FIELD INVESTIGATION OF AN OUTBREAK OF DIPHTHERIA

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An outbreak of diphtheria limited to one house occurred at a boys' boarding-school. The history of the outbreak and the tracing of the source of infection may be of interest. The house contained 39 boys, a matron and her daughter (Mrs. T. and A.T.), a house-master, his wife, and four children. The domestic staff consisted of five persons for the boys and three for the family. The population at risk therefore comprised 55 persons, consisting of 11 adults, 40 adolescents, and 4 young children. The house was roughly divided into a private side and a school side, but two of the private-side maids, Y.S. and M.R., waited at table on the boys and family. These maids occupied a bedroom opposite to A.T., the matron's daughter.

History of the Outbreak

A.T. attended a day school in London. During the half-term holiday the head mistress received a notification that a girl who had last attended school on Oct. 31 had developed diphtheria on Nov. 3. There was no direct contact between this girl and A.T., but on Nov. 12 A.T. developed diphtheria and was removed to the Isolation Hospital. This date occurred during the half-term holiday of the boys' boarding-school. All direct contacts were swabbed and found negative, but in spite of the negative swab Mrs. T. was isolated in her room for eight days as a near contact. The boys returned from the half-term holiday, spent at their homes, and as some of them had been in contact with A.T. previous to going away they were all swabbed. Five of the boys were found to be immune carriers of gravis type, so they were isolated at the school sanatorium. On Nov. 21, nine days later, one of the boys, the house-master's child, and the nursery governess all developed diphtheria. A child in the neighbouring town was also notified on Nov. 28, and two further cases occurred among the boys on Nov. 30.

Frequent throat and nose swabbing of all contacts of the cases was now carried out, and on Dec. 8 the matron and the butler were found to have positive throat swabs, and on these findings were admitted into the Isolation Hospital as carriers. As no K.L.B. were discovered at the Isolation Hospital after swabbing their throat and nose three times on alternate days, they were discharged on Dec. 14. On the 16th, however, the matron and butler were readmitted as they had again become positive. These two people were apparently transient carriers, as no positive organisms were detected on re-examination at the hospital.

The child in the town who developed diphtheria had been visited by one of the maids, Y.S., who was therefore subjected to repeated swabbing of the nose and throat, but every swab was negative. Subsequent inquiry, however, revealed the information that she had been suffering from sores on the scalp and limbs, which had been treated with a fair measure of success by the matron.

On Dec. 22 school holidays started. During the holiday Mrs. T., A.T. (now discharged from hospital), and the butler all had throat and nose swabs taken by their private doctors and were found negative. On Jan. 19, 1947, a few days before the school reassembled, the occupants of the private side returned to prepare the house. As an extra precaution they were swabbed again, and the matron and her daughter were found positive. They left the premises on Jan. 20, before the boys returned, and did not come back until March 1. On Feb. 12 a laundryman delivered a basket of clothes at the house and is said to have held a short conversation with one of the maids, M.R. This

man developed diphtheria on Feb. 16, twenty-eight days after the suspected carriers had left the house, and he suffered from a severe post-diphtheria paralysis. On Feb. 28 the night porter employed at the house also developed the disease and subsequently died of it. On March 1 the two maids, Y.S. and M.R., left the house and went to Hitchin. Before they left they had been in contact with a new nursery governess, who arrived on Feb. 22. On March 17 this governess developed diphtheria.

Summarizing the results of the outbreak: in a community of 57 persons (55 originally and 2 newcomers) there were 11 cases of diphtheria, with one death, one case of post-diphtheria paralysis, and nine immune carriers. The outbreak continued in spite of the absence of the suspected carriers—the matron and her daughter.

Continued Search for the Carrier

As the last three cases occurred after Mrs. T. and A.T. had left, suspicion fell on the butler, and on re-examining him a single colony of K.L.B. gravis was grown from the swabs taken on March 24, 26, and 27. Before the reports were received he also had left the neighbourhood, and could not be traced until April 9, when three concurrent swabs were negative. It was felt that his low infectivity was not a sufficient explanation of the continuance of the disease, although possibly he was responsible for the case occurring on March 17. It was therefore decided to follow up the two housemaids who had gone to Hitchin. Owing to the extraordinary sequence of events at the school the M.O.H. of Hitchin, co-author of this paper, had been informed of the arrival of Y.S. and M.R. at an inn in his district, and the following events occurred.

March 3.—Arrival of M.R. and Y.S. at the inn.

March 10.—A contact at the inn, S.B., developed a sore throat and was off work for a week.

March 12.—An out-worker at the inn developed diphtheria.

March 21.—A guest staying at the inn left for Brighton and was admitted into Brighton Isolation Hospital with diphtheria on March 24.

March 24.—V.B., S.B., Y.S., and M.R. attended a local dance.

March 28.—V.B. was admitted to hospital with diphtheria. Throat and nose swabs from Y.S. and M.R. were returned negative, but these two girls were admitted to the Isolation Hospital for further observation.

March 31.—A swab of S.B. was found positive and she was admitted to hospital for diphtheria. M.R. and Y.S. were discovered to have verminous heads, and in addition M.R. had scalp sores and an eczematous ear. (It is to be noted that whenever she had previously appeared for examination she had worn a head-scarf.)

April 2.—Swabs taken from M.R.'s external auditory meatus and scalp sores were all found to contain K.L.B., gravis type and virulent. Y.S. was negative.

April 4.—Y.S. was discharged and left for her home. The M.O.H. was informed of her contact with a carrier.

Possible Course of the Infection

There are three possible originators of this outbreak. In the first place, the girl at A.T.'s London school may have infected A.T. and through her the sores of the housemaids may have become contaminated with K.L.B. We think this is unlikely: twelve days is a long incubation period for diphtheria, and there is no evidence that the first girl already had the disease on the last day she attended school (Oct. 31), three days before her case was diagnosed. A.T. was isolated immediately diphtheria was suspected, and did not come into close contact with the maids before she was removed to hospital. Y.S. is the second possibility; and the chief point in suspecting her as the originator of the outbreak is that she was the only connecting-link between the school and the town and actually visited the house where the town case occurred. In addition, the matron dressed her sores, and she was in close contact with the butler, thus explaining the transient nature of the swabs taken from these two sources. She

waited on the boys at table, and the dates on which the cases fell among the boys are more suggestive of contact infection from one source than of infection from case to case. The last point applies equally well to M.R., and in addition she undoubtedly infected the laundryman. She did not, however, visit the child in the town. The Medical Officer of Health reports that by the time she was admitted into the Isolation Hospital at Hitchin her head was a mass of foul-smelling offensive sores, while Y.S. was comparatively clean. Taking the available evidence as a whole, we think M.R. was the originator and that she infected Y.S., whose skin was already in an unhealthy state. Y.S. took the infection to the town, but, possibly owing to the ministrations of the matron, by the time she reached Hitchin her sores were healing, and the infection was then carried on by M.R.

Steps Taken to Prevent Spread.—These were: (1) Careful and repeated swabbing of all members of the infected house and isolation of immune carriers; (2) isolation of the boys from the infected house; (3) protective injections (2,000 units of anti-diphtheria serum) and re-immunization of the boys and the domestic staff; (4) re-immunization of the rest of the school with 0.3 ml. A.P.T.

Points of Interest

(a) The comparatively small number of cases and carriers in a closed community.—This is no doubt due to the relatively large proportion of protected persons within the community at risk. All the boys except two had had their primary immunization before joining the school. Of the two who had not, one contracted the disease. The other three boys who had the disease had been immunized in 1939, 1941, and 1940 respectively, thus suggesting that the protective power had lessened after five years and that a "boosting" dose was required. Nevertheless, it is reasonable to suppose that the primary immunization of these three boys had helped in combating the disease, as the two adult cases (the laundryman and porter) who had not been immunized were more severely infected. The immediate steps taken to heighten immunity in those not attacked were also effective.

(b) The difficulty of determining the significant carrier.—Much time was lost and two serious cases received their infection through the assumption that Mrs. T. and A.T. were the significant carriers. It was only an obstinate refusal to discard the school-town infection clue, even after negative swabs, that led to the M.O.H. at Hitchin being put on his guard and to the detection of the actual infectors.

(c) That a number of cases of pharyngeal diphtheria occurred from a skin infection of virulent gravis diphtheria.—Although not unknown, this is an unusual occurrence and should lead to a careful scrutiny for skin lesions in an unexplained prolongation of an outbreak.

The spring number of the *American OSE Review* is particularly interesting for a number of articles by Jewish doctors on their experiences in the ghettos and concentration camps established by the Germans. Dr. E. Herman gives an account of a typhus epidemic in 1941-2 in the Warsaw ghetto, where over half a million people were crowded together. "Liquidation" of the ghetto followed in 1943, being "preceded by a tour of S.S. men and Gestapo with monacles in their eyes in shiny limousines." There were about 80,000 cases in the epidemic; he tabulates the neurological syndromes found. Conditions in the Vilna ghetto were little less deplorable, and Dr. Dworzecki mentions that about 75% of the women ceased to menstruate for a varying period of time soon after being herded into it. The camp commandant ordered several women with severe scabies to be shot. Dr. Rosenblum briefly describes the destruction of the Jewish community in Warsaw by shooting, gas, and burning, and the plight of children left to wander in the ruins and forests.

PARTIAL HEPATECTOMY AND RIGHT HEMICOLECTOMY FOR CARCINOMA OF THE HEPATIC FLEXURE

BY

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The object of this paper is to call attention to the feasibility of carrying out an operation for the removal of a carcinoma of the hepatic flexure of the colon which involves the right lobe of the liver by direct extension. Coincidental partial hepatectomy at the time of gastric resection for carcinoma involving the liver by direct extension from the stomach has been performed by Wangenstein (1943, 1945). It is of interest also to remember that in 1923 Grey Turner stated: "Direct extension of malignant disease from the stomach or colon may render removal of a portion of the liver necessary, and I think this will become one of the most frequent indications, especially as it usually only involves the removal of a slice or wedge from the edge of the organ. In cases of this kind such an extension to the liver need not in itself be a bar to successful operation if the extension of the growth in other directions rendered its removal profitable." Some six years ago I performed a right hemicolectomy for a carcinoma of the hepatic flexure which invaded the right lobe of the liver, and it was necessary to remove a slice of liver with the growth; this patient remains well without recurrence at the present time, proving that the end-result of such an operation is most satisfactory. Recently, however, a much more formidable problem presented itself, and it was necessary to remove a large portion of the right lobe of the liver, including the gall-bladder, for a massive carcinoma involving the liver and hepatic flexure of the colon. Two months previously a surgeon who performed an ileo-transverse-colostomy as a palliative measure considered this growth to be inoperable on account of the extension to the liver. The clinical details concerning this patient are embodied in the case record given below. Since an operation for resection of a large lesion of the right lobe of the liver is a rare surgical procedure the technical details are described.

Case Record

A man aged 38 developed pain in the right lower abdomen when in India a year ago. It was sharp in character and was accompanied by diarrhoea. This attack subsided and he was able to continue his work. Several weeks later the diarrhoea recurred with four stools a day. He still experienced pain in the right lower abdomen. His appetite was good and he felt fairly well. Seven months ago the abdominal pain became continuous; he lost his appetite, and noticed that the bowels had become constipated. He gradually lost strength, and on examination a lump was found in the right iliac fossa. Three months before we saw him he reached this country and was admitted to another hospital. A hard mass was noted in the right hypochondrium, blood was present in the stools, and *Entamoeba histolytica* was demonstrated. An x-ray examination after a barium enema showed a large filling defect in the transverse colon. He was given a course of emetine therapy to exclude an amoeboma, but this treatment had no appreciable effect. An exploratory laparotomy was then performed after preliminary blood transfusion, and the mass appeared to be a large scirrhous carcinoma of the transverse colon just medial to the hepatic flexure and invading the gall-bladder and liver, to which it was densely adherent, but no secondary deposits were found. The growth was considered to be inoperable and an