

## AN OUTBREAK OF ACUTE GASTRO-ENTERITIS CAUSED BY *B. PARATYPHOSUS* (B.).

BY F. A. BAINBRIDGE, M.D., F.R.C.P., D.P.H.

*Of the Lister Institute of Preventive Medicine,*

AND R. DUDFIELD, M.A., M.B., D.P.H.

*(Medical Officer of Health, Paddington).*

### *History of the Outbreak.*

ON June 14th, 1910, the attention of one of us was directed by the House Physician of the Hampstead General Hospital, to an outbreak in Paddington of what was thought to be "food-poisoning." Two of the patients were at the time under his care.

The history of the outbreak was briefly as follows: On the night of the 10th—11th June, eight persons out of twenty-nine living in a high-class boarding-house were taken ill, five of the cases being amongst the servants, seven in number, and three among the guests, twenty in number. The two proprietors of the house were not affected. All the patients were females and with one exception (aetat. 15) adults, some of mature age.

The symptoms were practically the same in all the cases, but one patient was much less affected than the rest. She had, by coincidence, taken a purgative on the night of the 9th and her escape from an attack of a severity equal to that of the others may be attributed to that cause. All had severe abdominal pain, followed by vomiting and persistent and violent diarrhoea, which could not be controlled by the usual remedies. Fever supervened, the temperature rising as high as 103° F. in some cases, and lasting for various periods up to a week. There were no indications of any pulmonary lesions, or of any splenic enlargement, nor was there any delirium. Some of the more elderly

patients had attacks of grave syncope, and, with the exception of the case already mentioned, convalescence was slow. All the patients recovered.

The first inquiries were naturally directed to find out what food had been the cause of the outbreak. The time of the onset of the outbreak and the fact that none of the male guests had been attacked suggested that the infected food—if there had been any—had been eaten at the midday meal of the 10th at which only one male guest had been present. Careful inquiries, however, failed to elicit any evidence of any item of the menu of that meal having been taken by the patients and passed by those who escaped. Still, in view of the well-known capriciousness manifested in the attack and escape of persons partaking of infected food, it was thought advisable to pursue inquiries with relation to each article of food provided at the meals of the 9th and 10th. The results of the inquiries were entirely negative and while they were in progress the bacteriological examinations, which are described below, led us to the conclusion that food infection had not been operative.

Samples of the faeces from two patients were received on the 14th and forwarded to the Lister Institute, the patients then having been three days ill. It was not known at the time that one of the patients had been treated with saline irrigations of the rectum, but that information subsequently explained the fact of her faeces yielding practically no growth. The specimens when received were quite fluid and of a brilliant green colour. A third sample was received on the 17th from a patient then ill six days, who had had 14 or 15 motions on that day. This patient (Miss L.) was upwards of 70 years old, and hers was one of the severest cases of the outbreak. She had several attacks of heart failure, and her case gave rise, at one time, to much anxiety.

Specimens of blood were obtained from six of the patients and submitted to agglutination tests at the Lister Institute.

In the course of the investigation, information was received of similar cases in Willesden, Hampstead and Lambeth which were thought to have been connected with the Paddington outbreak. Details of those cases were obtained from the Medical Officers of Health of the districts named and such information is summarised in the following paragraphs:—

(1) A group of cases occurred in the family (named H.) of the temporary cook at the boarding-house, four persons being taken ill during the morning of the 14th. All had abdominal pain and diarrhoea, but

vomiting was not present in all cases. There was a history of dried haddock being eaten at supper on the night of the 13th but, in the light of other evidence, the causal relationship between the fish and the illness appears to be doubtful. Specimens of the blood from two of the patients (Mr and Miss H.) were submitted to agglutination tests.

(2) A laundry proprietor, named T., also residing in Willesden, who called at the boarding-house on the 10th, had diarrhoea on that and the following two days, which he attributed to eating a veal and ham pie on the 10th. There was no history of any illness among the other members of T.'s family.

(3) A further case in the same district was reported in the person of a woman who was at the time of the outbreak kitchen-maid at the boarding-house, but, as the woman was said to have taken a purgative just before her attack of diarrhoea, the case was not (unfortunately) followed up.

(4) The case in Hampstead was in the person of a married sister (Mrs R.) of the temporary cook at the boarding-house, with whom the cook lived. Mrs R. visited her mother Mrs H. in Willesden on the 13th and the same evening had severe abdominal pain, followed in the morning by vomiting and diarrhoea. Mrs R. did not share the haddock supper to which the H.'s attributed their illness, but she had a piece of cold fried fish brought from the boarding-house on the previous Sunday (12th). An unavailing attempt was made to secure a specimen of Mrs R.'s blood.

(5) The Lambeth case was that of Mrs D. who had been married only a short time, leaving a situation in the boarding-house for that purpose. She visited the house on Monday June 27th to see one of the servants, had "tea" in a bedroom in which one of the original patients had been nursed and had an attack on the following day, which is best described, in the absence of medical information, in her own words. She wrote to her friend: "I have been so ill since I saw you on Monday. All day Tuesday and Wednesday I felt as though I was going to die. I was sick and all the other (*sic*) all day and night, doubled up with pain and all that came up was like thick green paint." Such account suggests that Mrs D. had a pretty severe attack of diarrhoea and vomiting, much the same as the inmates of the boarding-house. The Medical Officer of Health of Lambeth reported that Mrs D.'s medical attendant described the case as one of ptomaine poisoning. The "tea" referred to is said to have consisted of tea and bread and butter—no potted meats. A specimen of Mrs D.'s blood was refused.

*Bacteriological Examination.*

(a) Three samples of faeces were received during the outbreak, two on June 15th from Miss G. and Miss W. and one on June 17th from Miss L. When examined by the methods usually employed for such cases, the faeces of Miss W. yielded no growth, but the faeces of Miss G. and Miss L. yielded cultures which were identical in their cultural characters with *B. paratyphosus* (B.). The nature of these cultures was determined by observing their agglutination and absorption reactions with various sera. The results which are given in Tables I and II show that both the strain "G" from Miss G., and the strain "L" from Miss L. were indistinguishable from standard strains of *B. paratyphosus* (B.).

These results show that the bacilli isolated from the patients' faeces were *B. paratyphosus* (B.). Strain G was found to be highly virulent

TABLE I. *Agglutination tests.*

The Macroscopic method was used, and the agglutination limits were observed after incubation for 2 hours at 37° C. Controls were made in every case.

Organism	Serum		
	<i>B. paratyphosus</i> (B.)	<i>B. suipestifer</i>	<i>B. Gaertner</i>
<i>B. paratyphosus</i> (B.), McWeeney	20,000	5,000	<100
<i>B. suipestifer</i> (Laboratory strain, Lister Institute)	5,000	10,000	<100
Strain G 1	20,000	5,000	<100
Strain G 2	20,000	5,000	<100
Strain L	20,000	5,000	<100
<i>B. Gaertner</i> (original strain of v. Ermengen)	<100	<100	5,000

TABLE II. *Absorption tests.*

Macroscopic method. Agglutination limits after absorption, observed after incubation for 2 hours at 37° C. Controls made in every case.

Serum	Organisms			
	<i>B. suipestifer</i>	<i>B. paratyphosus</i> (B.)	Strain G	Strain L
I. <i>B. suipestifer</i> .				
Original titre	5,000	5,000	5,000	5,000
<i>B. suipestifer</i> . Absorbed with <i>B. paratyphosus</i> (B.).	2,000	<100	<100	<100
II. <i>B. paratyphosus</i> (B.).				
Original titre	5,000	20,000	20,000	20,000
<i>B. paratyphosus</i> (B.). Absorbed with <i>B. suipestifer</i>	<200	10,000	10,000	—

for guinea-pigs, since 1/1000 c.c. of a 24-hour broth culture, injected intraperitoneally, killed in three days.

The faeces of patients G. and L. were filtered through a Berkefeld filter, and a dose of 2 c.c. of the filtrate was injected into a guinea-pig without producing any obvious effect.

(b) Blood was obtained from six of the patients at intervals of 10—20 days after the onset of the symptoms and agglutination tests were carried out for strain G., *B. suispestifer* and *B. paratyphosus* (B.). It will be seen from Table III that, with one exception, all the patients' blood agglutinated these three organisms and as a rule to the same extent.

The serum of the patients was pooled, and the combined serum was absorbed with *B. suispestifer* and *B. paratyphosus* (B.) and its agglutination limits after absorption were ascertained (Table IV).

TABLE III. *Agglutination tests carried out with the patients' sera.*

Wright's method; controls were made in every case.

	Patients' serum	Organism		
		<i>B. paratyphosus</i> (B.)	<i>B. suispestifer</i>	Strain G
(1)	Miss G. 1st sample	1—200	1—200	1—200
(2)	„ 2nd „	1—400	—	1—400
(3)	B. B.	1—400	1—400	1—400
(4)	Miss W.	1—200	1—200	1—200
(5)	Mr H.*	1—400	1—400	1—400
(6)	Miss H.*	1—400	1—400	1—400
(7)	Mrs W.	1—100	1—100	1—100
(8)	Mr S.	—	—	<1—40
(9)	Miss L.	<1—200	<1—200	<1—200

\* These patients resided at Willesden, not at the boarding-house.

TABLE IV. *Pooled serum. Absorption test.*

Wright's method. Agglutination limit after absorption, observed after incubation for 2 hours at 37° C. Controls made in every case.

Pooled serum.	Serum	Organisms		
		<i>B. suispestifer</i>	<i>B. paratyphosus</i> (B.)	Strain G
(1)	Original titre	100	100	100
(2)	After absorption with <i>B. suispestifer</i>	< 20	80	80
(3)	After absorption with <i>B. paratyphosus</i> (B.)	< 40	< 40	< 40

## CONCLUSIONS.

It thus appears that, while the bacteriological evidence pointed to only one organism, viz. *B. paratyphosus* (B.), as the cause of the infection in all cases, no one article of food had been eaten by all the patients and the only link between the primary outbreak in Paddington and the secondary cases in Willesden, Hampstead, and Lambeth, was furnished by the exchange of visits between the different houses. A consideration of these facts made it clear that the outbreak was almost certainly not caused by food, and an attempt was made to find a paratyphoid-carrier. The existence of paratyphoid (B.) carriers is now well known (Lentz [1905], Prigge and Sachs-Muke [1909]), and there are grounds for supposing that this organism has its habitat in the human alimentary canal. It was impossible, however (as is often the case in such outbreaks), to obtain the necessary material (blood and faeces) from those members of the boarding-house, who had not been ill, and no actual carrier was found.

For a time suspicion fell upon a servant, who had entered the boarding-house only a few days before the outbreak took place, and who had remained at work during the outbreak (although she had a mild attack of diarrhoea); but the examination of her urine and faeces always yielded a negative result as regards *B. paratyphosus* (B.) although her blood still agglutinated this organism up to 1—100 four months after the outbreak.

Nevertheless, the outbreak is of interest for two reasons. In the first place, it is clear that, as Schottmüller (1904) pointed out, *B. paratyphosus* (B.) is capable of giving rise not only to paratyphoid fever, but also to acute gastro-enteritis simulating "food-poisoning," a fact not hitherto observed in this country. Secondly, the distribution and dates of onset of the illness of the various cases were unlike those of ordinary "food-poisoning," and pointed to a human source of infection.

## REFERENCES.

- LENTZ (1905). Ueber chronische Typhusbazillenträger. *Klin. Jahrb.*, Vol. xiv. p. 475.
- PRIGGE and SACHS-MUKE (1909). Paratyphusbazillen Ausscheidung bei Kranken und Gesunden. *Klin. Jahrb.*, Vol. xxii. p. 237.
- SCHOTTMÜLLER (1904). Zur Aetiologie der akuten Gastroenteritis (*Cholera nostras*). *München. med. Wochenschr.*, p. 294.