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The separation of the phagocytic cells of the peritoneal exudate into two distinct types.

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The observations reported in the preceding communication[1] led us to consider the possibility that the phagocytic cells occurring in peritoneal exudates might be separated into the same two groups that were found in the spleen. It has been possible to demonstrate that this is true. A normal rabbit was given intraperitoneally 25 cc. of whole blood, which had been removed by a sterile puncture from the heart of another rabbit, and, after 24 hours, samples of the exudate were removed and studied. Another injection was then given and the examination repeated at the end of the second 24 hours. This procedure was repeated at 24 hour intervals over as long a time as was desired. Some of the experiments were carried out on rabbits whose blood-cells had been carefully matched, while in other instances animals were selected in which the serum of one agglutinated the red blood-cells of the other and *vice versa*. The exudate was studied with neutral red and Janus green in vital-dye films. It has been shown[2] that the first reaction that takes place after the introduction of any substance into the peritoneal cavity is the emigration of polymorphonuclear leucocytes, which appear in the exudate at the end of four to six hours. In the material obtained from our animals at the end of 24 hours there were always large numbers of leucocytes, the majority of which were actively motile, though some were rounded up and a few were in the "non-motile phase." In addition to these, the predominant cell was the typical clasmatocyte which had phagocytized erythrocytes and whose general appearance corresponded very closely with those previously described.[1] They were usually large cells, varying in size from 20 to 30 micra in diameter. At this stage only part of them contained phagocytized red cells, the

[1] Cunningham, R. S., Sabin, F. R., and Doan, C. A., PROC. SOC. EXP. BIOL. AND MED., 1924, xxi, 326.

[2] Cunningham, R. S., *Am. J. Physiol.*, 1922, lix, 1.

remainder being filled with large and small neutral red vacuoles of various sizes and shades of color. These clasmatocytes were entirely characteristic, with oval nuclei, extensively vacuolated cytoplasm, few or no demonstrable mitochondria, and no radial arrangement of the neutral red around a centrosphere. At this stage there was always great variation in the amount and character of the exudate. In some experiments with matched blood, only clear fluid with few or no cells was obtained after 24 hours and at times even after 48 hours (*i. e.*, after two injections); while with unmatched blood there was generally a considerable amount of sero-sanguinous exudate at the end of 24 hours. With unmatched blood we found a few monocytes at 24 hours but they were not very numerous until 48 or 72 hours, when they had largely replaced the clasmatocytes and made up about 60 per cent of all the cells and about 90 per cent of the phagocytic mononuclears. These monocytes were entirely comparable to those seen in the spleen, except that they had been stimulated to much greater activity. They varied from cells the size of leucocytes to the medium sized clasmatocytes. These monocytes invariably contained a group of neutral red granules which radiated about a central clear area and this arrangement persisted even with the most active phagocytosis, cells having been found with from four to six red blood-cells and occasionally a leucocyte in the periphery of the cytoplasm, but never in the area of the rosette. The monocytes were in every stage of stimulation from the small cells similar to those of the peripheral blood to larger cells with heavy granules of red about the centrosphere and several phagocytized cells stored in the periphery. The mitochondria were characteristically distributed about the nucleus and the rosette; they were more numerous in the less stimulated cells, but were always more numerous in the monocytes than in the clasmatocytes. The clasmatocytes have not been seen to divide; but the monocytes have been observed to divide actively. The latter were seen in all stages of division and we have watched many of them actually divide on the slide. With a more chronic irritation, six to eight days, the monocytes were still predominant but there were more clasmatocytes than at the 48 to 72 hour intervals.

It seems therefore assured that the phagocytic cells of peritoneal exudates, which are induced by the exhibition of whole

blood, can be separated into two distinct groups of cells; one corresponding to the clasmatocytes or histiocytes of the spleen and connective tissues and the other to the monocytes of spleen and circulating blood. In all of these experiments we have found no evidence of any transformation of serosal lining cells into other types of cells; whenever seen, the serosal cell is entirely characteristic whether in a normal, stimulated, or degenerating condition. We have also made a few observations on the subcutaneous tissue after the introduction of blood, on the omentum and on the phagocytic cells obtained from the lung. In general here also we have been able to differentiate the same two types of cells.

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Clinical experience with the active principle of cod liver oil.

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Between the end of December, 1922, and the end of May, 1923, an attempt was made to determine the anti-rachitic activity in infancy of the active principle of cod liver oil[1] prepared in the Department of Pathology at the College of Physicians and Surgeons.

For this purpose two similar groups of infants were observed in the Out Patient Department of Bellevue Hospital. All the infants in one group received the active principle, those of the other serving as controls. In general each child had a monthly physical examination and an x-ray of the wrists. Their homes were visited regularly and classified *one, two, three* or *four* according to the number of rooms, how many were light or dark, and how much the infants were out of doors.

* Introduced by T. F. Zucker.

[1] Zucker, T. F., Pappenheimer, A. M., and Barnett, M., PROC. SOC. EXP. BIOL. AND MED., 1922, xix, 167; Zucker, T. F., PROC. SOC. EXP. BIOL. AND MED., 1922, xx, 136; Zucker, T. F., and Matzner, M. J., PROC. SOC. EXP. BIOL. AND MED., 1923, xxi, 186.