"MEGAKARYOCYTES" OF THE SPLEEN

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Many investigators, when studying the morphology of the mammalian spleen, have observed giant cells outwardly resembling megakaryocytes in this organ [9, 14, 15]. Because of this similarity, and also because of reports in the literature that myeloid hemopoiesis may take place in the spleen of many mammals throughout life [6, 10, 12], a number of workers [3, 9, 14, 15] have contended that these cells are true megakaryocytes. Their life cycle has even been described [15].

Other authors [2] describe them as megakaryocyte-like cells, thus stressing certain differences from true megakaryocytes.

The number of these cells in the spleen increases after denervation of the organ [2, 3], and after immunization [5] and irradiation [8] of the animal. They are numerous in the transplanted spleen [7, 8, 11], and their accumulation in the graft reaches its maximum when regenerative processes in the graft are at their height [11].

The author has observed cells of this type in both the intact and the deafferented spleen of cats [4]; in the latter case they were much more numerous. These cells differed from true megakaryocytes in certain characteristics.

In the present investigation the nature and genesis of the megakaryocyte-like cells of the spleen were studied.

EXPERIMENTAL METHOD

Experiments were carried out on cats. The spleen of healthy animals and of cats after extirpation of the spinal sensory ganglia of segments D_9-L_2 on both sides was used.

The material was fixed in Carnoy's and Schafer's mixtures and embedded in paraffin wax. Sections were stained with hematoxylin-eosin, azure-eosin, methyl green–pyronine, and alcian blue; the PAS reaction and the reaction with dialyzed colloidal iron were carried out on the sections, and control experiments were performed with ribonuclease, amylase, and hyaluronidase.

EXPERIMENTAL RESULTS

The megakaryocyte-like cells of the spleen are very large, widely different in shape, and the configuration of their nucleus is inconstant. The cytoplasm of the cells contains large amounts of RNA and glycogen, but no mucopolysaccharide components or azurophilic granules characteristic of true megakaryocytes and indicating formation of platelets.

These cells are capable of phagocytosis (see figure, F). They are localized in the spleen mainly near the trabeculae and the pulp vessels.

The study of the genesis of these cells showed that they are formed by fusion of several, as a rule, reticular cells, but often other cell types are involved in the merger (lymphocytes, immature plasma cells); the dynamics of their genesis is shown in the figure.

Initially, a group of cells differentiates from the surrounding structures and cells (see figure, A), and the borders between them disappear. The nuclei of these cells are apparently surrounded by a com-

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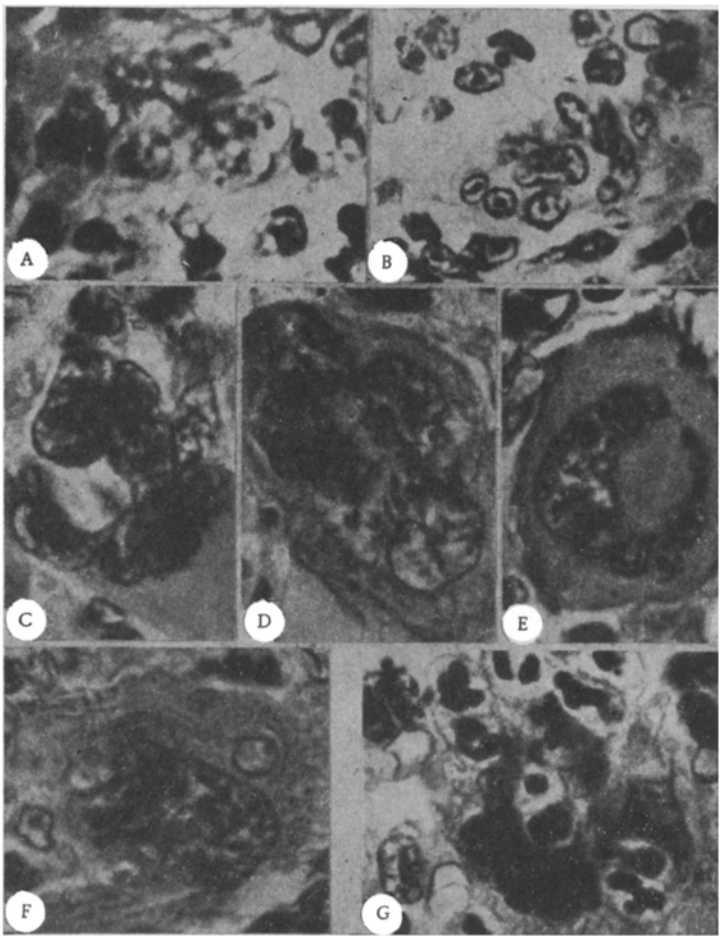

Fig. 1. Megakaryocyte-like cells of the spleen. A) Differentiation of reticular cells from the surrounding tissue; B) multinuclear syncytium, with individual nuclei and with a tendency to form a ring; C) unclosed ring with compactly arranged nuclei, syncytium incorporating a new cell (above); D) closed ring, some nuclei already fused; E) movement of contents of the annular nucleus toward one of its poles; F) stage of one giant oval nucleus, phagocytosed erythrocytes and pulp cells visible in cytoplasm; G) dead giant cells, segmented pycnotic nucleus, lysis of cytoplasm and nucleus by neutrophils.

mon cytoplasm (B). Such a syncytium may incorporate more cells, sometimes of different types (B, C). The nuclei in the syncytium undergo certain changes: their chromatin network is intensified, they increase in size and become uniform in their external appearance. Finally, the nuclei form a ring (C). The ring then becomes more compact and its nuclei lie closer together (D). Where the nuclei touch one another, the nuclear membrane disappears. At this stage a giant cell is formed, containing an annular nucleus. The contents of the nucleus then begin to move toward one of its poles. The nucleus at the opposite pole becomes thinner, and later it ruptures at this point. The nucleus becomes comma-shaped (E). This process of pooling of the contents continues, and as a result a single giant circular or oval nucleus is formed (F). Later it may become segmented (G).

The phagocytic power of the cell is independent of its stage of development. Death of the cells may also take place at any stage. The process begins with pycnosis of the nucleus, after which the cell is destroyed, neutrophils playing an active part in the process (see figure, G).

These observations on the ability of the giant megakaryocyte-like cells to perform phagocytosis are confirmed by data in the literature [5, 13]. The authors cited concluded that the megakaryocyte-like cells of the spleen are a special type of macrophages.

It may therefore be concluded from all the evidence that these are not megakaryocytes but special structures localized in the spleen, and increasing in number in response to various external stimuli. They possibly occupy a special place in the protective reactions of the reticulo-endothelial system.

The genesis of these cells as described above shows some similarity in principle with the genesis of the giant cells of Langhans [1] and Sternberg. The possibility is not ruled out that, together with the cells described in this paper, they reflect identical reactions of the body.

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