duodenal mucosa produced a copious pancreatic secretion and a considerable increase in the bile flow; they also evoked some gastric secretion but were much less potent in this respect than the pyloric extracts. Extracts from jejunal mucosa produced a secretion from the pancreas, but none from the gastric glands.

The active principle of the pyloric extracts was found to be soluble in 80% methyl and 80% ethyl alcohol and in dilute acetone, and to be precipitable from aqueous solutions by 10 to 30% NaCl, depending on the pH. By utilizing these properties, further purification of the pyloric principle was carried out, with resulting higher potency and complete elimination of secretin effect on the pancreas.

The above observations appear to support the "gastrin" theory of gastric secretion. They also suggest that "gastrin" may play some part in the intestinal phase of gastric secretion.

9917 P

Effect of Adrenal Cortical Hormone on Carbohydrate Stores of Fasted Hypophysectomized Rats.*

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Russell[1] and others have shown that the 24-hour fasted hypophysectomized rat is unable to maintain its carbohydrate stores within normal limits. Furthermore, Russell[2] has found that the injection of anterior pituitary extracts, while bringing about a preservation of the muscle glycogen, does not prevent the depletion of liver glycogen and hypoglycemia.

While the effect of anterior pituitary extract in maintaining the muscle glycogen appears to be independent of the adrenals,[3] Bennett[4] has recently found that the treatment of hypophysectomized rats for some days before and during fasting with an adrenotropic

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1 Russell, J. A., PROC. SOC. EXP. BIOL. AND MED., 1936, **34**, 279.

2 *Ibid., Endocrinology,* 1938, **22**, 80.

3 Bennett, L. L., *Endocrinology,* 1938, **22**, 193.

4 *Ibid.,* PROC. SOC. EXP. BIOL. AND MED., 1937, **37**, 50.

extract is effective in not only maintaining the glycogen stores of muscle and liver but also in producing a slight hyperglycemia.

One of us[5] has suggested that the alterations observed in the pancreatic diabetes of hypophysectomized animals are largely a consequence of adrenal cortical atrophy, and strong support of this view would be furnished by a demonstration of the ability of the adrenal cortical hormone to prevent or repair the depletion of the carbohydrate stores of fasted hypophysectomized rats.

The results in Table I indicate that either cortical extract, or a crystalline compound isolated from the adrenal by Kendall† will not only prevent the depletion of the carbohydrate stores of fasted hypophysectomized rats but will also restore the blood sugar, liver and muscle glycogen even though they have first been lowered by fasting. In fact, in both instances, the blood sugar and liver glycogen exceed that usually found in normal rats fasted for 24 hours.

TABLE I.
Carbohydrate Levels of Hypophysectomized Rats Fasted for 24 Hours and Injected with Cortical Extract (Upjohn).

		Muscle Glycogen Mg %		Liver Glycogen Mg %		Blood Glucose Mg %	
	No.	Mean	Range	Mean	Range	Mean	Range
Untreated Normals	13	521	480-560	188	110- 310	84	72- 96
Untreated, hypophysectomized	6	320	185-413	94	57- 108	52	20- 66
Hypophysectomized, 1 cc extract every hr for 24 hr	6	440	421-498	583	263-1010	101	94-105
Hypophysectomized, .03 mg Kendall's Comp. B every hr for 24 hr	1	450	—	1520	—	107	—
Hypophysectomized, rats fasted 24 hr, then inject. 1 cc extract every hr for 12 hr	2	450	425-474	1330	1030-1570	105	104-106

In view of these results, it is difficult to avoid the conclusion that a large part, if not all, of the inability of fasted hypophysectomized rats to preserve their carbohydrate stores is due to a deficient supply of the cortical hormone. The manner in which this hormone preserves or increases the glycogen stores is being further investigated, but it is apparent that either a decreased utilization of carbohydrate or an increased production of glucose from non-carbohydrate sources would account for the effects obtained.

[5] Long, C. N. H., *Harvey Lectures*, 1936-37, Williams and Wilkins, Baltimore.

† We are indebted to Dr. E. C. Kendall for this substance.

Since Russell has reported that the effect of anterior pituitary extracts in preserving muscle glycogen may be obtained in the absence of the adrenals, it is still possible that this gland secretes 2 substances affecting carbohydrate metabolism: (a) the adrenotropic principle and (b) a "glycostatic" principle which affects the tissues directly.

Summary. The injection of adequate amounts of either adrenal cortical extract or the crystalline compound B of Kendall will not only prevent the depletion of the carbohydrate stores of fasted hypophysectomized rats, but will also restore them after they have been depleted by fasting.

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Effect of Absolute and Partial Vitamin C Deficiency on Healing of Wounds.*

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It is now well established that the intercellular substances in general, and the collagen of all fibrous tissue structures in particular require ascorbic acid for their production and maintenance. Aschoff and Koch[1] made thorough postmortem studies of World War soldiers who had died of scurvy, and demonstrated constant pathological changes in the supporting tissues of the body. Höjer[2] found a general atrophy of the connective tissue in scorbutic guinea pigs, and pointed out for the first time a general deficiency in the formation of collagen. In a series of more recent communications Wolbach[3, 4, 5] and his collaborators confirmed the observations of Höjer, and conclusively showed that ascorbic acid is intimately concerned with the synthesis and maintenance of intercellular supporting materials. Jeney and Törö,[6] when they added ascorbic acid to the nutrient medium of a culture of fibroblasts *in vitro*, found a marked increase in the number of collagen fibrils that were produced.

* The expense of this investigation was defrayed by Davis and Geck, Inc.

1 Aschoff, L., and Koch, W., *Skorbut*, Jena, 1919.

2 Höjer, J. A., *Acta Pædiat.*, 1924, **3**, 8 (supp.).

3 Wolbach, S. B., and Howe, P. R., *Arch. Path. and Lab. Med.*, 1926, **1**, 1.

4 Wolbach, S. B., *Am. J. Path.*, 1933, **9**, 689.

5 Menkin, V., Wolbach, S. B., and Menkin, M. F., *Am. J. Path.*, 1934, **10**, 569.

6 Jeney, A. V., and Törö, I., *Virchows Arch. f. path. Anat.*, 1936, **298**, 87.