examining them with the microscope in a drop of water we find that they will continue for an indefinite time their lashing movements, which are just as much living or vital in their character as the writhings of a worm. And, as I observed many years ago, these detached cells behave under the influence of a stimulus just like parts connected with the body, the movements of the cilia being excited to greater activity by gentle stimulation, and thrown into a state of temporary inactivity when the irritation was more severe. Thus each constituent element of our bodies may be regarded as in one sense an independent living being, though all work together in marvellous harmony for the good of the body politic. The independent movements of the white corpuscles outside the body were therefore not astonishing, but they long remained matters of mere curiosity. Much interest was called to them by the observation of the German pathologist Cohnheim that in some inflammatory conditions they passed through the pores in the walls of the finest blood vessels, and thus escaped into the interstices of the surrounding tissues. Cohnheim attributed their transit to the pressure of the blood. But why it was that, though larger than the red corpuscles, and containing a nucleus which the red ones have not, they alone passed through the pores of the vessels, or why it was that this emigration of the white corpuscles occurred abundantly in some inflammations and was absent in others, was quite unexplained.

These white corpuscles, however, have been invested with extraordinary new interest by the researches of the Russian naturalist and pathologist, Metchnikoff. He observed that, after passing through the walls of the vessels, they not only crawl about like amoebæ, but, like them, receive nutritious materials into their soft bodies and digest them. It is thus that the effete materials of a tadpole's tail are got rid of, so that they play a most important part in the function of absorption.

But still more interesting observations followed. He found that a microscopic crustacean, a kind of water flea, was liable to be infested by a fungus which had exceedingly sharp-pointed spores. These were apt to penetrate the coats of the creature's intestine and project into its body cavity. No sooner did this occur with any spore than it became surrounded by a group of the cells which are contained in the cavity of the body and correspond to the white corpuscles of our blood. These proceeded to attempt to devour the spore, and if they succeeded, in every such case the animal was saved from the invasion of the parasite. But if the spores were more than could be disposed of by the devouring cells (phagocytes, as Metchnikoff termed them), the water flea succumbed.

Starting from this fundamental observation, he ascertained that the microbes of infectious diseases are subject to this same process of devouring and digestion, carried on both by the white corpuscles and by cells that line the blood vessels. And by a long series of most beautiful researches he has, as it appears to me, firmly established the great truth that phagocytosis is the main defensive means possessed by the living body against the invasions of its microscopic foes. The power of the system to produce antitoxic substances to counteract the poisons of microbes is undoubtedly in its own place of great importance. But in the large class of cases in which animals are naturally refractory to particular infective diseases the blood is not found to yield any antitoxic element by which the natural immunity can be accounted for. Here phagocytosis seems to be the sole defensive agency. And even in cases in which the serum does possess antitoxic, or, as it would seem in some cases, germicidal properties, the bodies of the dead microbes must at last be got rid of by phagocytosis, and some recent observations would seem to indicate that the useful elements of the serum may be, in part at least, derived from the digestive juices of the phagocytes. If ever there was a romantic chapter in pathology, it has surely been that of the story of phagocytosis.

I was myself peculiarly interested by these observations of Metchnikoff's because they seemed to me to afford clear explanation of the healing of wounds by first intention under circumstances before incomprehensible. This primary union was sometimes seen to take place in wounds treated with water dressing, that is to say, a piece of wet lint covered with a layer of oiled silk to keep it moist. This, though cleanly

when applied, was invariably putrid within twenty-four hours. The layer of blood between the cut surfaces was thus exposed at the outlet of the wound to a most potent septic focus. How was it prevented from putrefying, as it would have done under such influence if, instead of being between divided living tissues, it had been between plates of glass or other indifferent material? Pasteur's observations pushed the question a step further. It now was, How were the bacteria of putrefaction kept from propagating in the decomposable film? Metchnikoff's phagocytosis supplied the answer. The blood between the lips of the wound became rapidly peopled with phagocytes, which kept guard against the putrefactive microbes and seized them as they endeavoured to enter.

If phagocytosis was ever able to cope with septic microbes in so concentrated and intense a form, it could hardly fail to deal effectually with them in the very mitigated condition in which they are present in the air. We are thus strongly confirmed in our conclusion that the atmospheric dust may safely be disregarded in our operations; and Metchnikoff's researches, while they have illumined the whole pathology of infective diseases, have beautifully completed the theory of antiseptic treatment in surgery.

CONCLUSION.

I might have taken equally striking illustrations of my theme from other departments in which microbes play no part. In fact any attempt to speak of all that the art of healing has borrowed from science and contributed to it during the past half-century would involve a very extensive dissertation on pathology and therapeutics. I have culled specimens from a wide field, and I only hope that in bringing them before you I have not overstepped the bounds of what is fitting before a mixed company. For many of you my remarks can have had little if any novelty; for others they may perhaps possess some interest as showing that Medicine is no unworthy ally of the British Association—that, while her practice is ever more and more based on science, the ceaseless efforts of her votaries to improve what have been fittingly designated *Quæ prosunt omnibus artes*, are ever adding largely to the sum of abstract knowledge.

ON THE INCUBATION PERIOD OF VARICELLA.

BY

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THE Committee appointed some years ago by the Clinical Society to investigate, amongst other questions, the length of the incubation period of various infectious diseases, reported that the cases of varicella received by them were few in number, and not many of them would satisfy a rigid examination.¹ Hence we are induced to publish the following cases.

FIRST SERIES OF CASES.

CASE I.—Mary C., aged 4 years, was admitted into the Eastern Hospital with scarlatinal nephritis on October 18th. She was also the subject of well-marked varicella. Her mother stated that the chicken-pox eruption came out on October 16th. She also stated that another child, William C. (Mary's brother), had been removed to the North Eastern Fever Hospital on October 14th, and that there were no other cases of chicken-pox in the house. William C. had scarlet fever when removed, but not chicken-pox. For the subsequent history of William C., and for the notes of the cases to which he gave rise, we are indebted to Dr. Birdwood (Medical Superintendent) and Miss Sturge, M.B. (Assistant Medical Officer), of the North Eastern Fever Hospital. William C. was admitted into a ward in which there had never previously been a case of varicella. On November 2nd he was attacked with that disease; this gives an incubation period of at least nineteen days. Supposing the mother's account of the onset of the rash in Mary's case to be correct (and the ap-

¹ Clinical Society's Report on Incubation and Contagion; Supplement t Vol. xxv of *Transactions*, page 212.

pearance of the eruption rather confirmed her statement in that it looked recent), it would seem that varicella may be infectious before the outcome of the rash.

W. C. gave rise to the following cases. He was at once removed from the ward; but

CASE II, G. W., developed varicella on November 15th, incubation period at least thirteen days. G. W. was at once removed from the ward. He probably, however, infected:

CASE III, W. E., who developed varicella November 27th, incubation period at least twelve days;

CASE IV, H. F., who developed varicella on December 3rd, incubation period at least eighteen days;

CASE V, C. P., who developed varicella on December 4th, incubation period at least nineteen days;

CASE VI, M. W., who developed varicella on December 4th, incubation period at least nineteen days.

SECOND SERIES OF CASES.

CASE VII, R. E., was admitted into Charity Ward of the Eastern Hospital on October 14th. There had been no previous cases of varicella in the ward. He developed varicella on October 27th; incubation period at least twelve to thirteen days. He was at once removed; but

CASE VIII, A. A., developed varicella on November 11th; incubation period at least fifteen days. He was at once removed from the ward; but

CASE IX, F. M., developed varicella on November 27th; incubation period at least sixteen days. This patient was not removed from the ward till November 29th. The next case,

CASE X, G. S., developed varicella on December 18th, an incubation period of at least nineteen days.

THIRD SERIES OF CASES.

CASE XI, T. G., was admitted on April 25th into a ward (at the Eastern Hospital) which was, and had been free from chicken-pox. On April 29th another child developed the eruption of varicella, and was at once removed; but T. G. became attacked with varicella on May 12th. In this case the incubation period was not shorter than thirteen days nor longer than seventeen, supposing in the latter case T. G. to have been infected as soon as he was admitted into the ward. It is possible that T. G. may have been himself infected before admission to the hospital, which would make the incubation period not less than seventeen days.

FOURTH SERIES OF CASES.

C. B., aged 4 years, was admitted into a scarlet fever ward of the Eastern Hospital on November 8th, at 4.30 P.M. He came from a large workhouse school where several cases of varicella had recently occurred. On the morning of November 10th a well-marked varicella rash appeared, and the child was at once removed to an isolation ward. His case gave rise to the following:

CASE XII, Amy W., aged 10 years. Rash and pyrexia on November 27th, an incubation period of seventeen to eighteen days; and

CASE XIII, Rose R., aged 4 years. Rash on November 28th, an incubation period of eighteen to nineteen days. This child was the subject of scarlet fever and diphtheria, and was in a small ward adjoining the general ward. She never came into actual contact with or near to C. B., but both children were attended by the same nurse.

FIFTH SERIES OF CASES.

The following cases occurred at the London Fever Hospital, and some were under the care of Dr. Sidney Phillips, to whom we are indebted for permission to publish:—

Lionel B., aged 2 years, was admitted into a scarlet fever ward on January 2nd, suffering from scarlet fever. On January 3rd the eruption of varicella appeared. The ward had been previously free from this disease. He was at once removed; but his case gave rise to the following:

CASE XIV, Nellie L., aged 4 years. Rash and pyrexia January 17th, an incubation period of fourteen to fifteen days;

CASE XV, Elsie T., aged 4 years. Rash January 17th, incubation period fourteen to fifteen days;

CASE XVI, Frank F., aged 5 years. Rash and pyrexia January 21st; incubation period eighteen to nineteen days;

CASE XVII, Lydia D., aged one-and-a-half year. Rash and pyrexia January 21st, incubation period eighteen to nineteen days;

CASE XVIII, Lily B., aged 11 years. Rash January 21st, incubation period eighteen to nineteen days;

CASE XIX, Emma G., aged 11 years. Rash January 21st, incubation period eighteen to nineteen days.

It should be added that in all the above cases, when a patient suffering from varicella was removed from the ward, the bedding and linen were also removed and disinfected.

From the above cases it appears:—(1) That the incubation period of varicella is somewhat variable. (2) That it is never shorter than twelve days. (3) That it may be as long as nineteen, and is commonly longer than fourteen days.

OSTEOTOMY IN A MAN OF FORTY-TWO.

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I am led to report the following case of osteotomy for genu valgum, rather by a consideration of the difficulties encountered than by the results obtained.

The patient, J. T., came under treatment while I was acting as outdoor assistant in a colliery practice near Morpeth, Northumberland. He was greatly hindered in his work by the condition of the leg, and was anxious that something should be done for its relief. The patient, a collier, 42 years of age, looked somewhat older, was and had always been a fairly healthy man though his condition could hardly be called "robust." His knee had begun to trouble him when he was about 15 years old, the deformity getting at first almost imperceptibly worse: but during the last eight years it had increased so rapidly as almost to incapacitate him from his work in the pit.

On examination I found the right knee in a typical state of "genu valgum," the leg being thrown out at an oblique angle with the thigh. And so great was the obliquity, that although the measurement from patella to external malleolus showed less than half an inch difference on the two sides, there was shortening in the affected limb to the extent of 3 inches; while, when the patient stood fairly on both feet, the interval between his heels was 18 inches.

On April 21st, 1895, with the assistance of Dr. Rutherford of the Morpeth Dispensary, chloroform was administered, and I divided the femur by Macewen's method, care being taken to secure thorough asepticity of the wound. The limb was put on a "Liston's" long splint, without perineal extension, and remained so for four weeks. There was no rise of temperature, the parts uniting cleanly from the first; and when at the end of four weeks the splint was removed and the leg encased in plaster of paris, the ends of the bone had united and the incision was quite healed up. When in the beginning of June I left for South Africa the patient was able to go about on crutches with a patten on the sound foot.

The state of the patient on December 5th, 1895, is reported as follows:—"J. T. has started work again and says he walks very well now, although he feels the knee a little stiff and weak. It is, however, improving. When he stands with his knees together, the space between the heels is less than 6 in. in place of 18 in., and there is very little shortening. The operation has been a success, although he has not had all the chances he should have had, his circumstances having been so poor that he had to lack good support, and sometimes even necessary food."

Macewen has successfully carried out the operation up to the age of 46¹; but in his cases the conditions for after-treatment were much more favourable. In this instance the patient's age was 42 years. The collier's hut in which he lived, was operated upon, and nursed, contained but three rooms, and in these lived two families, five adults and their children; consequently the conditions as to quiet and cleanliness left much to be desired, yet the operation was a fairly successful one. It was to this overcrowding and prevalence of dirt, rather than to the patient's age, that I referred in speaking of the difficulties encountered.

¹ *Science and Art of Surgery*, Erichsen. Vol. ii, pp. 530 (Edition 1888).