lowed withdrawal of the extract. Complete recovery from the convulsions which usually immediately preceded death was readily brought about, in several cases in the same animal.

The low blood sugar, high non-protein nitrogen and increased blood cell volume are restored to within normal limits when the extract is given by mouth. All the effects which were produced by oral administration were in keeping, indeed, with those which resulted from intraperitoneal injection of the material. Approximately three to five times the intraperitoneal dosage was necessary to produce comparable results. It is definitely clear from the experiments, however, that the effective hormone of the adrenal cortex is not wholly if at all destroyed in its passage through the gastro-intestinal mucous membrane.

Numerous attempts to maintain the lives of adrenalectomized cats by feeding whole and demedullated adrenal glands have not to date been successful. The animals do not readily eat the glandular tissue; if they are forcibly fed, vomiting often follows.

Adrenalin given by mouth in similar concentration to that present in the cortical extract which was used had no noteworthy influence on adrenal insufficiency. Glucose solutions given orally were also without significant effect.

The development of a method by which potent extracts of the adrenal cortex can be consistently produced suggested that tests of extracts of other tissues be made. Knowledge that specific chemical agents or hormones may be separated from widely different body tissues, and also that certain characteristics of the adrenal cortex find a resemblance in other extra-adrenal tissues (*e.g.*, the brain and testes), gave some hope of success in these experiments. Extracts were made of the following tissues: testes, brain, liver, spleen, and heart muscle. The method of preparation of these extracts was in all details similar to that used concurrently in making potent preparations of the adrenal cortex. When the tissue extracts were tested on adrenalectomized cats showing different degrees of adrenal insufficiency, however, the results were in all cases wholly negative. No effects were observed on the muscular weakness or other symptoms, or on the length of survival after operation.

In a recent report[5] the striking influence of cortico-adrenal extract, in bringing about precocious sexual maturation in rats, has been pointed out. Maintenance of the lives of adrenalectomized animals and the effects on sexual maturity—two apparently widely-separated functions—which are brought about by cortico-adrenal extract indicate the presence in the material of two distinct chemical agents or hormones.

It is suggested that the primary action of the life-preserving hormone of the adrenal cortex, which is effective in conditions of adrenal insufficiency, is concerned with preservation of the normal carbohydrate balance in the body.

Observation that animals from which the adrenal glands have been completely removed may be kept alive with extracts of the cortex indicate the dispensability but not the inutility of adrenal medullary secretion.

SUMMARY

Increase of the blood sugar which invariably follows administration of cortico-adrenal extract to adrenalectomized cats with symptoms of insufficiency is a reliable index of potency and affords a means of bio-assay of the material.

Cortico-adrenal extract is effective when given by mouth. The lives of adrenalectomized animals are prolonged and all the signs and symptoms of severe insufficiency are rapidly abolished by oral administration of large doses of the extract.

Extracts which have been prepared similarly to cortico-adrenal extract from many different (extra-adrenal) body tissues have no influence on the symptoms of adrenal insufficiency.

The existence of two hormones in cortico-adrenal extract is postulated.

S. W. BRITTON
H. SILVETTE[6]

UNIVERSITY OF VIRGINIA

## VARVED CLAY IN HOLMES COUNTY, OHIO[1]

IN the course of field study of the glacial geology of Holmes County, Ohio, several deposits of layered glacial clay and silt have been discovered.

Holmes County is in northeast central Ohio. The region is one of maturely dissected upper Mississippian (Waverley) and Lower Pennsylvania (Pottsville and Allegheny) horizontal sediments. The usual relief is about 300 feet. The Late Wisconsin drift border crosses the county in a general east-west direction, except in the eastern portion, where the glacial boundary trends northeast-southwest. The farthest extent of the Late Wisconsin ice sheet is not well marked by a terminal moraine, except in some of the valleys which have their courses across the glacial boundary.

[5] E. L. Corey and S. W. Britton, SCIENCE, 74: 101–102, July 24, 1931.

[6] W. T. Porter Fellow in Physiology.

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[1] Published by permission of the Director, Geological Survey of Ohio.

Evidence is accumulating to show that the ice front retreated unevenly. Ice remained in the valleys for some time after it had melted from the hilltops. Such a condition was favorable for the formation of temporary lakes, not only in northward flowing valleys, but also in valleys flowing southward.

One of the lake deposits made up in part of varved clay is in southwestern Paint Township, in northeastern Holmes County, in the upper end of the valley of Middle Fork of Sugar Creek.[2] A well marked flat, now somewhat dissected by gullies to a depth of about 20 feet, is present on either side of the Mt. Hope-Winesburg road, two miles east of the first named village. The top of the terrace is approximately 1,110 feet above tide. A section of the material at the top of the terrace, measured in a newly excavated road-bank two miles east of Mt. Hope shows the following:

| | Ft. | In. |
|---|---|---|
| Fine gravel | 3 | 0 |
| Sand | 0 | 10 |
| Sand and clay layers, fairly even, each layer about ½ to 1 inch thick | 6 | 0 |

A short distance to the northwest, along a side road, about 10 feet lower than the deposits above, layered material resembling varved clay is present. It consists of evenly bedded sand layers about ¼ inch thick and layers of soft, soapy, bluish gray clay from 1 to 1½ inches thick. The clay layers contain thin streaks of sand about 1/64 inch in thickness. The clay layers can be separated along the thin sand partings.

Another deposit of layered clay was laid down in the southwestern part of Section Four, the southeast corner of Section Five and the northern part of Section Nine, Salt Creek Township, in the head of the valley of a small stream flowing southwest to Martins Creek.[3] This deposit is cut by the stream. The area is covered by irregular deposits of sand and gravel, giving a hummocky expression to the valley filling. The gravel and sand were probably washed into the lake after the deposition of the underlying clay and deposited around ice blocks. Along the road in central northern Section Nine, 20 feet of varved material is exposed. It consists of horizontal layers of clay and fine sand. The clay layers vary in thickness from ¼ to ½ inch, and the sand layers from one to two inches.

About three fourths of a mile to the northeast, in the southeastern part of Section Five, the relationship of the lake deposit to the underlying till is shown by the following section:

| | Ft. | In. |
|---|---|---|
| Clay and sand layers, clay layers the thicker | 7 | 0 |
| Gravel, small pebbles | 1 | 5 |
| Boulder clay, yellow, containing cobbles to 6 inches | 2 | 3 |
| Boulder clay, hard, tough, grayish blue, silty | 25 | 4 |

Some poorly exposed layered silt occurs in the valley of Martins Creek, one mile southeast of Benton, Salt Creek Township,[3] at an elevation of approximately 1,020 feet. To the northwest of Benton, kame terrace gravels overlie sand in which stratification is not well developed.

Layered clay is associated with the kame terrace on the eastern side of Killbuck Valley in the northern part of Millersburg, the county seat.[3] Clay four feet thick overlain by six feet of gravel is exposed at the end of North Grant Street. It is made up of layers ½ to ⅝ inch thick, separated by sand layers about 1/16 inch in thickness. The banding of this deposit may not be seasonal.

It is hoped that other deposits will be found and that sufficient data can be secured to correlate the deposits. A study of the till, and of the valley gravels, mainly of kame terrace type, is also in progress.

GEORGE W. WHITE
DEPARTMENT OF GEOLOGY,
UNIVERSITY OF NEW HAMPSHIRE,
DURHAM, N. H.

[2] Shown on the Millersburg and Navarre topographic sheets of the United States Geological Survey.

[3] Millersburg sheet.

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