cutaneously and by its stability, which resists heating to 110° C, and which is not neutralized by adrenalin.

B. It is possible that we have evidence here that the absence or the abnormal diminution of the adrenal secretion permits some of the pathogenetic action of the products and extracts of the tubercle bacillus and that their administration mixed with the whole adrenal or some part of it, in a measure overcomes their deleterious action.

C. It is possible that the neutralizing value of blood mixed with tuberculin or some other appropriate adrenal antagonist might be a valuable index of the functional condition of the adrenal glands.

25 (550)

Comparison of the blood-flow in the hands in a case with lesion of upper motor neurones (birth palsy) and in a case with lesion of lower motor neurones (infantile paralysis).

By **G. N. STEWART.**

[*From the Department of Experimental Medicine, Western Reserve University.*]

The blood flow was calculated from the formula

$$\varphi = \frac{H}{T - T'} \times \frac{1}{S}$$

where φ is the quantity of blood flowing through the hand in the period of observation, H the heat given off to a calorimeter containing the hand, T the temperature of the arterial blood coming to the hand (taken as rectal temperature),[1] T' the temperature of the venous blood leaving the hand (taken as the average temperature of the water in the calorimeter[2]) and S the specific heat of blood. Before being put into the calorimeter the hand was immersed for a sufficient time (usually ten minutes) in a large

[1]Observations since made on the actual temperature of the arterial blood show that in a healthy man the rectal temperature is about half a degree above that of the blood coming to the hand under the conditions of the experiments. The temperature of the arterial blood is arrived at by determining that temperature of the calorimeter at which the hand neither loses nor gains heat.

[2]That this assumption is approximately correct for a certain range of bath temperature has been shown by actual measurement of the temperature of blood issuing from one of the veins of the hand, with suitable precautions to render the loss of heat as small as possible.

bath containing water at the same temperature as that in the calorimeter in order that T' might approximate to the temperature of the calorimeter. All thermometers used were, of course, compared with a standard thermometer. In the cases observed, the two hands were simultaneously immersed in two precisely similar calorimeters. The volume of the hand enclosed in the calorimeter was determined by afterwards immersing the hand up to the proper level in a lipped beaker previously filled with water and measuring the overflow, or by immersing it in a vessel provided with a gauge.

Case 1.—Man æt. 46, weight 160 lbs., height 5 ft. 10 in. Marked contracture of the flexors of left wrist, with spastic paralysis of hand and fingers; also some deformity of left foot. A history was obtained indicating gradual onset of the contractures. At the age of two deformity was noted in the left hand and slight deformity in the left foot. The condition gradually got worse. The general health is good and the man is able to work as a telegraphist. There is some control of the movements of the left hand. He can extend the fingers and flex them but not normally. He uses the hand to a certain extent in his occupation. It is markedly smaller than the right. The pulse at the wrist is quite distinct. The hand feels as warm as the right one. The case was diagnosed as birth palsy by Dr. Henry O. Feiss, to whom I am indebted for the opportunity of studying it and the other case.

PROTOCOL OF EXPERIMENT.

Three liters of water in each calorimeter.

3.39 P.M. Both hands immersed in bath at 27.8°.

3.45 Temperature of bath 27.4°.

3.49 Left hand put into calorimeter A, right into B. Patient standing and hands hanging down.

	A.	B.
3.51	27.63	27.60
3.52	27.68	27.60
3.53	27.72	27.66
3.54	27.81	27.73
3.55	27.89	27.81
3.56	27.95	27.95
3.57	28.00	28.01
3.58	28.09	28.13
3.59	28.20	28.29
4.00	28.22	28.33
4.01	28.29	28.40

At 4.01 the hands were rapidly withdrawn and the final reading taken after vigorous stirring. Variations in the previous readings due to inadequate stirring or accidental contact of the fingers with the thermometer are thus controlled.

RATE OF COOLING OF CALORIMETERS AFTER WITHDRAWAL OF HANDS.

	A.	B.	Room.
4.18	27.94	28.10	20.1
4.27	27.85	28.00	
4.36	27.77	27.91	19.5

Volume of right hand in calorimeter 370 c.c.

Volume of left hand in calorimeter 330 c.c.

Pulse rate in standing position 84. Rectal temperature 37.4.

Taking the water equivalent of hand and calorimeter together as 300 grm. and the loss of heat by the calorimeter as 0.01° per minute, we get for the left hand H = 2,508 small calories; T = 37.4; T' (average temperature of the calorimeter) = 27.96. Taking the specific heat of blood as 0.9, we get

$$\varphi = \frac{2508}{9.4} \times \frac{10}{9} = 296 \text{ grm. blood}$$

in ten minutes, *i. e.*, 9.0 grm. blood per minute per 100 c.c. of hand.

For right hand φ = 354 grm. blood in ten minutes, *i. e.*, 9.6 grm. blood per minute per 100 c.c. of hand.

Case 2.—A boy 9 years and 4 months old. Normal delivery, no instruments used. At the age of one month the child had convulsions. At 6 months the mother noticed disability in the left arm and left leg. The arm has since become flaccid, and the whole arm is atrophied. The upper arm can only be raised level with the shoulder. Some power of flexion of the forearm at the elbow but hardly any power of rotation. The hand is held pronated and everted toward the ulnar side and the fingers are extended. They are small and cold. There is some power of flexion of the middle, ring and little fingers but very little in the case of the thumb and index finger. Movements at wrist very slight.

Diagnosis: infantile paralysis.

PROTOCOL OF EXPERIMENT.

At 2—11—30″ P.M. Both hands put in bath at 26.6°.

2.19 Temperature of bath is 26.5°.

At 2.19 Put hands into calorimeters, each containing 2,800 c.c. water. (These were somewhat smaller calorimeters than those employed for case 1.)

Patient standing.

	Calorimeter containing left hand.	Calorimeter containing right hand.
2.20	26.32	26.40
2.21	26.36	26.45
2.22	26.40	26.55
2.23	26.53	26.70
2.24	26.54	26.80
2.25	26.54	26.85
2.26	26.55	26.95
2.27	26.60	27.05
2.28	26.61	27.10
2.29	26.65	27.20
2.30	26.65	27.30

The last readings were taken after vigorous stirring immediately after removal of the hands from the calorimeters.

COOLING OF CALORIMETERS AFTER WITHDRAWAL OF HANDS.

	Left.	Right.	Room.
2.43	26.60	27.20	23.4

Pulse 95 in standing position. Rectal temperature 37.6°.

Volume of left hand in calorimeter 170 c.c.

Volume of right hand in calorimeter 210 c.c.

The hands being small, portions of the arms were included.

φ = 111 grm. blood in ten minutes for left hand, *i. e.*, 6.5 grm. per minute per 100 c.c. of hand.

φ = 306 grm. blood in ten minutes for right hand, *i. e.*, 14.5 grm. per minute per 100 c.c. of hand.

Conclusion.—In the hand whose lower motor neurones were not involved in the lesion producing the paralytic condition the blood-flow per unit volume of hand substance is scarcely inferior to that in the normal hand.

In the hand a lesion in whose lower motor neurones is responsible for the paralysis, the blood flow per unit volume of hand substance is 2½ times less than in the normal hand. The difference in the amount and condition of the muscular tissue is one important factor in causing the difference in blood flow in the two conditions.

26 (551)

Edema formation in guinea pigs in chronic experimental uranium nephritis.

By **ERNEST C. DICKSON.**

[*From the Pathological Laboratory of Cooper Medical College.*]

In a series of experiments performed on guinea pigs during the past two years, with the purpose of confirming the findings in experimental chronic nephritis which I have previously reported,[1] some interesting observations in edema formation have been made. Twenty-one animals received subcutaneous injections of an aqueous solution of uranium nitrate, as follows: six received numerous injections of 0.5 m.grms. at frequent intervals; eight received several injections of 5 m.grms. at longer and irregular intervals; and seven received one or more injections of 10 to 15 m.grms. Four animals died within two weeks after the first injection, and can be excluded from the chronic nephritis series. The remaining seventeen survived for from three to twenty-three months after the first injection, and all showed kidney lesions of a chronic nature, similar to those which I have previously described.

In Group I, which received the numerous small doses, two

[1] *The Archives of Internal Medicine*, June, 1909, vol. iii, No. 5.