Since skin potential seems to be in some ways related to the nervous system, the question arose whether there is also a relation between skin potential and the circulatory system. A number of frogs were prepared as in previous experiments and, after equilibrium potentials had been reached, the frogs were double pithed; then, after readings had been taken for 12 minutes, the heart was removed or injured through a small opening. As the data indicate (Table III), there was no appreciable change in potential for a 12-minute period after the operation as compared with the immediate change following injury of the nervous system. This steady state following removal of the heart was maintained for 30 to 40 minutes, after which there was a gradual but definite fall in skin potential.

Conclusions. I. Potentials across the skin in the intact frog remain remarkably constant. Manipulation of electrodes or position of the frog has little influence on potential readings. II. Destruction of the nervous system causes a sudden decrease in skin potential. The average decrease in potential after brain and spinal cord destruction is approximately 25% in each case. III. Following intraperitoneal injection of strychnine sulphate into the intact frog there is an increase in skin potential for approximately 15 minutes, after which there is a gradual return to normal. IV. Alterations in circulation by removal of the heart causes no appreciable change in skin potential.

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Pantothenic Acid and Hemorrhagic Adrenal Necrosis in Rats.

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A hemorrhagic necrosis of the adrenal cortex was frequently observed in rats used for a study of vitamin B_6 deficiency in this laboratory. This abnormality was prevented when Vitab or a filtrate factor concentrate was included in the diet. Similar observations were reported by Daft and Sebrell.[1] When synthetic pantothenic acid became available it seemed desirable to investigate its relation to this adrenal pathology. While these investigations were being completed, Daft, Sebrell, Babcock, and Jukes[2] reported

[1] Daft, F. S., and Sebrell, W. H., *Public Health Rep.*, 1939, **54**, 2247.

[2] Daft, F. S., Sebrell, W. H., Babcock, S. H., Jr., and Jukes, T. H., *Public Health Rep.*, 1940, **55**, 1333.

similar studies. The data herein presented are essentially a confirmation of the results obtained by the above workers.

The basal diet used in these studies consisted of alcohol-extracted Labco casein 18, sucrose 78, and salts No. 186[3] 4%. This diet was supplemented in all experiments with adequate amounts of thiamin, riboflavin, choline, calciferol, and carotene. Pyridoxine was given in some cases from the start of the experiment and in others after severe skin lesions had developed. In one experiment butterfat was included in the basal diet at 5, 10, or 20% levels without affecting the incidence of adrenal necrosis. Other dietary supplements are listed in Table I.

Severe adrenal cortical hemorrhage and necrosis was not produced in every case where pantothenic acid was omitted from the diet. However, it was never present in the rats which received a source of natural pantothenic acid or synthetic calcium pantothenate.

The animals which presented severe necrotic changes in the adrenal cortex failed rapidly, developed a severe hemorrhagic rhinitis, and, in some cases, passed into coma before they were removed for examination. Microscopic examination was made of necropsy material consisting of sections of adrenal gland, heart, spleen, liver, kidney, thymus, lung, and the intraorbital lacrimal gland. The adrenal hemorrhage originated in the inner zone of the cortex, but the medulla was not involved. Abnormal thymic involution was present in the animals with adrenal necrosis. Pneumonic processes were present in the lungs in most of these animals. They were, however, more severe and sometimes involved extensive consolidation of the lung tissue in the filtrate-factor-deficient animals. The intraorbital lacrimal glands from the filtrate-factor-deficient animals showed mild epithelial sloughing and some hemorrhage into

TABLE I.

Daily dietary supplements	No. of rats	No. of cases and type of lesion	
		Severe hemorrhagic adrenal necrosis	Adrenal hemorrhage only
300 mg Vitab*	10	none	none
Filtrate factor 2†	7	"	"
100 mg Ca pantothenate‡	8	"	"
No supplement	10	3	5
0.1 ml corn oil	9	7	2

*National Oil Products Company, Harrison, N. J.
†Equivalent to 100 mg of Eli Lilly liver extract No. 343.
‡Generously supplied by Merck & Co., Rahway, N. J.

[3] Guerrant, N. B., and Salmon, W. D., *J. Biol. Chem.*, 1930, **89**, 199.

the lumen. A very excellent report of the relation of pantothenic acid to the histopathology of filtrate-factor deficiency has been made by Ashburn.[4]

In conclusion, evidence is presented to confirm the findings of Daft and coworkers that pantothenic acid prevents the adrenal hemorrhage and necrosis frequently observed in filtrate-factor-deficient rats.

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Measurement of Diodrast and Inulin Clearances in Man After Subcutaneous Administration.*

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The administration of diodrast and inulin by constant intravenous injection for periods of 2-4 hours has been undoubtedly tedious to many of our patients, has made the use of catheters obligatory, and has required the coöperation of at least 2 operators when blood and urine samples are drawn at frequent intervals. One of us (HLW) found that in dogs subcutaneous injection of diodrast resulted in plasma concentrations sufficiently constant for the purpose of clearance estimation. We have greatly simplified our clinical work by applying this technic to humans.

Technic. Breakfast is withheld and a blood sample drawn for analytical blanks. Under procaine anesthesia a warm, freshly prepared 25% inulin solution (0.2 g inulin/kg) is introduced into the loose subcutaneous tissue of the axilla by means of a 50 cc glass syringe and a long spinal needle. The patient drinks a liter of water. About 45 minutes later diodrast (0.2 cc/kg) is similarly injected through the same wheal; if it is introduced directly into the inulin puddle the diodrast need first be diluted with only 2 or 3 volumes of salt solution in order to avoid irritation. Ten or 15 minutes later the first blood sample is taken, the patient discards his bladder urine, and clearance periods are then obtained in the usual way. Satisfactory plasma concentrations exist for at least 2 hours

4 Ashburn, L. L., *Public Health Rep.*, 1940, **55**, 1337.

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