

AN OUTBREAK OF POISONING FROM INFECTED BRAUN.

BY WILLIAM G. SAVAGE, B.Sc., M.D, D.P.H.,
Medical Officer of Health, Colchester;

AND C. HERBERT GUNSON, M.B., CH.B.,
Medical Officer of Health, Wisbech Rural District.

ALTHOUGH, during recent years, a good many food poisoning outbreaks have been described in the different Journals our knowledge as to the exact etiological factors is very deficient and it is still desirable that all outbreaks should be scientifically investigated and recorded.

The outbreak under consideration involved 18 cases with 3 deaths and occurred in May 1908 in the village of Murrow in Cambridgeshire.

Great difficulty was experienced in obtaining reliable particulars but the following was the general history of the cases.

On Friday, May 8th, 1908, Mrs J. B. of Murrow bought some pork bones, etc. from a local butcher in order to make pork-cheese (the local name for braun) for the following week. This was a regular practice of hers. The pork-cheese was prepared the same night and finished the following morning. Then (May 9th) the pork-cheese contents were emptied out and, without cleaning the saucepan, potatoes and asparagus were cooked in it.

Mrs B., her son J. B. a young man of about 20 years of age and two little children all partook of the potatoes and the asparagus on the Saturday (9th) about midday, for dinner. All four became ill with diarrhoea and vomiting, the little children during the night, Mrs B. early on the Sunday morning (10th) and the grown up son J. B. about noon on the same day.

Mr B., the husband, the only other occupant of the house, was not at home for dinner and did not partake of the potatoes and asparagus. He remained quite well and unaffected.

Three pork-cheeses only were made and all three set up disease.

On Monday May 11th Mr B. gave one of the pork-cheeses (No. 1) to his neighbour Mrs D. The following morning Mrs D. and her two grand-daughters E. D. and J. D., all ate some of the pork-cheese for breakfast. E. D. was taken ill on Tuesday night (12th) about midnight, her sister J. D. about 8.0 p.m. Wednesday night and the grandmother (Mrs D.) early on Thursday morning, all with severe diarrhoea and vomiting. In these cases the incubation period varied from 16 to 44 hours. They were the only persons in the house.

Mr B. also made a present of a second pork-cheese to Mrs D. This untouched and the remainder of cheese No. 1 were handed over to Mrs R. and eaten by a third family, consisting of Mrs R., her five sons and one daughter M. R. All of them, except one child, made a meal of the pork-cheeses for supper May 12th and breakfast May 13th. M. R. was taken ill the evening of May 13th and Mrs R. and four of the sons during the 14th, all with diarrhoea and vomiting. The child who did not eat the brawn remained quite well.

The remaining pork-cheese (No. 3) was given by Mr B. on May 12th to Mrs W. This household consisted of five persons Mrs W., Mr W., their son R. W. and Mrs W.'s parents Mr T. and Mrs T. All five consumed the pork-cheese but the exact time is doubtful. All fell ill with diarrhoea and some with vomiting also. Mr T. was attacked Wednesday night (13th) and the others on the following day.

In all 18 persons were attacked and all of them consumed either the pork-cheeses or the vegetables cooked in the saucepan used to make the brawn. As far as we could ascertain in none of the cases was any of the brawn eaten by persons who remained unaffected.

The incubation period varied from about 12 to 48 hours. In some instances during this period no symptoms were noticed, in others faintness, nausea and pains in the stomach were complained of. The essential symptoms were diarrhoea and vomiting and were accompanied by headache, muscular weakness and prostration. In some these symptoms were very marked. The temperature varied from 100° to 103°.

Three of the patients died, a case mortality of 16·7 per cent., a very high percentage for such outbreaks.

The fatal cases were Mrs B. who died 20 days after eating the infected vegetables, M. R. who died 3 days after eating the brawn and Mr T. who died on May 19th probably about 5 days after the fatal meal.

A post-mortem examination was made in the first case by Dr R. H. Barrett, in the subsequent cases by one of us (C. H. G.) assisted by Dr Barrett. In the case of the child M. R. the post-mortem appearances were confined to the stomach and intestines which showed intense hyperaemia and inflammation.

In the other two cases the alimentary tract from the stomach to the rectum showed an almost continuous inflammatory condition, most marked at the pyloric end of the stomach, the duodenum, the caecum and the rectum. Adhesions between the different coils of intestine were also present. In the case of Mrs B. the lining membrane of the rectum was extensively ulcerated, the individual ulcers being about the size of a pea. The peritoneal adhesions were also much more marked and organised.

Bacteriological investigation. The remains of the pork-cheese were sent for chemical analysis and unfortunately none of the peccant material could be obtained for bacteriological examination.

Bacteriological investigations were not conducted in the case of the first two deaths, but in the case of Mrs B. who died on May 29th, portions of the internal organs were forwarded to one of us (W. G. S.), who bacteriologically investigated them.

From the spleen, kidney, bone-marrow and small intestine, the only organs examined, the bacillus described below was very readily isolated.

The characters of this "Murrow" bacillus were as follows:

A short bacillus with rounded ends. Decolourized by Gram's method of staining. Very actively motile. Grows very rapidly upon the ordinary laboratory media. Produces uniform turbidity in broth. Semi-translucent growth upon sloped agar. Bluish translucent growth upon gelatin without liquefaction. Produces no indole. In litmus milk produces first a small amount of acid followed by alkali production, the milk being slightly blue after 7 days and very markedly so after 9 days' incubation. In glucose neutral red broth produces fluorescence and reduction to orange colour. Ferments glucose, dulcitol, mannitol and maltose with production of both gas and acid. No fermentation of lactose, saccharose or salicin.

A mouse injected subcutaneously with 0.5 c.c. of a young broth culture was very ill with marked diarrhoea next day and died within 40 hours. The inoculated bacillus was readily isolated from the internal organs and also from the loose motions evacuated the day after inoculation.

A guinea-pig fed with a broth culture (10 c.c.) showed no ill effects.

The bacillus isolated is undoubtedly a member of the Gaertner group identical with or closely allied to *B. enteritidis*.

The inter-classification of the members of the Gaertner group can only be determined by agglutination or allied tests.

For this purpose the reactions of the bacillus under investigation towards the sera of animals immunized to a fairly marked extent by recognized members of the Gaertner group must be determined. Fortunately such sera were available prepared by one of us by inoculating rabbits with pure cultures of the respective bacilli. The three sera used were (1) paratyphoid serum, (2) *B. enteritidis* (Gaertner) serum, and (3) Aertrycke group serum, obtained respectively by inoculating rabbits with *B. paratyphosus* β isolated from a case of paratyphoid fever, with *B. enteritidis* isolated from a meat poisoning outbreak and with *B. meirelbeek* isolated by Van Ermengem from the Meirelbeek outbreak. (The last organism was obtained direct from Van Ermengem.)

The agglutination reactions of the Murrow bacillus and also of the immunizing bacilli to these sera are shown in the following table.

Serum and dilution	Murrow	<i>B. paratyphosus</i>	Meirelbeek	<i>B. enteritidis</i>
Paratyphoid 1 : 100	+	+	+	-
„ 1 : 300	+		+	
„ 1 : 500	-	+	+	-
„ 1 : 1000	-	+	+p	
„ 1 : 5000		-	-	
Meirelbeek 1 : 100		+		-
„ 1 : 300		+		
„ 1 : 500	+	-a	+	-
„ 1 : 1000	+	-	+	
„ 1 : 5000	+		+	
„ 1 : 10000	+p		+	
„ 1 : 20000			+	
„ 1 : 40000	-		-	
<i>B. enteritidis</i> 1 : 100	-	-	-	
„ 1 : 500	-	-	-	+
„ 1 : 1000				+
„ 1 : 5000				-a
„ 1 : 10000				-

All microscopic tests in a hanging drop preparation ; time 2 hours.

+ p=partial and incomplete reaction only.

- a=no definite reaction but considerable action, i.e. a few scattered clumps.

From the serum reactions it is evident that the Murrow bacillus belongs to the Aertrycke or Meirelbeek sub-group and not to the sub-group represented by the *B. enteritidis* of Gaertner.

The proof that the Murrow bacillus was the cause of the outbreak was rendered nearly irrefutable by the results of a further series of tests with the blood of some of the sufferers.

It was only possible to obtain serum from three patients.

These were J. B. (of the first family attacked), Mrs R. and E. R. one of her sons.

The blood specimens were collected some weeks after the onset of the symptoms.

The results of the serum reactions are shown in the following table.

Serum and dilution	Murrow	Meirelbeek	<i>B. enteritidis</i>
Mrs R. 1 : 30	+	+	+
„ 1 : 100	+	+	-
„ 1 : 500	+	+	-
„ 1 : 1000	-	-	-
J. B. 1 : 100	+	+	-
„ 1 : 500	+	+	-
„ 1 : 1000	+	+	-
E. R. 1 : 100	+	+	-
„ 1 : 500	+	+	-
„ 1 : 1000	+	+	-

All microscopic tests : time 2 hours.

This table shows very clearly that specific agglutinins were present for the Murrow bacillus and also for the *Meirelbeek* strain.

The reactions confirm the identity of the Murrow bacillus with Meirelbeek and show that the cause of illness in these cases was due to infection with this bacillus.

The complete proof, the finding of this bacillus in the peccant material was unfortunately impossible, but the details of the outbreak makes it abundantly clear that the bacilli were ingested in the brawn or in the vegetables, infected by being in contact with the brawn, in the uncleaned saucepan.

All those who ate the pork-cheese or brawn became ill.

No persons were attacked except those who had either eaten the brawn or the vegetables cooked in the same vessel.

The question which next arises is, how did the brawn become infected? Did the Murrow bacillus infect this food before or after the cooking?

One of us (C. H. G.) has made very careful inquiries as to the methods of preparation of the pork-cheese. The method employed is to heat slowly and gently for many hours pigs-feet and any spare pork

bones in a saucepan with water. Towards the finish the bones are picked out, pepper and salt added and the whole remaining contents of the saucepan heated again and then poured into shapes. The method is one of slow heating and with a short boil at the finish. In this case the saucepan was allowed to stand on the side of the fire all night and the cooking finished the next day.

From the fact that the vegetables cooked after turning out the brawn became infected, it is very clear that the living bacilli were present in the brawn as present in the saucepan and that the infection was before and not subsequent to the preparation of the pork-cheeses. The fact that all the three pork-cheeses made were equally infective is also evidence as to the same fact.

It is quite clear, therefore, that in the present instance infected meat was used and that the so-called boiling which the food received was insufficient to kill the Gaertner bacilli in the meat, while on the other hand allowing the food to stand in the saucepan all night was probably a great factor in the multiplication of the organisms, a suitable temperature thus being afforded for the bacilli present to rapidly multiply in the highly nutrient material in the saucepan.

This great increase in the number of the bacilli makes it easy to understand that the contamination of the vegetables must have been gross and so have rendered the survival of some of the bacilli more probable. Possibly however the vegetables really were boiled and their infectivity may have been due to their being handled by utensils infected from the brawn and uncleansed.

In the present instance, unlike the majority of the English recorded outbreaks, it was possible to trace still further back the origin of the infection.

Careful inquiry elicited the fact that amongst the bones used to make this batch of brawn was a pig's-foot which appeared peculiar enough to cause comment upon it when Mrs B. saw it in the butcher's basket. This appearance the butcher attributed to the fact that on driving the pig to the starving-pen the foot was injured and he is reported to have said that although it could not be sold for prime meat it was all-right for cooking if she cut the injured portion out. We found it exceedingly difficult to obtain precise particulars, or indeed any information, as to the condition of this pig's-foot, the facts being concealed as much as possible. The nearest description we could get of it was that as purchased "it looked as if you had begun to cut a piece out and stopped short of doing so." It was also ascertained that the

injured pig was removed to the starving pen in a float and there kept for over 24 hours before being killed.

The facts are therefore not complete, but it is quite evident that some of the meat used was derived from a pig suffering from a local diseased condition. It may be that, as the butcher asserts, the local condition was the result of injury or, more probably from the description, that some local suppurative condition with abscess formation was present. In the latter case the condition was doubtless due to an infection with the Gaertner bacillus; in the former we must assume that the local condition offered a suitable nidus for infection by this bacillus derived from some unknown source.

The former is the more likely supposition and brings the condition in line with the findings in a number of the different German outbreaks.

The rest of the pig was also sold but no cases of illness traced to its consumption could be heard of, although careful inquiries were made.

Inquiries at the farm from which the pig came showed that no other pigs had been in any way ill, either locally or with diarrhoea and that there had been no cases of swine fever.

This last fact is of importance, since in cases of Swine fever or Hog cholera bacilli are present in the intestinal contents and elsewhere, which are of the Gaertner group and indistinguishable by their cultural characters from the bacillus isolated in this outbreak.

The relationship between paratyphoid fever and meat poisoning by Gaertner bacilli is at present undecided.

Two distinct views may be held. On the one hand it may be advanced that the two conditions are in no way related, and although both are caused by bacilli of the Gaertner group culturally indistinguishable yet the bacilli are really quite distinct and each can only set up its own pathological condition. On the other hand it is possible that the cases of meat poisoning due to bacilli of the Aerttrycke type are caused by bacilli identical with *B. paratyphosus*, the different clinical picture being determined solely by different methods of infection, dosage, etc.

We do not propose to discuss these interesting questions here but they are mentioned since the course of the disease in Mrs B. is suggestive in this connection. The symptoms in this case were more like those of enteric fever and had it been an isolated case it would most probably have been diagnosed as that disease or if examined bacteriologically as paratyphoid fever. This patient died 20 days after the onset. The somewhat different relative prominence of the symptoms and the late-

ness of the fatal result were probably largely determined by dosage, the brawn itself not being eaten but only the vegetables cooked in the same saucepan. This case supports the view that the two conditions are closely related.

SUMMARY AND CONCLUSIONS.

1. Eighteen persons after eating a certain batch of pork-cheese, or vegetables infected from it, suffered from severe illness and three died.

2. The illness was caused by a Gaertner bacillus of the Aerttrycke sub-group isolated from one of the fatal cases.

3. This bacillus was contained in the meat used for the pork-cheeses (brawn), infection being antecedent to preparation.

4. Part of the meat was obtained from a pig suffering from local injury or disease of one leg and the bacilli were no doubt etiologically connected with this condition.

5. The outbreak points to the need for a more complete and thorough veterinary inspection of meat before sale, and of the necessity for extended investigation into the diseases of animals used for human food caused by Gaertner bacilli.