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Response of the Exteriorized Spleen to Ephedrine, Acetyl Choline, Pilocarpine and Pituitrin.

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The importance of the spleen as a blood reservoir has been emphasized by Barcroft,[1, 2] who has calculated that this organ may, by a strong contraction, contribute an additional 10% of erythrocytes to the circulation. Barcroft and Stevens[1] observed, on their "exteriorized spleen" dogs, significant contractions of this organ under various conditions such as excitement, exercise, epinephrine injection, ether administration, etc. By a plethysmographic method, Hunt[3] obtained variable results on the spleen volume of anesthetized cats after the intravenous injection of acetyl choline. Farber[4] invariably noted decrease in volume of the spleen in unconscious dogs following intravenous injection of acetyl choline, and concluded that this drug may act upon the spleen either directly, or indirectly through the splenic nerves. Palitz,[5] using dogs with their spleen surgically placed in a subcutaneous position (but with nerve supply intact), reports splenic contraction following the intravenous injection of pilocarpine. This effect is antagonized by atropine. Simpson, Levy and Cadness[6] report that the subcutaneous injection of ephedrine into normal guinea pigs causes considerable increases of erythrocyte, leukocyte, and thrombocyte numbers, but that these increases are not so great in splenectomized animals. Dale[7] produced diminution of the spleen volume by the intravenous injection of pituitary extract into pithed cats. Sodium amytal anesthesia causes a fall in the erythrocyte number of dogs, which is probably due to relaxation or enlargement of the spleen, according to Essex, Seely, Higgins, and Mann.[8]

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1 Barcroft, J., and Stephens, *J. Phys.*, 1927, **64**, 1.

2 Barcroft, J., *Features in the Architecture of Physiological Function*, Cambridge, 1934.

3 Hunt, Reid, *Am. J. Physiol.*, 1918, **45**, 197, 231.

4 Farber, S., *Arch. Internat. de Pharm. et de Ther.*, 1936, **53**, 367.

5 Palitz, L. L., and Morse, R. P., *Proc. Am. Physiol. Soc.*, 1936, 118.

6 Simpson, Levy S., and Cadness, B. H., *J. Pharm. and Exp. Therap.*, 1936, **56**, 389.

7 Dale, H. H., *Biochem. J.*, 1909, **4**, 434.

8 Essex, H. E., Seely, S. F., Higgins, G. M., and Mann, F. C., PROC. SOC. EXP. BIOL. AND MED., 1936, **35**, 154.

Since anesthetics and trauma may affect the volume of the spleen, and the actions of drugs on that organ, I deemed it worth while to study the influence of several drugs on the spleen size of *fully conscious animals*. Therefore, I used the method of Barcroft and Stevens[1] to exteriorize the spleens of 3 dogs. After recovery from the operation they were trained to lie quietly upon a table. The drugs were injected into the saphenous vein and the length of the spleen was measured by caliper before, and at intervals after the injection.

Table I shows the average extent of shortening of the spleen, of one dog, following drug injections. Generally corresponding results were obtained in the 3 dogs. Contraction occurred practically always within 5 minutes after injection and remained for 25 to 45 minutes. The initial length of this spleen, under basal conditions of the dog and in the absence of excitement, was regularly 3½ inches.

TABLE I.
Average Magnitude of the Splenic Contraction Following Injection of Drugs into the Saphenous Vein of Dog No. 2.

Drug	Dose/Per Kilogram	Shortening in Length of Spleen
Epinephrine HCl	2 cc. 1:100,000/kilo	⅜ inch
Ephedrine Sulphate	1½ mg./kilo	⅜ "
Acetyl choline HCl	0.1 mg./kilo	⅛ "
Pilocarpine HCl	1 mg./kilo	¼ "
Pituitrin (S)	0.3 cc. (total)	⅜ "

Chloroform inhalation to anesthesia was observed (once) to shorten the spleen by ⅜ of an inch. This was only tried once, as was also sodium amytal injection (0.01 gm./kilo) which *elongated* the spleen by ¼ inch.

Barcroft[1] has, of course, observed that epinephrine causes a contraction of the exteriorized spleen, but I have not been able to find any reports of the effects of ephedrine, acetyl choline, pilocarpine or pituitrin on the exteriorized spleen of a conscious dog.

Conclusions. Injection of acetyl choline, pilocarpine, ephedrine, and pituitrin (S) into the saphenous vein causes significant contraction of the exteriorized spleen in conscious dogs. In 2 single observations, chloroform inhalation caused contraction and sodium amytal (intravenously) caused relaxation of the exteriorized spleen.