LESSONS FROM AN OUTBREAK OF SMALLPOX.

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BEING a seaport town, Leith is susceptible to imported cases of smallpox, and as oversea communication between Russian ports and Leith is frequent, the risk is further increased. Usually the cases imported are detected with the arrival of the infected vessel in the roads. But, since the voyage between Russian ports and Leith occupies only a few days, persons infected in Russia, or on the Continent, may not sicken with smallpox until some days after their arrival on this side The chief interest of the present contribution bears upon the latter point.

On the 11th December, 1907, a steamer arrived from Riga. All were well on board, there being only one passenger, a seaman, invalided from Riga Hospital, where he had been under treatment for enteric fever. This man I shall name Smith. He was confined to his house from the day of his arrival in Leith. On the 22nd inst., he sickened with smallpox, notification of that disease following on the 26th. The patient was removed to hospital, and the usual precautions adopted to prevent spread of infection. Smith developed confluent smallpox and died on the 29th.

Nothing untoward occurred during the sixteen days subsequent to Smith's removal to hospital, and hopes were entertained that the spread of the disease had been checked. Suddenly, however, we were confronted by an unexpected development, since between the 11th and 16th January, 1908, twenty-two cases of smallpox were notified in Leith, and six in Edinburgh. The situation became serious. Fortunately the district invaded was, for the most part, a better class one.

As soon as we had recovered from the temporary confusion, a minute investigation was instituted, with, however, disappointing results. None of the twenty-two patients in Leith had anything in common, and none of them had ever heard of Smith or his wife.

The steamer that had brought Smith to Leith had been laid up, and her crew paid off. Those members belonging to Leith were again visited and found in good health. The others could not be traced. During the round of visitation, it was learned that, despite Mrs. Smith's denial of visitors to her husband, an insurance representative and two girl tea canvassers had called on the evening of the 25th December, the day before Smith was taken to hospital. When questioned regarding her suppression of this information, Mrs. Smith, as is usual with unthinking persons, pleaded that she did not consider her visitors of sufficient importance to tell us anything about them.

The next step was to seek out the visitors. The insurance representative, afraid of quarantine, no doubt, denied his visit to Smith. Yet, be it observed, my clerks, subsequent to Smith's death, corresponded with the insurance company on behalf of the widow, who exhibited an entry in her book proving the traveller's call on the 25th. Happily no infection could be traced to this man.

With the tea canvassers it was different. Three houses visited by them were, a fortnight after their call, invaded by smallpox. Great difficulty was experienced in securing reliable information from these girls. They adopted a policy of denial. They said they had no bags, no parcels and no books with them in Smith's house. Part of their story was contradicted, since a book was produced to indicate to Mrs. Smith how heavy were her arrears of payments.

Parenthetically, the suppression of truth by Mrs. Smith, the insurance representative and tea canvassers, illustrates but too well some of the many obstacles that confront those called upon to deal with the arrest of smallpox outbreaks. During the severe outbreak of 1904, two navvies were, at an interval of fourteen days, removed to the Edinburgh Smallpox Hospital. They worked in the same gang and knew one another, but when taken to hospital they denied previous acquaintanceship! That is a parenthesis which I could not resist. Other instances could be quoted, but space forbids. It is a point to which those who believe in the aerial diffusion of smallpox ought to give due heed, since, when connecting links between cases are lost, the refuge sought is hospital influence, especially if the hospital be near the cases under notice.

To return to the almost simultaneous occurrence of twenty-eight cases in Leith and Edinburgh, Smith was not the cause, neither were the visitors to his house. The only theory that could be advanced appeared to me to be the following. It was thought highly probable that a member of the crew who had come over from Riga had contracted smallpox at or about the same date as Smith. Further,

it was presumed that this second patient, subsequent to being paid off, had spent his wages in a manner common to his class. When his means were exhausted, he proceeded to beg from door to door, a habit familiar to the police in Leith, and doubtless common in other seaport towns. If, then, this supposition was the correct one, the infected man palliated his premonitory headache and back-ache with further libations. That his illness was of a mild type was suggested by his being able to beg. Smith's rash was fairly typical on the 26th; the second man's eruption would also be acute on the same date. He probably began to beg on the 27th, that date being mentioned because, in the majority of the twenty-eight cases already mentioned, incubation dated from the 27th to the 29th December.

The mendicant theory has support lent to it by a reference to the local map, upon which could be traced, with striking precision, the route followed. The path of infection could be closely traced along one street, down another, round a corner here, into a side street with a blind end, then along a terrace of better class houses, subsequently across an open meadow to infect another district, and, finally, over the boundary line to attack six houses in Edinburgh. No new cases could be ascribed to the supposed mendicant subsequent to the 29th inst, that being a Monday, the presumption being that the infected seaman had signed on with another steamer, and had left Leith.

Additional support to my theory was afforded by the removal to hospital of five domestics who had probably come in contact with the beggar. At those houses where servants were kept, no other inmates were infected. Then, again, that Friday, 27th December, was the date when infection was principally spread, was suggested by the following case. One of the maids taken to hospital was cook in a medical man's house. When pressed to recall visits paid by pedlars, she was unable, like all the other patients, to bring back to mind what had taken place a fortnight before. Indeed, she could not understand the suggested contact between herself and any caller, because she never answered the door, except on *Friday* evenings, when the other servant had her night out.

Two clues came, but neither could be turned to advantage. One was the removal to hospital of a seaman who had slept in the Sailors' Home between the 21st and 27th December, his incubation dating from the 25th. The other was the infection with smallpox of a woman and her two sons. The woman was in the habit of washing clothes for seafaring men. She was unable, however, to give any information that could assist in tracing the suspect.

The Leith outbreak being a comparatively small one, it was possible, with few exceptions, to connect the cases with one another. "Leakage cases" did occur, but they were so far removed from the smallpox hospital that no account need be taken of them in connection with the aerial diffusion theory. Besides, one has but to recall the illustrations given of truth suppression to understand how "leakage cases" can arise. Two of these were accounted for in a peculiar way. After her husband's death, Mrs. Smith was re-vaccinated and engaged to assist in the kitchen at the smallpox hospital. Two "leakage cases" recognised her in the hospital, and gave the information that she had called on them on the evening of the 25th December. Mrs. Smith had informed the epidemic officer that she had "never crossed her door" from the 24th!

The ready way in which smallpox may be conveyed by those who have been in contact with the disease, had more than once been forced upon me. It is now a standing instruction in every instance to require the outer garments of actual contacts to be handed over for disinfection. I am convinced this precaution has been a good one. It increases our labours, but it may obviate much mischief.

Had the afore-mentioned two cases, and several others which came under my notice, occurred within a reasonable distance of the smallpox hospital, and had no trace of infection been discovered, I fancy the inference drawn would have been that infection had been wafted from the hospital.

To come to closer quarters, however, let me deal with the hospital itself. It is a wooden building erected in a hurry to deal with a serious epidemic of smallpox in 1893. From the aerial convectionist's point of view, the hospital could scarcely be in a worse position. Fortunately the building has been condemned, and, in all likelihood, will soon be demolished.

Immediately behind the hospital, and separated from it by a fence of disused railway sleepers, is a large ropery establishment, giving employment to several hundred persons. Some of the men work in sheds not more than thirty yards distant from the ward windows.

To the left of the hospital is open space; to the right, and 120 yards distant, is a large modern tenement, the windows of which overlook the hospital grounds. Beyond the tenement is a fairly densely-populated district, the inhabitants being, for the most part, artisans. In front of the hospital is a meadow, part of which, close up to the boundary fence, is used as a public drying ground. A much-frequented path also passes within forty yards of the hospital gate. On the other side of the meadow, and within the quarter-mile zone of the hospital, is a large residential district. On three sides, therefore, the hospital is beset by human habitations. The tenement protects the hospital, to some extent, from the prevailing winds, but, when most patients were in hospital (twenty-three), gales of wind continued for a week to sweep over the hospital in the direction of the tenement and ropery. The force of the wind was so great that damage was done to the hospital and a long stretch of boundary fencing was levelled to the ground. What influence, then, had the hospital in sowing infection about it?

First with regard to the ropery. From it two cases were taken to the smallpox hospital, one a man, the other a poorly vaccinated youth of sixteen. At odd times the workers stood at the boundary fence and bantered the patients and hospital staff. Now, and again, during their meal hours, the employees kicked a football into the hospital grounds. At first some of the patients, good naturedly, handed the ball over again! This practice was stopped; but, none abashed, the workers leaped over the fence after the ball and recovered it amid the plaudits of their fellows. The nurses were disturbed at night by tappings at their own and the ward windows. Lastly, the ash-pit was close to the fence that separated the ropery from the hospital grounds. Into this refuse-heap were cast floor and other sweepings.

As is well known, a common practice among smallpox patients in the convalescing stage is to pick the "blackseeds" from the soles of their feet and the palms of their hands. These "seeds" fall to the floor, are swept up, and if by chance, instead of being burned, they reach the ash-pit, it is not difficult to imagine how infection may be blown about. In the face of all these circumstances, is it not a matter for surprise that only two ropery workers became inmates of the smallpox hospital? From the tenement property, four cases of smallpox were taken to hospital. Every case had connection with the other, the first being infected on the 27th December, by the presumed mendicant. If one were to sum the matter up, it would be to say that, despite the fact that the hospital was scarcely deserving the name isolation hospital, its power for mischief had been negligible.

If concentrated poison is required to spread infection, then the instance of four acute cases of smallpox lying in an insalubrious den may be quoted. A husband and wife and two sons were accidentally discovered as victims of smallpox. The low-class tenement in which they lived was a warren of human habitations. No other cases occurred on the same landing, nor in the houses above nor below. Fortunately, from the official standpoint, the neighbours were not on friendly terms with those infected; opportunities for personal contact between them were thus rare.

Lest the citation of Leith smallpox hospital be objected to on account of the limited number of cases in hospital at one time, let me borrow from the experience of Edinburgh. Dr. Claude B. Ker, the Physician-Superintendent of the Edinburgh fever hospitals—no mean authority on infectious diseases—gave his views in the *Scottish Medical Journal*.

The Edinburgh smallpox hospital is wedged in between the large modern fever hospital and the Craiglockhart poorhouse. During the outbreak of smallpox in 1904, the population of the former was 450, and of the poorhouse 1,000. The main buildings of the latter stand within the quarter-mile radius of the smallpox hospital. In fact, within the quarter-mile radius, there is a population of 1,500 persons, and within the mile radius 5,000. Not a single case attributable to hospital influence occurred. Three cases arose in the poorhouse, but two sickened shortly after admission to that institution, and before they came under the alleged baneful influence of the smallpox hospital.

"Moreover," to quote Dr. Ker, "there was just as much smallpox in the other city poorhouse, several miles away." Any other cases that occurred within the mile radius were satisfactorily explained. Dr. Ker is careful to point out that the vast majority of the patients in the fever hospital were by reason of their youth protected by vaccination. But, the two pavilions nearest the smallpox hospital were occupied by cases of erysipelas, for the most part adults. These pavilions were only seventy-

two yards distant from the smallpox hospital. No vaccination was attempted, and no cases of smallpox developed. In the poorhouse vaccination was only practised in the infected dormitories.

The average number of patients in the smallpox hospital from the middle of January until the middle of April, was 47. From February till 31st March, the daily average was 55. In the case of Glasgow and Liverpool, 50 cases were asserted to exert hospital influence.

"I think," says Dr. Ker, "I may claim that these advantages of situation and nursing make the Edinburgh smallpox hospital a very fair test in the controversy, as infection except by air is very improbable." When the foregoing immunity was brought under the notice of Dr. Buchanan, of the English Local Government Board, he sought to explain it away by asserting that, "Craiglockhart Hill protected the neighbouring districts." To this Dr. Ker retorts, "This is not the case. Under no consideration could it have protected the 1,000 persons in the poorhouse, nor, indeed, the greater part of the population of 3,000 which lives beyond. On the contrary, if anything, it must have diverted the prevailing winds more directly upon the poorhouse." Dr. Ker ought to know. He lives on the spot and looks at Craiglockhart Hill every day. "But one conclusion is, I think, self evident," Dr. Ker concludes: "that is, that the Local Government Board regulations are of too hard and fast a character, and may also be regarded as 'vexatious.' Particularly unwarrantable is the recommendation not to have a smallpox hospital near the permanent fever hospital."

I am not surprised that the number, fifty, is taken as the critical one. When so many cases have occurred, and are in hospital, one can imagine how many contacts there have been, and how many modified cases have escaped notification. Each contact is, as I have shown, capable of doing mischief. If this mischief chances to be wrought within a theoretical danger zone, why rush to the conclusion that it is the hospital that is at fault? One cannot overlook the many concealed factors that are at work in spreading the disease.

If my memory serves me rightly, the east end of Glasgow was the spot first invaded by smallpox during the last severe outbreak, and the brunt of the epidemic settled upon that part of the city, which is thickly-populated. The outbreak had gained a good hold before the health authorities had the opportunity to grapple with it. The smallpox hospital is in the east end, at its outer fringe to be accurate. It was accordingly reasoned that the hospital kept the epidemic going in the east end. Had the west end been first attacked, and the east subsequently invaded by a more serious outbreak, one could have followed the reasoning. Yet, one who knows the east end can scarcely wonder that it should become a hotbed of infection, and that quite apart from hospital influence.

In 1881, Mr. Power formed his well-known conclusions regarding the evil influence of the Fulham smallpox hospital. It was shown, by the aid of maps and circles drawn round the hospital, how many more cases occurred within the vicinity of the hospital than further away from it. Mr. Power referred every case within the respective zones to hospital influence. Now, incredible as it may appear at the present time, many cases of smallpox were nursed in their own homes at Fulham. That fact suggests much. Dr. Tripe followed Mr. Power's investigations and quoted one case nursed in a densely populated alleyway, from which he was able to trace fifty others. Yet all had been grouped under one category by Mr. Power.

At Nottingham, the windows of a factory overlooked those of the smallpox hospital. Many of the workers had never been even vaccinated, yet not a case occurred among them. At Deptford, the spot-maps showed the heaviest incidence of cases as one approached the hospital on one side. A railway separated the streets on the other side from the hospital, communication between it and the houses being almost impossible. The streets beyond the railway enjoyed comparative immunity from smallpox.

At Sheffield, visitors entered the hospital and slept in it during the height of an epidemic that was said to have been kept going by means of the spread of aerial infection from the hospital. It has now come to light that swimmers went out to the hospital ships on the Thames.

It was because Mr. Power believed the aggregation of cases in smallpox hospitals led to diffusion of infection, that the Metropolitan Asylums Board resolved to alter its system. Under the changed method, only twenty to thirty cases were treated at one time in the

smallpox hospitals. The results, instead of proving beneficial, were the reverse. In fact, there were more cases of smallpox in Hampstead under the new order of things than when 600 were in hospital at one time. Formerly, the patients had been retained in hospital until they were free from infection; the new conditions necessitated the frequent removal of patients during the desquamation stage to the camp hospitals. Further than that, mild, but nevertheless acute cases, were, after detention in hospital for a few hours, also removed. By seeking to overcome aggregation, the authorities only encouraged the diffusion of infection by the off-repeated removals of patients to and from the hospital. In the face of such facts, one cannot be expected to place much reliance upon spot maps and circles as evidence against smallpox hospitals.

In conclusion, if reports are to be formulated regarding the alleged evil influences of smallpox hospitals, the reporter must follow at the heels of those actively engaged in combating the spread of the disease itself. He may observe for instance, infected bedding being thrown from a window three storeys up to the waiting "bedding van" down below. He must be careful to observe the manner in which contacts are traced and kept under observation. I need not, however, outline the plan for the would-be investigator. He must do his own prospecting. I might, however, turn his serious attention to the possibilities from crowds of sightseers who press forward and jostle the bearers and stretcher conveying the patient to the ambulance.

I began as a believer in the aerial diffusion theory. Actual participation in several smallpox outbreaks has changed my mind.

A Novelist's View of the Medical Officer of Health.—"It should be a part of the organisation of a civilised State to have a public health service of well-paid, highly-educated men distributed over the country and closely correlated with public research departments and a reserve of specialists, who would be as ready and eager to face dangers and to sacrifice themselves for honour and social necessity as soldiers and sailors. It is, indeed, a transition from private enterprise to public organisation that is already beginning. We have the first intimation of the change in the appearance of the medical officer of health, underpaid, overworked and powerless though he is at the present time."—*H. G. Wells, "New Worlds for Old."*

ENTERIC FEVER ON BOARD SHIP.*

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DURING the year 1907, an outbreak of enteric fever occurred on board a liner trading with America, which presented several features deserving of notice. In all, there were ten cases between August 10th and September 19th—a period long enough to allow of the vessel returning to this country from America, and again completing her voyage outward.

The patients included the saloon steward, two stewardesses, an engineer, two lady passengers travelling in the saloon, and the third officer, the purser, the second cook, and the captain. The first illness dates from August 10th, three days after the arrival of the ship in the foreign port, and was in the person of the saloon steward, whose berth was in what is colloquially known as the "glory-hole," or sleeping quarters of the stewards, and was in this case situated under the water line, in the fore-peak. He was nursed here for two days by the stewardess, who sickened on August 21st. From August 12th to 15th he was treated in the ship's hospital as a suspected case of enteric fever, the stewardess meanwhile continuing in attendance on him. The sequence of sickenings thereafter was as follows:—

August	21	... The stewardess.
„	22	... An engineer.
„	25	... Two lady passengers and third officer.
Sept.	6	... Another stewardess.
„	8	... The purser.
„	12	... Cook.
„	19	... Captain.

These cases would appear to fall into three groups, the first sickness standing alone, the second group including the five sickenings within four days, August 21st to 25th, and thereafter the four sickenings occurring separately at intervals between September 6th and 19th. The three officers of the second group remained on duty till the arrival of the ship in Glasgow on August 25th, and the first patient of the subsequent group sickened on the thirteenth day thereafter (September 6th.) During the first six days of the interval (August 25th to 31th), the ship was in dock in Glasgow.

*Annual Report, 1907.