# AN OUTBREAK OF PORK PIE POISONING AT DERBY.

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With a Foreword by

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## FOREWORD.

There are so many unexplained problems in connection with food poisoning that it is still of importance to study in detail and with care every outbreak. I have perused the records of several hundred food poisoning outbreaks, published and unpublished, and the prevailing impression left is one of regret that so many opportunities of clearing up obscurities and elucidating channels of infection have been lost by omission to push investigations home. The outbreak recorded here is in pleasant contrast and worthy of detailed study. It is noteworthy for two features. The bacillus isolated was not only isolated from the incriminated food but it was recovered from water from a tank in the slaughter-house, a rather unusual feature. This suggests a method of infection which has not hitherto been reported.

The other feature of interest is the serological character of the bacillus isolated. By the courtesy of Mr Peckham both cultures have been sent to me and Mr Bruce White has extensively studied its qualities in connection with extended investigation which we are making on the serological relationships of the Salmonella Group. We are not only in a position to confirm the very careful work of Mr Peckham but the strain (since both the pie and tank bacilli are identical) is unique in its serological relationship. It is identical with a strain isolated by us in May 1922 from a pig suffering from swine fever but otherwise, so far as we are aware, they stand alone. The two strains belong to no recognised type since serologically they stand between *B. enteritidis* and the larger *B. aertrycke—B. suipestifer* group. Hitherto no such intermediates have been described so the outbreak is of special interest.

W. G. S.

The following account of an outbreak of food poisoning, due to the eating of pork pies, is interesting because a bacillus of the Gaertner-paratyphoid group was isolated from the remains of a pork pie and from a tank of water on the same premises where the pork pies were made.

The two strains of bacilli were identical in all their reactions and closely resembled *B. Gaertner*. They could only be distinguished from *B. Gaertner* by absorption tests as shown later in the Report.

The pies were made in Derby and cases of poisoning occurred in Derby, Belper and Ambergate: the total number notified being 37.

The chief clinical signs were pains in the abdomen and limbs, violent vomiting and diarrhoea and pyrexia. There were no deaths, but in some cases the illness was severe and lasted for three weeks.

The period of time between eating the pies and onset of illness varied from 1½ hours up to 21 hours, the average time being approximately 11 hours.

Sausages, polony and potted meat were also purchased from the same source by two families in which illness occurred. In one case mother and daughter had pork pie and were ill: the father had only polony and suffered no ill effects.

The second family had pork pie and one hour before onset of illness had sausages. Two children of this family had potted meat only and sickness began 37½ hours after. The potted meat was eaten at 8.30 p.m. and again at 9 a.m. next morning. No other cases were notified after eating potted meat and it is probable that in this case the potted meat had become infected in the house, *i.e.* using the same knife for serving both pie and potted meat.

## INSPECTION OF THE PREMISES.

By Dr Wray, *Assistant Medical Officer of Health*, and
Mr Hanson, *Meat Inspector* (*Borough of Derby*).

These premises were visited on October 11th, 1921, and comprise a pork pie and bacon factory: the number of employees being five males and one female.

The pigs are slaughtered in the slaughter-house. Offal is removed and gut scraping is carried out in the slaughter-house. The offal is then placed in a tank.

Carcases are taken by overhead trolley to a cutting up room. At one side of this room is the cutting block, and opposite to this are boilers or cookers and a mincing machine.

### *Make up of pies.*

*Make up room.* At the end of this room, which is between cutting up room and cooking room, remote to the door leading to the cutting up room and yard and slaughter-house, is a bench where the pastry is brought and the pork filled in by the female employee, who alone handles the pork after it is cut up for pie making.

On Friday, October 7th, two hundredweight of pies were made, and these were distributed and sold on October 8th.

*Cooking room.* The pastry is made by the female worker on a bench in the pie cooking room. It is then conveyed in pans to the make up bench in the make up room described. The jelly for filling is made by the same firm and only sufficient is made to carry on from day to day.

The temperature of the ovens is stated to be 400° Fahr. (but the proprietor admits his thermometer is not accurate). No one handles the pies

except the female worker. When cooked they are placed on a bench in the middle of the cutting up room to cool: when cooled sufficiently the jelly is poured into the pies through a vent hole in the top crust of the pie. They are then distributed to the various shops on trays by a motor van. The proprietor says there is no possibility of under-cooking. All his ovens had been cleaned out and fires attended to the week previous.

*Utensils.* The baths, basins and carry tins are scrubbed out each day. One domestic bath in slaughter-house and one in cutting up room are provided with plugs, but are not provided with channel outlets, consequently they are emptied by lading with a small tin: hence water infected may thus remain.

The various utensils on both days of inspection appeared clean except the bath in the slaughter-house in which the offal is placed.

*Duties of employees.* The female worker as stated above. One man is supposed to handle the cut carcase. One is supposed to handle the offal. The others carry the various portions of the carcase to the curing room downstairs, and also attend the boiling, etc. It is doubtful if in practice these men are kept strictly to these duties. It is more probable that the male employees do whatever work is required at the moment.

*Health of employees.* They all claimed perfect health and stated that there was no illness in any of their families or in the houses in which they reside.

*Condition of buildings.*

| | |
|---|---|
| Slaughter-house: | Clean. |
| Pens: | Fairly clean, but malodorous. |
| Cutting up room: | Benches clean; floor, which was a wooden one, sticky and covered with wood chips. |
| Cook house: | Clean. |

The factory was again visited on October 19th, 1921. Slaughtering had taken place. The offal was in the bath mentioned. This bath on both occasions was not clean: the sides were dirty and sticky with dark deposits.

The following specimens were taken and sent to this laboratory:

1. Pie meat (uncooked).
2. Cold jelly (before boiling for pies).
3. Jelly (after boiling).
4. Lard.
5. Water from tank (or bath) in which large intestines were placed after slaughter.

The jars in which the specimens were placed had been previously boiled and wrapped in sterilised lint.

My thanks are due to Dr A. E. Brindley, Medical Officer of Health, Borough of Derby, for allowing me to use the above extracts from his report.

## BACTERIOLOGICAL INVESTIGATION OF THE CAUSE OF THE OUTBREAK.

On October 10th, I received from Dr Allen of Belper a portion of pork pie, purchased from a shop in Derby on October 8th, being one of a batch baked on October 6th, and alleged to be the cause of an outbreak of food poisoning involving at least 37 people. The pie was apparently fresh and had no offensive odour. The jelly was firm but was found to contain small whitish specks which turned out to be colonies of bacteria, when examined with the aid of a lens.

Emulsions made from the jelly and meat were plated out on bile salt lactose agar and lactose litmus agar. It was impossible to get a piece of meat that had not been in contact with the jelly. After 24 hours' incubation at 37° C. bacteria giving the following morphological and cultural reactions were obtained from both meat and jelly:

A small actively motile Gram negative bacillus, turning litmus milk acid, then alkaline, forming acid and gas in serum water containing glucose, dulcite, salacin, mannite, maltose, galactose, and laevulose. No change in saccharose, lactose, glycerine, inulin and raffinose. No indol was produced in peptone water and neutral red was reduced.

Typical *B. coli* were present in fair numbers.

On October 19th I received from the same factory the following specimens: lard, cold jelly, boiled jelly, uncooked minced meat, a pork pie, and water from a tank in the slaughter-house. These were examined by lactose bile salt agar plate culture with the following results:

Lard. A few colonies of *B. coli.*

Cold jelly. *B. coli* and moulds.

Boiled jelly. *B. coli* and *Staphylococci.*

Uncooked minced meat. *B. coli* and *Enterococci* were found in large numbers. There were a great many other bacteria present, but no organisms of the paratyphoid group were found.

Pork pie. Moulds. *Staphylococci* and a coliform bacillus were isolated. No organisms of the paratyphoid group were found.

Water from the tank. This water was distinctly coloured with blood and contained a small quantity of suspended matter. Plates of lactose bile salt agar were sown before and after incubation, and a bacillus, identical in morphological and cultural characteristics with that obtained from the portion of pie sent from Belper, was obtained in large numbers. A small portion of the incubated tank water was inoculated into a guinea-pig which died in 18 hours, and a bacillus, identical to that already isolated from tank water and pork pie, was obtained from the heart and spleen in pure culture.

No specimens of faeces from patients who had partaken of pork pie from this batch were received, but blood from three of them who suffered from

the poisoning was tested on the third day of illness, and in each case agglutinated the pork pie bacillus, the tank bacillus and that recovered from the inoculated guinea-pig in dilutions carried up to 1–100.

Blood from a fourth patient "A," obtained 17 days after eating a pork pie of this batch was tested with the above cultures and agglutination reached 1–500.

From the cultural characteristics of these bacilli, it was evident that they belonged to the Gaertner-Paratyphoid group and serological tests were undertaken to determine their place in this group. For this purpose the following cultures and specific sera were obtained from the National Collection of Type Cultures, Lister Institute: *B. paratyphosus* B. Strain "Tidy"; *B. suipestifer*, Strain "Mutton"; and *B. enteritidis* Gaertner, Strain "Stokes."

Direct agglutination tests with the blood of patient "A" (the only available blood at the time) were made, with the following result:

Table I. *Agglutination tests with serum of patient* "A." *Microscopical—2 hours.*

| Culture | 1–100 | 1–250 | 1–500 |
|---|---|---|---|
| *B. paratyphosus* B. | + | + | + |
| *B. suipestifer** | + | + | + |
| *B. Gaertner* | + | + | + |

The result was of such an indefinite character that an absorption test was made, and the result is shown in Table II:

Table II. *Agglutination tests after absorption. Microscopical—2 hours.*

| Serum and absorbing strain, 2 hrs. at 37° C. | *B. paratyphosus* B. | | *B. suipestifer* | | *B. Gaertner* | | Control |
|---|---|---|---|---|---|---|---|
| | 1–100 | 1–500 | 1–100 | 1–500 | 1–100 | 1–500 | |
| Patient "A" serum / *B. paratyphosus* B. | – | – | + | + | – | – | – |
| Patient "A" serum / *B. suipestifer* | + | – | + | + | – | – | +* |
| Patient "A" serum / *B. Gaertner* | + | – | + | + | – | – | – |

* These two tests gave very unreliable results. It was found that the cultures in use had gone "rough." Fresh cultures were obtained, but could not be tested with the above serum owing to the serum being used up.

A test was made to endeavour to find out how much of the agglutinins could be absorbed from specific sera by this "tank" bacillus. This is shown in Table III as follows:

Table III.

| Serum and culture used for agglutination tests. Microscopic 2 hours at 37° C. | Sera absorbed with "tank" bacillus, 2 hours at 37° C. | | | | | | Unabsorbed serum controls | | | Controls |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1–200 | 1–500 | 1–1000 | 1–2000 | 1–4000 | 1–8000 | 1–2000 | 1–4000 | 1–8000 | |
| *B. paratyphosus* B. | + | + | + | + | + | – | + | + | – | – |
| *B. suipestifer* | + | + | + | + | – | – | + | – | – | – |
| *B. Gaertner* | + | + | + | + | – | – | + | + | + | – |

In the above test saline emulsions of 18 hours old cultures were used, and by this method suitable suspensions were obtained. It will be seen that the

bacillus under examination is not *B. paratyphosus* B. or *B. suipestifer*, but is closely allied to *B. Gaertner*. As will be seen from this table, the "tank" bacillus was able to absorb a considerable quantity of the *B. Gaertner* agglutinins. Having some of this absorbed serum left over, it was again saturated with "tank" culture, to see if it was possible to lower the titre still further. A second test gave the same result.

The tank bacillus was inoculated into a guinea-pig on several occasions, using killed bacilli, and from it serum was obtained and was used for direct agglutination and absorption tests by the macroscopic method.

Table IV shows the agglutinating power of this serum for the chief members of the food poisoning group:

Table IV.

| Culture | Dilution of serum 1–20 | 1–100 | 1–200 | 1–500 | 1–750 | 1–1000 | 1–1500 | 1–2000 | Controls |
|---|---|---|---|---|---|---|---|---|---|
| "Tank" bacillus | + | + | + | + | + | + | + | ± | – |
| *B. Gaertner* | + | + | + | + | + | + | + | ± | – |
| *B. paratyphoid* B. | – | – | – | – | – | – | – | – | – |
| *B. suipestifer* No. 1 | ± | – | – | – | – | – | – | – | – |
| „ No. 2 | ± | – | – | – | – | – | – | – | – |

Two fresh strains of *B. suipestifer* were obtained from the Lister Institute and were found to be satisfactory.

The "tank" bacillus and the bacillus obtained from the pie had been re-plated and single colonies again re-plated several times, and tested out with sera but no change had taken place in their agglutinating powers.

The "tank" bacillus serum was absorbed with *B. paratyphoid* B. and *B. suipestifer*, but no change in agglutinating power for the "tank" bacillus took place.

Table IV shows the "tank" bacillus to be *B. Gaertner* or a bacillus very closely allied. To settle this point an absorption test was performed and is shown in Table V:

Table V. *Absorption tests with serum of guinea-pig inoculated with "tank" bacilli.*

| Absorbing culture and test culture | Dilution of serum 1–100 | 1–400 | 1–800 | 1–1600 | 1–2000 | Controls |
|---|---|---|---|---|---|---|
| Serum absorbed with *B. Gaertner* and tested with "tank" bacillus | + | + | + | + | ± | – |
| Serum absorbed with "tank" bacillus and tested with *B. Gaertner* | – | – | – | – | – | – |

In Table III it will be noticed that it was impossible to absorb the agglutinins from a Gaertner serum by the aid of the "tank" bacillus. Tables VI and VII confirm this result:

Table VI. *Agglutination tests with* B. Gaertner *serum.*

| Test organism | Dilution of serum 1–100 | 1–500 | 1–1000 | 1–2000 | Controls |
|---|---|---|---|---|---|
| "Tank" bacillus | + | + | ± | ± | – |
| *B. Gaertner* | + | + | + | + | – |

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Table VII. *Absorption and agglutination tests with* B. Gaertner *serum.*

| Absorbing culture and test culture | Dilution of serum | | | | |
|---|---|---|---|---|---|
| | 1–100 | 1–500 | 1–1000 | 1–2000 | Controls |
| Absorbed with "tank" bacillus and tested with *B. Gaertner* | + | + | + | + | – |
| Absorbed with *B. Gaertner* and tested with "tank" bacillus | – | – | – | – | – |

A number of the foregoing tests were also done with the bacillus isolated from the pork pie and the results were the same as those given by the "tank" bacillus.

In connection with this work a small investigation was made to see if the tanks used in other pig slaughter-houses contained any organisms of the Gaertner-paratyphoid group, and on November 11th samples of tank water from two pig slaughter-houses in Derby were submitted for examination. The samples were received in sterile test tubes and each was slightly blood stained. Nothing was added and they were incubated over-night. After incubation they were plated on bile salt agar, and any suspicious colonies that developed were examined for motility and preliminary agglutination tests with anti-sera.

The result of this examination was that from one of the tanks a bacillus was isolated which gave all the biochemical and serological reaction of *B. Gaertner* as shown in Table VIII:

Table VIII. *Agglutination tests with bacillus from tank.*

| Serum | 1–200 | 1–1000 | Controls |
|---|---|---|---|
| *B. Gaertner* | + | + | – |
| *B. suipestifer* | ± | – | – |
| *B. paratyphosus* B. | ± | – | – |

The tank water from the second slaughter-house was rich in excretal organisms, but although a large number of colonies were tested, none were found which reacted to any of the tests applied to the Gaertner-paratyphoid group.

## CONCLUSIONS.

It can be fairly safely assumed that the causal organism of the outbreak was the bacillus isolated from the pork pie. Agglutination tests with the sera of the patients who had partaken of that, or pies of the same batch, show this by their positive reactions to this bacillus and the bacillus isolated from the tank water.

It is to be regretted that no specimens of faeces from these patients were sent for examination.

That the pies were infected from the tank water is fairly conclusively proved by the isolation of a bacillus identical in all respects with the bacillus obtained from the pie, and this bacillus was undoubtedly of animal origin.

In my opinion the danger lies in the jelly filling of the pies and in the manufacture of pies on the same premises where they slaughter. It will be

noticed in the Report that I examined some so-called "boiled" jelly. This specimen was warm when received and it was plated out at once. *B. coli* and other organisms developed after incubation. It is the custom to fill the pies with cooled jelly and one can imagine many ways for this jelly to become infected, and given warm weather or warm air as found in cook-houses, with the rate at which this type of bacteria grows, it is no wonder that these outbreaks are always cropping up.

To sum up the results of this work, the organisms under examination were very closely allied to *B. Gaertner* and can only be distinguished from *B. Gaertner* by the absorption test.

For purposes of reference I have named it *B. enteritidis* [Tank].

I wish to express my sincere thanks to Dr W. G. Savage and Dr Bruce White for their kindness and trouble in checking these results.

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