have devoted most attention to climatic treatment make mistakes in particular cases.

Mountain climates are usually colder than the plains, and the loss of heat from the surface of the body acts as a stimulus and promotes nutritive changes. At the same time the rarefaction of the air stimulates the respiratory system, and an actual increase in the number of blood corpuscles is said to occur, to compensate for the smaller amount of oxygen inhaled at each breath. Now it is clear that the stimulus applied needs a certain degree of vigour in the subject, if the reaction is to be complete and beneficial. This warns us that we must select cases for this treatment with some care. We should choose, if possible, those in whom the disease is not far advanced, so that they are not exhausted by it; young persons rather than old; persons who appear comparatively robust and well nourished, possessing plenty of vitality and power of adaptation.

Very much the same considerations apply in a general way to the choice of a bracing seaside place, but here the stimulus is less sharp, if it may be so expressed—there is not the rarefaction of the atmosphere to compensate, only the stimulus of bracing air. Not only early, but moderately advanced cases may do well in such resorts as our East Coast watering places, but for debilitated cases we must choose a time of year when the air there is warm—summer, not winter—though robust patients do well here in the winter also. For more debilitated sufferers who cannot endure cold, warmer spots must be selected, either on our South Coast or inland. (I speak of our own health resorts alone, for I believe that they are just as beneficial for consumptives as are places on the Continent.) Sometimes this class can advance from a warmer to a more bracing climate as their strength improves. Persons with a weak circulation, shown by coldness and blueness of the extremities and feeble pulse, need warm climates. Those with weak digestions also seldom bear cold places well, and old persons have naturally less reserve power on which to draw. The existence of much emphysema of the lung usually contraindicates very bracing air. Nevertheless, I can only repeat what I said before, that each case is a law to itself, and advice is largely experimental.

It has often seemed to me that we are too much inclined to recommend residence or wintering abroad, even in cases which are unsuitable. I have especially in my mind the case of a gentleman owning a large estate, who had fairly advanced tuberculosis and was sent by one of our climatic authorities to winter in Egypt. He went, but found the hotel life much less comfortable than his home conditions. The journeys to and fro were exhausting, and it took him a considerable period of time to recover from the ill effects of his expatriation. We have also to consider all the circumstances of our patients—their social proclivities and dislikes, as well as their physical conditions—and also the general amenities, if I may so express it, of the places to which we send them. The question of hotels and lodgings is not an unimportant one, and the financial means of the individual sufferer bear largely on the question of the most suitable course for him to pursue.

A sea voyage has been recommended for the cure of consumption from very early times and considerable faith is still placed in it by many. On board ship there is, theoretically, plenty of fresh air, of a bracing kind, which stimulates the appetite. Rest is almost enforced, for there is little opportunity of exercise. On the other hand, there is, in the first place, the risk of sea-sickness, which may be very exhausting. There is the possibility of bad weather, when the passengers are to a great extent confined below in somewhat defective conditions of ventilation; the food is often monotonous and unappetizing; the doctor on board may be somewhat of a novice; and on the larger ships there is also the temptation to more social gaiety than is suitable for an invalid. Here again we must weigh all the circumstances of each case, and not prescribe this mode of treatment indiscriminately.

If I may sum up what I have been endeavouring to put before you it is that there is no specific remedy or universal mode of treatment for tuberculosis of the lungs. Neither tuberculin, nor rest, nor work, nor mountain air, nor a sea voyage, nor a sanatorium, is an infallible remedy to be administered to all, as we give quinine for malaria or mercury for syphilis. We have to study the individual patient, his circumstances and his idiosyncrasies, and,

armed with this knowledge, to try to raise his resistance to the bacillus and its poisons. Fortunately the human organism has considerable powers of resistance, if it is not debilitated by adverse conditions; and though we must, above all, endeavour to recognize cases early, before the disease has advanced far, yet even in advanced cases there is always hope of arrest of the disease or at least of a temporary reprieve and prolongation of life.

A SERIES OF ONE THOUSAND INOCULATIONS, CHIEFLY IN PRIVATE PRACTICE.*

BY
H. WARREN CROWE, M.D. OXON.,
YELVERTON.

AMONGST the many scientific achievements which have marked the opening of the twentieth century there is, perhaps, none which stands out so remarkably as the treatment of disease by means of vaccines. The medical world still waits to see the actual results of this new treatment before surrendering unconditionally to its claims. It seemed to me, therefore, that the publication of a series of 1,000 inoculations, tabulated without either suppression of unsuccessful cases on the one hand or italicizing of successful ones on the other, might be of use to the members of this society in assisting them to appraise the actual merits of vaccine-therapy when shorn of the inevitable halo of romance which ever enshrouds a new thing.

I do not propose to enter in any way on the technique of inoculation work, either by describing the methods of preparation of the vaccine or of determining the opsonic index, as these things are well described in other papers, but I should like to express my indebtedness to Allen's book on the opsonic method of treatment, which gives such extremely lucid descriptions of all the laboratory technique involved, though one might suggest that in some respects the work is made unnecessarily laborious.

As to the site of injection and method of sterilizing the skin, however, a word or two may not be out of place. The anterior surface of the thigh is the least painful, and in any patient who is at all needle-shy, I always inject in this region, varying each time the exact locality. Other situations are into the extensor surface of the upper arm, the deltoid, or into the skin of the abdomen, but I have usually avoided the conventional site, namely, that of the intrascapular region, as the skin is so tough that it is extremely difficult to avoid hurting the patient. Sometimes I give the injection deeply into the muscles, sometimes subcutaneously, but I do not believe the result is affected. One tries to avoid puncturing a venule, as this gives rise to an ugly looking bruise, owing to extravasation of blood under the skin.

The vaccine is usually taken direct out of a stock bottle by plunging the needle of a sterile syringe through a drop of lysol placed on the rubber cap which covers it. The amount required is withdrawn. A drop of pure lysol is then placed on the site of injection and the needle driven into the skin through the drop. This method, originally introduced, I believe, by Sir A. E. Wright, has proved quite safe. I have never known any local trouble arise at the point of injection as the result of sepsis.

Wright's method is also used for sterilizing the syringes, oil at 140° C. being substituted for boiling water. This prevents rusting of the needles. The syringe with which I have operated latterly is one made by S. Maw and Sons, which screws into a metal case and can therefore be preserved in an aseptic condition.

The vaccines have all been home-grown, with the exception of acne and tuberculin. The former I have never succeeded in making, and the latter is easily and cheaply purchased in bulk from the makers, Meister, Lucius, and Bruning. No vaccines have been administered by the mouth.

I have grouped my cases as far as possible under the causative germ, and have then divided each group into three classes, Alpha, Beta, Gamma. My reason for substituting these symbols for the time-honoured "cured," "improved," and "failed," or "died," is that my most important work is in phthisis, and in this disease it is

* Read before the Plymouth Medical Society, November 16th, 1910.

largely a matter of pious opinion whether a case is cured or not. At any rate, from recently published sanatorium statistics, it does not appear that all the cases which have figured on the books as discharged cured have entirely confirmed that judgement. I am certainly under the impression that the cases of phthisis which have been marked Alpha in my series are cured, but the time is too short to admit of a certain judgement being passed upon them. I prefer, therefore, to say that these Alpha cases fulfilled my most hopeful anticipations. The Beta cases did well at the time, but are known to have relapsed afterwards. The Gamma cases in phthisis did badly and died; in other diseases, unless specially mentioned, simply failed to respond to vaccine treatment.

Series I deals with cases in which the chief infecting agent was a staphylococcus.

SERIES I.

Nature of Infection.	Number of Cases.	Alpha.	Beta.	Gamma.
Whitlow	4	—	—	—
Furunculosis	7	7	—	—
Acute otitis media	3	3	—	—
Dermatitis	2	2	—	—
Lymphangitis	2	2	—	—
Abscess	2	2	—	—
Carbuncle	3	3	—	—
Impetigo	1	1	—	—
Pyæmia	1	—	1	—
Acne	5	3	2	—
Suppurating eczema	—	—	1	—
	32	28	4	0

In such a list as this, embracing as it does chiefly common and curable ailments, it is certainly not enough to state simply the fact that so many cases were treated, and that such a percentage were cured; for, with the exception of acne and suppurating eczema, all of which had been extremely chronic and of long standing, there is no reason to suppose that the series of cases here enumerated would not have recovered without any vaccine treatment whatever. At the same time it is only fair to say that they were bad of their kind. In the staphylococcus infections, then, the length of time required to attain a cure must be one of the standards by which the value of vaccine-therapy must be judged, and, I would also add, the extent of the damage done to the tissues.

Bearing, then, these two criteria in view, I will run over the different infections treated.

Whitlow.—Four cases, three on the finger and one on the great toe. Two of these I caught within twenty-four hours of the incidence. There was redness, swelling, and acute pain at night preventing sleep. In each case 100 million of a stock vaccine was given, and the next day all sign of the lesion had disappeared. One I incised, as pus was present, and had been oozing for ten days. Fifty million resulted in cure within forty-eight hours. The fourth was a bad case, with an open sloughing mass at the end of the finger. Fifty million was followed by cure in a week.

Furunculosis.—Seven cases. These had on the average two doses apiece, and in general I gave one of 50 million followed in three days by 150 million. Three of the cases were extensive. These were free from their trouble in three weeks at the longest, the other cases were cured in less than a week. None have suffered relapse to my knowledge, and all had histories of some considerable time.

Acute Otitis Media.—Three cases. One was a young man of 22, who developed the trouble after an attack of influenza, which was already complicated by dilatation of the heart. There was a scanty thick discharge. He complained of extreme aural pain and complete loss of

hearing on one side, with diminished hearing on the other. Both mastoid processes were very tender, and his condition caused me considerable anxiety. He had five inoculations of an autogenous vaccine varying from 50 million to 500 million during five weeks, when cure was complete and hearing perfect. The other two cases were in children, and I brought them to the notice of the society last year. It will be remembered that the organism was a Gramming diplococcus, I believe an aberrant staphylococcus, and that though the children were very ill, and one of them had a quantity of pus over the region of the mastoid, and possibly antral infection, yet both recovered rapidly and completely within three weeks. The children were sisters, and developed middle-ear disease as a result of a virulent "cold in the head." I am at the present moment treating a case of chronic otitis media of several years' standing in an adult who is stone deaf as the result of former catarrhs. The discharge, which was very offensive, ceased after the first dose of 50 million of an autogenous vaccine of *pyocyanus*, though it has recurred slightly from time to time, but the giddiness and pains in the head, from which the man suffered acutely, have completely disappeared. One can almost vouch for the effect of the vaccine in this case, as the symptoms reappeared, when, after the third dose, he refused further treatment, alleging perfect cure. Since then, on resuming treatment, the symptoms have again cleared up. The deafness has been in no way improved.

Dermatitis.—Two cases, both in children and accompanied with the formation of bullae and in one of pus in the blebs. The first seemed to be cured after one dose of 10 million—this an infant of twelve months; the other required some six weeks' treatment.

Lymphangitis.—Two cases, both acutely febrile, and each on the arm, arising from a small infection of the fingers. Both had but one dose, and the whole condition—original wound, axillary glands, and inflamed lymphatics—had become apparently well in forty-eight hours. I was much astonished at the result in these two cases, especially as it has been alleged that vaccine-therapy is only of use in chronic infections. My experience is rather that the more acute the condition the more dramatic is likely to be the result of an inoculation of the causative germ, provided only that the dose is approximately correct. One would suggest that it should be so small that it can by no means add fuel to the fire, and increase appreciably the amount of toxin circulating in the blood, yet at the same time it must be large enough successfully to stimulate the organism to repel the invader. Every vaccine that is made differs, but, roughly, in acute disease I have found 50 million of staphylococci to be the right dose. In all acute infections it seems better to use a stock vaccine, one of which one knows approximately the effect of a given dose, than to give an autogenous vaccine, where the dose may be numerically the same, yet of great difference in toxicity. I am inclined to adduce the rule, "In acute disease give stock vaccines."

Abscess, Carbuncle, Impetigo.—I have no particular comment to make on these, six cases in all, except that they all did well and seemed to heal quickly.

Pyæmia.—One case only. I did not see that case, but prepared the vaccine and took the opsonic index regularly. I believe the medical man in attendance was satisfied that the vaccine had assisted greatly in the improvement which took place, though afterwards other conditions developed which proved fatal.

Acne.—This is one of the original diseases treated by vaccines, and it is one of the most difficult to cure. A certain number of cases seem to do splendidly, with any vaccine you like to give them, either staphylococcus or acne, and these are the younger subjects, whereas others again are only relieved after a very prolonged course. I had one man under treatment for a year. He got well eventually after I had given him both vaccines combined. I have a case now on hand, a girl of about 25. I do not know whether she will get well. She is peculiar in that she gets sharp reactions even from so small a dose as 1 million acne and 5 million staphylococcus. But as long as reactions occur, one is not inclined to give up hope. The great secret, I believe, is to find the ideal dose and to stick to it.

SERIES II.
Infections by the Streptococcus.

Nature of Infection.	Number of Cases.	Alpha.	Beta.	Gamma.
Septicaemia	2	2	—	—
Wound infection	1	1	—	—
Nasal catarrh	1	—	—	1
	4	3	—	1

Streptococcus is one of the most difficult germs to work with, but it is well worth the labour. Although the cases are small in number, the results correspond with such as have been published in the quite dramatic success which has attended their administration in acute conditions.

It was due to the streptococcus that I first embarked on this line of work, and possibly that accounts to some extent for my kindly feelings for this virulent germ.

The following are the details of two cases :

1. A woman was run over by a motor bus with some twenty people in it. The car passed over both her legs, and, though it caused a very great amount of laceration of the tissues, yet no bone was broken. I attended the woman for some time, but the damaged tissues broke down, the inflammation extended, and eventually I was confronted with a leg which I can only describe as a bag of pus from end to end. I tried my best to promote drainage, but the temperature continued to rise, and I decided that the only chance to save the woman's life was to call in a surgeon to amputate. I had sent some pus up to Dr. Freeman at St. Mary's Hospital, and he reported a streptococcus infection and advised a vaccine. This he kindly prepared, and I had given the patient half a million dose without apparent effect. At this time she was very bad, with a temperature remaining about 104°, and in a thoroughly septicaemic condition. Two days later, in accordance with Dr. Freeman's directions, I gave 3 million. At her husband's special request I consented to wait three days before resorting to radical measures, though it was not without extreme anxiety and misgiving. On the third day I found, to my relief, that the temperature had dropped from 105° to normal, where it remained, except for a slight rise about a week later. The leg proceeded to heal most satisfactorily.

I firmly believe that in this case the vaccine not only saved the woman's leg, but probably also her life.

2. My other case of septicaemia was in a boy of 10, who developed acute pain in the ear after an operation for tuberculous glands. The abscess broke and a streptococcus was found in the discharge. Notwithstanding free drainage he continued feverish. Symptoms of septicaemia appeared and I considered his condition precarious. He was given two doses of half a million each at an interval of three days, when the temperature dropped; after a further 1 million the discharge cleared up.

The wound infection was a psoas abscess associated with high fever. The vaccine was of great benefit. This case is noted as a cure under tuberculin.

The nasal catarrh was apparently caused by an extremely long streptococcus. No conceivable dose had any effect whatever. This case was a complete failure under my treatment.

SERIES III.
Infections due to B. Coli Communis.

Nature of Disease.	Number of Cases.	Alpha.	Beta.	Gamma.
Nephritis	3	2	1	—
Mucous colitis	1	—	1	—
Ischio-rectal abscess ...	1	1	—	—
Appendix abscess	1	1	—	—
	6	4	2	—

All the above rather varied cases began treatment under opsonic determinations, as I found it easier to arrive at an effective dose through this means. In some cases, which seemed particularly wayward, indices were observed throughout. I find that the most usual dose was from 2 to 5 million.

Nephritis.—Three cases. Tenderness in the loin, an enlarged kidney, and coli bacilluria. Two uncomplicated

cases got well, but one in which the kidney was also tuberculous relapsed after a few weeks' inoculation and eventually died.

Mucous Colitis.—My single result conforms to the statements of others: temporary improvement, amounting to freedom from mucus and pain; relapse; vaccines then useless.

Ischio-rectal Abscess.—This had been operated upon, had become chronic, and refused to heal. Vaccines were immediately successful.

Appendix Abscess.—I cannot claim this case in any way as a triumph for vaccine-therapy. I do not know what effect the vaccine had, but at the operation, within forty-eight hours of the commencement of an acute attack, a dirty, sloughing appendix bathed in foul pus was removed, and I made a vaccine from a scraping of the organ. Two doses were given and it seemed possible that the post-operative temperature, which subsided six hours after the first dose, had been favourably influenced. On general grounds one cannot but feel that in every case of this kind, where large amounts of pus are found in the peritoneum, a vaccine should be prepared and administered as soon as possible, when I venture to think that the accident of fatal peritonitis would seldom if ever occur. In my case the child recovered without incident, but so she probably would have done without the vaccine.

SERIES IV.

Infections of the Respiratory Passages other than Tuberculous, and Caused by the Pneumococcus, M. Catarrhalis, Bacillus of Friedländer, and the Bacillus of Influenza.

Nature of Disease.	Number of Cases.	Alpha.	Beta.	Gamma.
Nasal catarrh	2	2	—	—
Bronchial catarrh with emphysema	5	4	—	—
Unresolved pneumonia	1	1	—	—
	8	7	0	1

Nasal Catarrh.—These two cases did well. One was a chronic case of twenty years' standing, in which the infection was by Friedländer's bacillus; the frequent colds ceased, and the constant hawking diminished greatly. The other case was associated with hay fever, and began with an attack of influenza four years previously. From this potential "carrier" the *B. influenzae* was isolated. It existed, apparently, in almost pure culture (with just a few *M. catarrhalis*). A vaccine from the former had no effect, whilst the latter succeeded. This case bears out Allen's contention that the *B. influenzae* requires another germ to assist it in its growth, and that its injurious qualities depend on the existence of this symbiotic companion.

Bronchitis and Emphysema.—Of the five cases two were infected with the pneumococcus alone, two by the *M. catarrhalis*, and one by a mixture of both, together with Friedländer's bacillus. All did well with the exception of one case, a very "dry" case, in which the sputum was extremely scanty. This case did not respond at all to vaccine treatment. I would regard such a "dry" case as unfavourable on general grounds. I was delighted with the improvement shown by the other patients, and my results fully bear out those of Carmalt Jones. It is so seldom that one can do anything to mitigate the distressing cough and dyspnoea which periodically prostrates these unfortunates. One old gentleman was so dependent on his vaccine that when he went abroad for the winter he took some doses away with him and used them as required. In a few months he sent for a fresh supply. I would strongly recommend this treatment in cases of "cardiac asthma," where bronchial secretion causes discomfort.

Unresolved Pneumonia.—One case. Here I found Friedländer's bacillus in pure culture. I gave two doses of 50 million and 100 million respectively with an interval of three days. The whole condition cleared up within forty-eight hours after the first inoculation, although the man had been in bed for a fortnight with high temperature, and extreme dyspnoea on the slightest movement. He was in fact very ill. The whole of the right chest was

involved. I would like to draw special attention to this case, for the reason that the causative germ was that of Friedländer. I have made many vaccines from growths of this bacillus to combat secondary infection in phthisis and always with remarkable benefit. From my own experience I would say that to find the Friedländer bacillus present is sufficient ground on which to base an excellent prognosis for vaccine-therapy. Further, since the vaccine is easy to prepare, the opsonic index easy to determine, and the results are so favourable, it is not surprising that this particular germ should be a general favourite amongst laboratory workers.

SERIES V.
Infections by the Tubercle Bacillus.

Locality.	Number of Cases.	Alpha.	Beta.	Gamma.	Still under Treatment.
Larynx	1	—	—	—	1
Skin (Bazin's disease)	1	1	—	—	—
Kidney	2	—	1	1	—
Peritoneum	3	3	—	—	—
Glands	4	4	—	—	—
Mastitis	1	1	—	—	—
Bones	5	1	1	2	1
Lungs	20	7	3	5	5
	37	17	5	8	7

Laryngitis.—A single case. The man is steadily improving under the treatment which I have described for phthisis. No silence treatment.

Bazin's Disease.—One case, which showed two or three ulcers on the legs. It was of long standing. At Mr. Penn Milton's request I gave the patient, a young woman, two doses of T.B.E. 10000 and 5000 respectively. The ulcers healed up very quickly, but whether *post hoc* or *propter hoc* I should not care to say. This is the only case (save that of mastitis shortly to be mentioned) in which I ever gave any form of tuberculin except T.R. and its bovine equivalent, P.T.R.

Kidney.—Two cases. Both did fairly well, and seemed to encourage one at first, but later relapsed. One died. I am not favourably impressed with the benefit of tuberculin in kidney disease; at the same time, the cases I had were very advanced.

Peritoneum.—Three cases. In contradistinction to the foregoing, I found disease in this region most rapidly influenced by vaccine treatment. One of the cases was remarkable. When I began tuberculin his condition was most precarious. He had had uncontrollable diarrhoea for weeks, was extremely weak, with a rapid pulse, slight fever, and extreme anaemia (blood count $1\frac{1}{2}$ million reds). From the first dose (100000 T.R.) he began to improve and is now in splendid health, though he had one severe relapse, owing, I believe, to his ceasing treatment too soon. That, of course, is the main difficulty in all forms of tuberculosis, that patients will not submit themselves to treatment for a sufficient time to eradicate the disease. I told this man that, as he was unable to take more than 50000 mg. without an unpleasant reaction, he ought to continue, but he was obdurate—quite certain he was cured—"Why, he could walk six miles!" Six months later he paid the penalty with a severe relapse, which I thought would have finished him, for even infinitesimal doses of tuberculin caused alarming reactions. His blood count was lower than before. Then I tried "soamin." This drug seemed to act like a charm, and in a week or so, on returning to tuberculin, he made steady progress, and did not cease treatment until he had been given three successive doses of 50000 mg. without alteration in the opsonic index. At such a point I considered it safe to relinquish inoculations. He has not as yet had a relapse (some six months).

Glands in the Neck.—These cases do uniformly well under inoculations, but I am not convinced that this method is the most appropriate. Cases treated by "auto-inoculation" alone appear to have got well quicker. The

procedure is simply to examine the glands thoroughly, about once in ten days, at the same time taking care to induce a fair reaction, by rather prolonged manipulation, and to warn the patient that it is essential not to rub the glands when washing. I was astonished in one child to see several glands the size of walnuts disappear after the third rubbing—that is, within a month. At the same time daily massage is most pernicious. The following case illustrates this.

Mastitis.—Some of the members of the society will remember a young woman I brought before them with tuberculous mastitis. Both breasts were affected. She had at one time been treated by daily massage. The effect was disastrous; and in a short time the mammae, together with the axillary glands, were so enlarged, that a portion was removed by operation. The explanation probably lies in the fact that at each rubbing an "auto-inoculation" is induced, and before the phase of reaction with swelling has passed off a further reaction is set up. The immunizing power of the patient is exhausted by this rapid stimulation, and thus, in the absence of antibodies in the serum, the disease is able to advance unchecked. The patient got perfectly well, and is now district nursing.

Bone Disease.—Five cases; three of spinal caries, one a tuberculous ankle, and one hip-joint. The last is still under treatment, doing well. Such statistics as I have read seem encouraging, but my own experience is varied. True that, on the whole, the cases have been bad, but two out of five failed to respond to treatment in any way. One, the ankle, I treated at a comparatively early stage, but without effect, as the joint steadily grew worse, until first an arthrectomy was performed and finally the foot was amputated. Fortunately this last measure freed the patient from his disease. I also lost a spinal case, which I had hoped would do well, since another similar one had recovered after having been at death's door. One cannot help thinking that age has a powerful bearing on prognosis in these conditions. The cases which do best are the youngest. In all these bone diseases and also in lung trouble I have generally used vaccines prepared from any secondary infection that may be present in addition to tuberculin.

Phthisis.—Twenty cases. Five of these were desperate when they came to me and ran a downhill course from the beginning. Ten were unfavourable cases. In only 5 was the prognosis good. Of these 5, 2 are not classified under any letter, as they are still under treatment; one comes under "Beta"—a woman of over 60, who under no circumstances could lose her infection, yet for whom the prognosis in regard to expectation of life seemed reasonably good; and the remaining 2 are included in the "Alpha" list. Thus, of the 7 "Alpha" cases, only 2 seemed likely to recover under open-air treatment alone.

I feel that I can honestly claim that in a large number of my cases, and especially in these 5—unfavourable and yet I trust "cured" cases—tuberculin has done for them what no other treatment could have done. Such treatment had been tried for periods varying from six years to eighteen months without improvement.

That the inoculation of phthisis is difficult no one who has tried it will deny; but why it should be more difficult, or why it is that one is more often faced by undesirable reactions in this disease than in any other, is a problem which is still far from solution. One can assert with confidence that there is a remarkable and distinct difference in the way in which the system responds to tuberculin, accordingly as the disease affects the lungs or other parts. In the first place, minute doses, even as small as one-millionth of a milligram, may cause the temperature to rise. Secondly, the opsonic curve which follows an inoculation pursues a course peculiar to this condition. Lastly, the same dose at different times, or after being repeated without harmful effect or reaction of any kind, may without warning result in a prolonged rise of temperature and distressing symptoms. Elsewhere I have attempted to explain these untoward reactions, which are usually, mark you, delayed several days after the dose, by the suggestion that, since the tuberculin causes a hyperaemia of the diseased area—and this is a well-recognized fact—therefore spontaneous autoinoculations occur as the result of such hyperaemia. Many facts seem to support this, especially the form of the opsonic curve, which shows

in these cases a double curve—a primary wave, due to the inoculation; and one or more secondary curves, due to the incidence of autoinoculations. Fortunately, these reactions are not fraught with so much anxiety as formerly, as it is possible to bring them to an end by a dose of bovine tuberculin.

This question of the bovine and the human strain is at the moment agitating the medical world, and whether one should use a homologous vaccine, or whether it is an advantage, as is claimed by Nathan Raw and by Camac Wilkinson, though on widely differing grounds, that the appropriate tuberculin to combat infection caused by the tubercle bacillus *typus humanus* is that manufactured from the *typus bovinus*, remains still unsettled. According to some searchers there is no difference between the supposed varieties, but these are now in a minority, and opinion is, I think, overwhelmingly in favour of the view that the bovine and the human tubercle bacilli belong to two separate and distinct varieties. The method I have used in the cases I am now bringing forward is that advocated in the *Lancet* of April 23rd, 1910. I would like, however, if I may be permitted, to advance the suggestion that larger doses of tuberculin than these should be more efficacious if they could be given without acute reactions. Perhaps a way may be found to control these reactions, or rather to prevent them, but until that time comes I can recommend my method with complete confidence to any medical man, whether he has experience of inoculation work or no, as being reasonably safe and most unlikely to result in harm.

Before closing my remarks there are two points I should like to touch upon.

The first is that I do not think it can be too often insisted upon, notwithstanding all that Spengler and Wilkinson may say to the contrary, that in the hands of the ordinary medical man there is grave danger associated with the exhibition of tuberculin in phthisis whilst patients are walking about and pursuing their ordinary avocations. It is only a matter of common sense after all. Tuberculin causes hyperæmia, and the more hyperæmic the lesion the more easily will a dangerous autoinoculation be induced by exercise. True the cure may be through autoinoculations; but if autoinoculations be allowed to become excessive, as they will become excessive if tuberculin and exercise are combined, then inevitably will the disease extend.

The second point is as to the length of time that it is necessary to continue treatment. Too little is known of the diagnostic tests of Calmette, Wolff-Eisner, Moro, and v. Pirquet, to adjudge their value as trustworthy guides on this question. Two excellent indications, however, remain to us, and both should be utilized before giving a definite opinion:

1. The patient should be able to take 1000 T.R. without any effect noticeable, either in the temperature or in the opsonic index.

2. After sufficient exercise to cause thorough exhaustion there should be no sign of an autoinoculation; that is to say, that the opsonic index, a far more reliable test than any subjective sensations and many times more delicate than the temperature—the opsonic index should not fluctuate.

One example of this and I have finished. A boy, whom I had considered cured, remained well for three months, then had an attack of influenza. After recovery the temperature remained above normal. The parents, afraid of a recurrence of lung trouble, kept the lad in bed. I ordered him to get up, to walk about for such time as might cause him to be fairly tired, and to send me specimens of blood taken before and at varying intervals after the exercise. I found no alteration in the index to tubercle, and I ordered him to disregard his temperature and to get up every day. The result justified this decision, for the temperature came down to normal after a few days, and in a short time he was able to return to school. The other day I heard that he had just won a quarter of a mile race.

THE next meeting of the German Psychiatric Association will be held at Stuttgart on April 21st and 22nd, 1911. Among the communications promised is one of methods of psychological investigation by Professors Kraepelin of Munich and Sommer of Giessen.

TYPHOID INFECTION.

BY

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TYPHOID fever is more common in autumn, and in consequence has been called "autumnal fever." There must be a reason for its greater prevalence at this season.

The rains of this time of year, as favouring the passage of the typhoid bacilli into sources of drinking water, have been assigned as a cause. But heavy and continued rainfall is common at other periods without a greater incidence of this disease. Such an explanation cannot, therefore, in itself be correct. Again, it may be said that the temperature in autumn is more favourable for the growth of the bacilli in media such as water, milk, and other everyday foods. This is not so, for typhoid bacilli grow best at 37° C., or about blood heat, which is a temperature belonging to the summer months. (Typhoid bacilli do not grow below 9° C. nor above 42° C.)

The fall of the leaf and fruit, it is conceivable, might produce decompositions favourable to bacillary growth; but here again the temperature would not be suitable. Flies, it is known, can and do convey typhoid; their number, however, decreases at the end of summer, and as a rule they are few and far between in October and November.

Another possible factor may be suggested: It is in autumn, when the grain has been gathered and as winter approaches, that rats and mice leave the fields and make for human habitations. One means by which they obtain entrance—as a matter of common observation—is by drain and sewage passages, especially if these be defective. (Rats themselves are apt to cause leakages and defects in improperly constructed sewage passages.)

Granted the existence of people with actual typhoid, or of human typhoid carriers whose excreta is among the sewage, where the rats live, and which it is possible they devour, it is easy to see how millions of bacilli may be present on the body, feet, jaws, and tails of these rodents, whereby food and drink may become directly as well as indirectly contaminated.

In addition typhoid bacilli may exist in the intestine of mice and rats, and their excreta in turn be a source of infection. (Proof of the latter assumption might be sought in bacteriological examination of the droppings and intestinal contents of animals in a typhoid area, and experimentally by feeding rats with typhoid germs.)

In this connexion it is interesting to note that the virulence of a great number of organisms can be increased by the passage from one animal to another, so that an attenuated and comparatively harmless growth of typhoid might, through the agency of a rat for instance, become at any time virulent and highly infective. Conveyance to fingers is probable, nor is the distance from there to the milk pail far.

Dr. J. Clements, Medical Officer of Health for Beckenham, Kent, is responsible for the statement:

Typhoid is a pure filth disease, and wherever there are facilities for human excreta to be carried to food and drink there cases of enteric will occur.

He further mentions in one of his reports that Dr. Robertson, of Birmingham, has grown typhoid bacilli from one season to another in the soil of a field.

Mr. Anderson, clerk of works at Durham County Asylum, has several times seen rats go up and down the pans of closets in the lavatories, and the workmen, on questioning them, have seen the same. There have been sporadic outbreaks of typhoid at that asylum for several years. Since 1896 the number of male cases recognized and notified has been 22. Fifteen of these were not over 30 years of age. Similarly the number of female cases has been 17, of whom 8 were not 30 years of age. The females do no outside work. Some of the above are traceable to workers on the sewage garden; some are traceable to direct infection from one patient to another; several have this in common that they slept in a large upstairs dormitory accommodating seventy patients; it is more recently built than most of the other parts of the asylum, it is well provided with closets, and is and has been free from rats.