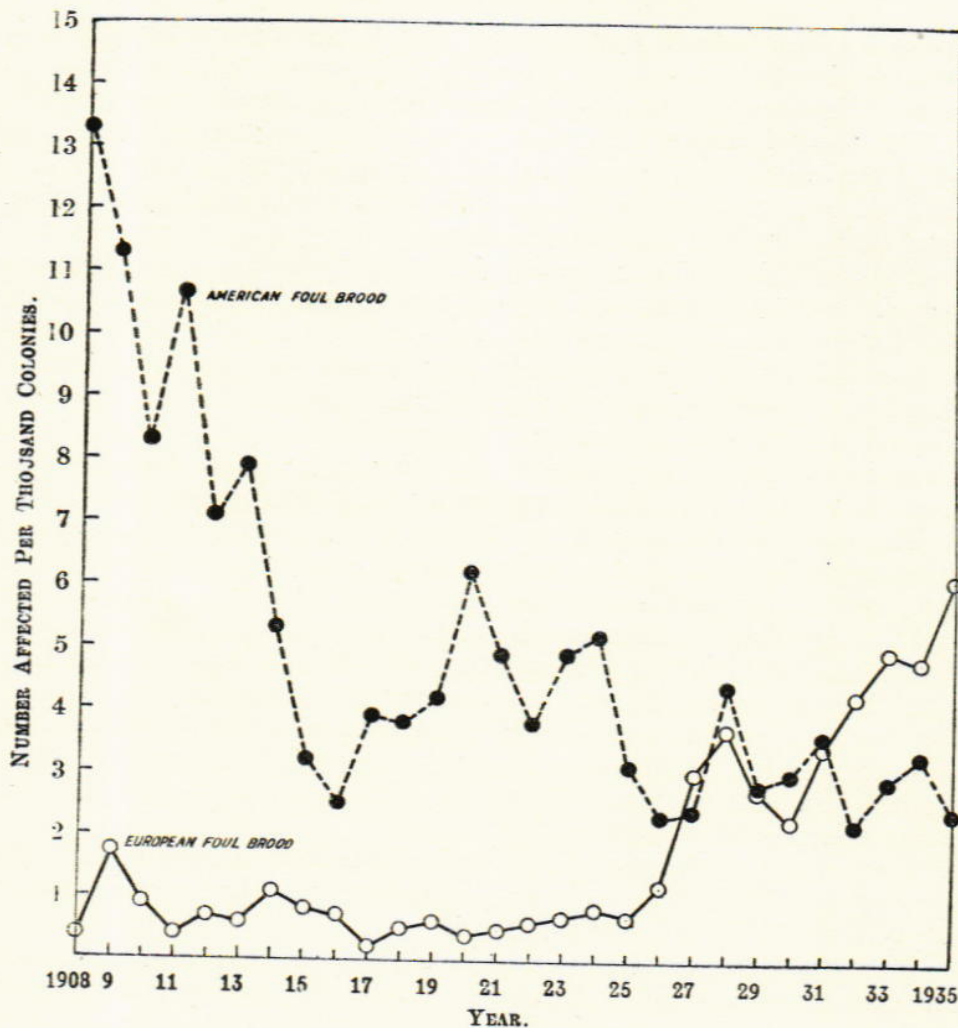


FIGURE 1.

the total number of cases of American and European foul brood from 1908 to 1935, taken from the reports of Dr Leuenberger. I am afraid you will be disappointed on examining this table to see that the success of which I have spoken has reference only to one form of foul brood, namely, American foul brood. We see a pronounced reduction of this disease from about 13 per thousand colonies in the year 1908 to about 3 per thousand in the year 1935. This is the splendid result of Leuenberger's organisation. The control method consists in burning the combs of a sick colony and shaking off the bees as an artificial swarm. The hive is disinfected with a flame and, what is most important, the apiaries of the entire neighbourhood are inspected repeatedly. In this way it has been possible to free large areas from American foul brood. If we have not yet succeeded in entirely banishing this disease from our country it is not the method which is to blame. I emphasize this because recently in America and in Germany certain workers

DISEASES OF BEES

25

have criticized the artificial swarm method and have wanted to burn the bees also. In answer to them we can point out that with us the artificial swarm method has proved a complete success in 28 years of practice. It is not this method which is to blame for the fact that we still have 3 cases of American foul brood per thousand colonies, but human imperfection, which again and again prevents the clear regulations for complete inspection, and eradication being correctly carried out.*

The curve which shows the occurrence of European foul brood since 1908 runs in quite another way. This disease was formerly scarcely known in German-speaking Switzerland. But during the last few years it has begun to increase seriously, and is now already more than twice as prevalent as American foul brood. This increase of European foul brood during the period in which we have successfully treated American foul brood was very painful for us, and we had to conclude that our methods of fighting European foul brood were inadequate. What were our control methods and our ideas with respect to European foul brood?

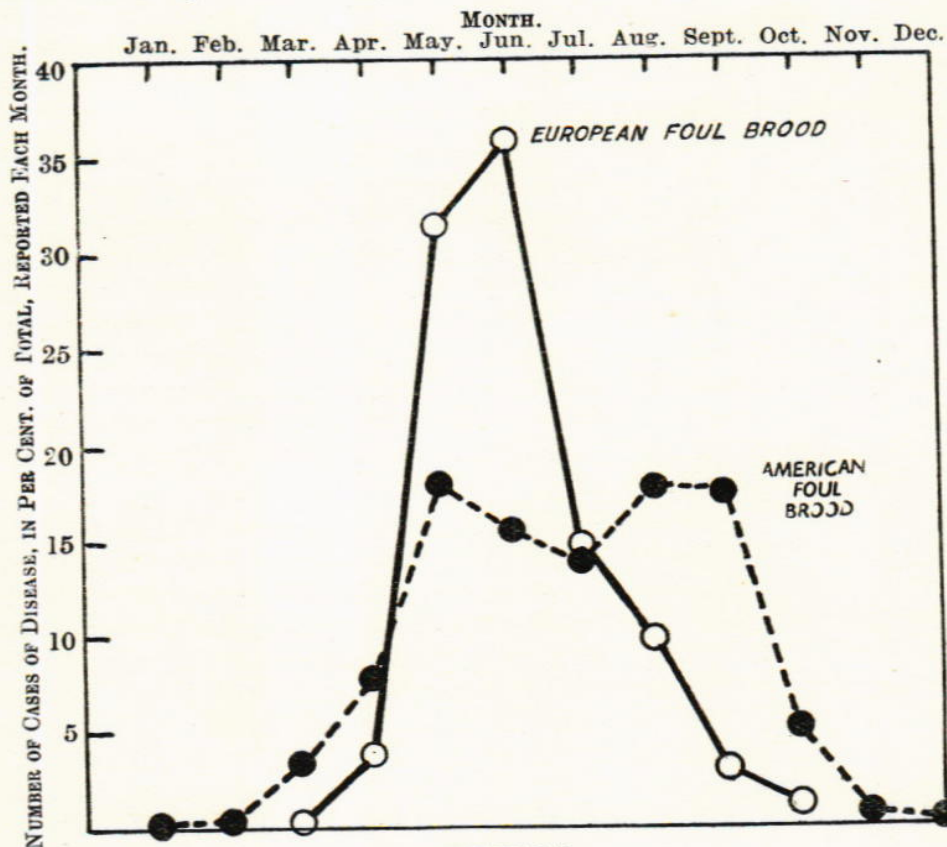


FIGURE 2.

* It is easy to prove that the shaking method, when carefully carried out, is really effective, but whether it is too complicated for official use in every country is a matter of controversy. We are of the opinion that this is really a question of the education of the beekeepers.

As we see, this disease played almost no rôle formerly and furthermore it was observed that it sometimes disappeared again spontaneously. We therefore did not bother ourselves much about it. We also became acquainted at this time with the opinion held in the United States, where on the basis of a very wide experience, European foul brood was represented as a deficiency disease, as a disease which only appeared where there were bad beekeeping methods and where the colonies, especially in spring, suffered from hunger, or for some other reason could not develop well. This hypothesis of a deficiency disease was also strongly supported by the very remarkable seasonal occurrence of European foul brood. I find this seasonal occurrence so interesting and so important for an understanding of European foul brood that I should like to discuss it briefly with the aid of Figure 2. You find here again American and European foul brood represented by two lines. The months are indicated above and directly under each month the number of cases of foul brood, in per cent. of the total for the year, observed in this month.† Let us first examine American foul brood. Naturally we have few cases in winter because few inspections are made then. But from spring until autumn one can always demonstrate the presence of this disease. We say that we can easily find American foul brood in a diseased colony at any time.

It is quite different with European foul brood. It begins slowly in spring, is often scarcely to be demonstrated in the first brood period in April, but increases rapidly, reaching a peak in May and June, then falls back again just as quickly. In autumn, when American foul brood is still very easily demonstrable, European foul brood has practically disappeared without any treatment, but will return again next May and June. We are surprised at the similarity between the seasonal course of European foul brood and that of *Nosema* infection. *Nosema* is also most pronounced in May, and apparently disappears in autumn, only to reappear the following spring.

We have no certain explanation for this remarkable seasonal occurrence of European foul brood, but it is understandable that one is inclined to find an explanation in the deficiency theory. May and June are also highly important months for normal bees. The time of greatest growth, of greatest breeding activity, of the mighty impulse for expansion of the bee colony is found at this time. It is a critical period. In the case of other living creatures and also in the case of man, one speaks of a growth crisis. This growth crisis of the bee colony coincides, unfortunately, all too often with a weather crisis, a setback in the weather in May. Instead of spring warmth and a rich flow of honey, hunger and cold invade

†This figure shows all the cases of foul brood received at Liebefeld during the past 30 years. (About 1,500 cases of American and 1,200 cases of European foul brood.)

DISEASES OF BEES

27

the hive, and then, even without the influence of bacteria, through undernourishment and lack of warmth alone, the colony can get into a wretched condition.

This temporal coincidence of the European foul brood peak with the growth and weather crisis in colonies has led to the obvious interpretation that European foul brood is merely due to insufficient nourishment and insufficient warmth ; that is to say, a deficiency disease. We do not deny that one can often observe cases where the disease after a good honey yield or after packing and artificial feeding has disappeared again. But recent years have shown us with all clearness that the nature of the European foul brood is not sufficiently characterized by the designation "deficiency disease." We have had several excellent years since 1930 and, in spite of this, the disease has spread. We have also often found a very marked European foul brood infection in vigorous colonies that had plenty of honey and pollen. We have not noticed that the race of bee has great influence on the appearance of the disease, for it is just as common with the black bee of German-speaking Switzerland as with the Italian bee of the canton Tessin and the hybrid bee of French-speaking Switzerland. All our experts and inspectors are now agreed that, although environmental conditions play an important rôle in the occurrence of European foul brood, we must not, however, disregard the significant part played by disease bacteria. And because we now attribute a more important rôle to infection than we have hitherto, we must also pay more attention to disinfection in its control. We are convinced, that failure in the control of European foul brood comes from the fact that we have tried to fight it only by indirect methods instead of by the direct removal of the infectious substance, as in the case of American foul brood. According to our observations it is not possible for the bees, even after dequeening, to remove the infectious material from the hive sufficiently. For the bacilli of European foul brood are not only present in the sick and dead larvae, but we also find them in great numbers under the cell cappings in cells which contained living and dead nymphs. It seems that the bacilli get into the cell with the excrements of the larvae before cocoon spinning. So we also burn the combs in the case of European foul brood and the experience of recent years leads us to hope that in this way we shall succeed in curbing the increase of European foul brood.

As we attribute a more important rôle to infection the great importance of bacteriological research becomes evident. We all know how involved the bacteriology of European foul brood is and what conflicting opinions the specialists hold to-day. However, I shall not enter further into such details here and only give expression to the great pleasure which it has afforded me to take a glimpse at the excellent and very important research of my colleague, Dr. Tarr.

As we see, of the two most important brood diseases one is conquered for the Swiss beekeeper, but the other still gives us much concern and requires further careful research. Conditions are exactly the same in the case of the two most important diseases of the adult bee, which I shall discuss in a few words:—When in 1922 acarine disease was discovered in our country, we were very fortunate to possess in the foul brood organization a weapon with which we could also control other bee diseases. Our foul brood inspectors became bee disease inspectors and to the animal disease law was simply added a new paragraph, "acarine disease." This immediate defence has allowed us, up to the present, to save the greater part of Switzerland from an acarine infection. But, in spite of the good organization, our campaign would probably have been hopeless if Mr. Frow had not come to our help at the right moment with his treatment. In extensive scientific and practical experiments we have tested this remedy and found that it actually exceeded the boldest expectations and, when used correctly, killed all mites. Swiss beekeeping owes Mr. Frow great gratitude for his discovery which he, in absolute unselfishness, offered the public for use. Acarine disease will soon be no longer a matter for public concern in Switzerland, since every beekeeper is able to protect his apiary from infection by correct application of this remedy. What remains for us to do in this matter is to get rid of certain disadvantages of the Frow treatment, principally the danger of robbing.

As far as the success of control is concerned, we can therefore compare acarine disease with American foul brood. On the other hand European foul brood has points of great similarity with *Nosema* disease, as I have already noted in my remarks relating to seasonal occurrence. Also, as yet an effective control method has not been found for *Nosema* disease. As with European foul brood, one knows much too little of its nature. We are glad that we have not included *Nosema* in the animal disease law. Before we can introduce a *Nosema* law or a *Nosema* insurance, we must study the disease itself further. With us the Swiss *Nosema* commission has taken up this task. In it the federal veterinary office, the entomological institute in Zürich, the bee division at Liebefeld, and the beekeepers' societies are represented. I think that our *Nosema* commission corresponds exactly to your Bee Research Advisory Committee.

In the *Nosema* question we have sufficient material for at least a days' discussion. You all know the remarkable phenomenon in which a bee colony which is 100 per cent. infected with *Nosema* can appear absolutely healthy externally. I shall not try your patience by naming all *Nosema* theories and should like here only to offer for discussion the theory which we hold at the present time. We believe that *Nosema* infection alone, in a well-managed colony and under good conditions, cannot cause great damage. The dreaded devastation which has hitherto been ascribed to

DISEASES OF BEES

29

Nosema and which consists in a conspicuous weakening of the colony in spring, "spring dwindling," we believe to be the result of a mixed infection of Nosema (in the middle intestine) and of amoeba (in the malpighian tubes). It interested us very much to learn that Amoeba has also been found in Great Britain by Dr. Morison.

Before I close my survey of Swiss experience with reference to bee diseases, I should like to mention a special field of research with which we have been busy for some years. It concerns the diseases of the queen. My colleague in Liebefeld, Mr. Fyg, who devotes himself especially to this problem, tells me that up to now, after an examination of about 500 queens, he has found 42 different abnormalities and diseases of the bee queen. We believe that queen diseases play a far greater rôle in practice than has hitherto been recognised.

According to our views bee diseases are not only a question of bad beekeeping methods and of bad environmental conditions. We have seen many cases in which bee colonies, with the best of care and under the best environmental conditions, suffered heavily from a brood disease or a disease of adult bees. Moreover, in the history of apiculture we have seen that the alarm over bee diseases did not originate with careless people and with bunglers, but on the contrary with the pioneers of practical beekeeping. They had realized that all their efforts to improve beekeeping were futile, as long as the diseases were not scientifically studied and as long as they were not conquered by special control methods.

Ladies and Gentlemen, Switzerland is a small country and our experience with bee diseases is based, therefore, only on relatively little material. But I should like to point out that with regard to climate, flora, beekeeping methods and races of bees we have very varied conditions which perhaps invests our conclusions with somewhat greater value. We are always very eager to learn the experience of other countries. Therefore I should like to take the liberty here, as I have done at former international congresses of apiculture, of pointing out the desirability of statistics on the occurrence of bee diseases in all lands. We were highly interested in the work which Mr. Morland has undertaken in determining the geographical distribution of foul brood in England.* I can show you here with the aid of maps the distribution of the four most important diseases in Switzerland.† We should be much better informed on many questions of bee pathology if we possessed such maps of all countries.

If, in conclusion, I should give the reason why Switzerland shows some successes in controlling bee diseases I believe I can say that

* "Brood Diseases of Bees." Rothamsted Experimental Station Conference Report 18, 1934. (Out of print in separate copies).

† Maps showing the distribution of American foul brood, European foul brood, Acarine disease and Amoeba disease in Switzerland were exhibited.

the reason lies in the good relationship between practice and science. The beekeepers know that they cannot get further in the control of bee diseases without scientific help, and the scientists know that they cannot understand bee diseases if they do not also to some extent understand the life and treatment of healthy bees, viz. apiary practice. I should like to close my address by saying how gratified I am by the fact that this good relationship between science and practice, and with it the most important prerequisite for a successful control of bee diseases, also exists in the British Isles.