(4) It is less sensitive than growth or the cure of ophthalmia for the detection of small amounts of vitamin A, *i.e.*, it takes more carotin to restore normal smears than to restore growth or to cure ophthalmia. For quantitative work this objection is not serious, since the amount of carotin (10 to 20 γ) necessary for normal smears is quite as definite as the amount (5 to 10 γ) necessary for growth, or the amount of (3 to 5 γ) necessary for a cure of ophthalmia.

(5) Like the ophthalmic method it is difficult to express the results in numerical terms. In this respect growth or maintenance in weight has obvious advantages, if one can be certain that all dietary requirements other than vitamin A have been supplied by the basal ration.

CARL A. BAUMANN
H. STEENBOCK

CHEMICAL CHANGES IN THE BLOOD IN ADDISON'S DISEASE[1]

THE significance of the loss of inorganic base from the body in diabetic acidosis, in cholera and in diarrhoeas of infancy, in high intestinal obstruction and in terminal chronic nephritis is now thoroughly appreciated. All these pathological states are characterized clinically by severe prostration, dehydration, lowering of the serum chloride concentration, nitrogen retention and frequently by a decrease in the bicarbonate concentration of the blood and "shock." Since these changes are also typical of the disease picture of severe adrenal insufficiency, we have studied in detail the electrolyte structure of the blood in three patients suffering from Addison's disease.

In the accompanying table it will be seen that all three patients showed deviations from the normal which were qualitatively similar. Of particular interest is the decrease in total base which occurs entirely at the expense of sodium, because in all three cases the potassium content of the serum was either at a "high normal" level or definitely increased. The changes observed in chloride, bicarbonate, non-protein nitrogen and blood sugar concentrations are those already well known. The retention of inorganic sulphate probably accompanies that of non-protein nitrogen. The abnormalities of the blood found in our patients suffering from Addison's disease are similar to the unpublished results attained by Zwemer in his study of adrenalectomized cats.

The loss of sodium and the increase in potassium in the blood serum of the patient E. C. is striking. This patient received two injections of extract of adrenal cortex prepared by Dr. R. Zwemer before the blood study was made and two injections later, but died in spite of this therapy. The patient J. V. was well except for increasing pigmentation of the body and buccal mucous membranes and for occasional vomiting spells for four months preceding admission to the hospital. In this patient, the decrease in the serum sodium concentration is also definite, but less marked than in the case of E. C. The blood of the third patient, M. W., was examined on three occasions. On admission the patient was markedly prostrated and, as in the other cases, showed a significant decrease in

[1] From the Department of Medicine, College of Physicians and Surgeons of Columbia University and the Presbyterian Hospital, New York City.

BLOOD CHANGES IN ADDISON'S DISEASE

Name	Date	T.B.	Na	K	Ca	Cl	HCO_3	PO_4	SO_4	Prot.	NPN	Sugar	Haemato-crit	Blood pressure	Remarks
		me.q. p.l.	me.q. p.l.	me.q. p.l.	me.q. p.l.	me.q. p.l.	me.q. p.l.	me.q. p.l.	me.q. p.l.	me.q. p.l.	mgm. per 100 cc	gm. p.l.			
E. C.	5– 9–32	127.7	109.5	8.74	6.6	70.1	18.0	4.3	4.0	18.2	75.9	0.72	44.4	76/52	Received 4 injections of Adrenal Cortex (Zwemer). Died on 5–11–32.
J. V.	5–17–32	144.9	131.3	5.3	5.4	97.6	26.1	1.9		17.0	32.0	0.91	41.7	102/60	
M. W.	7–19–32	136.3	123.5	5.3	5.3	88.6	21.8	2.6	2.3	15.1	39.0	0.73	42.0	85/55	
M. W.	7–26–32	125.8	107.8	7.1	4.8	72.7	21.5	2.4		16.9	45.0	0.80		65–70/48	Received 10 cc. of Eschatin on 7–26.
M. W.	8– 2–32	147.5	133.0	5.1	5.9	93.8	27.5	2.6		13.5	20.6	1.20	31.4	84/60	Patient had received 12–15 gm NaCl daily for 6 days.

sodium concentration in the blood serum. During the next week her condition became critical and the concentration of sodium fell still further to a level of 107.8 m.eq. per l. and the potassium rose to 7.1 m.eq. She was given only one injection of 10 cc of "Eschatin," a commercial preparation of adrenal cortex substance, intravenously and then received 12 to 15 gms of NaCl daily. It is interesting to note that after one week of NaCl administration the patient became almost entirely symptom-free and that simultaneously the abnormalities of her blood practically disappeared.

The mechanism of base loss in Addison's disease is not clear, but seems to be intimately related to the clinical picture of adrenal insufficiency and is being studied at the present time. It seems possible that the symptom complex may in part depend upon the profound changes in the relative concentrations of sodium and potassium. Whether or not the replacement of base in the patient M. W. was responsible for the amelioration of symptoms can not be stated, but the improvement which has persisted for two months with forced NaCl administration is impressive.

In conclusion, it may be stated that the clinical picture of severe adrenal insufficiency in many respects simulates that of other disease conditions, in which the loss of inorganic base plays an important rôle. Furthermore, a definite decrease in the sodium content of the blood serum, with a simultaneous tendency for potassium to increase in concentration, has been observed in three cases of Addison's disease. The patient treated with large doses of NaCl showed striking clinical improvement with the reestablishment of a more normal electrolyte structure in the blood serum.

ROBERT F. LOEB

HEREDITARY VARIATIONS IN THE SKULL OF THE RABBIT

THE skull of the rabbit presents a group of striking hereditary variations, including two distinctive types which may be designated as *dome* and *ridge* skulls. The exact mechanism of inheritance of these conditions has not been determined with certainty, but, so far, more than 500 skulls have been studied and a brief summary of the results may be given.

Dome and ridge skulls appear to be expressions of the combined action of a group of unit factors which affect the size and shape of individual bones, the number of bones, suture patterns and the character and angle of bony union with the bregma, the coronal and sagittal sutures as visible foci of action. The bones chiefly affected are the frontals and parietals.

Considered individually, the variations concerned may be designated as "reversed suture," "accessory bone" and "fused suture." These conditions are present at birth and with continued growth of the skull lead to or become associated with other structural alterations.

In general, the coronal and sagittal sutures of the rabbit intersect at right angles or the coronal dips forward to form a slight V. In the typical "reversed suture," the coronal turns posteromedially at some distance from the bregma to intersect the sagittal in its middle third. The size and shape of the frontal bone is thus altered and the parietal correspondingly affected.

The condition described as "accessory bone" is one in which a supernumerary bone is produced by the formation of an accessory suture extending from the coronal to the sagittal suture. This suture usually follows a course similar to that of a reversed suture giving the resulting bone a roughly triangular shape. Rarely an accessory bone is found with a disproportionately long sagittal border in which case the accessory suture branches from the sagittal and runs close to and parallel with it to intersect the coronal a short distance from the bregma. The course of the coronal is often modified, its junction with the sagittal lying some distance anterior to that of the opposite side, so that the accessory bone lies partly in the frontal and partly in the parietal area.

The term "fused suture" has been applied to a condition in which the serrated markings of the suture and even the line of demarcation between bones are largely or entirely obliterated and, on the outer surface of the skull, are replaced by a smooth overgrowth of bone which creates the visual impression of continuity; in reality, the bones are still separable. The sutures affected by this change are mainly the coronal and sagittal.

The conditions described occur as unilateral or bilateral variations and in various combinations, symmetrical or asymmetrical. Individually, they produce comparatively little alteration in the general appearance of the skull, but, in combination, profound modifications of form and size are produced.

The ridge skull results from variations affecting the sagittal suture and the parietal bones. In the normal skull, the slope of the parietals as they approach the sagittal suture is very gradual and the upper face of the calvarium is comparatively flat. In the ridge skull, however, the parietals unite at an angle and their line of union, the sagittal suture, is fused. The vertical distance between the sagittal and squamosal sutures is increased and the vertex falls posterior to the bregma. Fusion of the sagittal is most pronounced in the region between the parietal bosses where normally its denticulations are widest. Parietal bosses are small but distinctly outlined and lie close to the sagittal suture. The antero-posterior arch of