Report on outbreak of pork pie poisoning at Chesterfield / Derbyshire County Council.

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DERBYSHIRE COUNTY COUNCIL.

REPORT

ON OUTBREAK OF

Pork Pie Poisoning

— AT —

CHESTERFIELD.

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1911.

Derbyshire County Council.

OUTBREAK OF PORK PIE POISONING AT CHESTERFIELD.

At the end of June this year, there was a serious outbreak of food poisoning at Chesterfield, as many as 168 cases, with one death, coming to the knowledge of the Medical Officer of Health. The outbreak was caused by the consumption of pork pies, and from the investigations made by Dr. Peck it appears that the jelly was the portion of the pie which was responsible. The pies were supplied by a wholesale house—Messrs. H. Only a small proportion of the pies was affected: this shows that it was not the meat common to the whole of the pies, but one of the tins of jelly prepared the day previously, which was the vehicle of infection.

These outbreaks of food poisoning require most careful investigation. Pies and similar articles are prepared and consumed in large quantities without causing any illness; then quite suddenly without any apparent reason for it, a serious outbreak, such as that at Chesterfield, takes place.

In the first place it should be understood that there are two chief groups of food poisoning outbreaks:

(1) The first caused by food containing virulent living bacteria mainly of excretal origin.

(2) The second caused by food having been infected with bacteria which have grown and produced the products of their fermentation, some of which are poisons, while the bacteria themselves have been killed in the process of cooking.

These poisons may be of three kinds, (1) ptomaines or animal alkaloids, (2) albumoses or poisonous proteids, (3) toxins or poisons of uncertain composition. All outbreaks are popularly called "ptomaine poisoning," but this term should be abandoned, as only a small proportion of the outbreaks of food poisoning are scientifically, due to poisoning by animal alkaloids.

It will be obvious that many outbreaks do not fall wholly within one or the other group, there being a certain amount of overlapping of the first group into the second, although there may be outbreaks purely of the second group.

In outbreaks of the second group due to poison produced by bacteria, the symptoms come on more rapidly than in the first group. The time of onset in the first group will depend more or less upon the quantity of organisms consumed, and this may depend upon the time that the food has been kept before consumption.

Another form of food poisoning which is less common, is due to consuming the flesh of a diseased animal slaughtered after its flesh has been infected.

In practice, outbreaks due to the second group, putrefactive decomposition, and to bacterial poisons produced in the process of manufacture may be dismissed from consideration, when dealing with any well conducted business. This makes it all the more important to get to the bottom of outbreaks of bacterial poisoning similar to the present one and that which took place in Derby in 1902. This is more particularly necessary, as it frequently happens that the food appears in every way quite normal, as was the case with the Chesterfield pie.

In the case under consideration I had the opportunity of examining with Dr. Peck the conditions of manufacture, and found the premises excellent, but the accidental contamination of meat or jelly with excretal

organisms from the pig is almost inevitable where two trades; that of slaughtering and gut cleaning and that of preparing jellies and pies, are carried on in the same premises and by the same staff Messrs. H. had to a great extent recognised this and had kept the two trades almost apart.

The outbreak was thoroughly investigated locally by Dr. Peck who gave a detailed account of his investigation at the inquest on the boy E. W., who died. A most instructive fact was brought to light by Dr. Peck, namely, that of six people who ate the pies which had become infected on the same day that they were cooked, none became ill, that the average length of time before symptoms came on amongst those who ate the pie on the second day was 22¼ hours; on the third day it was 19½ hours, on the fourth day 20 hours, on the fifth day 19 hours, on the sixth day 14 hours, and on the seventh day 2¼ hours, showing that the proportion of poison present increased as the pie was kept and as the bacteria in the pie increased in numbers.

I am in agreement with Dr. Peck that the only opportunities for the contamination of the food were (1) The infection of the gravy (jelly) while being prepared. (2) The contamination of the jelly when placed to cool.

Messrs. H. are now making some structural alterations, and in future the staff engaged in the cooking of the food will be entirely apart from those engaged in slaughtering, the removal of manure, and the cleansing of chitterlings. The premises where the two trades are carried on will be completely cut off from each other.

There is a great difficulty in getting the lay mind to appreciate the infinite minuteness and the hundred and one ways of bacterial contamination, and as things are at present bacterial infection must be far more frequent than cases of food poisoning.

The practical question arises, why is this? Why is it that what can take place without harmful effect one day causes sickness and death another?

The same question arises with regard to Enteric Fever and polluted water. Although the water may contain excretal organisms no outbreak is caused until the organisms from a case of Enteric Fever, find their way into the water.

Prepared meat may regularly be infected with excretal organisms, and unless the quantity is large and the weather hot so that they grow rapidly no great harm is done. But every now and then the meat becomes inoculated with some specific, virulent bacillus which produces a deadly poison.

A portion of the pie and the organs from the boy who died were sent to me and were handed over by me to Dr. Thomson for bacteriological examination. Appended is Dr. Thomson's report. Owing to the insufficient laboratory accommodation the work was only carried out at great inconvenience to everybody, and the urgent necessity for the new laboratory was more than proved

The conclusion to be drawn from Dr. Thomson's investigation is that the pie was infected with a specific virulent, rapidly-growing bacillus, which produced a deadly poison. He found, in the pie, and in the spleen of the patient who died, the organism believed to be the cause of Swine Fever. It is an actively moving bacillus which increases in numbers at an extraordinary rate, and in its growth produces a virulent poison.

In Part C of his report, Dr. Thomson records the results of certain "Agglutination experiments." A word of explanation may not be out of place. When a person has, for instance, "Enteric Fever," he gradually develops in his blood a substance (called agglutinin), which paralyses the motion of the Enteric Fever

organisms and causes them to agglomerate. This fact is used as a means of diagnosis.

By applying this test Dr. Thomson showed that generally the blood of those who had consumed the pie had developed the agglutinins for the pie bacillus,* while the blood of others had not. A patient suspected of having Enteric Fever was shown only to have consumed the pork pie.

By inoculation of animals and applying this test the organism was shown to be the "Bacillus Suipestifer," an organism generally associated with Swine Fever.

When a previous outbreak of pork pie poisoning took place in 1902 your Committee resolved that—

> "With the object of preventing outbreaks of food poisoning no food should be prepared for human consumption within the same curtilage as any slaughter-house or premises wherein any offensive trade within the meaning of the Public Health Act, 1875, is carried on, and that further legislation is urgently needed to bring all premises wherein and methods whereby food is prepared for sale for human consumption up to the same standard of sanitation as at present applies to milk shops and dairies."

With regard to the Chesterfield outbreak when Messrs. H. have completed their alterations, their premises will comply with the principle of the above resolution.

I believe myself that the actual way in which the jelly was contaminated was that when it was set to cool, it was placed in a passage where there was a draught—a passage which communicated between the premises where the clean part of the trade

* Unfortunately the agglutinins produced are not always specific, and laborious investigation is required, as in the present instance.

was carried on and that where the slaughtering, etc., were carried on. It is likely that while the jelly was here it was either infected by hand or by dust. As the jelly is prepared a day and sometimes two days before it is used there was ample time for the organisms to increase to dangerous numbers.

I asked Dr. Thomson to make some experiments in covering nutrient jelly with layers of lard and of mutton fat, and then infect the surface with the organism found in the Chesterfield pie. It was found that the jelly covered with mutton fat remained quite sterile even though the layer was only ⅛ inch in thickness, while that covered with lard was infected within twenty-four hours.

I suggest, therefore, that it should be a rule in the trade that the jelly while still hot should be covered with a layer of melted mutton fat or paraffin wax; the wax or fat can be taken off and sterilized by heating and used over and over again. This would absolutely prevent contamination of the jelly if the fat or wax is poured over the gravy while the latter is still hot and sterile.

The outbreak confirms the conclusions your Committee came to in 1902, and the attention of the Local Government Board should be again called to the matter.

SIDNEY BARWISE

County Medical Officer.

County Offices, Derby,
August, 1911.

BACTERIOLOGICAL REPORT ON THE BACTERIAL FOOD POISONING EPIDEMIC AT CHESTERFIELD.

By W. LEWIS THOMSON, M.D., D.P.H.

(Assistant County Medical Officer of Health.)

A.

SAMPLE OF PORK PIE.

1. This was received for examination on June 29th from Dr. Peck, Medical Officer of Health of Chesterfield. It was normal in appearance and smell, the jelly was firm and clear, and the meat and crust apparently well cooked. The reaction to litmus was neutral, there was no free ammonia present, and no evidence of decomposition. On incubation of a portion of the sample at blood heat, a faint sour smell was perceptible in six hours, and became more marked in 24 hours. At the end of 24 hours also, minute white colonies were visible in the jelly, the majority of them being due to actively motile Gram-negative organisms. The same result was obtained in 48 hours, when a portion was kept at room temperature; in four days many moulds had developed.

2. The sample of pie submitted was small, and it was impossible to separate the jelly from the meat. The emulsion, in normal saline, therefore, made for test purposes, consisted of meat and jelly. Cultures were made on malachite-green, Conradi-Drigalski, and MacConkey's lactose neutral-red bile-salt agar. By far the largest number of colonies developing on these plates were of one type; on MacConkey's agar the non-lactose fermenters were in the proportion of three to one. From the agar plates selected colonies were taken and subcultured in lactose, mannite and glucose neutral-red broths, and from these on the following day in litmus milk, peptone water and various other carbohydrate and glucoside broths.

3. A small proportion of the colonies consisted of *Streptococci*, but the majority were due to bacilli of the two following types:—

(*a*) The *Bacillus Coli* type. They fermented glucose and lactose, did not ferment saccharose, gave the neutral-red reaction, produced indol in peptone water, and also acid and clot in litmus milk;

(*b*) The *Bacillus Enteritidis* or Gaertner type. They produced rapid and uniform turbidity in ordinary broth; a microscopic portion of a colony inoculated by a needle into 5 c.c. of broth rendered it distinctly *turbid in four hours*. On gelatine the growth was bluish and translucent, and there was no liquefaction of the medium; with Gram's stain the bacilli were decolourised, and no indol was produced in

peptone water up to the end of 10 days. The bacilli fermented glucose, maltose, galactose, mannite, and dulcite, producing both acid and gas, but failed to ferment lactose, saccharose, salicin, inulin, glycerin and raffinose. In litmus milk there was slight acidity for 48 hours, and then alkali was produced; the milk was of a deep blue colour at the end of 14 days. Fluorescence appeared in neutral-red broth, but was transient and only lasted some 30 hours.

The Gaertner group of organisms consists of four sub-groups, viz.:—(a) *B. Enteritidis* (Gaertner), (b) *B. Paratyphosus B* (c) *B. Suipestifer* (or *B. Aertrycke*), and (d) *B. Paratyphosus A*, all of which have been found associated with outbreaks of food poisoning. The last organism can be definitely recognised by cultural tests, but the first three give identical cultural reactions. The results obtained in the present instance shew the Gaertner organism to be one of the first three.

4. Animal experiments were made by feeding a mouse and a guinea pig with some of the pie, and by inoculating a mouse and a guinea pig with the emulsion. The inoculated mouse died in less than 18 hours, the inoculated guinea pig in 24 hours, and the fed mouse in 48 hours. The fed mouse suffered from diarrhœa, and *post mortem* all shewed signs of acute septicaemia. The fed guinea pig did not die, probably owing to an insufficient quantity of pie being available. From the blood, spleen, pleural or peritoneal fluid and mesenteric glands of the three former animals, an organism was obtained which in its morphological and cultural characteristics corresponded with the organism of the Gaertner group obtained by direct culture from the pie, and which, for convenience, I will call "X," and was evidently identical with it.

5. One cubic centimetre of a one-day old broth culture and ·2 cubic centimetre of a two-days' old broth culture of *Bacillus "X"* were injected intraperitoneally into guinea pigs. Both died—the first in 20 hours and the second in three days. The same pathological appearances were observed as before, and from the blood, pleural fluid, and liver *Bacillus "X"* was again recovered.

6. Simultaneously with the culture methods mentioned in paragraph 2, anaerobic cultures were made. Gas production and clotting were produced in milk, inoculated with the emulsion, heated to 80° C for 15 minutes, and then incubated at blood heat. On injecting some of the whey into a guinea pig, death resulted in 24 hours, and *B. Enteritidis Sporogenes* was recovered from the tissues. No organism corresponding to the *Bacillus Botulinus* was discovered.

7. The conclusions to be come to at this stage are—that the pie was contaminated by a bacillus of the Gaertner group which was pathogenic to animals, and likely therefore to be dangerous to man; and, further, that it was probably excretal in origin, as shewn by the presence of other organisms of an excretal type, namely, the *B. Coli* and *B. Enteritidis Sporogenes*.

B.

POST MORTEM MATERIAL FROM E. W.

8. This was received on June 29th from Dr. Chase, and consisted of the spleen, a mesenteric gland, portion of ileum, and portion of caecum. The patient was a boy, aged 7, who died two days after partaking of pork pie. Emulsions were made from those four organs, and plated on malachite-green, Conradi-Drigalski, and MacConkey's bile-salt agar, as in the case of the pie. From all the plates, organisms were obtained which were non-lactose fermenters, and which produced acid and then alkali in litmus milk. From one plate only, namely, the lactose neutral-red bile-salt agar plate of the splenic emulsion, were colonies taken and put through all the tests detailed in paragraph 3 (b). Of eight colonies taken, seven corresponded in all respects, so that a similar organism to our organism "*X*," belonging to the *B. Enteritidis* group, was found in the spleen of the dead boy as was found in the pork pie.

From the ileum, caecum, and mesenteric gland organisms of the *B. Coli* type were also isolated, but the *B. Enteritidis Sporogenes* was not recovered. No tubercle bacilli were found in the mesenteric gland, which was considerably enlarged and soft.

9. Animal experiments were made with each of the four organs. Four mice and four guinea pigs were inoculated with the emulsions, and all died in from 18 to 28 hours afterwards with septicaemic symptoms. Four mice and four guinea pigs were also fed with the material. Three of the mice died within five days, and the guinea pigs fed with the ileum and caecum died in 14 days. They suffered from diarrhœa, and *post mortem* there was evidence of septicaemia. Cultures on malachite-green, Conradi-Drigalski, and MacConkey's agar were made in all cases from the heart's blood, spleen or peritoneal exudate of the dead animals, but in one case only, namely, the lactose plate of the blood of the mouse inoculated with the splenic emulsion, was it considered necessary to carry out all the broth tests mentioned in paragraph 3 (b). Here, again, the Gaertner organism, previously described was isolated.

10. One c.c. of a one-day old broth culture of the organism obtained directly from the spleen was injected into a guinea pig. The animal died in 24 hours of acute septicaemia with profuse exudation into all the serous cavities. This exudate was markedly turbid from the enormous numbers of Gaertner bacilli present in pure culture.

11. One c.c. of a three-days' old broth culture of the organism obtained from the spleen was boiled for 20 minutes and injected intraperitoneally into a guinea pig. In a few hours' time the animal became ill, had convulsive seizures, and died in 30 hours. The toxin of this organism is virulent, therefore, and resists heat. Cultures made from the blood remained sterile. This experiment is stated to be a characteristic of the Gaertner group, and is a further proof that *Bacillus* "*X*" belongs to this group.

C.

AGGLUTINATION EXPERIMENTS.

12. Complete proof that *Bacillus X* was the cause of the outbreak was obtained when agglutination tests were made with the blood of some of the victims. Specimens of blood from 10 patients were sent in by Drs. Peck, Chase and Court, and the results of the serum reactions with *Bacillus "X"* are shewn in the annexed table. Numbers 1, 2, 4, and 5 were bad cases, 3 was moderately severe, and 6 and 9 were doubtful; 10, when received, was dry and could not be tested. Number 11 was the fatal case; an artificial serum was prepared by washing part of the splenic pulp in normal saline and then centrifuging it. Number 12 is the employee mentioned in paragraph 17. The controls comprised two normal individuals, three enteric patients, and one alcoholic. The microscopic method was used, with a time limit of two hours.

Serial Number.	Initials of Patient and days of illness	Dilutions Employed.						
		30	50	100	500	1000	5000	10000
1	H.C. ... 7	× × ×	× × ×	× × ×	× ×	×	—	
2	S.C. ... 7	—	—	—				
	,, 24	×	—	—				
3	M.A.W. 7	×	×	—				
4	R.S. ...15	× × ×	× × ×	× × ×	× × ×	× ×	×	—
5	W.D....31	—	—	—				
6	S.J.P. 31	—	—	—				
7	G.R. ...30	× × ×	× × ×	× ×	× ×	×	×	—
8	M.B. ...32	—	—	—				
9	A.D. ...35	—	—	—				
10	K.R. ...30	Not	tested.					
11	E.W. ...3	× ×	×	—				
12	H.M.	—	—	—				
13	SixControls	—	—	—				

× × × indicates marked, × × moderate, × slight, and — no reaction.

13. Although negative results were obtained in some of the cases, the agglutination characters of specimens 1, 4, 7, and 13 shew that the causal organism of the food poisoning outbreak at Chesterfield was the one isolated from the pie. Identical agglutination results were obtained with a culture of the organism isolated from the spleen of the fatal case, and also in the case of G.R. with the one isolated from the fæces of R.S. (paragraph 19). This proves that these two organisms are identical with *Bacillus "X."*

14. The next stage of the investigation was now to compare these results with those obtained by testing the specimens of blood against known organisms of the Gaertner group, and so to identify the *Bacillus "X."* From various sources therefore I obtained three strains of *B. Enteritidis* (Gaertner), two strains of *B. Paratyphosus B*, two of *B. Aertrycke*, one of *B. Suipestifer*, and one of *B. Paratyphosus A*, and tested all the specimens with them, as well as with *B. Typhosus*, two strains of *B. Coli*, one isolated from the pork pie and one from the fæces of a normal individual, and an organism isolated from the blood of a rat, related both to *B. Gaertner* and *B. Coli*.

Without going into these experiments in detail, I may briefly state that they were inconclusive. No agglutination was obtained with *B. Enteritidis*, but with *B. Paratyphosus B* (one strain), *B. Aertrycke* and *B. Suipestifer* good reactions were obtained up to 1 in 100, and partial to 1 in 500. As these organisms shewed a certain amount of spontaneous agglutination, however, no reliance could be placed upon the results, particularly as *Bacillus "X"* was agglutinated in higher dilutions. With No. 4 blood, *B. Typhosus* was agglutinated in a dilution of 1 in 1,000, but this is referred to again in paragraph 19.

15. The converse of the last test was next done, that is to say, the unknown organism (*Bacillus "X"*) was tested with known sera; in paragraph 14, the unknown (patients') sera were tested with known organisms. Through the kindness of Dr. Savage, Medical Officer of Health for Somersetshire, who has done a great deal of work in connection with the food poisoning bacilli, I obtained four sera from rabbits immunised against *B. Gaertner* (Tollesbury), *B. Paratyphosus B*, *B. Meirelbeek* and *B. Suipestifer*, representative organisms of the chief sub-groups of the paratyphoid-Gaertner bacilli. The Tollesbury serum had no agglutinating property with *Bacillus "X"* in a dilution of 1 in 100, but the Suipestifer serum caused a reaction up to 1 in 1,000. The Meirelbeek serum gave almost an identical reaction. As the Suipestifer and Meirelbeek (Aertrycke) organisms are believed to be one and the same, the identity of *Bacillus "X"* with *B. Suipestifer* was established.

16. A rabbit was immunised against *Bacillus "X"* by injections of first dead and then living cultures, and its serum tested with various organisms of the Gaertner group. The results here again shewed the relationship between *Bacillus "X"* and *B. Suipestifer*.

All the serum reactions are tabulated in the following table. The sera obtained from Dr. Savage were withdarwn four years ago, and their agglutination limit with their own organisms is less than 1 in 1,000. The organism isolated from the fæces of R.S. was accidentally destroyed before the *Bacillus* "*X*" serum was available, but its affinities for *B. Suipestifer* and *B. Meirelbeek* sera can be seen.

Serum and Dilution.		Bacillus "X."			B. Suipestifer.	B. Murrow (Aertrycke).	B. Paratyphosus B.	B. Enteritidis (Kràl).	B. Enteritidis (Tollesbury).	B. Paratyphosus A.	B. Typhosus.
		From Pork Pie.	From Fatal Case E.W.	From Patient R.S.							
Bacillus "*X*"	50	× × ×	× × ×		× × ×	× × ×	× × ×	× ×	× × ×	× × ×	×
	100	× × ×	× ×		× × ×	× × ×	× × ×	×			
	500	×	×		×	× ×	×	—	—	—	—
	1000	× ?	—		× ?	×	—				
	5000	—	—		—	× ?					
	10000	—	—		—	—					
B. Suipestifer	50	× × ×	× × ×	× ×	× ×	× × ×	× × ×	× × ×			
	100	×	× ×	×	×	× ×	× × ×	× ×			
	500	× ?	×	—	× ?	×	×	×			
	1000	—	×	—	—	×	—	—			
	5000	—	—			—					
B. Meirelbeek	50	× ×	× × ×	× ×	× ×	× × ×					
	100	×	× ×	×	×	× × ×	×	—			
	500	× ?	×	—	—	×	—				
	1000	—	× ?	—	—	× ?					
	5000	—	—			—					
B. Paratyphosus B.	50	×	×	×	× ×		× × ×				
	100	× ?	—	—	×	×	× × ×	—			
	500	—		—	—		×				
	1000	—					× ?				
	5000						—				
B. Enteritidis	50			—				× × ×			
	100	—	—	—	—	—	—	× ×	× ×		
	500	—						×			
	1000							—			

× × × indicates marked, × × moderate, × slight, and — no reaction.
The microscopic method was used with a time limit of two hours.

17. Cultures of *Bacillus* "*X*" were sent to the Lister Institute and through the kindness of Drs. Ledingham and Bainbridge agglutination and absorption tests with immune sera were undertaken. The reactions obtained confirmed my own results.

D.

EXAMINATION OF OTHER SPECIMENS.

18. As certain food poisoning outbreaks in the past have been discovered to be due to "carrier" cases, it was suggested this might be the case here, and that the blood and fæces of all employees should be examined. They objected to this procedure, however, and it was only possible to get samples from one man, H.M. It is noteworthy that this man was employed by the firm whose pork pies were responsible for the outbreak of food poisoning in Derby in 1902. Careful examination of his fæces was quite negative. Of 17 colonies investigated from MacConkey's agar plates, all non-lactose fermenters, not one was suspicious even, when subcultured. His blood (No. 12 on table) also did not cause agglutination of *Bacillus* "*X*," of the bacillus isolated from the fatal case, nor of any other bacillus of the Gaertner group.

19. A specimen of fæces from R.S., aged 4, sent by Dr. Court, was received on July 14th. As the blood of this patient gave a good agglutination result with *B. Typhosus* as well as with *Bacillus* "*X*," it was felt necessary to investigate whether or not the boy was suffering from a concurrent typhoid infection, although no typical typhoid symptoms were noted. There was no rash, no palpable spleen, no abdominal distension and the pupils were normal. He partook of the pork pie on June 25th, had slight sickness and diarrhœa, and was drowsy for two days thereafter. On June 28th, there was a temperature of 104°, but on July 6th it had fallen to 99°, and he appeared to be almost convalescent. The temperature began to rise again, however, and on July 11th it was 101°·2. By July 28th he was quite well.

20. Plate cultures of his fæces were made in the usual way, and an organism was obtained in very small numbers, which corresponded in all respects to *Bacillus* "*X*." Careful search shewed the absence of *B. Typhosus*. Dr. Court was unable to get me another sample of his blood to test its agglutinating properties with the organism from his fæces, but a positive reaction was obtained with the blood of G.R. (No. 7). There seems little doubt, therefore, but that the illness of R.S. was due entirely to *Bacillus* "*X*," and was not of the nature of typhoid fever, although his blood, taken on the 15th day of illness, in a dilution of 1 in 1,000, agglutinated the *B. Typhosus*. It is to be noted, however, that it agglutinated *Bacillus* "*X*" in higher dilution still. Absorption tests were undertaken, which shewed that the heterologous agglutinins were due to infection with *Bacillus* "*X*." When the agglutinins were absorbed with this bacillus, the reaction with *B. Typhosus* was only present in a dilution of 1 in 50. Why it did not disappear altogether was possibly due to faulty technique, and the minute quantity of serum available for testing.

E.

CONCLUSIONS.

21. (1) A specific actively motile bacillus was present in the pie, in the spleen and other organs of the fatal case, E.W., and in the fæces of a patient R.S.

(2) It was pathogenic to mice and guinea pigs, and was obtained from the bodies of animals that died as a result of the feeding and inoculation experiments.

(3) From its morphological, cultural, and pathogenic characters, the bacillus belongs to the paratyphoid-Gaertner group of organisms.

(4) Differentiation by means of agglutination and absorption tests shews it to be identical with the *Bacillus Suipestifer*.

(5) That it is the cause of the outbreak is shewn by the agglutination experiments with patients' bloods.

(6) The outbreak is undoubtedly excretal in origin, and the discovery of *B. Coli* and *B. Enteritidis Sporogenes* in the pork pie supports this statement.

(7) The usual habitat of the *B. Suipestifer* (bacillus of swine fever or hog cholera) is the alimentary canal of pigs and other lower animals, but that it is not a natural or common inhabitant is shewn by the comparative infrequency of food-poisoning outbreaks, in spite of the liability of prepared meat foods to fæcal contamination.

(8) Although no illness was noted in any of the animals used in connection with the manufacture of the pork pies, there can be no reasonable doubt but that at least one of the pigs was infected with *B. Suipestifer*, and that during the process of manufacture the meat or jelly became contaminated with this organism.

(9) A chronic *B. Suipestifer* human carrier has not yet been observed, and there is no evidence to suspect this in the Chesterfield outbreak.