

OUTBREAK OF TYPHUS FEVER IN THE CITY OF  
CARLISLE.

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On 5th April 1909 I was asked by a young practitioner to see two suspected cases of scarlet fever in a single-room tenement in one of the courts within this city. Upon visiting the house I found two young women, aged 17 and 15 years respectively, suffering from typhus fever. They were removed to the Isolation Hospital at once, the room cleansed and limewashed, the bedding and clothing destroyed, and the furniture washed with a strong disinfectant solution.

Upon investigating the cases I discovered that the grandmother of these two girls, an old woman aged 67, who had been bedridden for some time, had died in the same room, and was buried on 18th March. On looking up the certified cause of her death I found that it was stated that she had died from bronchitis, heart disease, and exhaustion.

At the time of the death of the old woman, and for some months previously, this tenement room had been furnished with two large beds, which were occupied by the old woman, her son, and two granddaughters, making in all four. The two girls before mentioned became ill on the 30th and 31st of March respectively, *i.e.* twelve and thirteen days from the date of the burial of the old woman, during which time they had occupied the bed which the old woman had occupied up to her death.

On making further inquiries respecting persons likely to have been in contact with the two girls and with the deceased woman I obtained the names of a number of people, who were afterwards visited daily for fifteen days, but amongst whom no outbreak of the disease occurred. On 14th April, in consequence of certain information obtained by the sanitary inspector, he visited two houses in a street in the same area of the city, at one of which he found the father, aged 40, the mother, aged 40, and a daughter aged 12 years, and at the other a female, aged 10, all suffering from severe headaches and extreme prostration.

Inquiring further, the inspector discovered that the woman had been in contact with the old woman before mentioned. He reported the cases to me at once, and upon visiting the two houses I found that all four persons were suffering from typhus fever.

After the removal of these four cases to hospital the rooms and furniture were cleansed and disinfected as in the previous instance, and the bedding and clothing destroyed. We had not previously been informed of this woman having been in contact with the old woman who died, but we now discovered that she had sat up with her prior to her death, and had laid her out after death, and had also lent the two infected girls bed sheets to lay out the corpse pending the arrival of the coffin. These sheets were returned the day after the funeral of the old woman, and were stated to have been washed and boiled immediately on being brought back, but they had not been washed before removal from the infected house.

The second little girl mentioned was a school-fellow and play-mate of the other little one, and, living in the same street, spent much time after school and at meal times in their house, and from the clinical history of the case would appear to have been infected about the same time as the man and his daughter.

The woman, in addition to suffering from the acute effects of the fever, was from seven to eight months advanced in pregnancy, with somewhat trying nervous symptoms, which made it difficult to obtain anything in the nature of an accurate account as to when she first felt ill.

The history would tend to show that these four cases might have been infected about the same period, but the records showed that the temperature of the woman and her child fell to normal on the seventh day after admission to hospital, that of the other child fell to normal on the tenth day, whilst that of the man remained fairly high till the tenth day, when it exhibited signs of hyperpyrexia, and he died.

Both the man and the woman stated that the sheets were the only things lent to the two girls, and that they were immediately washed and boiled after being sent home, but the suspicion of infection must fall either upon the bed sheets, or the woman became infected during her visits to the old person, and was later the means of infecting her husband, her child, the neighbour's child, and subsequently her niece. The latter view I think is the more likely, and it is reasonable to assume that owing to the pregnant condition of the woman the disease might be capable of exhibiting aberrant features.

On 10th May I received information of a suspicious case of illness in another court, which upon visiting I found to be a case of typhus fever in a young married woman who, with her husband,

occupied a single-room tenement in a more or less open court leading from one of the main streets in the same infected area as that in which the previous six cases had occurred. She was immediately isolated, and the house and bedding, &c., treated as in the previous cases. This woman was a niece by marriage of the female adult mentioned previously, and had undoubtedly been in contact with that family immediately before their removal to hospital. There was also strong suspicion of bed-clothing having been lent by the woman to her niece, this, however, both parties denied.

At a later stage a housemaid attached to the administrative portion of the Isolation Hospital developed the disease, no doubt through clandestine visits paid by her and by her stupidity in conversing with a typhus patient at the window of one of the wards.

The court in which the tenement is situated where the first two cases were discovered is a well court, reached by a long narrow passage running beneath shop property; it is practically in the centre of the city, and the property consists of two closely approximated blocks of dwellings, mostly single tenements. The tenement in which the outbreak occurred is at the far end of the court, and is one of four rooms crowded together and reached by a wooden staircase, at the top of which is a small dark landing on to which the doors of the four tenements open.

The street in which the four cases occurred is situated at the south side of the city; it is a moderately wide street, the houses being of the type known as "back to back," and three hundred yards distant from the previously mentioned court, both being distant from half to three quarters of a mile from any of the centres of the previous outbreak of typhus fever which have from time to time occurred within the city.

I was unable to trace the source of infection of the two girls, *i.e.* assuming that the old woman did not die of typhus fever; yet both girls swore that they were never away from home, except that one was engaged as day-maid with a good family in Carlisle from 8 A.M. to 8 P.M. each day and slept at home, the other being employed at a textile factory in the city, working with new cotton stuff. No suspicion fell upon any other worker in the factory, and as nothing but new cotton is used in the manufacturing process I attached no suspicion to the factory as a source of infection.

The people living in the first infected house were poor, and the two girls out of their earnings had, in addition to keeping

themselves and paying the rent, to support the aged grandmother and the uncle.

Nothing had been brought into the house in the nature of old clothes, and no one visited the house so far as one could ascertain who would be likely to import the disease.

Regarding the second family infected, it was impossible to trace anything likely to cause infection other than the visits of the woman or the bed-clothes which were lent, and it is important to mention that she did not visit the house after laying out the old woman, on account of a quarrel about money matters.

The old woman was said to have been bedridden for some months before her death, and the only outside visitors were the neighbours, therefore, so far as could be ascertained, no one visited her who would be at all likely to have imported the disease into the house.

The questions which arose were:—(a) Did the old woman die of typhus fever, and did she infect the two granddaughters? or (b) Were the two granddaughters the first and only cases of typhus fever in the house?

If the latter were the true explanation of affairs, how did they become infected? To this question I have no further answer, seeing that I was unable to obtain the faintest evidence of outside infection, either by means of contact, third person, or fomites.

I was therefore forced to the conclusion that the old woman died of typhus fever, and that she infected the two girls. This opinion is supported by the fact that the adult female of the second family infected, who had not been to the house or had any other communication with the girls after laying out the old woman, developed the disease, and presumably infected her daughter, a neighbour, in all probability her niece, and her husband, in whom the disease, unfortunately, proved fatal.

The almost complete disappearance of typhus fever may be said to be one of the triumphs of modern sanitation and public health measures, for at the present time the disease is seldom met with except in a few centres in Great Britain, Ireland, and on the Continent.

Sporadic cases, however, do appear from time to time, and every few years limited outbreaks are still met with in districts which have formerly been the scene of epidemics of the disease. Yet, curiously enough, as pointed out by Osler, the remarkable present-

day feature of the disease is the occurrence of a few cases at long intervals of time, and at great distances from known foci of the disease, this being probably one of the points which led Murchison to favour the theory that the disease might be capable of spontaneous origin.

Carlisle being a very old city with a large percentage of single-room, court, and back-to-back tenement property, and a large favourably placed element of its population occupying this class of property, little surprise can be felt that the disease should from time to time make its appearance or crop up as a legacy of former epidemics.

I have mentioned elsewhere the difficulty experienced in dealing with early cases of this disease owing to the fact that so few of the present generation of medical practitioners have had opportunities of studying it. Thus the earlier cases are missed, either as a result of the clinical manifestations being attributed to other causes, or the deaths ascribed to purely symptomatic features, and I am of the opinion that the old woman mentioned above died of typhus fever, but that partly at least through medical assistance not having been obtained until just before death. The disease was, as the practitioner who attended her said, marked by the immediate signs of approaching death.

In a previous outbreak in Carlisle, which commenced in April 1905, the first two cases were not diagnosed until received into the Isolation Hospital, when they were observed to be suffering from typhus fever, but had been notified as suffering from enteric fever, and were contacts from two other cases also notified as enteric fever, which turned out to be actually typhus, the origin of which could not be traced.

It would appear that Carlisle from time to time has suffered somewhat severely from the ravages of this disease. Upon making investigations into epidemic diseases in this city, evidence of the widespread outbreaks of typhus fever is not wanting, the occurrence of which lends weight to the suspicion that the earliest outbreaks were probably not altogether unassociated with the immigration of Irish people into Carlisle.

Between April and October 1905 sixteen cases of undoubted typhus fever occurred, practically all in a circumscribed area of nine streets, and traceable, in the first instance, to contacts of the two cases previously mentioned as having been notified as enteric fever. The incidence in relation to occupation was as follows:—  
Telegraph messenger, 1; telegraphist, 1; labourer at a nursery, 1;

biscuit factory hand, 2; hawker, 1; housewife, 3; painter, 1; sweet factory hand, 1; school child, 5.

During the same period three cases of typhus fever occurred in the adjacent rural district, which were contacts from one of the above cases.

My predecessor, the late Dr. Brown, in a note upon this and other outbreaks, says that since 1874 the early case or cases have always been mistaken for enteric fever.

The outbreak of April 1909, however, furnishes a somewhat different example, for the two cases when first seen by me would, if taken casually, have been mistaken for severe measles or scarlet fever, and it will be remembered that it was in respect of the latter disease that I was asked to see them.

It would be of interest to mention some of the previous outbreaks which have occurred since the present Carlisle Sanitary Authority was formed in 1874, during which year typhus fever was prevalent in the city in epidemic proportion.

Sir W. H. Power, then Mr. Power, afterwards Principal Medical Officer to the Local Government Board, in 1874 made a special medical inspection of this city, and after an analysis of certain statistical records estimated that from April of that year, when typhus began, to the end of September of the same year, there had been 680 cases of the disease, out of which number 68 proved fatal. This outbreak, which terminated in 1876, is said to have resulted in no fewer than 144 deaths from the disease, out of a total of 1440 cases computed to have occurred during the same period.

From 1876 to 1885, a period of nine years, Carlisle appears to have been free from typhus fever, but in the latter year the disease made its appearance in a house in Rigg Street, from which it spread by contact to adjacent houses, resulting in seven persons being affected. Two years later another outbreak occurred, which gave rise to eleven cases, followed in 1892 by a further outbreak resulting in sixteen cases, succeeded by the outbreak mentioned in 1905, and lastly, the eight cases mentioned as forming the first part of this article.

In some further observations upon the disease Dr. Brown says: "As to whether typhus fever originates spontaneously or from some pre-existing case has always been a matter of dispute. There are several circumstances in connection with Carlisle outbreaks which favour the *de novo* theory of origin. (1) In none of the various outbreaks in Carlisle for the last thirty-one years has its

origin from any pre-existing case been traced satisfactorily. (2) All the outbreaks have commenced in a limited area occupied by old house property in the Caldewgate district and a similar kind of property in adjacent districts situate in the immediate vicinity of Castle Street. (3) All the outbreaks have commenced in the early part of the year, and, with one exception, about the same month, viz. the month of April, and it is curious to note that this April occurrence attended a great epidemic of typhus fever in Carlisle in 1781, graphically described by the late Dr. Heysham, when some 600 persons were attacked, representing one in eleven of the then population of the city. (4) The Irish element of the population has always been the first invaded." Dr. Brown almost closes the portals of attack upon his theory of a *de novo* origin by stating that "these facts tend to show that for the production of typhus fever local conditions, race characteristics, and seasonal influence are factors of importance, and that some of these points have more than a speculative interest."

I have no intention of discussing the diagnosis of the disease, seeing that all text-books deal with the diagnosis, both actual and differential, by far the most important point in public health administration being its mode of transmission.

That typhus fever passes directly from the sick person to the healthy is established by the clearest possible evidence, such instances having been observed in hospitals into which typhus fever cases are admitted, and also where cases have been left in private houses or lodgings the disease passes not only to relations and other inhabitants of the same dwelling, but to doctors and clergymen whose contact may be said to be occasional.

With regard to the specific cause of the disease we may be said to be very little in advance of the days of Murchison; yet the cycle of changes brought about by research, and the rapid strides made by the preventive branch of modern medicine, have narrowed down the possible sources, so that at the present time, although the causal organism in this disease is still unknown, our modern knowledge and conception of the nature of the acute infections generally lead to the belief that the time is not far distant when the knowledge of its etiology will be an accomplished fact.

Fortunately and unfortunately the opportunities for studying the disease, both clinically and bacteriologically, become fewer and fewer, but modern views as to its spread become more and more reasonable.

Fagge and Pye Smith suggested that the poison gained entrance to the body by the breath, and successively invaded the lymph and blood streams, and it is doubtful if anyone would be bold enough to assert that typhus fever is not transmitted in this manner.

The theories (and views) as to the spread of the disease by fomites in this as in many other infectious diseases die hard, but this, in view of the most recent theories as to the mode of infection in typhus, is a circumstance not altogether undesirable.

Fagge and Pye Smith say that it is at any rate certain that clothes and bedding may become vehicles for the transmission of typhus; and Barker and Cheyne relate the incident where a child discharged from a fever hospital took to another institution a bundle of clothes which had not been disinfected, and that the woman who opened the bundle perceived an exceedingly disagreeable odour, and in a few minutes became ill with what proved to be the beginning of the fever.

The latter observers were presumably alluding to an incident which occurred in earlier days when smells were thought to be capable of setting up a number of diseases, but who amongst those engaged in the practice of medicine has not observed the intolerable odours which emanate from the bodies and clothing of dirty persons, yet who, in view of the light thrown on diphtheria and enteric fever, would assert that smells are the exciting cause of disease, at the same time who would attempt to disprove that in the bundle of clothes mentioned there might not be present a collection of dangerous body vermin.

Writers have said that very few positive instances seem to have been recorded of the communication of typhus by contact with the bodies of those who have died of it, yet Murchison, who was attacked in Edinburgh, had been dissecting in a close room in which there were many bodies of persons who had died from typhus fever, had not entered the wards of the Infirmary, nor seen a case of the disease; and the writer himself has seen a number of cases of typhus fever in persons who have been present at the holding of a wake.

Writing further, Fagge and Pye Smith say: "It appears that typhus is seldom conveyed by persons not themselves infected, but Murchison relates that in January 1867 a patient in a surgical ward at the Middlesex Hospital sickened with typhus fever after being in the hospital for three and a half months from some other

disease, but who had been receiving daily visits from a nurse who was in close attendance on a typhus patient downstairs.

Murchison endeavoured to prove that typhus, instead of always being due to contagion from a previous case, might be generated *de novo* in persons placed under defective conditions, of which overcrowding is the chief; but in attempting to establish this mode of origin of the disease we must first disprove—(1) That overcrowding of itself has never been shown to be capable of giving rise to the disease. (2) That the outbreaks of the disease cease when the affected persons are isolated and disinfection carried out. (3) That when the disease crops up the persons affected are not necessarily more poverty stricken, overcrowded, or dirty than hundreds of others of the same class amongst whom the disease, as far as history records, has never occurred.

Coming to recent considerations which have been given to the question of typhus infection arising out of a comparison of certain of its features with diseases not dependent upon contact, filth, poverty, or overcrowding, one is led to the question of the part played by insects, and in this particular disease the possibility of infection by the common varieties of body vermin.

Professor Matthew Hay of Aberdeen, in a report to the Local Government Board of Scotland upon an outbreak of typhus fever in Aberdeen (*inter alia*), says, "that at the beginning of the epidemic only one member (a nurse) of the hospital and sanitary staff had previously had typhus, and that out of the members of the staff, in all forty-six, some of whom were in intimate daily contact with the disease for three to four months, only one nurse, one ward-maid, and one ambulance driver were affected during the first eight weeks of the epidemic."

In discussing some interesting points regarding the distribution of attack among the staff, Professor Hay points out that no nurse or ward-maid in the convalescent wards was infected, although, owing to the press of patients in the acute wards, persons were transferred to the convalescent wards almost immediately after the acute stage of the fever was passed, and presumably a week or two before they ceased to be infectious, yet so few of the nurses in the acute wards, all of whom were intimately in touch with the patients during the whole course of the epidemic, were attacked, although unprotected by a previous attack.

Continuing, Professor Hay says that, having in mind the analogy of malaria and certain other fevers, he began to sus-

pect that the infection of typhus might be conveyed by insects—in this case body vermin—such as fleas. The fleas feed on the blood of the patient and may become themselves infected and act as carriers of the infection to fresh human beings, as mosquitoes are known to do in malaria and yellow fever, although he regrets that it was not found possible by experimental investigation to test this suggestion owing to the typhus germ having not yet been isolated by any bacteriologist, but that the following facts strongly support this hypothesis:—“In the first place, every typhus case seen and examined by his assistants and himself exhibited flea-bites, and the members of the hospital staff who complained most of flea-bites were those who were attacked with typhus. The ambulance driver who ultimately contracted the disease and died had repeatedly changed his underclothing because of fleas which he received upon his body whilst carrying some of the patients in his arms.

“In the second place, every case, however clean and free the patient might be from body vermin, was found to have been at the probable time of infection in contact with vermin-infested patients.”

After the death of the ambulance driver Professor Hay arranged for the rest of the ambulance staff to take precautions against the invasion by fleas from typhus patients or clothing by wearing top boots, then stuffing their trousers legs inside the tops of the boots, by wearing closely-fitting overalls buttoned tightly up at neck and wrist, and smearing the neck, wrists, and ankles with eucalyptus oil, after which precautions no member of the ambulance staff took typhus, and practically did not suffer from flea-bites.

Professor Hay was very careful to distinguish between flea-bites and petechiæ from rash.

In the last small outbreak in Carlisle seven out of the eight patients were flea-bitten, three being severely bitten, the marks being easily differentiated from the petechiæ present, the other patients being not so badly bitten, but still showing a number of distinct flea-bites.

The two first females had vermin in their heads and were very flea-bitten, but no body lice were observed in any of the cases, and the bedding from each house superficially appeared to be free from lice, but the two houses from which the first two and the last case were taken were bug infested.

The writer recalls that during a sharp short outbreak of the

disease at Bootle the only individual on the sanitary staff who contracted the disease was the male ambulance attendant, in whom the disease proved fatal, and who frequently complained of the annoyance which he was subjected to from flea-bites occasioned whilst handling and carrying the patients, clothing, and bedding.

It is significant that in former times typhus in hospital spread to patients suffering from other diseases, and also to nurses and others in contact with the sick person, but those were the days unfortunately when vermin often existed in the beds, bedding, furniture, and walls of the old hospital wards, and when the clothing worn by the patients before admission was kept in old lockers by the bedside without any attempt at disinfection being made, either during the illness or at the time of discharge from the hospital.

Dr. R. K. Brown, in an article relating to typhus fever in Bermondsey, refers to the possibility of infection by mild and unrecognised cases in day schools, and points out that the epidemic in that borough showed how typhus might be kept going by a condition in children analogous to masked or latent scarlet fever; he also remarks that the origin of the first case was as obscure and difficult to trace as when Murchison propounded his theory that it arose *de novo*; he further states that, failing the masked or latent type of theory, the only other feasible suggestion is that the poison is harboured for long periods in old second-hand clothes which find their way from certain endemic centres, and, if given a favourable soil, start the disease.

At a meeting of the Academy of Science held in Paris in 1909, M. Charles Nicolle, M. Compte, and M. Conceil said that some experimental observations on which they had been engaged seemed to show that the *pediculus corporis* was the principal agent in the transmission of the pathogenic virus of exanthematic typhus. *Pediculi corporis* collected from the human body and kept without food for eight hours were placed on a monkey suffering from the disease, they were then transferred to a healthy animal of the same species, which eventually became infected. These observers therefore believe that for the prevention of exanthematic typhus it would be desirable to get rid of the parasites which infest alike the body, clothing, and bedding.

The etiology of the disease is, however, still unsettled, and the source of infection of the first case or cases of an epidemic is

usually impossible to trace. Bacilli, micrococci, and protozoa have been described in connection with the disease, still the infective agent remains unidentified, and it is therefore not improbable that the pathogenic organism may be ultramicroscopic.

In addition to the presence of the infecting agent the prevalence of the disease would appear to be dependent upon social squalor, poverty, overcrowding, filth, and also want of ventilation, the improvement of which has been accompanied by a correspondingly important decrease of the disease in communities amongst whose members it formerly exacted its heaviest tolls.

The disease is, however, still met with in some towns and cities in this country, for the predisposing features ever favourable to its spread are still in existence. Therefore, besides remedying the above-mentioned defective and insanitary conditions and social submersion we must take such measures as will insure—(1) The avoidance of exhalations and excretions from the bodies of persons ill or dying from suspicious disease, as well as where the diagnosis of the disease is established; (2) a knowledge of the possibility of infection by vermin which may desert the body either during life or after death; (3) the impossibility of clothing and bedding harbouring living vermin after being in contact with an infected person; (4) that contacts should be regarded as potential sufferers and therefore carriers; (5) that the public may be educated to the knowledge that the atmosphere of an apartment occupied by the sick person, when vitiated, may possibly determine the disease in others occupying it; (6) the knowledge that in some individuals, especially children, the disease may be met with in a very mild form.

For as science every day brings to light something new in respect to the part played by insects in the causation of disease, in view of the modern trend of opinion as to its transmission, it may not unreasonably be assumed that the infection in typhus fever has more than a chance relationship to the vermin-bitten skin.

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