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DANGEROUS
INFECTIOUS DISEASES

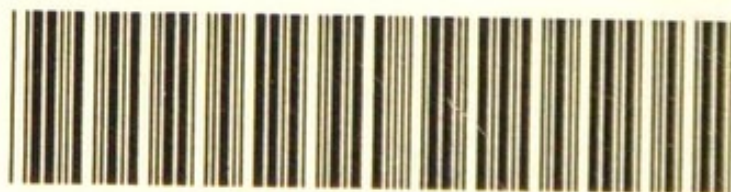
BY

FRANCIS VACHER

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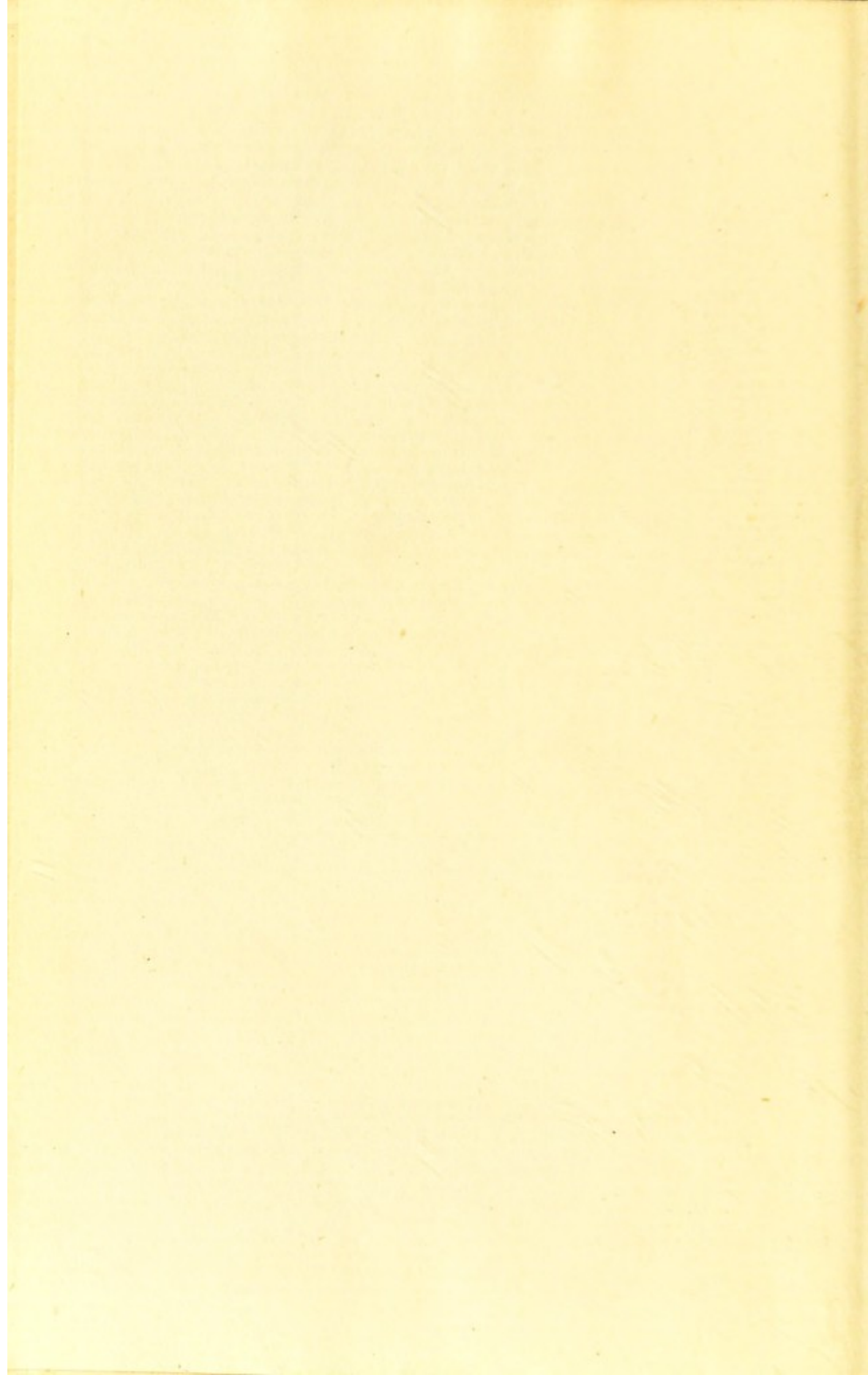
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DANGEROUS
INFECTIOUS DISEASES.

BY
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MEDICAL OFFICER OF HEALTH FOR CHESHIRE.

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PREFACE.

THE following brief articles, contributed to THE SANITARY RECORD, have been reprinted by request. As this journal is largely read by the general public, it was necessary that perfectly simple language should be used, and scientific terms avoided as far as practicable. However, the articles were primarily intended as a guide to recently-appointed Medical Officers of Health and Sanitary Inspectors.

The grouping of infectious diseases according to the length of their incubation time, &c., was first adopted by me in a little publication on *The Duration of the Latent Period, the Fever, and the Infectiveness of the Exanthemata, and some Allied Diseases*. I found it interesting and helpful, enabling me to see points of resemblance between diseases which I had not previously suspected.

I shall be happy to give particulars or authorities in regard to any subject dealt with, and grateful to any correspondent drawing attention to an inaccurate statement or literal error.

F. V.

Birkenhead.

June, 1897.



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DANGEROUS INFECTIOUS DISEASES.

PRELIMINARY REMARKS.

I HAVE adopted the term *dangerous infectious diseases*, as it occurs in some of the "notification clauses" in Local Acts, under which infectious diseases were first required to be notified. The expression is convenient, but savours of tautology; for whatever is infectious must be dangerous, and needs to be dealt with as dangerous. The initial question, therefore, in connection with my subject is, What are infectious diseases? The obvious answer is, Diseases communicated by infection. This suggests the preliminary inquiry, What is infection? "Infection," literally, means something which corrupts. I turn to the word in a vocabulary published about twenty years since, and I am informed that it means "the communication of disease through the medium of the atmosphere, or by means of fomites." Then I turn to "fomites" in the same vocabulary, and I find it means "substances which are supposed to contain contagious effluvia." Thus the idea was that infection was something of the nature of a fluid, liquid or gaseous—a subtle essence

contained in the infectious patient's breath, which mingled with the surrounding air, and was capable of being stored up in blankets and wearing apparel. It could not be discerned by the eye, but its presence was believed to be indicated by a more or less offensive odour. It may seem strange to some of my readers, that what has been discovered and is now taught with reference to infection is almost the exact opposite of this. The material by means of which a person having an infectious disease communicates his disease to another person is never liquid, never aëriform, is no part of the breath, and probably has no odour offensive or otherwise. It exists in the form of little solid particles. As regards many of the infectious diseases, it is known that these particles are alive (forms of bacteria, to use a now familiar word) and it is probable, and not unreasonable to assume, that all are alive. Still they are not alive in the sense of having an independent power of motion. They are given off, either as spores or as mature bacteria, along with much dead matter forming the discharge of the patient. When in water they do not swim, but are carried along by the current; when high and dry they do not fly, but are carried about by the wind as dust is. All this is important to bear in mind, for people labour under many delusions as regards infection. One patient says he got the infection from the sewer ventilator, for he smelt it; another is certain she was infected by the steam from the dirty clothes boiler; and a third is sure he was infected from a particular tumbler of water he drank, for he saw the bacteria swimming about

in it. Indeed, it is not long since one used to see bacteria referred to in the papers as "insects," and I once saw them described in print as "terrible little black beasts." Treating of that which infects in this manner is of course no less misleading than describing it as a subtle essence.

The question to be considered may, therefore, take this form—What are the diseases which may be communicated from the sick to the sound by particles discharged from the body of the sick? The following list, so far as this country is concerned, may be taken as fairly complete:—Small-pox, chicken-pox, measles, rubella, scarlatina, diphtheria, erysipelas, puerperal fever, epidemic pneumonia, influenza, whooping-cough, cholera, epidemic diarrhœa, typhus fever, typhoid fever, relapsing fever, mumps, tubercular disease, actinomycosis, tetanus, hydrophobia, anthrax, and glanders.

Thus, all these may be regarded as infectious diseases, and, because infectious, dangerous. However, only nine of them are named in the Infectious Disease (Notification) Act, 1889, as diseases to which the Act applies, viz., small-pox, scarlatina, typhus, relapsing fever, diphtheria, typhoid fever, cholera, erysipelas, and puerperal fever. Membranous croup is also named in the Act, and owing to this many cases of diphtheria are brought to the attention of the Local Authority which would otherwise escape notice. Enteric (a synonym for typhoid) fever is also named; and also "continued" fever, under which term cases of typhoid fever are often notified, and rarely cases of typhus. Among the diseases which have been added to

the statutory list in certain districts, extending the definition of infectious disease required to be notified locally, are chicken-pox, measles, rubella, whooping-cough, epidemic diarrhœa, and hydrophobia. The question of requiring the notification of influenza, mumps, and tubercular disease of the lungs has been discussed from time to time ; but I do not think anyone of them is required to be notified anywhere in this country. As to phthisis, it would doubtless have been made compulsorily notifiable in many districts had the Local Government Board approved of this being done.

I now propose, very briefly, to consider these diseases from a public health point of view, and for this purpose I shall divide them into five groups. The grouping is quite unscientific, and differs from that adopted by any writer with whose works I am acquainted ; but it appears well suited to my purpose, and may perhaps help to emphasise what I have to say. A few omissions in my list may be referred to. The disease called cerebro-spinal fever, or malignant purpuric fever, is so little known in this country, that I have not thought proper to include it. Leprosy, in some respects resembling tubercular disease, in some resembling glanders, is exceedingly interesting, but so rare in this country—I have only seen one case—that it may be regarded as a disease of the past, just as plague is. Dengue, or dengue fever, characterised by intense pain in the limbs, and a second eruption after the fading of the first, &c., is no less interesting, but is not referred to, being essentially a disease of warm climates.

GROUP I.

DISEASES IN WHICH ABOUT A FORTNIGHT ELAPSES FROM INCEPTION TO THE BEGIN- NING OF THE ERUPTION.

THIS group includes small-pox, chicken-pox, measles, and rubella. In a large proportion of cases the normal time before the eruption appears may be reckoned on, and the range between short and long incubation periods is less than in the other groups. The premonitory symptoms occupy from one day to four, seldom more. Again, the eruptions of these diseases are often so much alike as to lead to mistakes in diagnosis. Measles and rubella are often mistaken for one another. Small-pox when "coming out" often closely resembles measles, whereas it is frequently exceedingly difficult to say whether an initial case in an outbreak is small-pox or chicken-pox. In each of these diseases one attack usually protects from a second.

Small-pox, as it occurs in the present day, is really two diseases, viz., small-pox in the unvaccinated, and small-pox modified by vaccination. In both, after a person has caught the disease, he remains to all appearance quite well for eleven or twelve days—one or two days more or less—and then he is feverish and sick, and complains of pain in the back for two or three days. Finally, the eruption comes,

out (usually first on the face), pimples which fill with clear lymph, and then become pustules and form crusts. If the spots on the face run together, the disease is called confluent; if they remain separate on the face the disease is called discrete.

Thus, when a person has been exposed to infection, he should be quarantined for a clear fortnight. If he remain quite well, he may be regarded as safe. The patient is infectious from the very first symptom till all the scabs are off. However, a case is rarely notified until the eruption appears, and if then properly isolated the spread of the disease is generally prevented. According to my experience, I have found that if small-pox were modified by vaccination, a patient treated in hospital would be free from infection five weeks after the eruption began to appear; if the disease were not modified, a patient (provided he recovered) would be free from infection eight weeks after the eruption began to appear. As the particles, by means of which the disease is spread, are stored up in the crusts, these should be kept oiled from the time they begin to form.

Cases in which the disease is modified by good vaccination are often so mild that the whole eruption may not amount to a dozen spots. Such cases are particularly liable to escape attention. The head of the household may know nothing about it, and there is little likelihood of a doctor being called in. Yet disease communicated from such a patient, if the receiver be unvaccinated, may be as severe as possible.

How very severe small-pox may be exceptionally, those who have had long experience in connection with the disease can testify. There are two forms in particular that I have seen—the so-called “black small-pox,” where the eruption becomes dark from innumerable small hæmorrhages, and the *variola sine variolis*,* where the disease is so malignant that there is no eruption, but the skin is thickened and somewhat livid.

When a case of small-pox is notified and the Medical Officer of Health has satisfied himself that it is really small-pox, there are four things need to be done, and all as promptly as possible.

(1) The patient must be isolated.

(2) Vaccination (or re-vaccination) must be offered to and pressed on those in the same house as the patient, and persons ascertained to have been recently in contact with him.

(3) The patient's wearing apparel, bedding, &c., must be efficiently disinfected or destroyed, and his room thoroughly cleaned out.

(4) The origin of the case must be investigated. No pains should be spared in searching out the source of infection, especially if the case notified be the first in an outbreak. If the investigation be carefully made, the officer undertaking it will, I think, ordinarily ascertain the source. He must not abandon the search too soon, and be content with the lame conclusion that the disease reached the district aërially.

* I am not using this term as De Haen used it. He seems to have noted a form of small-pox, in which salivation took the place of the eruption—the morbid matter being expelled from the system by the salivary glands.

The necessity for a Medical Officer of Health satisfying himself that a case notified as small-pox is really small-pox, is obvious. Not only are cases of chicken-pox frequently reported as small-pox, but also cases of eczema and other skin diseases. Indeed, in one instance a man suffering from secondary syphilis only, was sent to Birkenhead Hospital as a case of small-pox. However, the fact of a patient having another disease is no reason why he should not have small-pox. I once treated a lad for modified small-pox who was suffering from itch at the same time.

Chicken-pox patients (like small-pox patients), after having caught the disease, remain to all appearance quite well for eleven or twelve days—one or two days more or less—and then are slightly feverish and indisposed for two or three days. The premonitory fever and indisposition may be absent. About the fourteenth day appears the eruption, usually commencing on the shoulders, neck and breast, and often sparing the face. The eruption is one of transparent vesicles, like little blisters produced by boiling water. The blisters come out in crops, the earlier ones shrivelling while the new are forming. Blisters which do not shrivel quickly get slightly opaque. A person exposed to infection, remaining well for a fortnight, is ordinarily safe. The patient is infectious from the first symptom till all the scabs are off. Chicken-pox is commonly a disease of children, but I have not infrequently seen adults suffering therefrom.

A district in which infectious diseases are compulsorily notifiable will do well to add chicken-pox to the list of diseases required to be

notified. If this be not done, sooner or later some mild case of small-pox will escape notice.

The children of a family in which one is suffering from chicken-pox should be kept from school, for the infectious particles may be conveyed in clothing. The patient's room should be cleaned, and his clothes, &c., disinfected.

An attack of chicken-pox is occasionally very severe. It is not prevented or modified in any way by vaccination.

Measles.—The subject infected with this disease remains to all appearance quite well for ten days. Then comes the introductory fever and catarrh. The eyelids and the lining of the nose and throat are inflamed. The eyes water, there is a copious discharge from the nostrils, and commonly a cough. There may be vomiting as in small-pox, but the back pain so characteristic of small-pox is absent. Usually four days after these symptoms begin the eruption appears. It at first consists of minute specks (measles is derived from a German word *maser*, a speck), which can be barely felt as raised above the rest of the skin surface, and these run together in patches, more or less crescentic in shape. The eruption commences on the face, neck, and arms, and takes two or three days to come out. By the time it has reached the legs it begins to decline on the face, getting browner as it fades. Wherever the eruption has been the cuticle comes off like scurf. In measles, as in small-pox, a person exposed to infection should be quarantined for a clear fortnight, and if, at the expiration of that time, he manifests no symptom of illness he may be

considered safe. The patient may be regarded as infectious from the first appearance of the earliest symptom till three or four weeks after the appearance of the rash. If care has been taken to cleanse the patient he is then safe. There seems to be little doubt that the patient is specially infectious during the primary or catarrhal stage.

Rarely a patient suffers from a measles eruption without any catarrhal symptoms, and sometimes patients exposed to infection manifest the febrile and catarrhal symptoms without there being any eruption. The first is a light form of measles, the second often a severe form. The disease described as putrid measles (marked by extreme debility, diarrhoea and frequent gangrene), I have never seen. Measles is not ordinarily required to be notified, and I know of no sufficient reason why it should be. It is not spread by milk or drinking-water, nor is its incidence influenced by sewer gas, and no form of inoculation will protect a child. Owing to the special infectiousness of measles for three or four days before the appearance of the eruption, and consequently before the malady is recognised, brothers and schoolfellows susceptible have probably been infected before the patient can be picked out and isolated.

The infectiousness of measles does not appear to last for a long time, as does that of scarlatina. However, little portions of infective matter discharged from the patient may lodge on the clothes of nurses, &c., and convey infection short distances.

The Medical Officer of Health, in presence

of an epidemic of measles, may often find it expedient to use such powers as he possesses for closing schools. Children from infected families are commonly kept from school as soon as a case is reported. Clothing, &c, known to be infected should be disinfected, and the rooms occupied by patients well cleaned.

Measles is seldom a fatal disease in families comfortably off, but among the poor is very fatal, the main difference being that well-to-do people understand the importance of keeping the patient warm, and the poor do not.

Rubella, better known as German measles, or epidemic rose rash, remains latent for about thirteen days, then there is a day or two of malaise or feverishness, and finally the rose rash, which more nearly resembles scarlatina than measles. A person exposed to infection should be quarantined for sixteen or seventeen days, and if at the end of that time he is quite well he may be regarded as safe. Rubella resembles measles in its exceptional infectiousness during the very earliest stage, and before the disease can be diagnosed. The patient ceases to be infectious after the rash has faded, and all branny skin is washed off, say, a fortnight after the rash began to appear.

The infectiousness of rubella has probably even less lasting power than that of measles, but here also portions of infected matter may be carried on clothes short distances. Children from infected families should certainly be kept from school. Infected clothing should be disinfected, and the rooms occupied by patients properly cleaned.

GROUP II.

DISEASES IN WHICH ABOUT HALF-A-WEEK
ELAPSES FROM INCEPTION TO THE BEGINNING
OF THE ERUPTION OR OTHER INITIAL CHARAC-
TERISTIC SYMPTOM OF ATTACK.

THIS group includes scarlatina, diphtheria, erysipelas, puerperal fever, epidemic pneumonia, influenza, whooping-cough, cholera, and epidemic diarrhoea. The range of the latent period is from a few hours to a fortnight, and the attack is noticeably influenced by the environment of the patient at the time of seizure.

Scarlatina after its inception commonly remains latent for two or three days, then the patient is feverish for a day or two and complains of headache, slight sore throat, and stiffness of the neck. This is followed by the eruption, beginning in minute points, but these soon become so numerous as to produce a general redness of the surface. It is brighter in colour and less elevated than the measles eruption. The rash begins on the face and neck and spreads over the whole body, and may be expected to last three or four days before fading. Probably, about a week after the first symptom the peeling begins, and a very slow process this is, lasting many weeks. The skin is usually shed in fine scales from the head and body, and in flakes from the extremities. With the early symptoms, a white fur gathers on the tongue, and

through this appear the red swelled papillæ, then the white fur clears away, and the whole tongue looks exceptionally red and rough. The throat gets very red, and the tonsils swell and redden. Then a whitish exudation may appear, and ulceration or even sloughing. The degree of severity and danger differs much in different cases and in different epidemics. In so-called simple scarlatina the florid rash may be accompanied by little or no sore throat ; and in malignant scarlatina the rash is usually late and imperfect or absent, while the throat symptoms or head symptoms are so severe as to cause death. I once saw a case in which the eruption was as in purpura, and the white of the eyes was deep red. This patient died in twenty-four hours.

Scarlatina is infectious from the earliest symptom till desquamation is complete and the patient absolutely clean. This is ordinarily not less than five or six weeks, and occasionally nine or ten.

A person exposed to infection should be quarantined for a week, and if he then shows no signs of illness he may be considered safe.

Though a case of scarlatina is not usually notified till the rash has begun to appear, the disease is so little infectious at first, that prompt isolation will generally prevent the spread of the disease. Indeed, isolation hospitals are probably of more use for isolating cases of scarlatina than for any other disease. The room, clothing, bedding, &c., should then be promptly disinfected ; and children from infected houses should be kept from school till safe.

In presence of an epidemic it may be well to take steps for closing the local schools; but when a good hospital is provided this will not be often needed.

Return cases (cases re-appearing in households shortly after the return of a patient from hospital) are not always easy to account for, but they would be very rare indeed if great care were always taken to keep patients in hospital till all peeling had finished, and any discharge they might have from ears or nose had ceased. Infectious particles may be retained in clothes, &c., for months.

That a person suffering from a wound or injury, or a woman recently delivered, is specially liable to become infected with scarlatina, is a well established fact. It is reasonable therefore that special efforts should be made for the protection of surgical and puerperal cases from the risk of scarlatinal infection.

In investigating an outbreak of scarlatina, the frequency with which this disease has been spread by milk must be borne in mind. The milkers, collectors, or distributors of the milk may have contaminated it, the vessel in which the milk is delivered may have been recently in an infected house; and there is some ground for believing that occasionally the cow herself has an allied disease and yields infective milk.

Diphtheria, like scarlatina, after its inception remains latent for two or three days. Like scarlatina, also, it is a disease mainly affecting children at school age (three to twelve years), and occasionally so mild that no serious disease is suspected, and the patient never comes under

medical treatment. The initial case in an epidemic is thus often an unsuspected case. The first symptom attracting attention is commonly a sore throat, and sometimes with this or before it is a patchy red rash about the neck and chest. Next a false membrane forms, extends and thickens, and in course of time is shed. However, diphtheritic membrane need not be in the throat—it may be in the windpipe or nostrils, or the membrane covering the eyes, &c., and false membrane is not peculiar to diphtheria, even when it is in the throat. The difference between diphtheria and some other diseases which resemble it (and which Bretonneau himself would doubtless have called diphtheria), according to the modern view, is that diphtheria is the disease due to infection by the bacillus of Klebs and Loeffler. The bacillus starts the disease, and the fever and other symptoms following are mainly the result of chemical poison made by the living bacillus being absorbed. After the membrane has been shed, or before, an attack of diphtheritic paralysis is not infrequent. Indeed, paralysis may follow in cases where the diphtheria was so mild as to be unrecognised.

Diphtheria is infectious from the inception of the disease till the throat is quite healthy. In cases sent to hospital, or carefully treated, this time will not ordinarily exceed five weeks.

A person exposed to infection who remains well after a week's quarantine may be considered safe.

Diphtheria is not usually notified early, but prompt isolation will often prevent the spread.

Isolation hospitals are particularly useful for cases of diphtheria, as the disease often occurs in insanitary dwellings, from which it is of first importance to remove the patient.

The house where a case occurs should be examined for defects, and if discovered these should be remedied. The disease seems to favour damp houses. The room, clothing, bedding, &c., should be disinfected, and the children from infected houses should be kept from school.

Schools may be closed with a view of checking the spread of diphtheria when nothing worse than what appears to be sore throat is prevalent among the scholars; and children suffering from sore throat, however mild, should be kept from school. The disgusting way in which slates are often cleaned, the transferring of sweets from mouth to mouth, and the use of drinking cups common to many, are some of many means by which diphtheria may be spread at schools.

In investigating diphtheria, it is often easy to trace the disease from case to case by means of personal intercourse, whilst it is usually most difficult to offer a reasonable explanation of the first case. The initial case or cases may have come from a specifically infected cesspit, ditch-drain, &c., from drinking water polluted thereby or otherwise, and even from cats, domestic fowls, or pigeons. As regards milk, it seems to be able to initiate the disease, and may certainly spread it. When the bacillus is once introduced into milk, it readily multiplies even at ordinary temperatures. What was said of scarlatina is

true of diphtheria, viz., there is ground for believing that occasionally the cow herself through being diseased, yields infective milk.

Persons who have just had or are recovering from scarlatina or measles are specially liable to take diphtheria, and so apparently are women who have been recently delivered.

The infection of diphtheria, like that of scarlatina, can be retained in clothes, &c., for a long time—many months.

Erysipelas is characterised by spreading inflammation of the skin (or mucous membrane) due to the presence of a micro-organism. After inception, no symptoms are manifested for three to five days. About the time the swelling and redness of the skin begins there is fever and languor, often headache, shivering, and vomiting. The locality generally attacked is some part of the head (the first patch being on the lip, cheek, scalp, &c.), and there is often some sore throat. The fever is remittent in character, but present to some extent till the inflammation ceases to spread. Occasionally the inflammation is very slight, but not unfrequently continues to spread for ten days. Where it is spreading there is a raised red line, and in rear of this the redness and swelling shade off to the part attacked earliest, which has recovered. Thus, while the disease is advancing in one part it is receding in another. The inflammation at a particular part lasts about five days. Sometimes the disease reappears during convalescence.

Debilitated persons, puerperal patients, drunkards, and those suffering from wounds,

are specially liable to attack, and often suffer severely and fatally. In bad cases there may be typhoid symptoms and death from exhaustion, or head symptoms and death from coma, &c. The scarf skin is shed at the parts attacked, and the particles of shed skin carry the infection, as they do in scarlatina. The contents of the blisters, which form and burst, must also be regarded as infectious.

In very young children the disease may commence at the vulva, and in infants the navel may be the first part attacked. Such cases seem specially likely to prove fatal.

Erysipelas is infectious from the beginning of the inflammation till desquamation is finished, and the parts affected are absolutely clean; commonly this period is a little more than a fortnight.

A person exposed to infection after a week's quarantine is safe.

Cases of erysipelas certainly require isolation, and are well suited for hospital treatment, where accommodation is available. The infected room, clothing, &c., should be promptly disinfected. Infectious particles may be retained in clothes, and carried short distances.

In erysipelas, as with scarlatina, special efforts may be needed for the protection of surgical and puerperal cases from risk of infection.

Puerperal Fever is not now regarded as an acute specific fever occurring in lying-in women only, but a puerperal septic disease caused by infectious germs directly conveyed to the patient by defiled hands, instruments, sponges, &c., or

otherwise. The organisms found are similar to those found in erysipelas and wound fever. Indeed, infective matters from an erysipelas patient or a scarlatina patient, while they may cause erysipelas or scarlatina, may also cause disease not distinguishable from ordinary puerperal fever.

Generally about three days after delivery is completed the first symptom (chilliness or actual rigors) is noticed. The onset of the disease may be a day after confinement or may be delayed for five days. If no symptom arises during the first week the patient has not been affected during delivery. The fever, at first rather high, usually continues for about a fortnight, when there is a change for the better or worse. In very severe cases death may take place in a few days.

The patient, and all that comes from her, must be held as highly infectious from the first.

What can the Medical Officer of Health do in puerperal fever cases? They are ordinarily notified to him, or should be, and he ought to take some steps to prevent the spread of the disease.

Hospital isolation is not practicable, nor can much be done for the patient, for a case is rarely notified till the patient is dying. The infected room and contents should be thoroughly disinfected. The midwife or nurse in attendance should also be urged to submit to disinfection, and to abstain from attendance on other cases for a short period.

Epidemic Pneumonia is an undoubtedly infectious disease, though it has only been clearly

recognised as such within recent years. After inception the disease is latent from about two to five days. The first symptoms are rigors or shivering, pain in the side or over the stomach, and fever. Sometimes the pain is quickly followed by diarrhoea and vomiting. Commonly on the second day there is pleuro-pneumonia on one side or both sides, followed by delirium. Cases are often fatal in three or four days. The crisis may be expected in a week or ten days, but this may be followed in a few days by a relapse.

This disease is not primarily an affection of the lungs, but a fever of which the pleuro-pneumonia is a symptom, and the constitutional disturbance is usually out of all proportion to the local disease.

Debilitated persons, intemperate persons, the aged, and all living among squalid surroundings appear to be specially liable to attack and to have the disease severely.

Epidemic pneumonia may be considered infectious from the onset of the disease till the lung disease is recovered from, and the patient ceases to expectorate — say three weeks or more.

A person exposed to infection, after a week's quarantine is safe.

Had this disease been more common, or had it been more frequently recognised, it is probable it would have been included in the diseases ordinarily required to be notified; but little was known of epidemic pneumonia till the Middlesbrough epidemic was investigated and reported on, and this was only just before the

Infectious Disease (Notification) Act, 1889, was passed.

If the disease were required to be notified in any district, early cases would probably be reported, and might be removed to hospital with advantage. The infected room and clothing could then be disinfected, and any sanitary defects discovered on the premises could be remedied.

Wherever else the infection of epidemic pneumonia may be, it is certainly in the expectoration, and as portions of this, if allowed to dry, may be carried about as infectious dust, patients should cough or spit into a piece of rag or paper to be at once burned, or into a spitting-cup or vessel containing a little water, which can be emptied from time to time into a drain leading to a sewer, and cleansed with scalding water.

Influenza is latent ordinarily for three or four days, a day more or less being not uncommon. Occasionally the latency appears to have been less than twenty-four hours. The onset of the attack is marked by pain coming on suddenly in the head and back, and this is followed by the usual symptoms of a bad cold. There is some fever, a furred tongue, foul breath, and great prostration. After four or five days the fever subsides, and the patient is left weak and depressed, and liable to fits of chilliness, followed by sweats. Not rarely there is some delirium, even at an early stage.

Influenza does not always correspond to this description, as there are cases where the disease is much more severe in the lungs, cases in which drowsiness is a prominent symptom from the

first, cases in which there is no fever, cases in which the disease closely resembles typhoid fever, &c. &c. The intemperate, and the over-worked, and the harassed, seem specially liable to attack, and likely to have the disease severely.

The influenza patient, and what is discharged from his body, is infectious from the onset of the disease, till he is well enough to resume his occupation ; this will ordinarily be in about ten days, but it may be three or four weeks.

A person exposed to infection and manifesting no symptoms for six days is probably safe.

I wish something could be done by Local Authorities for checking the spread of this disease, as it has been lately very widespread and fatal. In Cheshire, during 1895, no less than 157 deaths were ascribed to influenza, and in one institution there were eleven deaths from influenza in seventeen days. Besides the large number of deaths from the disease, many of those who recover remain for long in a weak condition, peculiarly liable to neuritis, pneumonia, bronchitis, &c.

However, I am not able to recommend any active measures. Compulsory notification, even if practicable, would be of little use, and certainly hospital provision could not be made for cases. Still the public might be informed that the infective particles are present largely in what is discharged from the lungs and nasal passages, and that these should not be allowed to dry and scatter infection, but be at once burnt, or received into water and emptied down a drain leading to a sewer.

It goes without saying that after the recovery

of the patient, infected rooms and clothing should be disinfected.

Whooping-cough.—The onset of this disease is in many cases so insidious that it is difficult to say for how long it is entirely latent. It is probable that the latency does not ordinarily exceed four or five days; then follows the catarrhal stage, lasting from three days to a week (occasionally a fortnight), and finally the paroxysmal cough and whoop. The cough consists of a number of expiratory motions in rapid succession, followed by a long inspiration, the air making a whooping noise as it passes through the partly-closed *rima glottidis*, and this may be repeated two or three times during a paroxysm till mucus is forced up, or the child vomits. During the intermissions, if the disease is uncomplicated, the patient (usually a child) appears quite well. The violence of the paroxysm appears to depend on the difficulty of getting up the expectoration. The frequency of the paroxysms varies much in different cases and at different times. The duration of the disease is from about three weeks to three months. Relapses are not uncommon, and these may occur more than once.

Whooping-cough may be complicated with bronchitis or emphysema, or trouble from determination of blood to the head, and not unfrequently small ulcers appear under the tongue.

As the disease is infectious from the beginning of the catarrh (when probably whooping-cough is not suspected) till mucus ceases to be coughed up, it is not surprising that it spreads

rapidly, and is the most fatal of all diseases of children under five years of age.

A person exposed to infection, and manifesting no symptom of catarrh for a clear week is probably safe.

In some districts whooping-cough is required to be notified. However, notification is not of much service in respect of a disease which is infectious for days before it can be recognised.

Of course children from infected houses should be kept from school ; and in presence of a severe outbreak it may be expedient to close the local schools.

As for the expectoration, people should be informed that this is infectious, and instructed to deal with it accordingly.

After convalescence is established, the infected room, clothing, &c., should be disinfected.

Cholera Asiatica is a specific communicable disease, endemic in parts of India, and spread epidemically elsewhere. The dejecta contain the particles (bacilli) which infect those receiving them. The cholera bacilli, after being swallowed, multiply greatly, producing toxins, and setting up profuse purging, &c. As the cholera bacillus is soon killed by drying, it seldom or never is received into the system of the person infected as dust. Through want of scrupulous cleanliness in those attending on the sick, or in charge of the dead, or by means of flies, infective material is conveyed to food or water, and thus eaten or drunk. Under certain conditions in water (and probably in some foods), the bacilli multiply and appear to increase in

virulence. Under other conditions they cease to multiply or are killed.

After a little of the dejecta has been received into the system, a patient will ordinarily remain well for about three days—the time varies from a few hours to a week. Then there is some malaise and depression, and then irritation of the stomach and bowels, and watery diarrhoea more or less copious. Quite commonly the first symptom is violent purging and vomiting, quickly followed by cramps and increasing exhaustion. This stage of evacuation may last two or three hours only or more than twelve. The later stools are pale, like water in which rice has been boiled. There may be griping, but frequently there is not any pain. The vomiting or retching generally begins later than the purging. About this period, or earlier, the muscular cramps begin, the temperature falls, and the surface of the body becomes cold and clammy, the features are drawn, the tongue is white, and there is great thirst. At this time the purging, cramps, &c., may cease, and strength be gradually restored, but in most cases the stage of collapse comes on gradually or quickly. This stage, in which the exhaustion is alarming, may last two or three hours or two or three days. The pulse is quick and flickering, or imperceptible. The surface becomes livid, the breathing difficult, the voice weak, the temperature is lowered, and the face has the characteristic cholera expression. During this stage, early or late, death most frequently occurs. The stage of reaction is characterised by gradual restoration of power and resumption of function. The

patient may recover in a few days, or slowly, or some complication may yet prove fatal.

The variations which take place in the course of an attack are numerous. The above description may be taken as fairly typical.

The prevalence of cholera on the Continent from time to time, and the probability of its reappearing, have induced the Local Government Board to urge sanitary authorities to take special precautions to prevent the spread of the disease should any case be imported. What the Local Government Board advise should be done is set forth in the official memorandum entitled "Precautions against the Infection of Cholera." A print of this is in the hands of all Medical Officers of Health, and all must be fairly familiar with its terms. As, however, the Local Authority cannot accomplish much unless assisted by the local householder, it may be well for the District Council, on the approach of summer, to issue an annual circular to householders. This circular must, of course, be drafted by the district Medical Officer of Health, and would be varied to meet the requirements of different districts. Ordinarily the contents would be to the following effect :—

It is the duty of every householder :—

1. To report to the Health Department every case where the water-closet is flushed direct from the main, in order that steps may be taken for breaking the connection by interposing a separate service cistern.
2. Not to use the water from a cistern serving a closet for any other purpose whatsoever, except the connection between the closet and the cistern be broken, the water for the closet passing through a separate service cistern.

3. To see that his household is provided with a separate and direct service from the main for drinking purposes. It is recommended that the tap delivering this water should have the word "main" stamped upon it.

4. To instruct the household always to use water from the main for drinking purposes, and for filling the bedroom carafes.

5. To see that the discharges of all sick persons in his house are efficiently disinfected before being thrown away, and that the soiled clothes, towels, &c., are efficiently disinfected before being sent to the wash or removed from the house.

6. To see that the soil pipe is efficiently ventilated, the ventilator being of the same diameter as the soil pipe, and carried up at least two feet above the roof eaves.

7. To see that all waste pipes in the house are disconnected from the drains and made to deliver on gulley traps.

8. To see that all cisterns are thoroughly cleansed at intervals of not less than six months, and that their overflow pipes are made to terminate externally as warning pipes.

9. To see that no house refuse or filth of any kind is permitted to accumulate, and that the midden is cleansed and disinfected at short intervals.

In the event of a case of suspected cholera being imported into a district, or arising, the matter should be reported to the Local Government Board, and an expert consulted.

Cholera nostras, or English cholera, or choleraic diarrhœa, begins (as cases of true cholera do) with pronounced diarrhœa, accompanied often with nausea or vomiting, and not rarely with cramps. The stools, at first feculent, gradually become rice-watery, like cholera stools. Cases of this kind may be the first in an outbreak of true cholera, and occur frequently

during an epidemic. Recovery is usual in about twenty-four hours, but such cases not unfrequently develope into true cholera.

Epidemic Diarrhœa is almost always associated with increased temperature of the air and autumn changes, and the mortality is for the most part among infants and very young children; still there are records from time to time of epidemic diarrhœa at various seasons (even in mid-winter) when those who died were not even chiefly little children. The length of the latent period there is no means of computing, but it is certainly short. The attack begins with pain in the epigastric region or abdominal griping, some rise of temperature, vomiting, and diarrhœa. The stools show that there is intestinal catarrh, and are sometimes bloody. There is commonly thirst and some suppression of urine, a weak and frequent pulse, and often cramp, extreme prostration, and it may be collapse. The attack lasts from about three days to a week.

According to the late Dr. H. Tomkins, at Leicester (where diarrhœa has been for many years exceptionally prevalent), though the mortality is principally infantile, by far the larger proportion of sufferers are persons of mature years. Out of 9700 patients of whom particulars were obtained, two-thirds were twenty years old and upwards, and less than one quarter were children under five years old.

According to Dr. Ballard, whose investigations into the nature and causes of epidemic diarrhœa are well known, the malady is a veritable specific disease of a febrile nature, pathologically most comparable to scarlatina and

cholera. Convulsions occur in 82 per cent. of bad cases, doubtless of a uræmic character, and albuminuria is not infrequent. The epidemic wave of the disease is determined mainly by the temperature of the earth. As soon as this reaches 56 deg. Fah. at a depth of 4ft., the disease may be expected to appear more or less extensively, especially among its chief victims—infants fed on artificial food. Dr. Ballard has no doubt of the dependence of the disease on some chemical irritant, produced by a microbe in certain loose soils. He adduces some striking illustrations of the contagiousness of this disease.

As epidemic diarrhoea is intimately associated with conditions of filth which favour its propagation, it is the duty of the Local Authority and the householder to remove such conditions.

The Local Authority will be much assisted by adding diarrhoea to the diseases required to be notified, at least during summer and autumn.

Handbills stating the precautions which should be taken against diarrhoea, for information of householders and others, should be distributed as may be required. I have received copies of such handbills from many Medical Officers of Health at different times. Perhaps the handbill issued from the Public Health Office, Manchester, is as complete as any.

GROUP III.

DISEASES IN WHICH ABOUT THREE WEEKS
ELAPSE FROM INCEPTION TO THE BEGINNING
OF THE ERUPTION OR OTHER INITIAL
CHARACTERISTIC SYMPTOMS OF ATTACK.

THIS group includes typhus fever, typhoid fever, relapsing fever, and mumps. These diseases, though generally spreading from subject to subject by known media, are eminently diseases of overcrowding and filth and depressing surroundings.

Typhus fever is happily now so uncommon that not a few practitioners have never seen a case. It has been my lot to have to do with a great many cases, and also to have personal experience of an attack. There is an abundance of testimony as to the duration of the period of incubation, but much of it is of little practical use, so wide is the range allowed. Haygarth makes the latent period from five days to two months; Bancroft from one day to five or six months; Barker and Cheyne from a few minutes to six weeks. Dr. Bristowe, who is a recent writer, and has had much experience, puts the incubation period of typhus at from five to twenty-one days, or even more. As far as I have been able to ascertain, I believe the average period during which the disease is wholly latent is about twelve or thirteen days. The onset is generally rather sudden, a feeling

of chilliness, fatigue, and malaise, being quickly followed by intense headache, all the indications of high fever, and often delirium in a few hours. From the commencement of the indisposition to the appearance of the eruption (consisting often of a few not very distinct spots) is usually about a week ; thus, from the inception to the beginning of the eruption may be counted twenty days. In fourteen days from the beginning of the fever, or seven days from the first appearance of the eruption, the formidable symptoms subside, and the temperature is normal. Ten days or a fortnight afterwards the patient may be convalescent, free from infection, and fit to be discharged. Occasionally the fever, instead of lasting about fourteen days, lasts twenty-one days, or it may subside after seven days. Thus a crisis may be looked for after a week of fever or two or three weeks. A typhus patient is very infectious from the onset to the end of the fever and till he has been efficiently cleansed.

The incubation period in typhus is so uncertain, that after a person has been exposed to infection it is not practicable to quarantine him for a definite period, and then pronounce that he is safe. As most Sanitary Authorities will rarely or never have to deal with an outbreak of typhus, there is no need to dwell on what is required to combat it effectually. The Authorities of the few large towns where typhus yet lingers, know what to do, and are doing it. Typhus is, and always has been, associated with dirt and overcrowding. Wherever it is epidemic, these conditions obtain. Should a case be imported into

any district, it should be at once removed to hospital, and the premises where the patient was lodged disinfected and cleansed with the most scrupulous care.

Notification should also be promptly sent to the Medical Officer of Health of the district from which the patient came.

I have found the clothes of typhus patients exceedingly difficult to disinfect, so as to make them absolutely safe, and I should recommend their being destroyed by fire.

Typhus is especially liable to be disseminated by tramps.

Typhoid fever.—There is comparatively little direct evidence as to the incubation period of typhoid fever. This is partly accounted for by its not being infective in the sense or in the degree that typhus and scarlatina are infective. Then the attack commonly comes on so insidiously its nature is not readily recognised, and the rash is scanty and not very distinct. According to Quain's Dictionary, the incubation is probably in most cases about twenty-one days. The range seems to be from one day to eleven weeks. It may, I think, be taken that the disease is wholly latent for about a fortnight; then there is a loss of appetite, furred tongue, headache, pain in the limbs, chilliness, and a regular rise of temperature from day to day. The spots may begin to appear on the fourth or fifth day, but not usually till the seventh day of the fever, or later. It is thus usually three weeks after inception before the disease can be recognised and notified. The fever lasts from twenty-one to thirty days.

The irregular chills, headache, and pains in the limbs may be absent, in which case diarrhoea will probably be the first symptom to attract attention. The signs of invasion in this disease are generally so indefinite that the patient often remains at his ordinary occupation for days after the temperature has begun to rise, and possibly does not consult a doctor till a week has elapsed. About this time the eruption begins to appear, and continues coming out for at least a week.

During the third week the morning remissions of temperature are more marked, showing the patient is beginning to improve, or less marked, indicating that the patient is sinking into a "typhoid state." In the course of the fourth week, and for a day or two after, if the patient is to recover, and escape sequelæ, the temperature gradually falls to normal. If the patient continues well for a fortnight after defervescence he may be discharged, as there is no risk of his infecting others. His infectiousness commences with his first symptom.

A person who has been with a typhoid patient may ordinarily, but not certainly, be considered safe after three weeks' quarantine. If the person has been strictly cleanly he has run little risk of being infected.

In typhoid fever, as in cholera, all matters which the patient discharges from the stomach or bowels are peculiarly infective, and where local conditions exist, can operate at a considerable distance from the sick. The patient's power of infection is ordinarily by means of these discharges tainting food, air, or drinking water ; and precautionary

measures should therefore be directed at preventing such contamination. The discharge, cast without previous disinfection into a drain, cesspool, or midden, infects the excremental matters with which it mingles. The discharge also infects bedding, clothing, towels, &c., which it soils, and renders these, if not efficiently disinfected, liable to spread the disease to places to which they are sent to wash. It follows that by leakage from a drain or cesspool, or by cast-out slops or washing water, infective material may get access to wells or other sources of drinking water, and impart to enormous volumes of drinking water the power of propagating the disease.

When, therefore, a Medical Officer of Health is investigating an outbreak of typhoid fever, he will bear in mind that the source of infection may be:—

- (1) A polluted water supply.
- (2) Milk, directly polluted with discharges of patient, or to which specifically polluted water has been added for adulteration or for washing cans.
- (3) Other food, directly or indirectly polluted with discharge of patient. House flies may convey the discharge to milk and other food.
- (4) Clothes fouled with discharge of patient. Such clothes may retain the infection for a long time—two or three months probably.

It is just conceivable that the source of pollution may be portions of discharge dried and carried in the air as dust. In any case the infection would not be conveyed far in this way.

An imported typhoid case will not serve as a

source of infection if he is attended to in a proper and cleanly manner. However, to insure this, initial cases should if possible be isolated in hospital, and great care should be taken in disinfecting and cleansing infected clothing, bedding, &c., and premises.

As this disease, in its mode of access to the body, and the way it is propagated, so closely resembles cholera, when typhoid fever appears in a district or its neighbourhood, it might be well to issue a circular to householders, similar to the one recommended in my notes on cholera. In districts where pail-closets are used, and in any district where practicable, a covered pail to receive excreta should be left at every house where a typhoid patient is being treated. The pail should be charged with a disinfectant, changed daily, and the contents cremated.

Typhoid fever, like epidemic diarrhœa, is ordinarily most active during warm weather. As Mr. Spear remarked, in a report on an outbreak of typhoid fever at Pemberton, "There is much ground for the belief that the typhoid contagion may lie dormant in the soil for prolonged periods, becoming again active during the heat of summer."

According to the well-known Report of a Committee appointed by the Clinical Society of London to investigate the periods of incubation, &c., "An epidemic due to milk contamination may be expected to cease at or about the end of the second week after the arrest of the contaminated supply; but an epidemic due to the contamination of a public water-supply may not come to an end until the end of the fourth

week after the source of specific pollution has been removed. Where an epidemic can be traced to well-water its duration may be very much more prolonged, and no general statement as to the probable date of its spontaneous termination can be made."

Relapsing fever, formerly confused with typhus and typhoid fever, is quite distinct from either. It is distinguished from typhus by the occurrence of the relapse, and from typhoid fever by the absence of intestinal lesions. In this disease, as in others in this group, the period of incubation varies much—the range being from less than a day to three or four weeks. It may be wholly latent for about a fortnight. Then there is probably a little malaise and nausea, followed by rigors, headache, and pain in the back and limbs. There is also fever, which may run rather high, hurried breathing, a cough, a flushed face, and some yellowing of the skin over the rest of the body. The yellow skin is considered characteristic. There is generally no rash, but not uncommonly rose-coloured spots appear on the chest, abdomen, and limbs. They are scarcely distinguishable from the spots of typhoid fever, but smaller. This rash may come out on the third day of the fever, or not till the fifth, and disappears in a day or two. In some epidemics the appearance of a rose rash has been the rule. After the onset it is probably five or six days before the disease will be recognised. The persistent yellow in the skin, and the rash, if present, will help the practitioner to a correct diagnosis. The dulness over the spleen is

always increased, and usually the dulness over the liver is increased. There is also often distressing bilious vomiting and much thirst. After these symptoms have continued from five to nine days, there is a sudden crisis (which may be marked by diarrhœa, profuse perspiration, a rigor, &c.), and immediately the patient feels well. The crisis and the accompanying fall in the patient's temperature are almost always at night. The relapse generally occurs on the fourteenth day after the fever originally commenced, thus the intermission is of varying duration. The relapse is ushered in by rigors and lasts from three to five days, the symptoms being those of the primary fever and as severe. The second crisis is also abrupt, and followed by convalescence. Rarely there is a second relapse, and even a third and fourth—the symptoms in these being less severe. During the intermission and after the relapse the temperature is sub-normal.

Although one of the names given this disease is "famine fever," epidemics have occurred when work was abundant and there was no scarcity of food. Still it is eminently a disease of the very poor, and commonly associated with destitution. As a rule it is seldom fatal.

Relapsing fever is due to the presence in the patient of a characteristic micro-organism, unlike any other, which was demonstrated twenty-three years since. The disease may be regarded as infectious from the onset till the patient is convalescent and the normal temperature of the body is restored—a period extending usually to three or four weeks.

A person exposed to infection, who after three weeks' quarantine remains quite well, is probably safe.

In presence of an outbreak of relapsing fever a well-advised Sanitary Authority would, as a first step, see to the isolation of all cases notified and the efficient disinfection of infected premises, clothing, &c. Then it might be expedient to communicate with the Guardians of the Poor, with a view to their giving especial relief to the destitute. In the third place, a special investigation should be made as to the domestic environment of those affected. If necessary, of course, the whole question of the housing of the poor should be considered. In 1870, when relapsing fever was epidemic in Liverpool, it was found that many of the dwelling-houses of the infected were built on foul foundations (midden refuse) or on insufficiently drained sites, and that many of the infected lived in cellar-dwellings in filthy courts.

Mumps is characterised by an inflammatory affection of the salivary glands, and of the parotid gland in particular. It may be noted here that in the other three diseases in this group, inflammation of the parotid is occasionally seen.

On the length of the incubation period in mumps, the Report of the Clinical Society Committee contains the following conclusion:—
“The interval between the exposure to the source of infection, and the onset of parotitis in mumps is most commonly about three weeks, a day more or a day or two less.” It is occasionally as long as twenty-five days, and more rarely as

short as fourteen days. In my little book on incubation periods (published in 1884), the interval from exposure to the onset of parotitis is stated to be about eighteen days—range eight to twenty-five days. There seems to be ordinarily about three or four days of premonitory symptoms, though these amount to little more than general malaise, with some slight fever, and are generally overlooked.

In a typical case the glandular swelling probably reaches its height in about four days, and in three days later the temperature is again normal. The infectiousness in mumps begins with the earliest symptom, and the patient is probably more or less infectious till about three weeks after the commencement of the glandular swelling.

Mumps, like measles, is so very infectious that it has often been communicated to companions before the Sanitary Authority has notice of the initial case. Being a disease of children and young persons, information of cases is as a rule mainly derived from school attendance officers. The Sanitary Authority can do little except recommend, and try to obtain such isolation for the patient as is practicable at his home. Children from infected houses should be kept from school, and after recovery of the patient, infected things should be disinfected. It is seldom necessary to close a school on account of the prevalence of mumps.

GROUP IV.

COMMUNICABLE DISEASES COMMON TO MAN AND SOME ANIMALS, IN WHICH THE INCUBATION PERIOD IS GENERALLY LONG AND UNCERTAIN.

THIS group includes tubercular disease and actinomycosis (sometimes mistaken for tubercular disease), and tetanus and hydrophobia, a pair of diseases which also in some respects resemble each other.

Tubercular Disease is classed by the Registrar-General under four headings :—

- (1) *Tabes mesenterica*.
- (2) Tubercular meningitis (acute hydrocephalus).
- (3) Phthisis.
- (4) Other forms of tuberculosis, scrofula.

All tubercular disease (in theory) is infective, the source of infection being minute organisms, termed bacilli, or their spores, capable of prolonged vitality in a dry state.

In infants and young children tubercle is often deposited in the membranes of the brain, causing inflammation of the membranes and brain, hydrocephalus, convulsions, headache, sickness, &c. The wasting of the body in *tabes mesenterica* is due to tubercular disease of the mesenteric glands, probably owing to the micro-organism having been introduced in the alimentary canal. The various forms

of disease known as scrofula or struma are due to the micro-organisms having gained access to the parts affected in various ways. Phthisis pulmonalis, and consumption, are names given to tubercular disease of the lungs, which appears to be about two-and-a-half times as frequent and fatal as all other forms of tubercular disease taken together.

Tubercular disease is common among oxen and cows ; not quite so common among swine, rabbits, domestic fowl, &c., and occasionally affects sheep. There is, therefore, a risk of tubercular disease being acquired by human beings eating meat or drinking milk infected with tubercle. Indeed, the probable source of infection of those who suffer from tubercular disease other than pulmonary, is infected milk, human or bovine, and infected meat, including glands, tissue, &c.

In phthisis the source of infection appears to be mainly the phlegm coughed up from diseased lungs, portions of which are allowed to dry, and carried about as fine dust, or on minute fragments of cotton fibre, &c., rendering the air infective.

When the infecting micro-organisms find their way into the body, if favourable conditions for their growth exist, they multiply, producing nodules (tubercles), which tend to soften. The discharges from the softened tubercles contain the living bacilli and their spores, and what the phthisical patient spits up contains these often in enormous numbers.

After a person has been infected, a long time elapses (months or even years) before material

discharged by him contains large numbers of bacilli and is actively infective ; but after he has begun to discharge bacilli, the quantity tends to increase and may go on increasing for years.

As tubercular disease may affect any organ or tissue of the body—and phthisis (tubercular disease of the lungs) is said to cause nearly one-fourth of the deaths occurring in human beings during adult life—it is manifest that some exceptional measures should be taken for its abatement.

First, it should be brought officially under the surveillance of the Sanitary Authority ; in other words, cases should be compulsorily notified. As, for the present, this is not permitted, the only way the Authority can ordinarily obtain information of cases is by inviting voluntary notification, as has been done at Manchester, Salford, Oldham, &c.

Secondly, Sanitary Authorities should, by means of handbills and otherwise, disseminate among the people locally some elementary information as regards tubercular disease—in particular that it is communicated chiefly by dried and pulverised phlegm (from consumptive patients), carried in the air as dust, and that this may be prevented by easily applied measures of cleanliness.

Thirdly, Sanitary Authorities should, through their officers, visit houses in which cases have been notified, report as to the state of the premises, and remedy defects noted, see that steps are taken for burning the infective material, or discharging it into sewers, as well as for

cleansing infected rooms and things from time to time.

Fourthly, Sanitary Authorities should make regulations, and see that they are carried out, for the inspection of cattle in dairies, for the ventilation, cleansing, draining, and water supply of dairies and cow-sheds, for securing the cleanliness of milk stores, shops, and vessels, for prescribing precautions to be taken against infection, &c. Such regulations are often made, but seldom faithfully carried out. Tuberculosis of the udder is the form of the disease especially infecting milk, and this can, in most cases, be detected with certainty.

The Authority should also recommend the boiling of all milk to be used for food, thus rendering it absolutely safe.

Fifthly, the Sanitary Authorities should, through their officers, inspect, far more efficiently than has been done hitherto, all slaughterhouses and butchers' shops, and if possible, obtain the destruction of meat infected with tubercle. The Authority should also recommend the thorough cooking of all meat to be used for food, as diminishing any risk of infection from tubercle.

Sixthly, the Sanitary Authority should arrange for the bacteriological examination of the phlegm from cases of lung disease of doubtful character, when the medical practitioner in attendance or Medical Officer of Health desires that this should be done. This is with a view to obtaining definite knowledge on which to base action.

Seventhly, as cases of phthisis are not received

into ordinary infectious hospitals, and it is not expedient to treat them in general hospitals, Sanitary Authorities should take steps to obtain a provision of hospital accommodation, especially for cases in the early stage, which are probably curable, and cases in the late stage, when they are most infective.

Actinomycosis.—I have not seen many cases of actinomycosis in cattle, and have reason to believe it is less frequent in man. My introducing it into these notes at all is due to its occasional close resemblance outwardly to some forms of tuberculosis. The disease manifests its presence in the form of tumours, ulcerations, and abscesses in various parts of the body, especially the head and neck. The new growths characteristic of the disease, according to their gross appearances, have been called wens, polypi, cancer of tongue, lung tubercle, bone tubercle, lumpy jaw, &c. The nature of the disease is indicated by the presence of a micro-organism, which is not in the least like the tubercle bacillus. Inside the mouth the disease appears as nodules, and attacks the jaws, especially where there are bad teeth. The disease may appear in the nasal cavities, gullet, windpipe, and lungs. The wens (tumours in or just under the skin) may grow to a great size, or break down early, and discharge their contents.

In the pig actinomycosis commonly attacks the throat and milk glands. This disease is less widespread and, on that account, a less serious disease than tuberculosis, but like scrofula, it affects so many parts of the body, a carcase

infected by it should not be regarded as fit for the food of man.

There is no doubt it is spread by means of the parasitic organism associated with it, which is contained in the discharges from the broken-down wens, &c. These organisms obtain access to the body, and where they lodge multiply, probably taking very many months to produce effects large enough to attract attention.

All that Sanitary Authorities can do is to see that slaughter-houses, butchers' shops, and cow-houses are efficiently inspected, and that no part of a carcase infected with actinomycosis is allowed to be used for human food.

Tetanus is a specific infective fever, the symptoms of which are not unlike those produced by the poison strychnine.

It may ensue from any wound in any part of the body, in any state of the wound, or without any apparent wound; occurring, however, more frequently when the wound is in a part exposed to earth or dirt. Twelve years ago it was found by experiment to be due to the introduction into the system of a micro-organism in soil taken from the streets or cultivated land. The spores of this organism, protected from air and light, may retain their vitality for a year or more.

The tetanus bacillus has not only been detected in earth, but in the dirt between the boards of room-floors, and in animal excrement, especially that of the horse. The bacilli have been found to a depth of two metres from the earth's surface, but not lower; they grow and multiply in manured fields and in the stable. Sheep and oxen are often affected. As regards

human beings the disease is most common among agricultural labourers, gardeners, soldiers on campaign, barefooted children, &c. The bacillus forms its poison exceedingly slowly, and the organism is ordinarily soon destroyed by the tissue cells.

Tetanus appears never to be produced through the bacillus being swallowed, but probably always through its being received into a wound, so-called idiopathic attacks being probably cases in which the wound has been so slight as to escape notice. In the human subject the period of incubation (*i.e.*, before there are even local spasms) is said to be from one to twenty-two days. The bacilli remain localised entirely in the region of the wound, but the poison they generate is absorbed from the seat of inoculation and widely diffused. The shorter the incubation period the more severe the disease.

The spores may remain latent in the tissues till long after the wound is healed, and yet finally develop into bacilli which in turn make the toxins capable of producing the muscular spasms and tension characteristic of lock-jaw.

If the first spasms are not, as frequently they are, in the neighbourhood of the wound, they are in the muscles of the neck, jaw, and face. If the symptoms go no further the patient commonly recovers; if the muscles of the back or side or abdomen become affected, a fatal issue may be looked for.

Fortunately in this country tetanus is not a common disease, yet it may become common, for in some countries it has occurred as an epidemic.

There is not much the Sanitary Authority can do, except by diffusing a little useful information upon the subject. So little is known at present about tetanus that the common belief is that it is not infective, but the ordinary outcome of a severe wound between the thumb and forefinger. Indeed, so ignorant are most people of the true nature of tetanus that it is usual for country folk to apply earth to a wound, and tie up the wound with the earth in contact, probably with the idea that earth will check the bleeding.

I would suggest that Sanitary Authorities should, by such means as are in their power, instruct the people that in respect of wounds, as in all other matters, infinite cleanliness is of first importance. The wound should be washed till free of all foreign substances, and soaked and dressed with an antiseptic solution. The patient should be kept quiet, protected from draughts, and all external irritants.

Antitoxin has been proposed as a remedy for tetanus, and it may be that in the near future some efficient way of protecting the system against this disease may be made accessible to all.

Hydrophobia, or rabies, never arises spontaneously, and in the human subject the onset of the disease has always borne a definite relation to some such injury as the bite of a rabid dog or cat or wolf, or the licking of an abraded surface by a dog or cat which may afterwards have developed symptoms of rabies. Besides the animals mentioned, horses, deer, rabbits, and guinea pigs may be affected. The material

causing the disease is contained in the saliva of the animal, which, in biting a man or animal, transmits the poison. There may be no symptoms for a month or two, and in some cases for a year. Then the wound becomes slightly itchy and uncomfortable, and later on grows exceedingly hot and painful. In a short time the patient is feverish and thirsty, pale and anxious looking. The facial muscles are drawn, and the expression of the face is one of horror. On the second or third day the patient becomes much more excited and restless, and looks suspicious. With increased fever comes rambling delirium, and with increased thirst difficulty in swallowing, till the very sight of water terrifies the patient. Next muscular tremors come on and increase, and violent spasms (as in tetanus) are readily stimulated. Finally, the spasms increase in intensity and frequency, and the patient dies at last, suffocated.

Of course, only a certain proportion of those bitten by a rabid animal develop hydrophobia.

M. Pasteur, finding that fluids and tissues taken from a rabid animal varied in their virulence, that virus could be intensified or modified, and that different animals were affected in a different degree by the same virus, set himself to discover whether it was possible so to alter the resistance of an individual that a virulent hydrophobic material would have little or no effect on the tissues. How he solved this problem it would be out of place to describe here. Suffice it to say that he did solve it satisfactorily. This there is now abundant evidence to prove.

The first human being inoculated against hydrophobia was Joseph Meister (aged 9 years), who, on July 4th, 1885, was severely bitten on arms and legs by a dog which was undoubtedly mad. The worst of the wounds were treated with carbolic acid, but not till twelve hours after they had been inflicted, so that in the ordinary course there would have been little prospect of the child escaping hydrophobia. The child never had the faintest symptom of the disease. Since that time an enormous number of patients have been inoculated, and the percentage of deaths after inoculation has been very much lower than among patients not inoculated.

M. Pasteur's researches on the production of immunity against the attack of this disease were carried on under the conviction that in hydrophobia the exciting cause is a poison the most probable source of which is a vegetable organism. Drs. Woodhead and Wood explain the results of Pasteur's treatment by saying that the treatment consists in causing the tissues to acquire a tolerance before the microbe has had time to develope. The tissue cells are acted upon by increasingly active virus, each step of which acclimatises the cells for the next stronger virus, until at length when the virus formed by the micro-organisms introduced at the time of the bite comes to exert its action, the tissues have been so far altered or acclimatised that they can continue their work undisturbed in its presence ; and treating the micro-organisms as foreign bodies, destroy them. Thus the factor of time between the bite and the beginning of the treatment is most important, and other things being

equal, the greatest success is obtained with patients treated within two or three days of being bitten.

The duties of the Local Authority as regards hydrophobia, or rabies are obvious. First, such steps should be taken as may be practical for informing the public as to the nature of this disease. Secondly, the Authority must, of course, see that all cases are duly reported, and dealt with, so as to prevent the spread of the disease. In the third place, a combined attempt should be made by all Local Authorities to continue to require the muzzling of all animals liable to take and communicate the disease, till it is stamped out. Finally, arrangements should be made for sending to the Pasteur Institute any human being bitten by a rabid animal, as promptly as possible.

GROUP V.

COMMUNICABLE DISEASES COMMON TO MAN AND SOME ANIMALS, IN WHICH THE INCU- BATION PERIOD IS GENERALLY SHORT.

IN this group I place two maladies only known to attack man by transmission from the lower animals—anthrax and glanders. These diseases have no marked points of semblance beyond those noted in the above heading, except that the bacilli of both may enter the body through the respiratory tract or through a wound, so that there are apparently two distinct forms of anthrax and two distinct forms of glanders. There is a great difference in the bacilli—those of anthrax being large and easily distinguished, those of glanders small and difficult to distinguish. Again, whereas anthrax seems to be allied to septicæmia, glanders more closely resembles tubercular disease and actinomycosis.

Anthrax, or splenic fever, is an infective disease due to the presence of a comparatively large bacillus, which multiplies rapidly in the blood of its host, and may be easily cultivated outside the body. The bacillus cannot develop unless it obtains a free supply of oxygen, and spores are never developed in the bacillus that grows in the blood. However, where the bacilli make their way from the lungs into the mouth, or from the bowels, and are discharged, spores may be readily formed. Thus, an infected

animal may infect whole herds or flocks and render the pasturage infective. A diseased animal, therefore, should be at once killed, and either burnt or buried 6ft. or 7ft. deep (a depth at which the temperature will be below 54 deg. Fah. and oxygen will not be obtainable). Dung from infected animals, or blood, may be disinfected with 5 per cent. of carbolic acid.

Sheep and oxen, which readily take anthrax, from eating infected material, are but slightly susceptible when the bacillus is introduced into the tissue through a wound; but rabbits, guinea-pigs, mice, &c., are readily susceptible when the disease is inoculated.

In man, anthrax commonly affects butchers and those who attend on animals, the infectious material obtaining access to the body through a wound—often a very slight one. A man has a scratch, probably on his face or one of his hands or arms, and in killing or attending to an infected animal, inoculates himself. In from one to three days irritation is noticed at the point of inoculation. A day later there is a very small blister (containing clear serum) in the centre of an inflamed area. Then the contents of the blister become brown, and other blisters form round it. Gradually a brownish-black eschar is formed, indicating the beginning of an area of mortification. Before the nature of anthrax was understood, this used to be called a malignant pustule. If this be promptly and freely excised, and the wound well cauterised, the disease will be effectually cured. If this be not done, and the inflammation be allowed to proceed, a considerable area becomes

affected, part of which mortifies, and probably, sooner or later, the bacilli find their way into the system, giving rise to general anthrax, as indicated by symptoms one associates with "blood poisoning."

Woolsorters' disease (so-called because it especially attacks persons employed in processes of sorting various wools and hairs in worsted manufactories) is anthrax derived from infected wool and hair. The disease was long known under this name at Bradford, though not recognised as anthrax; and about 1863, when Van mohair* was introduced as a textile fabric, the cases became more numerous. The disease occurred in two forms—that characterised by the malignant pustule already referred to, or by a minor pustule or boil, and that having no external lesion.

"Internal anthrax" so-called, which among woolsorters appears to be more common and more fatal than the other form of the disease, has ordinarily a rather longer incubation period. After, say, from two to twelve days, chilliness, profuse perspiration, flushing of the face, and shortness of breath, &c., indicate the onset, and these symptoms are somewhat suddenly followed by stormy toxic manifestations, characterising the fully developed disease—high fever, delirium, cramps, purging, vomiting, &c., usually followed by the death of the patient in from two to five days. In cases not fatal at this time, improvement begins about the sixth day. Even after

* The fleece of the goat inhabiting the Van district in Asia Minor.

much improvement the patient may have a relapse, and succumb to secondary inflammatory processes, in which the lungs are specially apt to be involved. There are, however, cases of internal anthrax in which the disease is very mild—the symptoms being headache, depression, nausea, restlessness, dimness of sight, constriction of the chest, and some cramp in the calves. Often quite early in the disease symptoms of various acute local congestions arise. The lungs are specially apt to be affected, and the physical signs of that condition, with the occurrence of a copious, frothy, blood-stained expectoration, are noted. Pleurisy, too, sometimes comes on, an extraordinary amount of serum being rapidly effused into the pleuræ. The spleen is usually enlarged.

By what channels do the bacilli reach the system? In the case of butchers and attendants on cattle, infection appears to be usually through a wound, but no doubt occasionally through the alimentary tract. Woolsorters handling dirty fleeces, wool, or hair, work in air polluted with dust, and if the animals from which the fleeces come have had anthrax, specifically infected dust. This dust may infect through a wound or the alimentary tract, or it may be inhaled and reach the system through the respiratory tract.

The chief remedial measures recommended for the relief of woolsorters are to the following effect:—

(1) That bales of noxious wools or hair before being opened be steeped in water for ten or twelve hours, and in case the bales do not

freely admit water, that they be opened so as to do so.

(2) That after this the wool or hair be placed in a sud of hot water (about 120 deg. Fah.) and washed, then passed through rollers and sorted while still damp.

(3) That sorting-rooms be well ventilated, the floors swept daily, the walls and ceilings thoroughly cleansed once a quarter, and the walls washed with lime-wash mixed with carbolic acid once a year.

(4) That no wool, hair, or other material be kept in a sorting-room so as to interfere with the proper ventilation thereof.

(5) That no meals be taken in a sorting-room or food kept there, and that proper provision be made for sorters to wash in or near the sorting-room.

The duties of the Local Authority as regards anthrax are to disseminate information about it; to see that all cases in cattle or sheep are duly reported and dealt with, so as to prevent the spread of the disease; to investigate all cases occurring in man, and to see that all preventive and remedial measures are enforced as required.

Glanders is an infective disease especially associated with the horse and ass, but occasionally attacking other animals. The malady is due to and communicated by micro-organisms (in size and general appearance closely resembling the tubercle bacilli) which find their way into the tissues, occasioning small nodules in the skin or mucous membrane. These nodules are grey, and about the size of millet

seeds; but after a time they grow, become yellowish in the centre, soften, and break down. Usually the disease begins in and about the nostrils or lips, affecting frequently the respiratory passages and lungs. Secondary abscesses occur in various parts of the body, the infecting material being apparently carried by the blood or the lymph stream. When the disease, instead of being in the respiratory tract, is under the skin in various parts, causing nodular swellings along the lymphatics, it is called "farcy." In man it usually takes this form.

In the early stage of the disease in the horse, there is commonly a copious discharge of water or watery matter from the nostrils. By this and the softened contents of the nodules the disease is spread. The nodules, after discharging their contents, form ulcers, and run into one another.

Glanders and farcy are not always acute forms of disease, but may both be chronic. The disease is, however, always infective. Indeed, so-called "occult glanders," the only external manifestation being occasional slight nasal discharge, is infective. As glanders is readily and directly communicated by the nasal discharges, characteristic nodules are soon produced—probably in from a few days to a fortnight. The intensity of the disease is in ratio to the rapid formation and softening of the nodules. The human subject, like the horse, may be inoculated through wounds or scratches, or through the application of the nasal discharge of a glandered animal to the mucous membrane of the nose or mouth. Acute farcy, in man, runs a very rapid course, the average period

being from two to three weeks, and perhaps one patient in ten may recover.

At a temperature of 77 deg. Fah. the bacilli grow and develop outside the body, especially in such material as fodder, manure, and stable refuse. However, a temperature, of 131 deg. Fah., continued for ten minutes, is sufficient to destroy the bacilli.

A stable which has been occupied by a glandered horse may remain infective for some weeks. It may be efficiently disinfected by a good washing with boiling water. A solution of carbolic acid (containing 4 per cent.) applied to the nasal discharge will make it innocuous in a minute.

The duties of the Local Authority as regards glanders are to disseminate information about it; to see that all cases are duly reported and dealt with, so as to prevent the spread of the disease; and to inspect, more efficiently than is usual, all knackers' yards, and prevent the sale of glandered carcasses.



