in their capacity to produce haemolytic and other toxins. In the first two cases the rapidity of the haemolysis was such as to suggest chemical poisoning, whereas in the third the production of gas was the most obvious feature and more readily suggested the diagnosis.

In the two cases of septicaemia the infection was of a particularly fulminating nature, the patients dying nineteen and twenty-one hours respectively from the onset of symptoms. Hill describes one case in which death occurred within sixteen hours after interference, but in most of his cases the duration of life in those that were fatal was considerably longer. It seems probable from our experience that in some of these fatal cases the correct diagnosis is not made, and that some other factor, such as shock or chemical poisoning, is held responsible for the patient's condition.

In none of the three cases was the mode of infection determined. In every instance the pregnancy was an unwanted one, and all patients admitted having taken drugs with the object of procuring abortion, so that it seems probable that instrumental interference had also been attempted.

The treatment of this type of infection has been discussed in some detail by Hill, but it seems unlikely that any method would have been successful in these fulminating cases at the time they first came under observation.

Summary

Three fatal cases of infection with *Cl. welchii* following abortion are described. In two of these the infection was a fulminating one in which the main feature was the occurrence of haemolysis, and a correct diagnosis was not made before death, the condition being attributed to chemical poisoning. The third case was one of a rapidly fatal infection of the uterus.

We should like to express our thanks to Dr. H. H. MacWilliam, medical superintendent of Walton Hospital, and Mr. St. George Wilson, consulting obstetrician and gynaecologist, for permission to record these cases.

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ON CERTAIN PHASES IN THE LIFE HISTORY OF THE POLYMORPH LEUCOCYTE

THE INFLUENCE OF CELL ACTIVITY ON THE NUMBER AND ARRANGEMENT OF THE NUCLEAR LOBES

BY

C. J. BOND, C.M.G., F.R.C.S.

Arneth (1904), Schilling (1929), and other observers have attributed the multilobular condition of the polymorph nucleus to increasing age of the cell, while others—for example, Price-Jones (1933)—have not accepted this conclusion. In the following communication I shall hope to show that previous activity on the part of the cell, as represented by amoeboid movement and phagocytosis, may be an important factor in determining the number of nuclear lobes or, in other words, the shift to the right in the Arneth count.

Chart I

This curve gives a count of the total number of nuclear lobes in 100 polymorph leucocytes taken from the blood of the same individual at the same time but under different conditions: (a) the normal blood film; (b) the same blood after incubation; (c) the same polymorph cells when re-incubated after standing at room temperature for six hours.

In film (a) the total number of lobes per 100 cells was	271
" (b) " " " " " " " "	303
" (c) " " " " " " " "	394

This rise in the number of nuclear lobes in 100 cells represents a considerable shift of the Arneth count to the right. It suggests that the increased work done by the incubated cells over that of the resting blood cells, and the still greater activity of the reincubated cells after a period of rest, are responsible for the rise in the number of nuclear lobes in the activated and reactivated cells.

CHART I.—(a) Normal blood film: 271 lobes in 100 cells. (b) Incubated blood film: 303 lobes in 100 cells. (c) Re-incubated blood film: 394 lobes in 100 cells.

Chart II

This gives the total number of nuclear lobes in 100 polymorph cells in two cases of pernicious anaemia. In Case 1 the polymorphs constituted 31 per cent. and haemoglobin 55 per cent.; and in Case 2 they were 50 per cent. and 72 per cent. respectively. Marked leucopenia was present in both cases. The number of nuclear lobes per 100 cells was 472 in Case 1 and 455 in Case 2. In both cases this marked increase in the number of nuclear

The eighth conference of military medicine and pharmacy in Luxemburg was distinguished by a very detailed discussion of systematic radiology in land forces, inaugurated by the Belgian, French, and Swiss delegates. It was decided that the administration of the International Committee of the Congresses of Aviation and Health should henceforth pass into the control of the conference of military medicine and pharmacy. With regard to the statutes of the permanent committee of the congress it was apparent that now that the sixteenth International Red Cross Conference was to discuss the revision of the Conventions of Geneva and The Hague in respect of the sick and wounded of armies in the field, and that the proposals of the International Committee of Military Medicine and Pharmacy had been referred to diplomatic discussion, these two objectives had been achieved. This success, which was announced with great enthusiasm, would now permit the International Committee to devote its activities to its primary purpose—namely, the science of military medicine. The commission of medical jurisprudence might have been accordingly dissolved, its work having thus been crowned with success. But the problem of the protection of civil populations was still the focal point of discussion throughout the world, and it was agreed that this subject might still preferably occupy the attention of the commission independently of the International Committee.

lobes per cell coexisted with a considerable reduction in the total leucocyte blood count.

The question arises whether this shift to the right in the Arneth count was due to the greater demand on the activity of the reduced number of cells or whether it depended on the circumstance that fewer young polymorphs—that is, cells with the average number of two or three lobes—were being discharged into the blood stream from the bone marrow. It is a significant fact that in both cases of the disease a number of cells contained as many as six or seven nuclear lobes.

CHART II.—Pernicious anaemia. Case 1: polymorphs, 31 per cent.; haemoglobin, 55 per cent.; 472 lobes in 100 cells. Case 2: polymorphs, 50 per cent.; haemoglobin, 72 per cent.; 455 lobes in 100 cells.

Chart III

This chart gives the total number of nuclear lobes in 100 polymorph cells in (a) a blood film; (b) an incubated pus film; (c) a reincubated pus film. The films were all taken from a patient with cerebrospinal meningitis, and the pus was obtained from the cerebrospinal fluid by puncture.

Film (a) gives a total of 273 lobes in 100 cells
 " (b) " " 335 " " "
 " (c) " " 422 " " "

Here again the film from the pus cells—that is, cells which have emigrated from the blood vessels into the cerebrospinal fluid—shows a greater number of nuclear lobes than the corresponding cells circulating in the blood stream, while the reincubated pus cells after standing at room temperature show a still greater increase in the number of lobes.

CHART III.—Cerebrospinal meningitis. (a) Blood smear: 273 lobes in 100 cells. (b) Pus smear: 335 lobes in 100 cells. (c) Pus reincubated: 422 lobes in 100 cells.

Cell Emigration

Now the living pus cell is a polymorph leucocyte which has passed through the capillary wall into the tissue spaces, or into a serous cavity, or on to the surface of a granulating wound, or, as in this case, into the cerebrospinal fluid. To enable it to carry out this migratory journey the cell must become plastic. The nuclear mass,

which in the resting cell consists of two or three lobes aggregated together in the centre of the cell, undergoes marked changes in shape. The nuclear lobes become thinner and more widely separated, like a string of sausages when pulled apart, within the common enveloping skin. In some actively moving cells the fine strand of chromatin, or nuclear material connecting one lobe with another, may break, and one lobe may thus become disconnected from its fellow, though still enveloped by the same cytoplasmic covering. Metchnikoff (1893) has drawn attention to the segmental character of the polymorph nucleus as an aid to diapedesis and emigration.

It is also historically interesting to note that T. Wharton Jones (1853, 1884, 1887) strenuously rejected the emigration theory put forward by Cohnheim, both in his writings and in his lectures, one of which, given at University College, London, in 1878, I attended. Wharton Jones regarded the nucleus of the polymorph cell as composed of a single mass, and he looked upon the multilobular form—which, for instance, is revealed by treatment of the cell with diluted acetic acid—as an artefact. Probably this misconception in regard to the shape of the normal polymorph nucleus may have made it difficult for Wharton Jones to accept the possibility of diapedesis and emigration through the capillary wall.

The changes in shape of the nucleus which occur during emigration in the living body can also be demonstrated experimentally as taking place outside the body (C. J. Bond, 1924). Thus, if a drop or two of blood drawn from the finger be incubated in a Ponder's chamber, the cells which emigrate from the red clot and settle on the glass floor will show similar changes in shape of the nucleus. If, further, these activated cells are allowed to stand in the closed chamber at room temperature for a short time the string of nuclear lobes tends to aggregate, or even in some cases to fuse into two or three lobes, and the cell resumes the rounded shape of the "resting" cell. But it must be remembered that not only the *resting* but the *dead* polymorph are both *round cells*. The latter, like the dead pus cell, can, however, be distinguished from the living resting cell by their reluctance to take up stains like Janus green, and by inability to reassume amoeboid movement or phagocytosis when stimulated.

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E. Grevelink (*Thèse Paris*, 1938, No. 24), who records two cases in unmarried women, aged 32 and 38, with a review of the literature, states that feverish attacks which may be called ovarian fever occur in the female sex between puberty and the menopause. The most frequent are premenstrual, in which the evening temperature hardly ever exceeds 100° or 100.6° F. The commonest symptoms are asthenia, cardio-vascular disturbances, and various nervous or psychical troubles. The attacks cease with the natural or artificial menopause. The patients must be examined for the presence of a hyperfolliculin syndrome, which often occurs and justifies treatment by a hormone which neutralizes the excess of folliculin, especially an extract of the corpus luteum or mammary gland or a testicular extract. In one of Grevelink's cases the fever was dispelled by stimulation of the ovaries or mammary glands by diathermy.