A summary of results of the assay of each group of pituitaries is given in Table I. It may be seen from this table that 12 to 13 mg of fresh pituitary tissue from rabbits which had received 25 daily injections of anol was required to establish a mouse unit of mammogen; whereas 20 mg was required with pituitaries from animals which had received 20 rat units of dihydrotheelin daily for 25 days. Seven to 7.5 mg of fresh pituitary tissue from rabbits which had received 0.1 mg of anol and 20 rat units of dihydrotheelin simultaneously daily for 25 days was required to establish a mouse unit. Dosages as high as 60 mg and 80 mg of fresh pituitary tissue from adult males and young virgin female rabbits respectively, were ineffective in stimulating the growth of the mammary glands of male mice. These results were interpreted as indicating that the pituitary of normal adult males and young adult virgin female rabbits contain little or no mammogen.

Both the anol and dihydrotheelin definitely stimulate the production of mammogen by the pituitary gland of rabbits. Though the relation of the anol and dihydrotheelin to the production of mammogen has not been established in this experiment, the present results seemed to indicate that at the dosage level administered anol was more effective insofar as the stimulation of the production of mammogen by the pituitary gland is concerned. It is interesting to note that anol is capable of inducing growth in both the ducts and lobule-alveolar systems of the mammary gland.[3] The simultaneous injections of anol and dihydrotheelin considerably increases the mammogenic activity of the pituitary gland of rabbits as compared to the pituitaries of animals which had received either anol or dihydrotheelin alone. Further studies to determine the effect of dosages and length of administration of anol and dihydrotheelin as well as other naturally occurring and synthetic estrogens are now in progress.

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Phlorhizin Glycosuria and Hypoglycemia Unaffected by Excess Ingestion of Na and K Salts.

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The daily ingestion of sodium salts in large amounts (1 to 2 g per kg of body weight per day) was found by Thompson, McQuar-

rie and Anderson[1, 2] to increase the ability of diabetic children to utilize carbohydrate, as shown by a marked decrease in glycosuria and a gradual lowering of the fasting blood sugar level. Corresponding potassium salts were found to exert a diametrically opposite effect on carbohydrate metabolism, one part of potassium counteracting the effect of approximately 3 chemically equivalent parts of sodium. The beneficial effect of a high intake of sodium chloride was confirmed in adult diabetic subjects by MacLean[3] and by Sanstead.[4] More recently Crabtree and Longwell[5] have partially explained the action of the excessive intake of sodium salt by their demonstration that it causes a marked increase in the deposition of liver glycogen in young rats. On the other hand Silvette and Britton[6] have recently shown that potassium in large amounts tends to interfere with the deposition of liver glycogen. That potassium is involved in the mechanism of normal carbohydrate metabolism is further suggested by the fact that its level in the blood plasma tends to follow that of glucose, being reduced markedly by the injection of insulin.[7, 8] In a study on the influence of phlorhizin on the inorganic metabolism in dogs, Kastler[9] found that the serum potassium was decreased while the inorganic phosphorus was increased following the administration of this glucoside.

The present investigation was undertaken with the hope of shedding additional light upon the apparent interrelationship between carbohydrate metabolism and the economy of sodium and potassium. The direct object of the experiments was to determine the specific effects of NaCl and of KCl on phlorhizin glycosuria and hypoglycemia when given separately in excessive amounts. Four normal dogs kept in individual metabolism cages were given basal maintenance diets, consisting of lard 2.0, butter fat 1.0, sucrose 2.5, whole wheat flour 3.0, artificial "bone ash" 0.4, egg white 2.0, and

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[3] MacLean, A. R., *Proc. Staff Meet. Mayo Clin.*, 1935, **10**, 321.

[4] Sanstead, H. R., *Hospital News*, 1936, **21**, 1.

[5] Crabtree, D. G., and Longwell, B. B., PROC. SOC. EXP. BIOL. AND MED., 1936, **34**, 705.

[6] Silvette, H., and Britton, S. W., PROC. SOC. EXP. BIOL. AND MED., 1937, **37**, 252.

[7] Briggs, A. P., Koechig, I., Doisy, E. A., and Weber, C. J., *J. Biol. Chem.*, 1923, **58**, 721.

[8] Harrop, G. A., and Benedict, E. M., *J. Biol. Chem.*, 1924, **59**, 683.

[9] Kastler, A. O., *J. Biol. Chem.*, 1928, **76**, 643.

egg yolk 2.0 g per kg of body weight daily. In addition each dog received one-half gram tablet of powdered yeast daily. Drinking water was given *ad libitum*. Two dogs were used for determination of the effects of NaCl and 2 for the KCl experiments. In each instance the time for the experiments was divided into periods of 6 or 7 days each, during which the animal received the diet alone, the diet plus extra salt, the diet plus daily injections of phlorhizin and the latter plus the extra salt. Recovery and post-recovery periods were also included. Phlorhizin was administered subcutaneously in olive oil in single daily doses of 100 mg per kg of body weight. NaCl was given with the diet in enteric coated pills at the rate of 1 g per kg of body weight per day. KCl was given to one dog in this manner and in the same dosage. The second dog to be given KCl received but 0.5 g per kg of body weight daily. The excretion of nitrogen, glucose and minerals was measured for all periods. In addition the non-protein-nitrogen, the sugar and the chief electrolytes of the blood were determined at the beginning of the experiment and at the end of each period, blood samples being obtained after a 14-hour fast.

TABLE I.

Summary of Data Regarding Effects of NaCl and KCl on Phlorhizin Glycosuria and Hypoglycemia.

Experimental Condition	Days	Blood Glucose mg/100 cc	Serum K mg/100 cc	Serum Inor. P mg/100 cc	Glucose Excreted g/kg/day
		Dog 22.			
Diet alone	6	63	18.2	4.8	0
Phlorhizin	7	51	15.3	4.2	4.5
Recovery	7	63	19.7	4.3	0.5
NaCl (1 g per kg per day)	6	56	18.5	4.4	0
NaCl plus phlorhizin	7	55	14.7	4.8	5.5
Phlorhizin	3	—	—	—	5.2
Recovery	10	69	19	4.1	0.2
		Dog 25.			
NaCl (1 g per kg per day)	5	94	17.9	2.8	0
NaCl plus phlorhizin	7	63	12.3	3.3	4.9
Phlorhizin	3	—	—	—	4.3
Recovery	6	80	17.2	3.4	1.5
		Dog 10.			
Diet alone	6	72	17.2	4.6	0
Phlorhizin	7	43	14.3	4.3	5.0
Recovery	7	62	18.4	4.2	2.4
KCl (1 g per kg per day)	5	69	17.5	4.3	0
KCl plus phlorhizin	7	37	18.6	3.7	5.0
Phlorhizin	3	—	—	—	3.3
Recovery	4	69	18.0	3.1	1.1
		Dog 32			
KCl (0.5 g per kg per day)	6	69	19.1	4.5	0
KCl plus phlorhizin	7	55	17.6	4.8	3.9
Phlorhizin	3	—	—	—	5.1
Recovery	8	64	19.6	4.1	3.8

The essential results are summarized in Table I. The effects of phlorhizin alone on the blood constituents were similar to those reported by Kastler, except for the absence of a significant increase in serum inorganic phosphorus. While the serum potassium was regularly reduced by phlorhizin alone, it remained unchanged when phlorhizin administration was accompanied by the ingestion of potassium chloride in large amounts. On the other hand, the reduction of serum potassium as a result of phlorhizin administration was apparently accentuated by the feeding of excessive amounts of sodium chloride. In neither instance, however, did the extra salt ingested significantly influence the degree of phlorhizin hypoglycemia. The glycosuria due to phlorhizin administration was likewise essentially unaffected by either salt. The slight increase observed in some experiments was obviously due to an accentuation of the phlorhizin diuresis by the salt ingested. Slight variations which were noted in the excretion of nitrogen and of minerals could be accounted for in the same way. The calcium, magnesium, sodium, non-protein nitrogen, chloride and CO_2 content of the serum were not significantly altered by the procedures employed.

It is concluded from these experiments that the disturbance in carbohydrate metabolism due to phlorhizin poisoning bears no relationship to that of diabetes mellitus as regards its response to ingestion of excessive amounts of sodium or potassium salts. The characteristic effects of these salts on hepatic glycogenesis in the normal dog appear to be abolished by phlorhizin.

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Use of Aluminum Metal in Contact with Blood in Perfusion Systems.

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In attempting to use the Bayliss-Fee oxygenator in isolated mammalian heart studies it was found that the life of the preparation was very short, as little as 30 minutes. The coronary flow was found to diminish progressively and the hearts failed rapidly. In investigating possible causes it was found that considerable $Al(OH)_3$ accumulated in the system. The oxygenator is made of cast aluminum. The corrosion of the aluminum metal obviously led to the production of $Al(OH)_3$. Therefore all surfaces were