Short Clinical Lectures

ON

THE FIRST PRINCIPLES OF MEDICINE.

Delivered at King's College Hospital.

BY

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II (*concluded*).

ON THE VITAL CHANGES OCCURRING IN THE MUCUS-CORPUSCLE.

I HAVE seen an entire corpuscle move onwards in one definite direction for a distance equal to its own length or more. Protrusions would occur principally at one end, and the general mass would gradually follow. Again, protrusions would take place in the same direction, and slowly the remainder of the corpuscle would be drawn onwards, until the whole had been removed from the place it originally occupied, and advance onwards for a short distance in the mucus, in which it was embedded. From the first protrusions smaller protrusions very often occur, and these gradually become spherical, but remain attached by a narrow stem, and in a few seconds perhaps again become absorbed into the general mass. From time to time, however, some of the small spherical portions become detached from the parent mass, and become independent masses of germinal matter, as represented in the figure.

An imperfect notion of these wonderful phenomena may perhaps be formed by reference to the drawing. The three outlines mark the changes in form which occurred in one of these so-called mucus-corpuscles within the period of a single minute. The protrusion, when it first takes place, appears very transparent, as at *a*; but several of the small particles, like those in the salivary corpuscles, make their way into the projecting portion with a peculiar

A mucus-corpuscle from perfectly transparent healthy mucus expectorated from the air-tubes, under a power magnifying 3000 diameters. (The 1-26th of Messrs. Powell and Lealand, with the tube of the microscope lengthened by four inches.) *a*. An outgrowth actually forming, with a small portion completely detached. *b*. Another detached portion growing independently.

oscillating movement. These particles are in active motion in every part of the mass. Although the movements of the included particles are not generally so active as those in the salivary corpuscles,

they occur not only in the mucus-corpuscles, but in the young epithelial cells detached from the mucous membrane of the nose and trachea. The very transparent matter which first protrudes is, however, not devoid of corpuscles; for, with care in arranging the illumination, very delicate spherical particles, varying greatly in size, can be now and then distinguished. In rapidly growing cancer-cells a very transparent matter which assumes the spherical form is often seen. This is living germinal matter, also composed of minute and very delicate particles. Like germinal matter in other situations, it is coloured by carmine.

The movements above described closely accord with those taking place in the *amæba*, and are of the same nature as those which occur in the protoplasm of many plants, easily observed in the *valisneria*, and the appearance of the living matter under very high powers of the microscope is precisely the same in all cases. Similar movements probably occur in cancer and pus; for I have seen appearances in both these rapidly growing morbid structures exactly corresponding to those observed in the mucus corpuscles *after* the changes have ceased in consequence of death. Indeed, it is almost certain that such movements are constant in every kind of living matter. In some instances they continue for some time after the living matter has been removed from the surface upon which it grew. In other cases—and we are not surprised that this should be so in the higher animals—death occurs the instant the conditions under which the living matter exists are but slightly modified. These movements must not be confounded with the Brunonian molecular movements which occur in pigment and other cells. The movements I have been describing cease when the germinal matter dies. The latter, as is well known, take place whenever mineral insoluble particles are suspended in limpid fluid.

What is the nature of these particular movements? Are they physical, or are they vital? There are no examples of any movements like these occurring in any form of matter destitute of life. The matter which moves exhibits the same general characters which I have mentioned belong to living matter in all living organisms; namely, a granular appearance, with a tendency to assume the spherical form when free; a certain amount of viscosity; a tendency to divide; the property of being rapidly coloured (in a few seconds) with an ammoniacal solution of carmine.

The movements I have described clearly show that there exists a tendency in the mass to separate into smaller portions; and probably this is due to a tendency of the particles of which the mass is composed to separate from each other. By division, these masses multiply in the soft viscid mucus in which they are imbedded. Sometimes the entire mass divides into two equal portions; and sometimes it gives off several small portions, each of which may grow. If but a very small portion be detached, and supplied with nutrient pabulum, it *grows* into a mass like that from which it is, in fact, but an off-set. But how does it grow? Certainly not by the addition of particles on its exterior; for the whole mass exhibits the same general character, and differs in most important characters from the matter which surrounds it. There is no matter around it

like that of which it is composed; yet the *pabulum* must be around it; and that it is possible for fluids to pass very rapidly into the central portion of the mass, is proved by the fact that carmine solution actually does so penetrate in a few seconds. Now, since there is a tendency for portions to move away from the general mass, is it not clear that such movements must cause fluids to flow in the opposite direction—that is, towards the mass and into its substance, or into the substance of the particles of which it is made up, and, if each component particle be regarded as a spherule, towards its centre? So that we are brought to the conclusion that living particles move *from the centre*, while the inanimate *pabulum* is caused to pass *towards the centre*. We may suppose that this *pabulum*, having come into contact with, and perhaps passed into, the substance of living particles, itself becomes living, and moves from the centre by virtue of new powers it has acquired, just as other particles have moved which were animated before.

The further prosecution of this inquiry would involve me in a discussion upon the nature of vital force, but this must be postponed for the present; and I shall also defer the consideration of the precise part the germinal matter takes in the formation of the viscid mucus, as it is part of the same question.

In conclusion, I would venture to offer the following opinions upon this difficult question. It seems to me there is much evidence in favour of the inference—

1. That the movements described in the mucus-corpuscle are due to peculiar endowments; and, as such movements take place in living matter alone, it is right to speak of them as *vital*.

2. That physical and chemical changes take place in the fully formed mucus; but neither this nor any form of formed material (cell-wall, intercellular substance, etc.) is endowed with *vital* power.

3. That the only part of any cell-tissue, viscid mucus, etc., actually concerned in vital changes, is what I have termed *germinal matter*. If a structure be destitute of germinal matter, or if this substance have ceased to change, the structure is not living, but dead.

4. *Pabulum* is *inanimate*. Germinal matter *lives*. Formed material was once alive (as germinal matter), but no longer possesses *vital* powers.

ANIMAL REPRODUCTION. In experiments upon the lower animals, such as the polype, it is most extraordinary that, although cut up into various pieces, each particular piece will grow up into the form of the primitive stock; the head, if separated, will reproduce the body and the tail; and if you cut off the tail, you will find that that will reproduce the body and all the rest of the members, without in any way deviating from the plan of the organism from which these portions have been detached. And so far does this go, that some experimentalists have carefully examined the lower orders of animals—among them the Abbé Spallanzani, who made a number of experiments upon snails and salamanders,—and have found that they might mutilate them to an incredible extent; that you might cut off the jaw or the greater part of the head, or the leg or the tail, and repeat the experiment several times, perhaps cutting off the same member again and again; and yet each of those types would be reproduced according to the primitive type; nature making no mistake, never putting on a fresh kind of leg, or head, or tail, but always tending to repeat and to return to the primitive type. (*Huxley*.)

Addresses and Papers

READ AT

THE THIRTIETH ANNUAL MEETING OF THE BRITISH MEDICAL ASSOCIATION.

[Held in LONDON, AUGUST 5th, 6th, 7th, and 8th, 1862.]

OBSERVATIONS ON THE OCCURRENCE OF MALIGNANT PUSTULE IN ENGLAND: ILLUSTRATED BY NUMEROUS FATAL CASES.

By WILLIAM BUDD, M.D., Clifton; Honorary and Consulting Physician to the Bristol Royal Infirmary.

"Le médecin doit, dans ses premières études, jeter un coup d'œil sur les animaux qui se rapprochent le plus de l'homme."—*Chaussier*. (Adopted from Régnier.)

[Concluded from page 241.]

This paper would be incomplete were it to conclude without a word on treatment. As, with one exception, all the cases of which I have any knowledge ended fatally, it will be readily understood that I have nothing of my own to offer in the way of cure. Unfortunately, there is too much reason to suppose that, in some of the number, the measures intended for relief were worse than futile, and only hastened death. This was certainly the case with the incisions made in two of the instances which fell under my own eye, and with the leeches that were applied in some others. This uniformly fatal issue is the more mortifying because, in its first period, the disease seems to be in a great degree under the control of remedies.

Rayer, who has had great experience of it, says, in reference to the disease during this period, "its progress may very certainly be arrested by the use of caustics." Nothing can be more positive or unqualified than this statement. The testimony of all the best continental observers is to the same effect.

In Bourgeois's valuable paper, and in Enaux and Chaussier's monograph, numerous cases are given in illustration, which seem to leave no doubt of the fact. Of the various caustics in use the evidence appears to preponderate in favour of the potassa fusa. It is right, however, to state that Chaussier, and one or two other writers of equal eminence, prefer nitric acid or the chloride of antimony. For information as to this and other practical points, I think it best, however, to refer to the original authorities.

From all this it is evident, as I remarked at the outset, that everything hangs on the recognition of the disease in its first stage. In that stage I have myself never seen it. As the subject is comparatively new to the profession in England, and as the point is one of such vital importance, I shall not, perhaps, do amiss in inserting here one or two descriptions of the malady as it presents itself at its onset.

Anthraxion with Diffuse Gangrene. "This variety begins with a considerable degree of pruritus, which is succeeded by the appearance of a red spot like a flea-bite. The vesicle, of the size of a millet-seed at first, soon acquires larger dimensions, and if not ruptured by the patient bursts spontaneously. Twenty-four or thirty-six hours after the attack, a small, hard, and circumscribed nucleus, having the form and size of a lentil, is perceptible under and around the seat of the vesicle. In the circumference of this, a soft, but still resisting, swelling, of a reddish or livid colour, covered by and by with secondary sero-sanguinolent vesicles, at first isolated, but speedily becoming confluent, is de-