LOCALIZED TYPHOID FEVER OUTBREAK IN GLASGOW, 1942

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The following is a description of a small localized outbreak of typhoid fever which presented some rather unusual features and for that reason is considered to be worth recording. The cases, of which there were 41 in all, occurred among the staff and customers of a butcher's shop in one of the poorer districts of Glasgow. The outbreak took place at the end of winter at a time when otherwise the city was free from enteric infections.

General Description of the Outbreak

The first indication of the existence of typhoid fever came on Feb. 6, when 3 cases, all in one family, were diagnosed as this disease. These patients had been admitted to an infectious diseases hospital on Feb. 4. A second group, of 4 cases, consisting of a mother and three children, were removed to another infectious diseases hospital on Feb. 6; and a third family group, consisting of two children, came to notice on the following day. Up till this time all the patients had been women or young children; but on Feb. 9 a fourth family became affected, the patients being two adolescent males aged 15 and 17. Thus within the first two days of our knowledge of the outbreak three families were involved, giving rise to 9 cases.

At first the age and sex distribution caused the investigation to be concentrated on the milk supply, which was common to the first three families; but before reports could be obtained upon the bacteriological specimens submitted, further cases had come to light in which there was no obvious connexion with the dairy. The preliminary investigation had, however, shown that all the infected families received their meat supplies from a butcher's shop in the district, though the usual routine inquiry had failed to incriminate any special meat product. It became clear, however, that the butcher's shop was the only common link between the cases. Specimens of faeces and blood were examined from the staff, which consisted of five persons, with the result that one male employee was found to have *B. typhosus* in stools and urine and a blood agglutination for *B. typhosus* of 1 in 2,500. A second male employee had a positive agglutination reaction (1 in 250), but in his case there were no other positive findings even after investigation in hospital. He had been inoculated against typhoid during the last war. The former case (J. P., aged 62) was ultimately regarded as the probable cause of the outbreak. This man subsequently died of typhoid fever in hospital, and his case is discussed in more detail below.

Further investigation disclosed sickness, later confirmed as typhoid fever, in a female employee who had left the butcher's employment on Jan. 24—that is, before the occurrence of the cases. She lived in another part of the town. The date of onset in her case—Jan. 27—coincided with the starting of the epidemic, so that she is to be regarded merely as one of the cases and not as the original source of infection.

Intensive house-to-house visitation of the district was carried out by the medical officers and sanitary inspectors, and at the same time a circular letter was addressed to local medical practitioners advising them of the presence of the disease. Suspicious febrile cases were removed to hospital for observation, and a frequent and careful check-up was made on all family contacts. The intensive visitation and follow-up of contacts were generally successful in preventing the occurrence of secondary cases. Daily visits were paid to the butcher's shop, and a complete overhaul was made of the hygienic arrangements, which were on the whole of a very low order. All cooked meats found in the shop were destroyed. Some of the customers' ration cards were in an incredibly filthy condition, and it was observed that the shop-assistants handled

these cards and then handled meat. By arrangement with the local food office large numbers of ration cards were withdrawn and fresh ones issued. This may not have had any bearing on the genesis or spread of the outbreak, but nevertheless it is a matter worthy of careful consideration from the point of view of the hygiene of food-handling generally.

One case occurred among the attendants of a public washhouse in the area. This patient had no direct connexion with the butcher's shop and took no food at all in the district; but since many of the patients' families were in the habit of taking clothes to the washhouse, he was probably infected by an article of clothing belonging to a typhoid case, although this was never definitely proved.

Analysis of Cases

Time Distribution.—There were 35 primary cases, and, of these, 30 sickened between Jan. 27 and Feb. 3, a period of eight days: 26 of them sickened in the first five days. The following table shows the dates of onset and admission to hospital.

Date of onset	January					February								Total Cases			
	27	28	29	30	31	1	2	3	8	14	15	18					
Cases ..	2	3	4	11	6	1	1	2	1	1	1	2	35				
Date admitted	February																
	2	4	5	6	7	9	10	11	12	14	16	17	18	20	21	25	
Cases ..	1	3	1	5	4	1	2	1	2	6	3	1	2	1	1	1	35

There were, in addition to the 35 primary cases, six secondary ones in which infection could be traced to one or other of the primary cases. These consisted of 3 clinical cases and 3 symptomless carriers.

It is apparent that the infection must have been distributed on or around Jan. 16. The patient J. P. was isolated on Feb. 20, and there is a strong presumption that he must have been a potential source of infection while working in the shop throughout the whole period up to that date. If he was the cause of the epidemic he must have transferred infection to foodstuffs in large amount during the few days around Jan. 16. The dropping cases towards the end of February can be explained by later infection from J. P. or by a much-extended incubation period.

J. P. was a man of irregular habits who lived in model lodging-houses and was somewhat addicted to alcohol. He was careless as regards his person, and as an example of this he had a large untreated varicose ulcer of some 20 years' duration. He maintained from the first interview that he had no symptoms, and indeed it was with some difficulty that he could be persuaded to give the necessary specimens for examination. On Feb. 20 *B. typhosus* was reported in a sample of faeces, and arrangements were made for his removal to hospital; but even on that day he was at work in the shop, and when interviewed by the medical officer he denied that he was in any way ill. Later in the day, in hospital, it was found that he had a moderate pyrexia and some degree of splenic enlargement. Subsequently he developed bronchopneumonia and died on March 6. Post-mortem examination confirmed the diagnosis of typhoid fever. The spleen was considerably enlarged; Peyer's patches were acutely inflamed and oedematous but not ulcerated. This patient may either have been a carrier who became a clinical case or he may have been an ambulant case somewhere about the middle of January, with a relapse in February. The date of his last attack is not definitely fixed, but, according to the clinical signs in hospital, was probably some time about Feb. 15. The very high titre of his blood agglutination reaction would appear to indicate that his illness following admission to hospital was not his primary attack, although from the end of January right up till Feb. 20 he was seen by a member of the staff of this department and made no complaint as regards his health. Thus, in the absence of definite pointers, no detailed clinical examination was made, but had there been such an examination it might have led to an earlier diagnosis. An important point emerges, however—that in the search for carriers the question of ambulant or

relapsing cases should be borne in mind, particularly when dealing with the lodging-house type of patient.

Age and Sex Distribution.—The age and sex distribution of the 35 primary cases were as follows:

Age Group	—1	—5	—10	—15	—20	—25	—30	—35	—40	—45	—50	—55	55+	Total
Males	—	2	5	1	2	—	—	2	1	—	—	—	1	14
Females	—	3	3	4	2	—	2	4	1	—	—	1	1	21
Total	—	5	8	5	4	—	2	6	2	—	—	1	2	35

Although in the early stages of the outbreak women and young children were mostly affected, some adolescent and adult male cases soon followed. The table shows more children under 10 and a higher proportion of women than one would expect in a meat-borne outbreak. It may be that the women and children consumed the ready-prepared meats—the tinned beef and other canned meat products which were sold in the shop by weight—whereas the men were more likely to get the chops and steaks, which, of course, would be cooked at home. It is clear that in investigating typhoid epidemics the age and sex groupings of the early cases may be misleading if the investigator does not maintain an open mind on the consumption of different foodstuffs at different ages. The case for a differential age and sex incidence in milk outbreaks has never been convincing, and any such preconceptions should be discarded.

Secondary Cases.—The secondary cases—i.e., cases infected directly from one or other of the primary cases—numbered 6, but three of these were actually symptomless carriers. The remaining 3 had typical typhoid fever. One of these was a nurse in an infectious diseases hospital. These secondary cases are excluded from the tables so that the description of the epidemic may be confined to infections contracted directly from the butcher's shop.

Family Distribution.—In all, 15 families were involved. In 10 families there were multiple cases: 5 had two cases each, 2 had three, 2 had four, and 1 had five. Thus an exceptionally high proportion of multiple family cases occurred in this outbreak.

Housing and Social Circumstances.—All the cases occurred in 15 tenement houses, 12 of which had two apartments, 2 had one apartment, and 1 had three apartments. The patients were thus all from the poorer working class. As regards spatial distribution, the great majority of the cases occurred in a very circumscribed area surrounding the butcher's shop, but a few arose in distant parts of the town. In the latter, however, direct personal contact was clearly established with the original focus. For example, a woman aged 29 was taken ill on Feb. 2 and was removed to hospital on Feb. 12. Her home address was far removed from the other cases, but she worked in a factory beside one of the patients, whom she visited about the middle of January, partaking of some corned meat.

Clinical Types of Disease

The onset of illness was generally rapid, usually with diarrhoea, abdominal pain, and vomiting. There was, as already noted, an unusually marked tendency for the disease to attack several members in one family. The times of sickening of these cases were often so close together as to raise the question of food-poisoning; and, indeed, 11 of the 35 primary cases were so notified to the department, the diagnosis probably being suggested by the rapid onset. Only in 8 cases was typhoid fever intimated as the probable diagnosis before admission to hospital.

The disease in hospital tended to be severe, and ran the typical course of typhoid. Of the 38 clinical cases admitted (including the 3 secondary clinical cases), 5 terminated fatally—a rate of 13%. Case-to-case infectivity was comparatively low, and none of the patients became a persistent carrier, the usual criteria for dismissal from hospital—namely, three negative faeces and urine examinations—having been satisfied.

Commentary

A meat outbreak of this nature is a comparatively rare occurrence, but with the increasing proportion of canned and processed meats being distributed it is not unlikely that outbreaks spread in this way may become more frequent. The danger

lies, of course, in the handling of preparations which are usually eaten without further cooking, such as corned beef, pressed beef, and canned meats of various kinds, the cans being opened within the retailer's premises and the meat sold by weight in small quantities over the counter. Cooked meats sold by retailers may also be infected. But even meat and meat products which are usually cooked in the home are now exposed to much-increased handling in distribution, and this in itself may constitute an added danger. The sausage particularly is suspect, because it is doubtful if, in cooking, its centre always reaches a very high temperature.

The meat which was the vehicle of infection was heavily infected for a few days in the middle of January. When the patient J. P. was found to have *B. typhosus* in samples of faeces and urine it was naturally concluded that he must have been the source of infection. He was employed almost entirely in the back shop, cutting up carcasses into joints, etc., for sale over the counter. He did not normally handle canned meat, nor did he serve customers, but is said to have done so on occasion. He was by reason of his personal habits a very likely type of man to convey any infection he may have had to whatever he handled. Unfortunately for the complete acceptance of this theory, shortly after admission to hospital he was himself discovered to be a case of typhoid fever, dying later of a pulmonary complication, the active typhoid being confirmed by post-mortem examination. Therefore, if he is to be regarded as the source of the outbreak we are driven to put forward the two possibilities already mentioned—that he was a chronic carrier who developed clinical disease, or that he had had an ambulant attack of typhoid with a clinical relapse. On the other hand, he may simply have been infected in the same way as all the others, in which case the source of infection must remain unknown. No cases occurred through infection from the shop during the period when he was known to carry typhoid bacilli—namely, the few days prior to Feb. 20. His discovery as an actual or probable source of infection was thus made after the epidemic was over, and no further cases have arisen from this focus up to the date of publication.

With regard to the sending out of circular letters to practitioners warning them of the existence of typhoid fever, while this may be of considerable value, it should not be allowed to take the place of a house-to-house visitation and search for cases, particularly if the outbreak is localized. Many cases of illness in the area were thus traced to infectious disease hospitals and to wards of general hospitals, having been admitted with a diagnosis of pneumonia, influenza, cerebrospinal fever, or enteritis. In fact, as mentioned already, only 8 were actually sent to hospital as typhoid fever. The active search for cases presumably had its reward in the small number of secondary infections.

In this outbreak the first five families had the same milk supply, and although they dealt with the same butcher no particular kind of meat appeared to have been consumed by all cases. Furthermore, the butcher's clientele was far wider than the dairyman's. Suspicion at first therefore rested on the dairy, and although general supervision was exercised over the butcher's shop, bacteriological investigation was at first confined to the dairy staff. Other cases continued to arise from the same milk supply, and even in instances where the milk supply was stated to be from another source, one could not be sure that casual purchases from the suspected dairy had not been made. After an exhaustive examination of the milk supply had yielded entirely negative results, more detailed attention was directed to the butcher. He had at first not been too co-operative, but finally he and his staff provided all the specimens required. By this time, however, it was evident that the peak of the outbreak was past. The butcher probably had about 2,000 rationed customers. Thus the maximum risk to these customers, among whom 35 primary cases occurred, was 1.75%.

The exceedingly low standard of hygiene and general cleanliness in the butcher's shop must also be commented upon. It is feared that such conditions are common in the poorer quarters of towns. It may be remarked, too, that shortage of good-quality skilled labour and other difficulties are matters of concern at the present time.

REFERENCE

Davies, I. G., Cooper, K. E., and Fleming, D. S. (1942). *Lancet*, 1, 129.