

COMPENSATORY CHANGES IN HEMOLYMPHATIC NODES AFTER ISOLATION OF THE SPLEEN IN ALBINO RATS

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Among the numerous investigations of regeneration of the spleen, there are reports [9] that regeneration of this organ is possible after total splenectomy. These reports, however, were not subsequently confirmed [7, 8, 10]. In isolated cases the formation of an accessory spleen has been described in man after splenectomy [2].

The regenerative power of the spleen is considered by many investigators to be dependent on the compensatory powers of the remaining lymphoid organs. Absence of regeneration of the spleen in rabbits after partial splenectomy has been attributed [3] to a compensatory reaction of the lymphatic system. Enlargement of the lymph glands, with the appearance of structures similar to the spleen in them, has been described in rabbits after total splenectomy [5]. In the compensatory reaction after splenectomy an important role is played by the hemolymphatic nodes which have been described in ruminants, the dog, and the rabbit [6], and as an inconstant finding in man.

The problems under discussion assume a different character in the albino rat. The death of these animals has been reported after total splenectomy [1, 4]. According to one writer [6] no hemolymphatic nodes are present in albino rats.

In continuing the study of regeneration of the spleen, the compensatory changes in the lymphoid organs of rats were studied after total isolation of the spleen within the body by ligation of the neurovascular bundle. Attention was also directed toward the lymphoid structures resembling hemolymphatic nodes discovered in certain of the rats.

EXPERIMENTAL

To obtain the initial data for the state of the lymphatic system, 30 intact albino rats were autopsied. After a careful inspection of the organs and the serous cover of the peritoneal cavity, some of the mesenteric lymph glands were extracted and the hemolymphatic nodes, if present, were taken for examination.

The spleen was isolated in 15 rats. The animals were anesthetized with ether and the spleen extracted through an incision in the abdominal wall on the left side behind the ribs. Because passing one ligature around the whole of the neurovascular bundle would put traction on the spleen, two ligatures were applied, one to the dorsal and the other to the ventral parts of the spleen, so that the normal shape of the

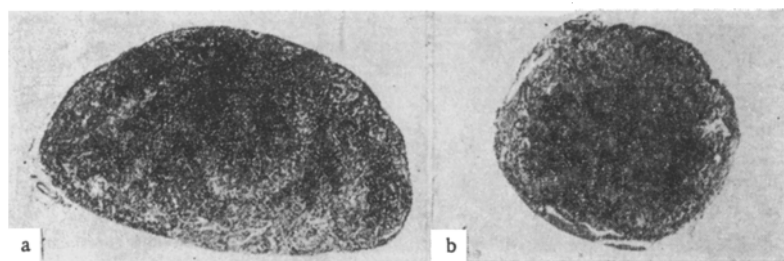


Fig. 1. Hemolymphatic nodes from intact rats. a) Secondary follicles present. Erythrocytes can be seen in the sinuses; b) secondary follicles absent. Erythrocytes diffusely distributed among the pulp. Objective F-40.

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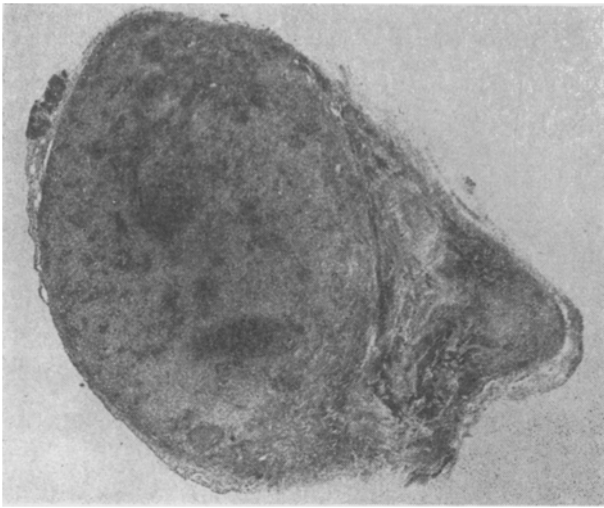


Fig. 2. Compensatory changes in the hemolymphatic node 20 days after isolation of the spleen. Objective F-40.

organ was retained. At autopsy the spleen, the mesenteric lymph glands and, where present, the hemolymphatic nodes were removed. The material was treated by the usual histological methods.

EXPERIMENTAL RESULTS

In about 10% of the intact rats, round or slightly oval, dark cherry-red, relatively compact nodules measuring 1×1 or 1×1.5 mm were found close to the spleen along the course of the blood vessels. Externally they were covered by a serous membrane with a slight basement layer of connective tissue, unlike a compact capsule in character. In some cases the reticular synsytium was tightly packed, mainly with lymphocytes. These were diffusely arranged as a rule, but here and there more compact groups of cells, circular in shape were seen. Slit-like spaces, sinusoidal, and filled with erythrocytes (Fig. 1a), were located centrally or excentrically.

In other cases, no secondary follicles were found, and the erythrocytes were distributed in clusters or diffusely in the spleen pulp (Fig. 1b).

After isolation by ligation of its neurovascular bundle the spleen gradually became smaller and lost its typical histological structure. By the 10th day only isolated Malpighian corpuscles could be seen in the sections.

The spleen on the 30th day was surrounded by omentum, firmly adherent to the capsule. As a result of the development of atrophic processes, the organ was much smaller in size and had lost its customary shape. In sections of the remnant of the spleen, on account of the marked decrease in the areas of the white and red pulp, the connective tissue trabeculae were very conspicuous. Between them, clusters of lymphocytes were seen here and there, differing from the Malpighian corpuscles by the absence of centerl arter-ies. A collection of disintegrating erythrocytes and granules of blood pigments were present in the center of the residual spleen.

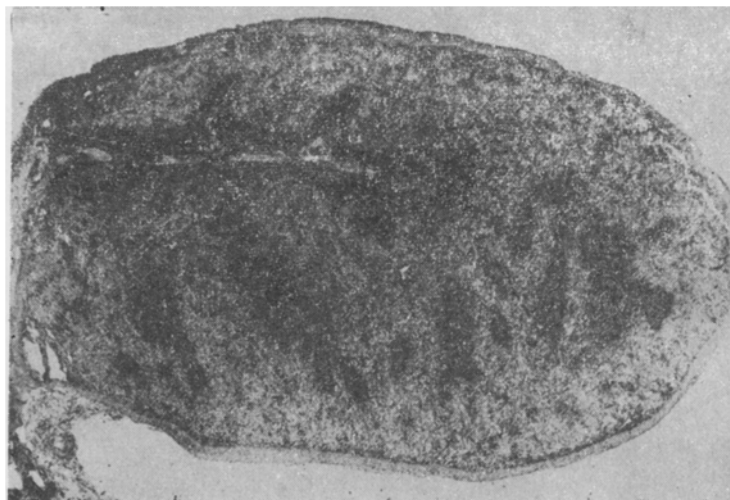


Fig. 3. Transformation of a hemolymphatic node 30 days after isolation of the spleen. Objective F-40.

Histological investigation of the mesenteric lymph glands of the experimental rats revealed no significant changes from their normal structure.

In 3 of the 15 experimental animals (20%), lymphoid formations as described in the intact rats and resembling hemolymphatic nodes in structure, were found. In two animals they appeared on the 20th day after operation and were twice as large as those described in normal animals, reaching 2×3 mm in size. They were surrounded by a compact capsule, thicker than the capsule of lymph glands. In the pulp, consisting largely of lymphocytes, variously shaped clusters of these cells were present. Between them, besides white blood cells, were a few erythrocytes. There was no trace of a vascular system like that of the spleen (Fig. 2).

In the animals sacrificed 30 days after the operation a hemolymphatic node measuring 3×5 was found a little above the ligature on one vascular bundle of the spleen. The node was covered by a well developed capsule in which smooth muscle cells were visible. Because of the large number of erythrocytes the distinction between red and white pulp was clearly visible in the organ. In many of the variously shaped clusters of lymphoid cells, arteries were seen, giving them the appearance of the Malpighian corpuscles of the spleen (Fig. 3).

The positive Perls' test for iron demonstrated phagocytosis of the erythrocytes.

Isolation of the spleen by ligation of the neurovascular bundle thus leads to atrophy and complete destruction of the organ without causing death of the rats. If the spleen is isolated, the hemolymphatic nodes, described by the authors, become compensatorily enlarged and acquire the structural characteristics of the spleen.

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