

carcasses, including the head and lymphatic glands about the throat.

- (b) Pork imported in portions less than the entire carcass to be enclosed in boxes, barrels, bags, or other receptacles bearing an official mark which has been accepted by the Board. The Board's acceptance of any proposed mark as an official mark would depend upon the evidence forthcoming from the exporting country that the mark affords a guarantee that the carcasses from which the portions of pork have been derived have been examined by competent and responsible officers, and have been found free from tuberculosis in any degree.

The question of tuberculosis in pigs from which bacon and ham are obtained differs from that of tuberculosis in fresh pork in its public health aspects, and does not at present give rise to administrative difficulties (*cf.* p. 39 of my London report on Pig Tuberculosis). The Danish prohibition of meat of tuberculous pigs for export to the United Kingdom applies not only to fresh pork, the export of which is comparatively small, but to all Danish bacon and hams, which form a very important item in the trade of Denmark with this country. The practice is one which deserves recognition in the interests of the British consumer. In present circumstances, however, the conditions above outlined are suggested for application to fresh, refrigerated, or frozen pork, but not to bacon or ham.

OUTBREAK OF PORK-PIE POISONING.*

By GEORGE NEWMAN, M.D.

THIS outbreak included the following cases:—

(a) On Tuesday, June 26th, Mr. and Mrs. L. (Bedford) and their family were in perfect health. The household consisted of the following eleven persons: Mr. and Mrs. L., J. L., N. L., M. L., R. L., the cook, a French maid, and also the grandmother, a housemaid, and B. L.

In the evening of that day at or about 7 o'clock, the first eight of the above-named persons partook of some pork pie. M. L. had meat only, and the cook had crust and gravy only. Between the hours of 4 a.m. and 12 noon on Wednesday, June 27th, all eight persons who had eaten any of the pie were seized with violent colic pains in the abdomen, vomiting and excessive diarrhoea. The other three persons who had not eaten any of the pie remained perfectly well. Of the eight who were ill the younger members also suffered from feverish symptoms (as for the French maid, "*elle avait une grande douleur dans la poitrine et le ventre, elle grognait beaucoup et voulait le pâté au diable.*") Under suitable treatment the severe symptoms gradually subsided, but all the patients were

* Extracted from the Annual Report on Sanitary Condition and Public Health of the Administrative County of Bedford for 1906.

ill for some days. The patient (M. L.) who had meat only was much less affected than the others, but the cook, who took pastry and gravy only, suffered very severely. N. L., who partook freely of both the pastry and meat of the pork pie, suffered a more severe and prolonged attack of poisoning than any of the others. It also appears that those who consumed more of the pie commenced their symptoms at an earlier hour than those who partook less of the pie. In other words, the incubation period was short (say eight hours) in those who ate most, longer (say sixteen hours) in those who ate least.

(b) On Monday, June 25th, a pork pie was partly consumed at supper in the household of Mrs. S. (Bedford). M. S., aged 28, ate some of the pie on that evening, and next morning had to return to bed with symptoms of great prostration, which lasted three or four days. On Tuesday, June 26th, E. R., aged 18, and C. S., aged 24, ate some of the same pie and suffered from vomiting and diarrhoea within a few hours. On the other hand M. R., aged 16, who consumed some of the same pie at the same meal, suffered from no marked symptoms. On Wednesday, June 27th, Mrs. S. had the small piece of pie remaining, and the same evening she was attacked with colic, diarrhoea, vomiting, prostration, and syncope. She did not fully recover for several days. The maid-servant in this household ate no pie and had no symptoms of disease.

I also heard of six other centres of infection outside Bedford.

(c) The first being "a lady and gentleman who were going to the Derby Show," who ate part of a pork pie purchased in Bedford, "of the same batch" as those to which reference has been made. The gentleman was taken ill whilst on the railway journey, and suffered from similar symptoms to the above.

(d) The second centre of attack outside Bedford was in a village in Buckinghamshire, the pork pie having been purchased in Northampton on Saturday, June 23rd. On Monday, June 25th, the four persons in this house who partook of it were seized with vomiting and diarrhoea.

(e) The third centre of which information has come to me was at Blisworth, in Northamptonshire. On Saturday, June 23rd, a pork pie was purchased in Northampton, and on Sunday Mr. and Mrs. B. and family (6 persons) partook of it. On Monday morning the whole family were seized with severe vomiting, diarrhoea, colic and prostration. The incubation period was about 8-10 hours. A visitor at the house, who was the only person who did not eat any of the pie, escaped entirely from illness.

(f) Fourthly, at a camp for members of the Y.M.C.A., near Northampton, six young men ate of one of these pork pies on the evening of June 26th, and on the morning of June 27th. Three of these consumers were affected on the evening of the 27th with diarrhoea, and one of them suffered also from vomiting. The pie was purchased in Northampton on June 26th.

(g) Dr. Beatty, of Northampton, also reports the occurrence of another case of similar poisoning in the town, which had been reported to the maker of the pork pies, but which it has since been impossible to trace.

(h) Lastly, two cases occurred at Crick, a small village in mid-Warwickshire, situated between Northampton and Rugby, namely, a lady and her niece, who ate portions of a pork pie purchased in Northampton on a date corresponding with the date of the other cases. The pie was eaten on the evening of the day it was purchased. Next morning both ladies were seized with colic, vomiting and diarrhoea. In this instance it is reported

that the meat of the pie appeared to be redder in colour than is normally the case, and was "flabby" to the touch.

BACTERIOLOGICAL EXAMINATION OF THE PORK PIE.

From the above record it appears that not less than 29 persons suffered from illness of a similar character after eating pork pie, and the evidence seemed to point definitely to some infective property in the pork pies consumed by the patients. Accordingly, on June 28th Dr. H. Savory, of Bedford forwarded to me in a tin box the remnants of the pie consumed in Mr. L.'s family. It was supplied by a firm of grocers in Bedford, who stated that it had been made in Northampton several days before. Indeed there is reason to believe that all the pork pies implicated in the outbreak under consideration had been made by the same manufacturer at Northampton.

Without delay I forwarded the remnant of pork pie to Mr. A. G. R. Foulerton, F.R.C.S., D.P.H., the Director of the Bacteriological and Public Health Department of the Middlesex Hospital, London, and on July 5th he furnished me with the following report:—

Report on the Examination of a Sample of "Pork Pie" received on Thursday, 28th June, 1906.

The sample was received in a clean tin, and consisted of portions of the meat and crust of a "pork pie." The sample had a faint unpleasant odour, and both crust and meat were distinctly acid in reaction.

From the sample two species of bacilli and one species of coccus were isolated and examined; the last-named organism was probably not of any special importance. The two species of bacilli isolated were *Bacillus coli communis* and *Bacillus enteritidis* (Gärtner); both were uniformly distributed through both crust and meat, *Bacillus enteritidis* being present in preponderating numbers. Small particles of meat and crust were shaken up in a little distilled water, and the respective emulsions were injected into mice, with the result that in both cases death occurred within twenty hours afterwards.

Bacillus enteritidis is well recognized as a cause of food poisoning, its effects are manifested by acute and severe inflammation of the intestines, sometimes resulting in death. Also the presence of *Bacillus coli communis* in the meat for any length of time would result in the development of considerable quantities of toxins.

The presence of these two bacilli in a pork pie of this description is due to the use of unwholesome meat; the cooking of the pie would suffice to sterilize the external crust, but the heat might not penetrate sufficiently into the centre of the mass of meat to destroy any bacteria which might be there, and the meat would afford an excellent medium for the multiplication of any bacteria which might thus have escaped destruction, and which would afterwards grow through to the crust.

The occurrence of bacteria of this description within a pie is an indication that either diseased meat or imperfectly cleaned offal has been included amongst the ingredients.

(Signed) ALEX. G. R. FOULERTON,
*Lecturer on Bacteriology and on
Public Health to the Middlesex Hospital.*

A consideration of the facts set out in the above report makes it almost certain that the pork pie in question contained virulent matter which set

up poisoning in the persons consuming it. Confirmatory evidence of a convincing character is however obtainable owing to the fact that seven of the patients in Mr. L.'s family were each willing to supply for subsequent examination a few drops of blood. As is now well known, it is possible by bacteriological examination to test the blood serum of a poisoned person with artificial cultures of the specific organism which is believed to have been the cause of the infection. This test is in common use in the case of typhoid fever, and is frequently used as a means of diagnosis in that disease. If the blood serum contains the toxin of the specific organism in appreciable quantity, there are produced in the blood as a result of the interaction between the body cells and the toxin (or the specific organism) protective substances known as "anti-bodies." These anti-bodies exert a special and injurious action upon the particular organism or its toxin which causes the disease, and when brought into contact with an artificial fresh culture of that organism, set up a positive reaction of *agglutination*. This term means that a cessation of mobility takes place in the motile organisms which collect together in clumps. When such positive reaction occurs, especially in a marked degree, it can no longer be doubted that such blood serum actually contains specific anti-bodies, which can have been formed in it only by infection with toxic bodies allied to or identical with the toxin of the specific organism, or with the specific organism itself. Mr. Foulerton was able in the present instance to test seven blood serums from Mr. L.'s family against cultures of the two organisms (*B. enteritidis* and *B. coli*) actually isolated from the pork pie, portions of which had been consumed by these patients. The results of these seven tests and of four control tests of persons who had not eaten any of the pie are as follows :—

| | | Bacillus Enteritidis (Gärtner). | | Bacillus Coli Communis. | |
|---|----------|--|---|-----------------------------|---|
| | | Dilution 1 : 40. | Dilution 1 : 20. | Dilution 1 : 40. | Dilution 1 : 20. |
| 1 | Mr. L. | Good agglutina- tive reaction within 30 minutes | Good agglutina- tive reaction within 30 minutes | No reaction (60 minutes) | Some indication of agglutina- tion, but quite incomplete (60 minutes) |
| 2 | Mrs. L. | No reaction ... | Some indica- tions of agglu- tination, but reaction in- complete after 60 minutes. | " | As No. 1 |
| 3 | J. L. | Immediate and complete re- action | Immediate and complete re- action | " | No reaction |
| 4 | N.L. (1) | No reaction ... | No reaction ... | " | " " |
| | " (2) | " " | " " | " | " " |
| 5 | Cook | Good agglutina- tive reaction within 10 minutes | Immediate and complete re- action | " | As No. 1 |
| 6 | R. L. | No reaction ... | No reaction ... | " | No reaction |
| 7 | M. L. | " " | " " | " | " " |

Contro! Experiments.—Normal serums against culture of *Bacillus enteritidis* isolated from pork pie.

| | | Dilution 1 : 20. |
|---|-------------|-----------------------------|
| 1 | A. G. R. F. | No reaction (60 minutes) |
| 2 | L. C. | " |
| 3 | E. H. | " |
| 4 | E. M. | " |

From these findings it becomes evident that the agglutinations were specific, and there cannot be the smallest doubt of the fact that this remnant of the pork pie contained virulent and poisonous toxins (derived in all probability more from *B. enteritidis* than from *B. coli*), which were the cause of the illness. It is true that three of the patients who suffered, one of them very severely, did not yield blood serum giving a positive reaction, but this is probably due to individual inability to produce "antibodies" in the blood, and hence the patient suffered from a severe attack. It is for this reason that in a series such as this, it may and does happen that serum from patients who have suffered most yields a negative reaction. The general results then of the bacteriological findings are clear, and leave us in no doubt as to the materials of infection.

CHANNEL OF INFECTION.

Since the occurrence of the "Welbeck disease" in June, 1880, which was investigated by Dr. Ballard and Dr. Klein, there have been not less than 50 somewhat similar epidemics, shown to be due to infection through such food as pork pies, boiled hams, tinned meats, etc. One of the most widespread occurred at Derby, in 1902, when more than 200 persons were poisoned by eating pork pies. Professor Delépine, of Manchester, who investigated that outbreak, isolated the *Bacillus enteritidis derbiensis*, an organism identical with or closely allied to *Bacillus enteritidis*, of Gärtner, isolated from this Bedford pie. He considered the presence of this bacillus in the pie was due to contamination of the meat before it was cooked, arising from insanitary environment or unclean treatment at the maker's shop, and that subsequently the central parts of the pie were not thoroughly cooked. It frequently happens in these cases that some constituent part, such as the jelly, is really the polluted portion. Experience of these outbreaks leads one to the conclusion that the meat has contracted its poisonous properties in one or other, or both, of the following ways: (a) By putrefaction, or unsoundness, in the meat itself; (b) By unclean manipulation or storage in insanitary places. In addition to such channels of infection there is failure of sterilization in the cooking process. It has been repeatedly pointed out since the Royal Commission on Tuberculosis of 1895, that rolled meat, meat pies, and frequently "joints" are not, in the process of cooking, always sterilized in their central parts.

In accordance with these facts I communicated with the Medical Officer of Health of Northampton (Dr. Beatty), enquiring as to what evidence, if any, there was of negligence or of the use of unsound meat at the shop where it was alleged these Bedford pies had their source, and also as to whether or not there had been similar cases of poisoning in Northampton. Dr. Beatty replied as follows:—

..... "I have not yet completed my enquiries in regard to the matter, but so far I have not heard of any outbreak here. Messrs. [X.Y.Z.] are a respectable firm in a good way of business. I have examined carefully into the method of manufacture of their pork pies, and though the arrangements of the bakehouses and preparation room are somewhat old-fashioned, there is no evidence so far that they do not carry on their business with care. I have found the utensils in a clean condition and the tables and benches are scrubbed daily. The walls of the rooms are fairly clean, the walls of the preparation room being lined for some distance above the tables with white glazed tiles.

"There is no evidence of the use of unsound food, though it is possible that some was sent to Messrs [X.Y.Z.] by one of the butchers who supply the firm, but Mr. [X] has no recollection of anything wrong.

"Should I find anything further of importance I will let you know.

Yours sincerely,

(Signed) JAMES BEATTY,

Medical Officer of Health."

Subsequently Dr. Beatty informed me of the occurrence of other cases of poisoning, and stated, that in the opinion of Mr. X. all the cases of illness arose from eating from "one batch" of pork pies. Mr. X. considers it remarkable that though he sold, at or about the time of poisoning, upwards of 300 pies in Northampton, only one case of illness should occur in the town. At first sight that does give rise to surprise, but it may be that other cases of slight or even severe illness were produced without coming to our knowledge, or it may be that only one part of a batch of pies contained unsound meat, or that the poisonous agent had not had time to increase in other pies before they were consumed. Mr. X. asserts that one of the first signs of a pie going or being bad is the liquefaction of the jelly, though sometimes mould forms first on the meat immediately under the crust. If this be so, it is interesting to know that such liquefaction actually occurred in two of the cases above recorded.

CONCLUSIONS.

I am afraid the only conclusions to be drawn from the above report are as follows:—

1. Certain persons—concerning 29 of whom we have some information—ate pork pies and suffered from subsequent illness.

2. A bacteriological examination of a remnant of one of the implicated pork pies yielded a positive result and virulent pathogenic organisms were found in it. The food was also directly poisonous to animals. There can be little doubt it was also the direct cause of poisoning in these 29 persons. This view of the case is confirmed by the results of the examination of the blood serum in seven cases.

3. The agents of infection probably existed in the meat, either from the fact of the meat being unsound or diseased, or imperfectly cleaned and prepared, or prepared under insanitary conditions. Dr. Savoury believes, from clinical evidence, that the gravy was the offending ingredient. It may have been so. In any case the poisonous pies were ultimately more or less affected throughout. But as to these points of primary origin we have no reliable information.

I beg to acknowledge my thanks to Dr. H. Savoury, Dr. Wilmer Phillips (Medical Officer of Health of Bedford), Mr. Foulerton, and Dr. Beatty (Medical Officer of Health of Northampton), for the information supplied by them, and which is incorporated in the above Report.