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A Humoral Control of Parathyroid Secretion.

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There is considerable circumstantial evidence that a low serum calcium is a stimulus for the parathyroid glands to produce more hormone. Parathyroid hyperplasia may be induced experimentally by low calcium diets.¹ Clinically, hyperplasia of parathyroid tissue may occur in association with chronic nephritis.² This may be a compensatory reaction to the hypocalcemia which is the result of a phosphate retention and consequent hyperphosphatemia. The present work was undertaken to determine the relationship of a low serum calcium to parathyroid secretion.

For the production of a hypocalcemia the method of Hastings and Huggins was used.³ Small dogs were alternately bled maximally and immediately transfused with an equal volume of decalcified blood. The blood was decalcified by shaking the plasma with solid lead phosphate. Allowing 10 minutes to elapse between transfusions, the total serum calcium decreased to 5.5-7 mg % after about 14 transfusions, and in several dogs localized muscle fibrillations and tremors were seen. Twenty minutes after the last transfusion the serum calcium rose 1 to 2 mg in both the normal dogs and in dogs thyroparathyroidectomized just prior to the experiment. Subsequent samples—40 and 80 minutes after the last transfusion—showed no further rise in serum calcium. Such transfusion experiments were performed on 7 normal and 3 thyroparathyroidectomized dogs.

In a second series of experiments, large amounts of sodium oxalate (40 mg/kg) were injected intravenously into both normal dogs and into dogs thyroparathyroidectomized just prior to the oxalate injections. The serum calcium fell immediately after the injections to 5.5-7 mg %, but rose promptly in the normal dogs and within 1½ to 3½ hours returned to the normal level (9.5-11 mg %). Only a very slight rise in serum calcium (1-2 mg %) occurred in the parathyroprival dogs and there was no further change although the observations extended over a 7-hour period (see Fig. 1). Experiments

¹ De Robertis, E., *Anat. Rec.*, 1941, **79**, 417.

² Longmead and Orr, *Arch. Dis. Childhood*, 1933, **8**, 265.

³ Hastings, A. B., and Huggins, C. B., *Proc. Soc. Exp. Biol. and Med.*, 1933, **30**, 458.

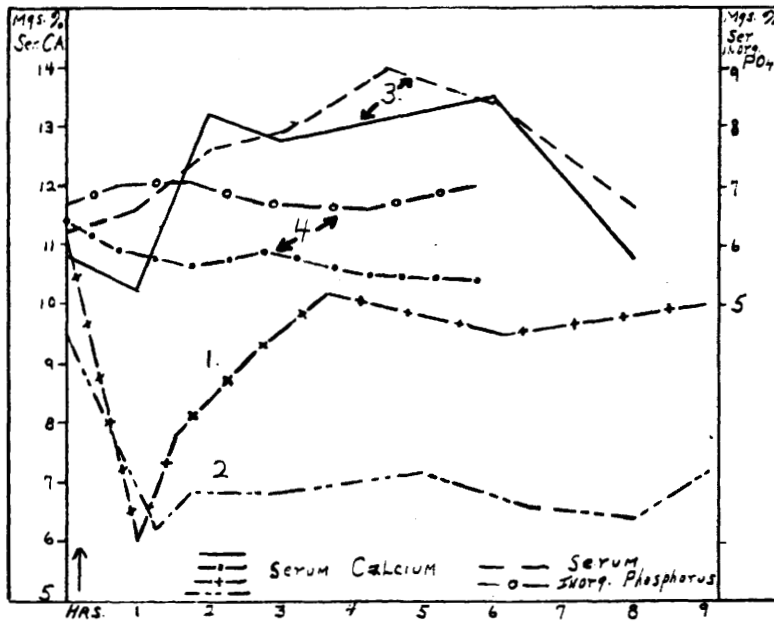


FIG. 1.

Serum calcium following I.V. injection of sodium oxalate into (1) normal dog and (2) dog thyroparathyroidectomized just prior to oxalate injection. Serum calcium and serum inorganic phosphorus following I.V. injection of decalcified blood parathyroid perfusate (3) and normal blood parathyroid perfusate (4).

of this nature were performed on 5 normal and 4 parathyroprival dogs.

A more direct experiment was performed as follows: The thyroid-parathyroid gland in a dog was isolated from the systemic circulation by tying appropriate vessels, leaving open only one artery (the superior thyroid) and one vein (the internal jugular into which several thyroid veins empty). The superior thyroid artery and the internal jugular vein were cannulated. Decalcified heparinized blood was perfused through the gland for 2 hours at a rate of approximately 3-4 cc per minute and the blood coming from the thyroid and parathyroids was collected. The plasma of this perfusate was then injected intravenously into a normal dog (anesthetized with sodium barbital) and the serum calcium and phosphorus changes were followed. A rise in serum calcium of from 1.6 to 4.5 mg occurred 1½ to 3 hours later. There was also an increase in serum inorganic phosphorus at this time, but the maximum elevation in phosphorus occurred somewhat after that of calcium (see Fig. 1). In one dog the rise in phosphorus was preceded by a fall. Alteration in serum inorganic phosphorus is not very significant unless correlated with urinary phosphorus. Unfortunately, simultaneous urine samples

were not taken. This is being done in the present series of experiments. The calcium and phosphorus returned to normal in 4½ to 7 hours in 4 of the dogs but remained elevated in 3 dogs 7 hours after the injection.

When normal heparinized blood was perfused through the thyroid-parathyroid apparatus, the collected perfusate upon intravenous injection yielded no significant change in serum calcium and serum inorganic phosphorus. The maximum elevation in calcium was 0.6 mg % and in phosphorus 1.0 mg %. Eleven experiments involving the perfusion of both decalcified and normal bloods have been performed and are interpreted as evidence that a low serum calcium is a stimulus for the parathyroid glands to produce more hormone.

Summary. Preliminary investigations involving (a) the intravenous injection of sodium oxalate into normal and parathyroprival dogs and (b) the perfusion of decalcified blood through the thyroid-parathyroid apparatus and injection of the perfusate into normal dogs, indicate a humoral control (low blood calcium) of the parathyroid glands.

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Progesterone Effect on Pituitary Lactogen Content and on Mammary Glands of Ovariectomized Rats.*

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Selye^{1, 2} has shown that the administration of progesterone alone is sufficient to induce the development of the lobule-alveolar system of the mammary glands of ovariectomized rats. Since the mammary glands of such rats showed no histological evidence of secretory activity, it was of interest to determine the influence of progesterone on the lactogen content of the pituitary gland.

Twenty-four sexually mature virgin rats were ovariectomized and

* Journal Series Paper of the New Jersey Agricultural Experiment Station, Rutgers University, Department of Dairy Husbandry.

¹ Selye, H., *Proc. Soc. Exp. Biol. and Med.*, 1940, **43**, 343.

² Selye, H., *Anat. Rec.*, 1940, **78**, 253.