

Effect of Parathyroidectomy on Calcium Concentration of the Rat Submandibular Glands.* (30461)

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Dreisbach(1) reported that the concentration of calcium in the submandibular salivary glands of the rat was greater than that of the kidney, liver, or plasma. In view of this relatively high concentration of calcium in this tissue, it was of interest to determine what effect parathyroidectomy would have on the calcium content of this gland compared to that of other tissue. Talmage *et al* (2) reported the uptake of radiocalcium by various tissues of the rat in normal and hypoparathyroid animals and found a slight increase in uptake of Ca^{45} in the kidney, liver, and prostate of parathyroidectomized rats. Kraintz and Andrews(3) reported that parathyroidectomized rats showed a paradoxical increase in the calcium concentration of pilocarpine-evoked submaxillary saliva, but a drop in calcium concentration of parotid saliva paralleling that of blood.

Material and methods. Male rats of the Holtzman strain weighing from 150-250 g were used for this study. One group of 14 rats was surgically parathyroidectomized by the method of Richter and Birmingham(4). An equal number was sham-operated for a control group. Both groups were maintained on a standard laboratory diet (Purina) and tap water. Fourteen days after surgery the animals were given 40 mg/kg of sodium pentobarbital i.p. and killed 15 minutes later by exsanguination. To ensure uniform exsanguination, 0.2 ml of heparin (1:1000) was injected *via* the abdominal artery 2 minutes prior to withdrawal of blood from the same vessel. Blood was centrifuged to obtain plasma for calcium determinations. Submandibular glands (submaxillary and sublingual), muscle and kidneys were removed, weighed and transferred to crucibles. The samples were dried at 100°C for 24 hours, then placed in a muffle furnace at 500°C 24 hours for ashing. The ash was dissolved in a small

volume of 2 N HCl and diluted with an appropriate quantity of distilled H_2O to allow for multiple aliquots for analysis by automatic EDTA titration(5). Calcium values were calculated on the basis of milligrams per 100 grams wet weight of tissue.

Results. A summary of the calcium concentration found in the plasma, kidneys, muscle and submandibular glands of control and parathyroidectomized male Holtzman rats is given in Table I.

Parathyroidectomy resulted in an anticipated decrease in total serum calcium. There is significantly less calcium in the kidneys of the parathyroidectomized group paralleling the drop in plasma calcium. The calcium content of the muscle is approximately 60% of the plasma value and decreases following parathyroidectomy. The submandibular glands from the control group contain approximately 3 times the concentration of calcium found in plasma while the glands from the parathyroidectomized animals contain over a 5-fold concentration.

Discussion. There are several possible explanations of the high tissue concentration of calcium in the submandibular salivary glands. Dreisbach(6) has suggested that the high concentration of calcium in this gland could be maintained without a specific concentrating transport mechanism since either fresh, previously frozen gland slices or homogenates are capable of binding calcium *in vitro*. The presence of sialic acid containing glycoprotein in the submaxillary gland could also account for the high calcium concentration. A submaxillary mucoid containing 3.3% calcium and capable of further calcium binding *in vitro* has been isolated from cattle glands(7). It has been suggested that increased amounts of mucopolysaccharides in tissues could accelerate calcium deposition because of the affinity of these long chain polyanions for calcium(8). The increase of cal-

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TABLE I. Comparison of Calcium Concentration in Plasma and Tissue Between Control and Parathyroidectomized Male Rats.

	Calcium as mg/100 g wet wt of tissue*			
	Plasma	Submandibular salivary gland	Muscle	Kidney
Sham operated control	10.1 $\pm$.07	27.1 $\pm$ 1.30	6.37 $\pm$.06	6.41 $\pm$.06
Parathyroidectomized	6.80 $\pm$.16	36.5 $\pm$ 1.10	5.76 $\pm$.04	5.65 $\pm$.04

* Values reported as arithmetic mean $\pm$ standard error for groups of 14 rats.

cium concentration on the submandibular gland in the absence of parathormone may reflect an increased transport of calcium into the gland and subsequent binding with glycoprotein. Parathyroidectomized lactating rats have an increased calcium concentration in the milk. It has been suggested that the increased calcium concentration of the milk from parathyroidectomized lactating rats is due to an increase in the transport of calcium to the mammary gland in the absence of parathormone(9).

Summary. Submandibular salivary glands of parathyroidectomized rats have an increased calcium content compared to control rats. Kidney and muscle from parathyroidectomized rats had decreased calcium concentrations paralleling the plasma calcium changes.

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Gastric Inhibitors in Fasting Canine Thoracic Duct Lymph.* (30462)

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Gastric juice, especially that from the antrum, has been found to contain a substance (G.I.S.) which inhibits gastric secretion upon intravenous injection in dogs or rats [Hood *et al*(1); Menguy *et al*(2); Semb *et al*(3)]. A similar substance has been demonstrated in human saliva. The mechanism of transport of this gastric inhibitory substance is not clear—it is possible that it may be transported in lymph. Certain humoral substances,

notably thyroid hormone [Daniel *et al*(4)], renin and an angiotensin-like substance [Lever and Peart(5)] have been demonstrated in the lymph.

The present study was undertaken to ascertain whether G.I.S. or a similar substance was present in autogenous thoracic duct lymph.

Methods and materials. Collection of lymph. Five Heidenhain pouch dogs weighing between 12 and 22 kg were utilized. The thoracic duct was cannulated with polyethylene cannulae both cranially and caudally,

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