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Influence of Spleen on Leucocyte Count of the Albino Rat.

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Numerous investigators[1-5] have found that following splenectomy in dogs, rabbits, and rats there is produced a leucocytosis of unusual severity, which lasts longer than the time required for a return to normal following other surgical procedures of similar intensity. Bonanno[4] demonstrated that benzol administered to normal and splenectomized rabbits induced a consequent leucopenia, but that the renewal of leucocytes was more rapid in the splenectomized animals than in the controls. Lee[5] showed a change toward normal from leucocytosis following the injection of spleen emulsion to splenectomized rabbits. MacDonald[1] observed that the return to normal of the leucocyte count of dogs was more rapid, if at least 1/10 of the spleen was left *in situ* during splenectomy. Liles[6] found that the usual post-splenectomy rise in blood-platelet count decreased following the transplantation of spleen tissue into splenectomized rabbits.

These investigations seem to show that the spleen exerts some sort of inhibitory influence upon blood leucocyte and thrombocyte formation or release, which function is lost by the organism, at least temporarily, following splenectomy.

It was our purpose to observe the changes in the leucocyte count, total and differential, in *Bartonella-free* albino rats: (1) following splenectomy, (2) following splenectomy of rats with spleen transplants, (3) following splenectomy of rats with muscle transplants, and (4) following a major surgical operation, partial hysterectomy.

To determine the picture obtained following splenectomy, the spleens were removed from a group of 24 male and female albino rats. It was found that the post-splenectomy rise in leucocyte count was consistently 3 to 4 times normal, due to a marked myeloid neutrophilia. Blood was obtained by clipping off a portion of tail including 3 or 4 caudal vertebrae, a procedure used in all cases.

Four female rats, litter mates to some of the splenectomized

1 MacDonald, *Am. J. Surgery*, 1934, **23**, 514.

2 Tramontano, V., *Pathologica*, 1932, **24**, 667.

3 Godard, H., *J. Phys. et path. Gén.*, 1932, **30**, 640.

4 Bonanno, A. M., *Pathologica*, 1934, **26**, 832.

5 Lee, Y. C., *Trans. Jap. Path. Soc.*, 1932, **22**, 299.

6 Liles, R. T., PROC. SOC. EXP. BIOL. AND MED., 1926, **23**, 489.

animals, were partially hysterectomized, a procedure which consisted of excision of a portion of the left cornua of the uterus between a point about one cm. below the abdominal ostium and the uterine bifurcation. The post-operative rise in leucocyte count was found to be 1½ to 2 times normal, due to a slight neutrophilia. The return to normal took place in less than a month, a marked contrast with the splenectomized rats which retained a count above normal for several months.

Early in December, 1936, 4 eight-month-old rats received spleen transplants from younger rats, each animal receiving one whole spleen. These homiografts were planted in 4 equal pieces into 4 pockets in the fascia just ventral to the rectus sheath of the abdominal wall. Four other litter mates received muscle transplants similarly administered. Counts in both these groups one month following transplantation showed no significant change over counts obtained immediately before. Both groups were splenectomized February 11, 1937, and counts of tail blood were taken at varying intervals for a month and a half. On April 5 the sites of spleen transplantation were explored, and of the 16 transplants given more than 4 months previously, 14 appeared to have taken, as evidenced by reddish-brown nodes that were found in the positions of the former transplants. These nodes were excised, fixed, sectioned, mounted, and stained with Delafield's haematoxylin and eosin. The sections were studied and from the appearance of their histological

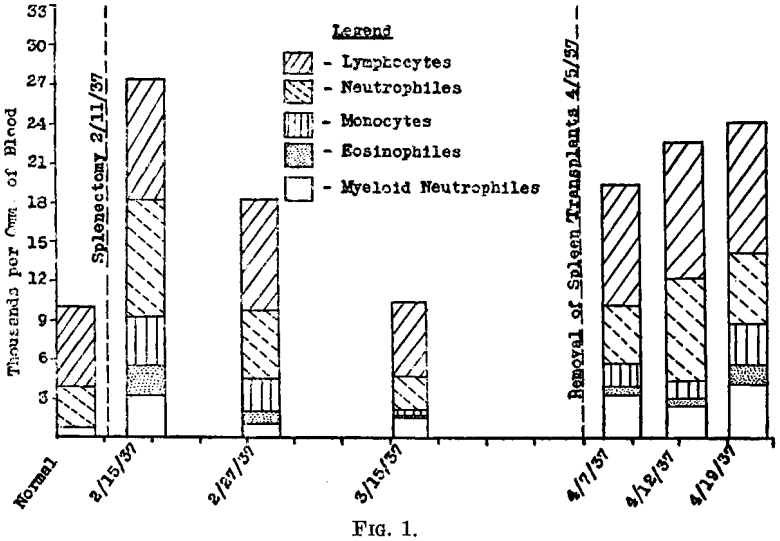

FIG. 1.

Leucocyte Count, Spleen Transplant and Splenectomy. Typical Case—Rat No. 62.

structure the spleen transplants were considered functional. After April 5, further counts were taken in each rat. (Fig. 1.)

Similarly, the muscle transplant sites were explored. As no particular centers of activity were found, 4 sections of fascia were removed from each of these animals on April 10, and blood counts made subsequently until April 19. (Fig. 2.)

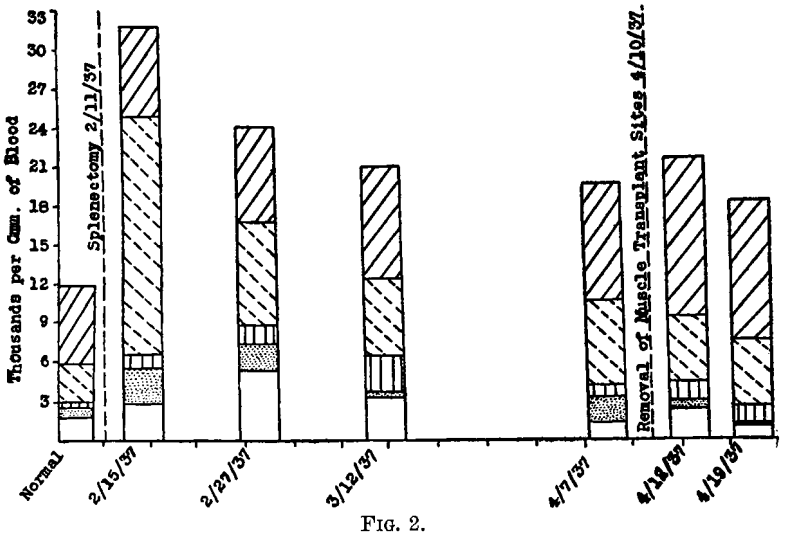

FIG. 2.

Leucocyte Count, Muscle Transplant and Splenectomy. Typical Case—Rat No. 69.

Summary. It is evident from the work described and the charts shown that in the *Bartonella-free* albino rat: 1. Following splenectomy, the total leucocyte count increases to 3 to 4 times normal. 2. This increase is due to a neutrophilia of a myeloid type which is more intense than that following other trauma. 3. Following a comparable surgical procedure, partial hysterectomy, the total leucocyte count increases to 1½ to 2 times normal. 4. This increase is due to a weak neutrophilia of a type that is usually found following surgical trauma. 5. Following spleen transplantation into a spleen-possessing rat, there appear to be no significant changes. 6. Following splenectomy, there is a lesser leucocytosis of a neutrophilic nature in the spleen transplant recipients than in the muscle transplant controls. 7. This leucocytosis approaches normal with greater rapidity in the spleen transplant recipients than in the controls. 8. Following removal of the spleen transplants, the blood picture resembles that following splenectomy, though in milder fashion. 9. Following removal of the muscle transplant sites, the blood picture indicates mild trauma. 10. Spleen homiotransplants may be 88% successful.

Conclusions. It is concluded that in the *Bartonella-free* albino rat: 1. Splenectomy induces greater neutrophilic leucocytosis than does a comparable surgical trauma, due to the consequent absence of an inhibitory influence on leucocyte production. 2. The normal spleen, as one of its functions, exerts an inhibitory influence on the leucopoietic centers, thus balancing the activity of leucopoietic-stimulating centers. 3. Spleen transplants function similarly to normal spleen tissue in controlling leucocyte production or release. 4. This inhibitory influence of the spleen on leucocyte formation or release may be considered as possibly an endocrine activity.

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Mechanism of Cellular Death by High Pressure, Compression of Yeast in Sodium Chloride Solutions.

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In a previous work[1] it has been shown that yeast cells suspended in tap water are killed in various lengths of time by pressures extending from 4000 to 7000 atmospheres. The present investigation was undertaken to determine the effect, if any, of the kinetic conditions resulting when high pressure is exerted on salt solutions of various concentrations.

The yeast, *Saccharomyces cerevisiae,* strain "Levure Royale", was obtained from the Anheuser-Busch Brewing Co. of St. Louis, in starch-free cakes. Two percent suspensions of the yeast in distilled water solutions of NaCl, varying in concentration from .005M to .4M, were put into glass vials of about one cc. capacity, stoppered with rubber corks. The pressure chamber consisted of a cylindrical cavity, 1.2 inch in diameter, bored in a steel block, and fitted with a hardened steel plunger. A rubber disc served as packing for the plunger. Four vials containing yeast in solutions of different concentrations could be compressed in the chamber at the same time. Care was taken to exclude air from the solutions in the vials and from the water which filled the chamber. A motor-driven hydraulic press supplied the pressure. From the readings of a previously tested gauge, mounted on the press, we calculated the effective pressures inside the chamber. After a 2-minute compression and a

[1] Luyet, B., *Comptes Rendus de l'Ac. des Sc.,* 1937, **204**, 1506.