

powerfully phagocytic that they can swallow up and destroy not only individual microbes, but large quantities of diseased cells and organisms *en masse*.

What about artillery? In disease, just as in battle, much of the fighting takes place from a distance by gunfire. The microbes secrete a poison (toxin), and the white corpuscles substances called antibodies, which are capable of neutralising the toxins—antitoxins—or of destroying the microbes themselves—lysins. In the case of the blood, however, this artillery fire is not confined to one particular corps, but is performed in different degrees by all three types of cell.

Now let us see what we learn from the general count of corpuscles and examination of a film with a "differential" count of the proportion of each variety; both are taken together.

In health the total number of white cells in each cubic millimetre (c.m.m.) of blood is about 8,000, and the differential count shows them to consist (roughly) of Polymorphs, 65 per cent. Lymphocytes 30 per cent., and Hyalines 5 per cent. In disease we may get either an increase—leucocytosis—or a diminution—leucopenia—and the proportion of the different cells may vary.

Generally speaking—we can neglect the exceptions for the moment—a total increase is of favourable omen, for it shows, as we might expect, that the call to the colours is being met. In lobar pneumonia, for example, the total count may go up to 20,000 or more in normal cases on the first day of disease. If it is not increased the outlook is bad. By examining the blood, therefore, we can often foretell the ultimate issue of the illness, a point which is of great assistance to the nurse and patient or his relatives.

The proportionate increase of the different varieties varies, however, in different diseases. In those due to infection by cocci there is usually an increased percentage of polymorphs; this is well seen in such maladies as pneumonia, appendicitis, and septic infections, such as wound infection and puerperal septicaemia. When the hostile agent is a bacillus, as in enteric fever and tuberculosis, however, we find, as a rule, a total count that is not much, if at all, higher than normal, while the lymphocytes are increased relatively to the polymorphs. In diseases due to parasites, such as malaria, there is often a relative increase in the hyalines.

In warfare an intelligence department would not content itself with a single initial estimate of the forces on either side, but would make

constant reconnaissances; on the same principle we gain a more accurate knowledge of the progress of an illness by examining the blood at frequent intervals, and this is often of very great practical value.

For an instance we will come back to our patient with pneumonia. I have selected this disease because it is particularly difficult to form an accurate opinion on the outlook by clinical methods alone. Some patients who have only a small patch of dulness in the chest succumb, while others pull through with both lungs solid from effusion, and the temperature chart similarly gives us little or no help; even the pulse—ordinarily the most reliable guide of all in acute disease—may fail us. We then take four hourly blood counts. If the total number of white cells steadily creeps up and the comparative predominance of polymorphs is maintained, the outlook is good, and vice-versa. Over and over again has one been able to tell the relatives that the outlook is good or the reverse, from examination of the blood alone. In puerperal sepsis also, repeated blood counts are of inestimable value.

But we can go further than this. It is known from laboratory research that the red and white corpuscles are not created suddenly by the body in the form in which they ultimately appear, but are the result of gradual development from a cell which is the parent of both, and between it and them are numerous intermediate forms.

The two main factories of the blood cells are situated in the bone marrow and the lymphatic glands. Ordinarily speaking, the bone marrow makes red corpuscles and polymorphs, while lymphocytes, and perhaps hyalines also, are constructed in the lymphatic glands, though there is a certain amount of evidence that these latter are sometimes derived from the spleen. Now, in the marrow and lymphatic glands of the foetus up to the sixth month, only one type of cell is found—which is called a lymphoidocyte—and from that period till birth various intermediate forms leading to the fully developed corpuscles of the circulating blood gradually appear.

After birth, in health, these intermediate types are never found in the blood, though they may be seen in films made from the bone marrow or scrapings of lymphatic glands, but they may appear in certain diseases, or, as I believe, in almost any disease where the resistance is seriously lowered.

Let us come back to our military analogy. During the war numerous trench raids were practised by both sides, not simply in order to kill so many men, but to find out by capturing

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