

## THE SOURCES OF INFECTION IN FOOD POISONING OUTBREAKS.

BY WILLIAM G. SAVAGE, M.D., B.Sc. (LOND.),  
*County Medical Officer of Health, Somerset.*

COMPARED with 20, or even 10, years ago our present knowledge of food poisoning outbreaks is extensive and in certain directions fairly complete. In spite of this greatly extended knowledge there are some aspects in regard to which we are yet lacking in fundamental information. This is particularly the case as to the precise sources of infection. It may be accepted as a demonstrated fact that most outbreaks of food poisoning are due to infection of the food eaten with one or other member of the Gaertner group of bacilli. The present paper is only concerned with the outbreaks associated with this group of organisms. A study of the individual outbreaks usually supplies evidence which definitely incriminates a certain article of food, and for most of the recent outbreaks further evidence is forthcoming that this has been infected with one or other member of the Gaertner group of bacilli. Tracing the matter a step further back it is only in a quite small minority of outbreaks that the recorded facts show how the food has become so infected. In a proportion of cases, perhaps more than half for continental recorded outbreaks but in only a small fraction of the British outbreaks, it is true that definite evidence is forthcoming showing that the meat was derived from an animal itself suffering from general or local disease caused by Gaertner group bacilli. Even, however, for these cases our recorded knowledge ceases with this information, and we do not know how these animals became infected or whether they represent isolated cases or are part of widespread epidemics amongst the animals affected.

For the majority of the outbreaks, i.e. those in which no animal affected with disease is reported, our information as to causation is absolutely negative. Our ignorance on these points is really extraordinary and not less so is the complacency with which these important questions are ignored in the majority of the reported outbreaks. I am of

opinion that the widespread, but inaccurate, idea that these organisms are ordinary inhabitants of the animal intestine is frequently the cause of the failure to probe deeper into the precise channels and methods of infection.

Three hypotheses may be advanced to explain the origin of the Gaertner group bacilli in those cases for which definite disease of the animal supplying the meat could not be traced. These three hypotheses are fully discussed in my Report to the Local Government Board on Food Poisoning and Food Infections (Savage, 1913) and need only be mentioned here.

The first view suggests that the bacilli are of human origin, the food being infected with pathogenic Gaertner bacilli from a human source, i.e. a case of disease (paratyphoid fever) or a carrier case. In my opinion the available evidence certainly excludes this conception.

The second hypothesis, that the Gaertner group bacilli which set up the food-poisoning outbreaks are derived from ordinary faecal infection of the food, is contrary to ascertained fact, as the extended investigations which have been carried out in this country show conclusively that this group of organisms are not natural inhabitants of the intestine of the domestic animals used for food.

The remaining hypothesis is the one which I have advanced elsewhere and which, I believe, best explains the available facts. This hypothesis suggests that the Gaertner caused food-poisoning outbreaks are due to infection of the food with virulent Gaertner group organisms, derived either from animals which are at the time suffering from disease due to Gaertner group bacilli or from animals acting as carriers of these bacilli.

It will be noted that this hypothesis is adequate to explain the outbreaks associated with meat derived from a definitely diseased animal, and also those in which infection occurs during the preparation or storage of the food for consumption. In the above mentioned Report I have given data which make this view a probable one. The purport of the present paper is to further elaborate the significance of this hypothesis and the lines by which its truth can be tested experimentally.

If this view is accepted it implies that certain of the animals used for human food, or which come into contact with food eaten by man, suffer from Gaertner diseases and that in this way the food becomes infected and originates a human outbreak. We should expect therefore to find that diseases of this causation were recognised amongst the domestic animals.

ANIMAL DISEASES CAUSED BY INFECTION WITH MEMBERS  
OF THE GAERTNER GROUP OF BACILLI.

1. *Swine Fever*. This disease is now generally accepted as due to a filterable virus, but in a considerable proportion of cases *B. suispestifer*, a member of the Gaertner group, is also found to be present, not as a mere passive concomitant but apparently with a distinct, although subsidiary, disease-producing rôle. The proportion of cases of swine fever in which this bacillus is found seems to vary from 0 to 45 per cent. or over (Uhlenhuth, Hübener, Xylander and Bohtz (1908), Uhlenhuth and Haendel (1913), Grabert (1907)).

While recorded investigations give the occurrence of this bacillus as prevalent to the considerable extent indicated it is of importance from the present point of view to point out that in many of the records the term *B. suispestifer* is used in a wide sense and include many organisms which with any strict definition of the Gaertner group, such as should be employed, must be excluded as not members of it. Uhlenhuth and Haendel (1913) discuss at some length the varieties of *B. suispestifer* and while they point out that many of these are culturally identical and differ chiefly as regards virulence, motility and other variable characters, yet they include under this term as varieties organisms described by Dorset and also by Joest and Grabert which do not ferment glucose and the bacillus described by Rietsch and Jobert from swine fever pigs at Marseilles which produced acid and clot in milk. Also the eight bacterial strains described by Uhlenhuth, Hübener, Xylander and Bohtz (1908) which failed to be agglutinated must be regarded as suspicious, although they report them as culturally in agreement with *B. suispestifer*, since they do not appear to have recognised the existence of the para-Gaertner organisms which I have described (Savage, 1912). (The dulcitate and salicin tests for example were not employed.)

Certain named varieties of *B. suispestifer*, i.e. *B. typhi suis* (of von Glässer) and *B. suispestifer voldagsen* show, in at least some strains, cultural differences from true *B. suispestifer*.

Two recent investigations in Scotland and America respectively are of interest in this connection. In Scotland M'Gowan (1915) carried out some very thorough post-mortem investigations on cases of swine fever. Cultures were made from the various organs and lesions of 11 cases of this disease in the neighbourhood of Edinburgh and 27 organisms were isolated. None of them however belong to the true Gaertner group as shown by their action upon glucose, dulcitate and litmus milk, while all

(with one possible exception) were non-motile. In two other isolated cases true *B. suispestifer* was not found.

Eberson (1915) studied the chief groups of organisms found in a number of hogs artificially infected with the hog cholera virus, 55 animals being examined: 106 so-called paratyphoid strains were isolated. The cultural character of these organisms are not given in detail, but for some the few cultural tests employed show clearly that they are not true Gaertner strains while for the rest the tests employed are totally inadequate to say if they are Gaertner organisms or not. Yet in this paper it is set out that "classification of the organisms shows that the greatest number belonged to the paratyphosus B. group."

In a recently issued paper Jordan (1917) has shown that the majority of the *B. suispestifer* strains tested by him, and which were mostly derived from affected pigs in America, showed cultural differences (i.e. attack arabinose and dulcitate slowly or not at all) from those given by the strains isolated from food poisoning outbreaks.

It is I think a fair and justifiable criticism to make that if more exact and extended cultural investigations were made of the organisms present in pigs suffering from swine fever a considerably smaller percentage would be recorded as true *B. suispestifer* strains. Apart however from such necessary corrections it would still appear to be true that genuine Gaertner organisms are frequently met with in cases of swine fever, that is organisms which with the most refined bacteriological tests are indistinguishable from the strains isolated from human victims of food poisoning.

2. *Septicaemia and other diseases of calves.* It would appear that while calf septicaemia, dysentery and pneumonia are caused by a number of different bacteria, in a certain proportion of cases Gaertner group bacilli are either the cause or are found to be present.

Thomassen (1897) described a fatal septicaemia in calves in the neighbourhood of Utrecht and isolated a bacillus, now identified with *B. enteritidis*, from the spleens, kidneys and other organs of the affected animals. Since that date Gaertner group bacilli have been reported by several continental observers in cases of septicaemia, white scour, etc. Such reports have been published by Zeller (1909), Titze and Weichel (1909), Schmidt (1908), Riemer (1908) and Winzer (1911). The necrotic areas sometimes met with in the spleen, liver and other organs of calves in slaughter houses have been shown to sometimes contain Gaertner group bacilli (see for example Joest (1914)).

Uhlenhuth and Hübener have shown that Jensen's paracolon bacillus,

described by him as the cause of calf dysentery, is, in at least many cases, a true Gaertner group bacillus. Jensen's (1913) own figures however show that Gaertner group infections are only responsible for a small proportion of the cases which he groups under the term "Kälberruhr." Of 251 cases he only found these bacilli in 16 or 6·4 per cent. Apparently they were all in new born calves and no doubt were all infected at parturition. It is possible that a few may be of human origin but this is a most unlikely source of infection, and the most probable origin is either an infected cow, infected litter, etc.

That bacilli in these calf infections may be pathogenic to man is illustrated by a case recorded by Meyer (1916). A man 26 years old became infected by feeding with a Gaertner group bacillus isolated from the heart blood of a calf which had died from infectious diarrhoea. The patient suffered from severe abdominal cramps, nausea, diarrhoea, flatulence and elevation of temperature but recovered within a week. He had been feeding a calf with milk containing this bacillus. A bacillus was recovered from his excreta identical in every particular with this organism, while specific agglutinins developed in the blood.

3. *Pyæmic and septicaemic conditions in the domestic animals generally.* Bollinger in 1876 first drew attention to the frequency of the association of food poisoning outbreaks in man with the consumption of the meat of animals suffering from such diseases. In a certain number of cases Gaertner group bacilli have been isolated from such conditions and apart from food poisoning outbreaks. For example the *B. morbificans bovis* of Basenau is a Gaertner organism and was isolated by him from a cow emergency slaughtered on account of puerperal metritis, while Fisher in 1896 isolated *B. enteritidis* from the spleen of a cow with udder inflammation. Also of particular interest is the outbreak of acute mastitis in cows recorded by Zwick (1909) and Zwick and Weichel (1910) in which Gaertner group bacilli were isolated from two out of 21 cases.

Against these recorded cases we have the fact that a long series of bacteriological examinations of animals suffering from septicaemic diseases—made on the continent—have failed to show Gaertner group bacilli, except in rare instances.

We must therefore conclude that while conditions of this sort may be caused by Gaertner group bacilli it is a rare and exceptional occurrence and the vast proportion of cases are due to the ordinary pathogenic pyogenic bacteria.

4. *Enteritis in cows.* Such cases are of exceptional interest in view of the fact that in a number of meat poisoning outbreaks the meat has

been derived from a cow suffering from enteritis. Instances of enteritis in cows, unassociated with food poisoning outbreaks, in which Gaertner group bacilli have been isolated are rare and I have only been able to find the following.

Mohler and Buckley (1902) record an outbreak in which seven out of 21 cows in a cowshed suffered from enteritis and died, while three others exhibited early symptoms but recovered. A Gaertner group bacillus was isolated from all the fatal cases. One cow apparently recovered from the acute attack, but ultimately died 26 days after the onset.

Meissner and Kohlstock (1912) describe an interesting outbreak. Dysentery was prevalent amongst some calves causing the death of some, although the majority recovered. One of these animals which had apparently recovered was transferred to pasture land shared by a number of cows. A number of these then suffered from diarrhoea and enteritis and died. The only one investigated showed *B. enteritidis* in pure culture. The affected cows were then moved to cow stalls. These contained two lame cows and a 1½ year old bull none of which had been out in the pasture field. One of these two cows fell ill after the addition of the affected cows and from it *B. enteritidis* was isolated. The calf, which had apparently recovered and which was transferred to the field, was then examined bacteriologically and *B. enteritidis* isolated (the report does not say from which organs). A further calf which had died of enteritis was also subsequently examined and *B. enteritidis* isolated.

In this outbreak we have an illustration of a calf suffering from a Gaertner group infection recovering and acting as a carrier of infection.

5. *Abortion in mares.* While it is evident in the great majority of cases that this condition, at least in this country, is due to bacteria other than food poisoning bacilli (see *Annual Report* (1914) of Chief Veterinary Officer of the Board of Agriculture) there is evidence that in certain outbreaks bacilli of the Gaertner group are present in the lesions, and in a number of cases have been reported as the cause of the condition. In 1893 Kilborne and Smith (U.S. Board of Agriculture, 1893) studied an abortion outbreak occurring amongst the mares of a large stud in Pennsylvania and isolated a bacillus which they grouped as a hog-cholera bacillus. The characters described are insufficient to group it as undeniably a true Gaertner group organism, but it fermented glucose but not lactose and saccharose, and the other characteristics given are those of Gaertner organisms.

Similar bacilli have been isolated from American outbreaks by Good and by Meyer and Boerner (1913). The latter observers from an outbreak in 1913 in Pennsylvania isolated a bacillus which they called *B. abortus equi*. The serum of the aborting animals gave positive agglutination results as high as 1 : 2500 with this bacillus, but a complete complement fixation with comparative high titres was only noted in four animals. This bacillus exhibited the cultural characters of the Gaertner strains except that the growth on agar slope was membranous, dry and brittle, and the gas produced in dulcitate media was large in amount. One of the two strains isolated by Good also exhibited similar characteristics on agar. Their agglutination results suggest that their *B. abortus equi* is neither *B. enteritidis* nor *B. paratyphosus* B, while it was only partially in agreement with the only strain of *B. suipestifer* tested. The authors put it in a separate sub-group.

In 1897 Lignières and in 1905 Lignières and Zabala isolated a Gaertner group bacillus from a series of cases of epizootic abortion in mares, sheep and cows in France and Argentina. In Holland outbreaks ascribed to members of this group have been described by de Jong and by Van Heelsberger (1914). The bacillus isolated by Van Heelsberger was pathogenic to the smaller laboratory animals and, as far as its cultural characters were tested, agreed with the Gaertner group. The agglutination reactions seem to show that it is not identical with either *B. enteritidis*, *B. suipestifer*, or *B. paratyphosus* B.

I am not concerned with the question as to how far these bacilli were the true cause of the abortion and other symptoms or whether they played a rôle analogous to that of *B. suipestifer* in swine fever, but their presence in this condition in horses is certainly of considerable interest.

6. *Certain diseases of birds.* Epidemics, usually marked by a high fatality rate, have been recorded as affecting a number of different species of birds and from which Gaertner group bacilli have been isolated. The best known are the outbreaks in parrots, the so-called Psittacosis disease (see *Baumgarten's Jahresbericht*, 1896, for an account of several outbreaks). Nocard in 1893 isolated a bacillus, which he called *B. psittacosis*, from the bone marrow of birds which had died on the journey from Buenos Ayres. In subsequent epidemics this bacillus has been isolated both from the diseased parrots and from the blood of the human cases. From the parrots the disease has spread to man, and in April, 1892, an extensive outbreak occurred in Paris, with 42 known cases and 14 deaths. *B. psittacosis* is undoubtedly a Gaertner group organism and probably identical with *B. suipestifer* (Böhme, 1906, Selter, 1916).



Tartakowsky has described an infectious enteritis in sparrows due to a Gaertner bacillus.

Joest (1907) isolated a bacillus, apparently a Gaertner group organism, from a canary suffering, with others, from an epidemic disease associated with catarrhal enteritis and splenic tumour. Zingle (1914) in 1913 isolated in pure culture a Gaertner group organism from pigeons in an outbreak affecting 14 birds in the Military pigeon station at Strassburg. This strain was agglutinated nearly to the titre limit by a *B. paratyphosus* B serum but was only partially agglutinated by a *B. enteritidis* serum, so apparent is the former organism, according to German nomenclature. Manninger (1913) investigated three birds of the finch family sent to him from the Buda-Pest Zoological Gardens and isolated from them a Gaertner group bacillus. The birds suffered from an acute intestinal catarrh. Like the bacillus from the last outbreak this organism was only agglutinated in moderate degree by a *B. enteritidis* serum but to the titre limit by a *B. paratyphosus* B. serum.

The outbreak of acute infectious disease in young pheasants recorded by Klein (1893) in which over 700 out of 1800 died may have been due to a Gaertner strain, but the characters of the bacillus isolated from the heart blood are insufficient to settle this point and the fact that indol is said to have been produced is against this assumption.

7. *Canine distemper*. I have only come across one report dealing with the presence of Gaertner bacilli in dogs. Torry and Rahe (1912) in a series of 63 consecutive cases of natural and experimental distemper isolated *B. enteritidis* in one or more of the internal organs in 12 cases (19 per cent.). They suggest the bacilli invaded the organs in the final stages since 75 per cent. of the findings were in animals severely attacked. The bacilli were non-toxic to dogs. Their characters are not given in detail but were said to be identical in cultural and agglutination characters with *B. enteritidis* (Gaertner).

8. *Diseases amongst rodents*. *B. typhi murium* (a Gaertner group organism) was isolated by Löffler as the cause of an epidemic in mice and has been subsequently isolated from other mice epidemics. It has been used as living poison to set up an epizootic among mice and so cause their extermination. In the same way a number of Gaertner group bacilli have been used to set up infective disease in rats. Of these Danysz's bacillus is the best known.

Spontaneous outbreaks of infectious disease amongst rats and mice and due to Gaertner group strains are not uncommon. Three such have occurred at widely different periods amongst my own laboratory mice,



while a number of outbreaks abroad have been recorded. These bacilli have occasionally been found in rats and mice not showing definite disease (Savage and Read, 1913). The question of the infection of rats and mice is obviously of considerable practical importance in view of the frequency with which these animals gain access to food used for man and animals.

It is now well recognised that persons suffering from typhoid fever and paratyphoid fever after recovery may continue to excrete the bacilli of these diseases for prolonged periods and in this way may act as carriers of infection. It is highly probable therefore that animals suffering from Gaertner group infections, caused by bacilli closely allied to those responsible for these two diseases, may after recovery also act as carriers of infection. Information in regard to this very important point and as to the duration of the carrier stage is most desirable and it is unfortunate that recorded data are so scanty. Some ascertained facts are however available.

O'Brien (1910) recorded a naturally occurring outbreak caused by a Gaertner group organism (*B. suispestifer vel B. aertryche*) amongst the laboratory stock of guinea-pigs, only 21 out of 500 surviving. Examination of the faeces of nine of the survivors showed that five animals were carriers of the bacillus. The serum of four of these agglutinated the bacillus in dilutions of 1 : 50 and 1 : 100. The duration of the carrier state was not worked out but these five excreted the bacilli intermittently five months after the epidemic.

Petrie and O'Brien (1910) also studied the excretion of bacilli in feeding experiments and record "in the course of a series of feeding experiments we have found that guinea-pigs fed with cultures may excrete the bacillus in the faeces for some time subsequently while remaining apparently healthy, and that the blood of some of these animals agglutinates the bacillus."

A fact which is very obvious from the above summary of diseases in animals caused by Gaertner group bacilli is that, apart from outbreaks in rats and mice and cases of swine fever, all have been described abroad. I have been unable to find any reports of similar infections due to these bacilli in Great Britain. Are we to assume they do not exist?

In favour of such a supposition is the fact that the rigid delimitation of the Gaertner group to organisms with certain definite characters, which has been adopted by most workers in this country, does not prevail to the same extent in Germany and other parts of the continent, and possibly not all these recorded outbreaks are due to true Gaertner group

organisms. A careful study of the original papers however makes this improbable for more than a minority.

A study of the food poisoning outbreaks recorded in this country is most disappointing from this point of view since so few of the records supply any information in regard to this most important matter. In only two of the 79 British outbreaks summarised in my Report to the Local Government Board is any evidence adduced as to the existence of disease in the animal supplying the incriminated food. Two others have since been described. Some particulars of these four cases are of interest.

In the Murrow outbreak (Savage and Gunson, 1908) amongst the bones, etc. used to make the brawn which caused the outbreak was a pig's foot which was obviously diseased and which, from the description available, probably had an abscess on it. The pig was sufficiently affected to have to be taken by cart to the place of slaughter.

In the Limerick outbreak (McWeeney, 1909) the available evidence is not very precise, but the infected meat (from an ox) was purchased ready killed by the contractor and at an unusually low price. No reliable information was obtainable as to the condition of the animal prior to or at the time of slaughter, but since the butcher who sold it to the contractor would appear to have sold it below cost price it is highly probable that it was not sound healthy meat.

In the Newcastle-upon-Tyne outbreak in 1913 (Kerr and Hutchens, 1914) due to infected milk derived from a cow, recently calved and added to the herd, which had shown signs of illness a day or two before, and died almost coincidentally with the occurrence of the first cases of the outbreak. Although the milk had markedly diminished and was abnormal in character it had been mixed with that from the rest of the herd and sold. *B. enteritidis* was isolated from the internal organs, intestinal contents and from the milk, drawn from the udder after death, of this cow. No information was available as to how this cow became infected or if other animals had been attacked.

The fourth instance, one mentioned by Hutchens (1914) but not described in detail, is an outbreak of food poisoning affecting 105 persons after drinking milk, a Gaertner group bacillus being recovered from the milk on two consecutive days before the cow died. The cow in this case had also recently calved.

In contrast to the above I may mention that in 50 per cent. of the continental outbreaks summarised in the same Report definite disease of the animal supplying the food was found. Owing in part to the inadequate system of food inspection in this country it is often extremely

difficult to obtain reliable information as to the health of the animals supplying any particular specimen of meat.

In connection with infections with one or other member of the Gaertner group it is an important fact that naturally occurring outbreaks nearly always show a low rate of mortality. In human food poisoning the case-mortality rate for a large number of outbreaks was only 2·7 per cent.

With laboratory animals subcutaneous and especially intraperitoneal inoculation usually produces a fatal result, but it is far otherwise when natural methods of infection are employed. Feeding experiments both with the smaller laboratory animals and with larger animals such as dogs, calves and goats have given very irregular results, and this with strains showing evidence of high virulence when inoculated subcutaneously or intraperitoneally. In some of the animals fed in this way agglutinins developed, so probably some infection resulted. The following is an interesting instance.

Reinhardt and Seibold (1912) fed a goat with four agar cultures of a strain of *B. enteritidis* which had previously been passed through four other goats, causing marked illness in them, when the method of introduction was by intraperitoneal injection or injection into the udder or knee joint. Every day for the next five days the animals received by the mouth an emulsion containing the whole of a 24 hours old agar slope culture. Some rise of temperature was noted but there was no noticeable effect upon the health of the goat. Bacteriological examination of the blood was negative. Before feeding no agglutinins for this bacillus could be demonstrated and none four days after feeding. Nine days after feeding a reaction of 1 : 40 was obtained while 16 days after the start of the experiment the serum reacted to the bacillus in a dilution of 1 : 1280. The goat was killed 16 days after the start of the feeding. There were no pathological lesions while all the organs were sterile. Nothing is said as to the presence of the bacilli in the intestinal contents.

The same authors give an interesting instance of a case of natural infection which throws light upon the way these diseases may be spread. A goat was inoculated by the injection of an emulsion of four agar cults into the uterus this causing marked illness. The three kids of this goat born two days before the inoculation were removed from her but were brought back in the evenings and drank her milk. Two remained unaffected but the third sickened eight days after the mother was infected and died three days later showing, *post-mortem*, gastritis and duodenal catarrh. The bacillus was readily isolated from the internal organs.

It is of interest to note that recovery after severe infection may take place in naturally infected animals. In the two mastitis cases of Zwick and Weichel (1910) in one the cow had one quarter of the udder much swollen, hard and painful, yielding only a little yellow watery fluid with grey-white flakes from which *B. enteritidis* was isolated. The cow was "off its feed" and the temperature was raised. Five days after the onset the general condition improved while milk could be obtained from the affected quarter, but the next day the animal was worse with increased udder swelling and also ulceration. The animal then became rapidly better, the ulcers healed and the milk secretion gradually returned. Unfortunately the report does not say how long the bacilli continued to be excreted in the udder fluid or if the bacilli were excreted with the intestinal contents. Such a case might be a carrier of infection for a long period and a possible source of infection to man.

The necrotic foci sometimes found in the liver, spleen and kidney of apparently healthy animals and especially calves have in some instances been shown to contain Gaertner group bacilli (Langer, Ledschbor, Joest, etc.). They indicate recovery after infection.

Considerations of the facts detailed in this paper suggest certain conclusions of great practical importance in connection with the causation of food poisoning outbreaks.

Extended direct examination has proved that Gaertner group bacilli are not natural intestinal inhabitants either of man or of animals used for human food or which come into contact with food. The instances in which true Gaertner group bacilli have been found in such situations are rare and can be readily accounted for on the supposition that they are bacilli present as the result of previous infection (carrier state) and are strictly comparable to the presence of typhoid bacilli in the human intestine.

Gaertner group bacilli are pathogenic, but with much variation as to degree of pathogenicity, for most of the domestic animals and various investigations show that spontaneous outbreaks of disease, with however a number of different local manifestations, are set up by them in these animals.

The prevention of human outbreaks of food poisoning, and possibly a considerable amount of unrecognised disease in animals, can only be attained by an extension of knowledge as to the extent to which these pathogenic organisms are a cause of animal disease.

I desire to emphasise the need for exact investigation of the extent to which these bacilli are responsible as a cause of animal disease and

the fact that there appear to be no records of outbreaks of Gaertner infections in animals *in this country*, apart from cases traced back to animals because they had caused an outbreak of human disease. The investigation of these problems and questions is clearly a matter in which co-operation between the bacteriologist and the veterinary surgeon is required and such co-operation should yield results of great practical value.

The investigation of the bacteriology of cases amongst domestic animals of abortion, septic diseases, enteritis, metritis, etc. from the point of view of the presence or absence of members of the Gaertner group of organisms, either as the causal organism or as a concomitant bacillus, does not appear to have been undertaken in any systematic manner. I would suggest that extended observations on these lines with careful inquiry and following up of all cases which show the presence of members of this group of bacilli is likely to throw considerable light upon the causation of human food poisoning<sup>1</sup>.

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<sup>1</sup> The importance of this line of inquiry has been apparent to me for a good many years and I have carried out a series of investigations from several points of view, some of the results of which I hope to publish shortly.

As regards the examination of material from diseased animals or from animals which have died from one of the diseases associated with food poisoning bacilli, I have been greatly hampered by inability to obtain suitable cases for examination.

I should be very glad to arrange for the bacteriological examination of such material and would be pleased to supply outfits and detailed particulars to any one in a position to obtain material of this nature.

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