

sexes. The degree of impairment is very similar to that occurring after thyroidectomy, as reported by Althausen and Stockholm.⁵ Adrenalectomy, like thyroidectomy, nullified the normal difference^{2, 5} in absorption of dextrose between sexes.

Our experiment with rats given sodium chloride shows that this substance did not alter the absorption of glucose in normal rats, but restored it to normal in adrenalectomized animals. This finding is of particular interest in view of the work of Anderson and Joseph,⁶ who showed that administration of sodium chloride corrects the abnormalities of potassium and sodium excretion in adrenalectomized rats. Administration of sodium chloride after adrenalectomy did not raise the average rate of absorption in female rats above that in males. The present work reconciles the contradictory reports regarding the effect of adrenalectomy on intestinal absorption of dextrose.

Conclusions. Adrenalectomy markedly diminishes intestinal absorption of dextrose. Administration of sodium chloride after adrenalectomy restores the absorption of dextrose to normal.

10408 P

Electrolyte Excretion Studies in Rats Maintained on Low-Na and Low-K Diets.*

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The rates of excretion of radioactive sodium and potassium have been studied in rats which were reared on the McCollum low-sodium and low-potassium diets.¹ The low-sodium diet was found by analysis to contain 0.6% sodium; the low-potassium diet, 0.4% potassium. The animals were maintained on these diets from the time of weaning until the excretion studies were made 5 to 6 months later.

⁵ Althausen, T. L., and Stockholm, M., *Am. J. Physiol.*, 1938, **123**, 577.

⁶ Anderson, E. M., and Joseph, M., *Proc. Soc. Exp. Biol. and Med.*, in press.

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¹ Orent-Keiles, E., Robinson, A., and McCollum, E. V., *Am. J. Physiol.*, 1937, **119**, 651.

The sodium-deficient rats were definitely inferior in growth and in general appearance. Their average body weight at 6 months was 163 g as compared with the average body weight of the control animals on the regular stock diet which was 352 g. The potassium-deficient animals more closely resembled the control rats. Their average body weight at the same age was 362 g. Both groups of rats on the special diets were given distilled water in the drinking bottles. Unfortunately there were no control groups of animals fed the special low-sodium diet to which adequate sodium chloride was added, and the same may be said with reference to the low-potassium diet. However, since the only difference between these two diets was that the low-sodium diet contained potassium chloride and the low-potassium diet contained sodium chloride and the group on the low-potassium diet grew as normal animals, it appears permissible to assume that the defective growth in the low sodium diet was not due to any other deficiency than inadequate sodium.

The animals were taken off the special diets 24 hours before the radioactive isotopes were administered and were given Locke's solution made up with 6% glucose by stomach tube in amounts of 10 cc 3 times a day. The radioactive sodium and potassium were prepared by the method described by Hamilton.² The technic used in the excretion studies was similar to that described in a previous paper by the authors.³ Each rat was given 1 cc of an isotonic solution of the radioactive isotope intraperitoneally. The excretion of this material was followed over a 48-hour period. During this period the Locke's solution with glucose was given by stomach tube in 10 cc doses 3 times a day. Some of the rats with the sodium deficiency were given adrenal cortical hormone (Upjohn), 1 cc twice daily, in the 24 hours preceding the administration of the radioactive isotopes and during the 48-hour excretion period.

The results of this study are recorded in Tables I and II. It will be seen that the rats suffering from sodium deficiency excreted the radioactive sodium more rapidly than normal animals and retained the radioactive potassium in greater amounts than normal. In the potassium-deficient rats the urinary excretion of the radioactive sodium was the same as in the normal rats; however, there was a retention of radioactive potassium.

The finding of an increased rate of excretion of radioactive sodium and a retention of radioactive potassium in rats which are suffering

² Hamilton, J. G., *Ibid.*, 1938, **124**, 667.

³ Anderson, E. M., Joseph, M., Lawrence, J. H., *PROC. SOC. EXP. BIOL. AND MED.*, in press.

TABLE I.
Effect of a Low-Sodium Diet on Urinary Excretion of Sodium²⁴ and Potassium⁴².

	Sodium ²⁴			Potassium ⁴²		
	No. animals	0-24 hr. %	0-48 hr %	No. animals	0-24 hr. %	0-48 hr %
Control group: Rats fed standard diet I	6	31.4 (27.2-35.1)	43.8 (40.5-49.0)	7	6.0 (4.9-7.5)	9.5 (8-11.5)
Exper. group I: Rats maintained on low-Na diet	4	33.2 (28.0-41.3)	55.2 (51.3-60.8)	6	3.1 (2.6-4.4)	7.1 (6.3-7.7)
Exper. group II: Rats maintained on low-Na diet but given cortin	5	31.0 (25.7-36.7)	49.9 (43.1-55.1)	5	6.9 (5.6-8.7)	14.4 (14.8-16.3)

TABLE II.
Effect of a Low-Potassium Diet on Urinary Excretion of Sodium²⁴ and Potassium⁴².

	Sodium ²⁴			Potassium ⁴²		
	No. animals	0-24 hr. %	0-48 hr %	No. animals	0-24 hr. %	0-48 hr %
Control group: Rats fed standard diet I	6	31.4 (27.2-35.1)	43.8 (40.5-49.0)	7	6.0 (4.9-7.5)	9.5 (8-11.5)
Exper. group I: Rats fed low-K diet	5	31.7 (27.8-36.0)	46.7 (40.4-49.3)	5	2.8 (1.9-3.4)	6.3 (4.6-8.9)

from a deficiency of sodium but which have an adequate potassium intake, suggests that the mechanism for the control of potassium and sodium excretion has been seriously disturbed. This alteration in function resembles that seen in untreated adrenalectomized rats.⁴ Furthermore, the giving of cortin to the sodium-deficient animals caused the excretion rate of sodium to return to normal, and to increase the rate of excretion of potassium over that of the normal. It is apparent that sodium-deficient animals are more sensitive to cortin than are normal rats. The retention of the radioactive potassium in the potassium-deficient rats might be interpreted as due to the need of the body for more potassium.

Summary. (1) Rats which have been reared on a low-sodium diet excrete radioactive sodium more rapidly than normal rats, and retain radioactive potassium in greater amounts than normal. In this respect they resemble untreated adrenalectomized rats. The giving of cortin corrected this disturbance. (2) Rats deficient in potassium excrete radioactive sodium at a normal rate but retain radioactive potassium.

10409 P

Urinary Excretion of Radioactive Na and K in Adrenalectomized Rats, With and Without Salt.* †

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Radioactive sodium and potassium‡ have been administered to adrenalectomized rats and the rate of urinary excretion of these substances determined. The advantage of using "tagged atoms" for studying the metabolism of sodium and potassium is that it offers a rapid and highly accurate method for detecting in the body and in the excretions the identical atoms of sodium and potassium which have been administered.

⁴ Unpublished data by the authors.

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† We wish to thank Dr. John H. Lawrence of the Radiation Laboratory for providing us with the radioactive isotopes used in this study.

‡ The preparation of the radioactive isotopes has been described previously by Hamilton (*Am. J. Physiol.*, 1938, **124**, 667).