

was originally made to work its highest marvels. Amateurs desirous, therefore, of effecting all that the optician desires to be accomplished, should urge him to supply the proper kind of glass cover for which the objective was made. The screw collar is but a rough compensation, at the best, for a variable thickness of glass when the instrument is pressed into extraordinary degrees of amplification, such as 5200 diameters for Powell and Lealand's new immersion one-eighth objective.

There is still a wide field of research open to amateurs and opticians in using other immersion fluids besides water, —a subject upon which the writer has been engaged for some time past.

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OBSERVATIONS *on* PATHOLOGICAL CHANGES *in the* RED BLOOD-CORPUSCLE. By J. BRAXTON HICKS, M.D. Lond., F.R.S., &c. (With Plate VIII.)

THE numerous observations which have been made within the last ten or twelve years by the means of reagents have done much to elucidate the construction and composition of the red corpuscle of the blood; but it has struck me, as probably it has done others, that these observations fail to satisfy the cravings of the vital pathologist, inasmuch as most of the reagents employed are not of a kind to be found in the body, or likely to come into contact with the corpuscle in the living subject; nor could the physiologist derive any satisfactory information from the effect of these kinds of experiments, because they were diverse from anything likely to be found in the healthy body, so that he could not argue from the effects produced to the ordinary healthy processes. I mean he could not, by them, presume to explain the growth or mode of origin of the red globule—the relationship between it and the white corpuscle or leucocyte. The rapidity of the change which takes place in the blood on leaving the body has always hindered the satisfactory observations which were needful. Some of this difficulty has been overcome by the moist and warm stages, as also by the electrical chambers, whereby vitality and activity are prolonged.

The results of the application of reagents, however, have only supplied us with information upon cadaveric changes. In the living animal, if we except Cohnheim's discovery of

the passage of the globule through the wall of the capillary, but little has been made out to show the alterations of the corpuscle or its origin and formation, or the influence of vital forces on it. Of course, it may be rejoined that many elucidations of the structure of bodies have been arrived at by the means of reagents in a similar manner. This is true, but still, probably, had some of the energy which has been spent on the tracing the changes external to the body, been devoted to observations on the living body, more valuable information would have been yielded us.

It is not pretended that the following remarks will clear up the whole subject. They are merely a slight contribution to our knowledge in this direction, in which it appears to me that it is desirable that observers should continue.

It is many years since the observations which are here below recorded were made. The first in my note-book was in the middle of 1859, the others within a year afterwards. In the mean time the principal amount of what we know on the subject of leucocytes and the red corpuscle has been gained by numerous zealous inquirers, and thus the novelty of the phenomena recorded in them has necessarily been lessened. Yet it is hoped that, made, as they were, on corpuscles which had been for a longer or a shorter time under the influence of the vital forces, though in most instances in abnormal conditions, they possess still some slight value; at any rate they are remarkably confirmatory of what has been subsequently noticed under various modes of investigation.

*Observation 1.*—My attention was first drawn to the changes in the blood-corpuscles upon observing, on June 17th, 1859, the fluid derived from an ovarian cyst. It was of a kind very commonly found in that growth, namely, of a dark coffee colour. It was examined shortly after, and the different bodies depicted in Pl. VIII, fig. 1, were found in it. The changes in the red corpuscle into the "œcoid" and "zoid" of Brücke are very plainly seen in all stages. First of all, the œcoid is indicated by a transparent centre, and then it is to be seen in all stages of extension from one side or the other. It will be seen, however, that the œcoid is not always single; sometimes it is double, one being extruded from each pole of the red corpuscle. In employing Brücke's two names for the stroma and this clear colourless material, I do so the more easily to distinguish them, not pledging myself as agreeing necessarily with his explanation.

But what was the most interesting in this observation was this, that the small œcoid was set free, and found floating

in the fluid, transparent, but with slightly granular surface. A large number were visible floating about, but it was impossible to say that all were from the same sources. Some, no doubt, were, and from the exact resemblance of those free to those ready to be so one can hardly assign them a different origin. Be this as it may, it was clear that from the stroma of the red corpuscle small, transparent, colourless globular bodies were set free. Their diameter, in this instance, was about the  $\frac{1}{10000}$ th of an inch. These corpuscles had, doubtless, been effused into the ovarian cyst, and had been exposed to a more natural experiment, and had been in stricter relation with vital forces than when held in microscopical stages. The shape which the "zoid" or stroma more generally assumed was that of a semilunar character, the "œcoid" occupying the cavity.

The fluid was, as before stated, of dark brown colour, of mucous consistence, highly coagulable, and of the sp. gr. 1030. The red blood-corpuscles least changed were about the ordinary size.

*Observation 2.*—In consequence of the foregoing facts, I instituted an experiment to know what change occurred in the red corpuscle within a small serous vesicle on my hand. I opened it, and found it free from any cells. I then caused a small proportion of blood to flow into it; after a short time (the time, unfortunately, is not mentioned in my notes, but, probably, about half an hour) I found the change represented at fig. 2. It is very like that noticed in the first observation.

*Observation 3.*—Blood was mixed with the serum from a dead body. The result is not dissimilar to the above observations, the concave and double watch-glass forms being observable (fig. 3).

*Observation 4.*—Again, in September, 1859, I examined the fluid of an ovarian tumour shortly after tapping, and found the condition of the red corpuscle altered very much; they were found as in the first observations; they are drawn at fig. 4; but transparent globules (œcoids), which are expelled from each, are generally more than one. Three or four were noticed in a few.

The sp. gr. of the fluid was 1025, of mucoid consistence, alkaline. There were many small transparent cellules throughout the fluid, slightly granular on the surface, which were exactly like those seen emerging from the red corpuscles. Besides these were small fat-globules and aggregations of them with albumen.

*Observation 5.*—Another condition, where the corpuscle

is much under the influences of the vital forces, is that of retained menses. The microscopical appearances I have shown at fig. 5. Masses of the stroma of old corpuscles (zoid) were very readily recognised, aggregating into various sizes, and blood-corpuscles not much altered. Besides these were numerous transparent cellules, of the size and appearance of those extruded from the red corpuscle in the former observations, but there was not sufficient evidence to show how far they were of similar origin, excepting their close resemblance.

*Observation 6.*—Blood was dropped into fluid drawn from a hydrocele as it flowed. Very shortly (within an hour) it was examined, and the corpuscles showed the appearance of separating into the œcoid and zoid of Brücke very markedly (see fig. 6). The same fluid was examined after ten hours, when the red globules presented the appearance shown in fig. 7; but the “œcoids” were larger than in the earlier observations, being  $\frac{1}{100}$ th of an inch diameter.

*Observation 7.*—When blood-globules had been in contact with mucus of the mouth and vagina, I find in two instances that they were merely stellate, but extruded no transparent cellules.

Those acquainted with the action of reagents will be able to compare their effects with the results of the action of the various fluids in which the red corpuscles were placed. They seem to confirm the observations of others, which point to two constituent parts. That these are both of them in a plastic state seems to be shown by these as well as by many other phenomena; that they are composed of material rather in a condition of “formative” than formed; that no distinct cell-wall, properly so called, exists.

Whether the small bodies shed from them under various abnormal conditions are merely a sign of dissolution, or whether, under close contact with vital forces, they are capable of becoming something more definite, assisting to form the tissues, or even growing into the red corpuscle, yet remains to be seen. The experiments necessary must be difficult to carry out, and must consume much time; still, it is now rather in this direction we must turn, assisted by the light already shed by so many observers, as is well shown in your last number by one of the Editors of this Journal.