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Effect of Adrenal Cortical Hormone on Reduction of Plasma Volume Resulting from Etherization.*

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Recent determinations with the blue dye T-1824 have shown that etherization of dogs causes a marked reduction (average 12%) in plasma volume.[1] Because the adrenal cortex appears to be concerned with the regulation of blood volume (Swingle, *et al.*,[2] Harrop, *et al.*[3]), it seemed of interest to study the effect of the administration of adrenal cortical hormone‡ on this fluid shift occurring under ether.

The changes in plasma volume were calculated from alterations in a dye disappearance curve established by spectrophotometric analysis of serum samples (Gregersen, *et al.*[4, 5]). Plasma volume changes were also calculated, with considerable agreement, from variations in the concentration of plasma proteins (measured with refractometer). Five intravenous injections of adrenal cortical extract, totalling not more than 30 cc. (3,000 dog units§) were made during each experiment; the first of these injections (usually 500 to 1000 dog units) was given prior to etherization, the remaining 4 at approximately 15-minute intervals during anesthesia. It has been shown that intravenous injections of adrenal cortical hormone must be repeated at frequent intervals to produce a prolonged effect (Thorn[6, 7]).

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1 McAllister, F. F., *Proc. Am. Physiol. Soc.*, in press.

2 Swingle, W. W., Pfiffner, J. J., Vars, H. M., Bott, P. A., and Parkins, W. M., *Science*, 1933, **77**, 58.

3 Harrop, G. A., Weinstein, A., Soffer, L. J., and Trescher, J. H., *J. Exp. Med.*, 1933, **58**, 1.

‡ The adrenal cortical extract used in these experiments was supplied by Dr. David Klein of the Wilson Laboratories, Chicago.

4 Gregersen, M. I., Gibson, J. J., and Stead, E. A., *Proc. Am. Physiol. Soc.*, 1935, **113**, 54.

5 Gregersen, M. I., to be published.

§ "Dog units" refers to an assay standardized on adrenalectomized dogs.

6 Thorn, G. W., Garbutt, H. R., Hitchcock, F. A., and Hartman, F. A., *Endocrinology*, 1937, **21**, 213.

7 Thorn, G. W., PROC. SOC. EXP. BIOL. AND MED., 1937, **36**, 361.

In 5 experiments, repeated intravenous injections of adrenal cortical extract, in every case, modified the reduction in plasma volume which is consistently produced by ether anesthesia. When a delay of 4 or more minutes occurred between the initial dose of extract and the application of ether, the plasma volume first decreased and then with successive injections quickly returned to normal. When anesthesia was induced immediately after the first dose of extract, the initial reduction did not occur and the normal plasma volume was maintained. The results of a series of experiments on one of the dogs are presented in Table I.

TABLE I.
Effect of Adrenal Cortical Hormone on Plasma Volume During Etherization.

Dog No.	Date	Weight	Decrease in Plasma Volume during Ether Anesthesia		Remarks
		kg.	cc.	%	
2M	Dec. 10	14.9	90	10.0	Control
2M	Jan. 4	15.4	95	10.4	"
2M	Jan. 26	16.4	90	9.7	"
2M	Mar. 17	15.8	0	0	Adrenal Cortical Hormone*

* A total of 2,800 dog units was administered intravenously in 5 doses.

Four of the animals showed, on recovery, either a maintenance of their normal plasma volume or a rise above it. The fifth animal suffered a gradual reduction in plasma volume beginning near the end of anesthesia and continuing for 2 hours thereafter. Such reactions may normally occur after etherization and are probably not due to the cortical extract.

Determinations of plasma sodium and chloride were made on blood samples drawn immediately preceding, during and 3 hours following anesthesia. No significant difference was noted in the concentration of these electrolytes in the serum of control animals as compared with those treated with the hormone.

Conclusion. Preliminary experiments demonstrate that repeated intravenous injections of adrenal cortical extract may act to preserve the normal plasma volume under ether anesthesia.