FURTHER OBSERVATIONS ON THE CONDITION OF THE BLOOD AFTER DEATH FROM SNAKE-BITE.

By G. B. HALFORD, M.D.,

Professor of Anatomy in the University of Melbourne.

[MR. JAMES PAGET, F.R.S., in forwarding the subjoined communication, writes:—"I enclose a slip from Professor Halford of Melbourne, on the growth of cells in the blood of animals killed by snake-poison. It tells the result of a continuation of experiments of which you were so good as to insert an account in your JOURNAL during the summer. I hope you will deem it right to publish this also; for the facts are very strange—so strange, that it may be well for me to add that Professor Halford, writing to me, says, that I may 'depend on the patience and fear of error' with which he has worked at them."]

Professor Halford, in again bringing this subject before the Society, said he should confine his remarks this evening to the life of the foreign cell he had the honour of describing to the Society at the June meeting, and to the passage of the poison from the mother to the embryo. Perhaps nothing was more difficult and tedious than to trace the growth of a microscopic particle, but he would endeavour in a few words, and by the help of diagrams and microscopic preparations, to present to the Society all he had been enabled as yet to learn on this important subject.

The following was the result of numerous experiments on dogs and cats. Blood soon drawn from an animal bitten by a snake contains a larger amount of nebulous or finely granular matter than is usually seen. After the lapse of one hour this nebulous matter is much increased in quantity, lying in the intervals of the red corpuscles, and presently it breaks up into small masses, out of which the cell is gradually evolved. In two hours after the bite the cells may be seen in great numbers, but very indistinct. From this time every further microscopic observation shows them in great abundance; and from the sixth to the twelfth hour they may be seen in perfection, macula and nucleus included. Whilst this is taking place the nebulous matter disappears. The nebulous matter must therefore be regarded as the germinal matter out of which the cells are formed. At this time the cell-wall is extremely delicate, the macula very plain as a bright particle, and the nucleus either single, reniform, double, triple, or multiple. It would appear that the cells are now increasing in number by division of their nuclei, and the minute particles, having the vibratory movement of molecules in fluid, may be seen between the nucleus and cell-wall. On one occasion he watched for upwards of half an hour a constant revolution within the cell of a particle corresponding in all particulars to a macula. This particle passed regularly round the nucleus at a uniform rate, revolving both in the direction of and against the current of the fluid in which the cell was floating, reminding one of the movements seen in *Valisneria*, etc. Twenty-four hours after the bite, the cells attain their greatest size, and, supposing the animal then dead, have probably ceased multiplying, and are simply living; or perhaps growing, the nucleus being usually single, the macula extremely distinct, and the cell very large. It is not uncommon at this time and later to see a cup-shaped hiatus in the cell-wall from which the macula has escaped. The cells may be seen in the blood for many days, their presence seeming to be preservative against putrefaction. Where they have most room, as in the *venæ cavæ*, cranial sinuses, and cavities of the heart, they attain the greatest size and most circular form. In every instance the cell-wall is very elastic, and accommodates itself to surrounding pressure.

To ascertain how soon after inoculation these cells appear, is a matter of some difficulty. It is not necessary to suppose that at first they are very numerous; and, in order to detect them so early, it might require fifty or a hundred microscopes and observers at work at the same instant. Still, from their having been seen two hours after the bite, and from all we know of the rapidity with which new formations occur, both in health and disease, it is doubtless extremely soon. Of one thing we are sure; viz., that the nebulous germinal matter from which they spring is within a few minutes diffused all over the body; for, supposing an animal to die in five minutes, and hence all circulation stopped, the cells are as readily seen in its blood a few hours after death as if it had lived as many hours as we say minutes. The macula is, doubtless, a particle of germinal matter; but, whether it is to be regarded as that from which the whole cell has sprung, or whether it has been detached from the nucleus and is destined for independent existence, it is difficult to say. The fact that it is almost invariably large when the cell is small, and small when the cell is large, favours the first view. Perhaps the most impor-

tant point must be left still undecided. Has the blood built up these cells, directly or indirectly, from the germinal matter of the serpent? The answer to this question the Professor would endeavour to give at a future meeting; but in either case the result was the same: Storing up of force in the new growth, at the expense of the nutritive properties of the blood, and by perversion of those chemical changes necessary to the maintenance of the life of the infected animal.

That the germinal matter exists in a state of extreme minuteness, the following experiment shows. A cat, being with young, was inoculated with the poison, and, dying in three hours, her four kittens were removed from the womb. They were dead, and the blood of all contained the foreign cells, as did that of the mother. To pass from the cat to the kittens, the germinal matter must have penetrated the delicate membrane covering the tufts of the foetal vessels. If the poison of serpents can thus readily be traced through the body, and from parent to offspring, why should not the path of all infections be tracked? Some months ago, it was stated that it was conjectured that a child had been bitten by a snake. No doubt need ever exist for the future; a drop of blood will always furnish the necessary evidence. He trusted the subject would not be let fall to the ground in Victoria, for it would assuredly be taken up at home. It had been to him a matter of surprise that, while this colony very properly appoints men to survey her coasts, explore her skies, and the ground beneath her feet, no one systematically explores her diseases, a subject in which the rich and poor, the living and those about to live, are equally and deeply concerned, and in comparison with which many other subjects that excite her people are trifles. The Professor would not conclude without thanking Dr. Gummow of Swanhill for having sent him a fine supply of snakes, nor without expressing his acknowledgements to Messrs. Lawrence and Ashworth for their ready assistance in his many experiments.

AN IMPROVED METHOD OF EXTRACTING IN CASES OF CATARACT.*

By CHARLES TAYLOR, M.D. Edin., F.R.C.S.E.,

Surgeon to the Nottingham and Midland Eye Infirmary.

I WAS led early in the year 1865 to devise an operation which should combine the advantages of the old flap and those of Schuff's method, without the peculiar risks attendant upon either, and I found that extraction could be accomplished through a wound small enough to admit (without danger) of manipulation of the eyeball, and yet of sufficient dimensions to permit the exit of the lens without the introduction of any instrument into the eye. I arrived at this conclusion by various experiments upon animals' eyes, and some operations on the dead subject, and have since exclusively adopted the method I am about to describe in all cases of senile cataract coming under my care. I was then satisfied that, with the enlarged pupil and extended surface for operation, obtainable either by a combined or preliminary iridectomy, the large flap formerly employed became unnecessary, and that an extended flap-like incision, comprising a little more than one-third of the corneal surface, if made well back in the corneo-sclerotic junction, would suffice for the ready exit of the lens without the use of any traction instrument. I found, also, that a wound, flap-like in form, yielded more readily to the advancing lens than one more strictly linear in its character, while it was still sufficiently slit-like to close without artificial apposition, strong enough to resist protrusion, and too resilient to permit of accidental reflection.

I may mention that I had fully worked out this method and demonstrated its advantages before I had heard of Professor von Græfe's modification of linear extraction, and before any account of his experiments had been published. In my first operations I used a ground-down cataract-knife, reduced to about the size of the secondary cataract knives sold in most cases of ophthalmic instruments. I have since used Von Græfe's knife, and Bader's smallest sized iridectomy-knife; provided, however, that the incision is made within the prescribed limits, it is of little consequence what instrument we employ. If the narrow bladed knife be used, it should be entered in the corneo-sclerotic margin about the junction of the upper and middle third of the cornea, passed across the anterior chamber, and brought out at a counter-puncture similarly placed. The site of the entrance puncture should vary somewhat, according to the size of the globe, as a very shallow flap will suffice if the cornea be of more than average dimensions, and a deeper one will be required if it be below the standard size; as a rule, the knife is entered three lines lower down than in Von Græfe's method,

* Read before the Surgical Section at the Annual Meeting of the British Medical Association in Dublin, August 1867.