lesions often prove obdurate to treatment. The extent of the usefulness of iron in this disease and in others in which this association is found is therefore being investigated.

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WATER EXCRETION AS A MEASURE OF EQUILIBRIUM WITH ENVIRONMENT

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The use of biochemical formulae as a measure of the emotional tension in psychotic patients has been advocated by McCowan and Quastel,¹ who suggest that the results of blood sugar curves can be used in the formula—

$$\frac{\text{2-hour blood sugar level minus the fasting level}}{\text{The highest blood sugar level minus the fasting level}} \times 100$$

and that the product in manic-depressive psychoses is in numerical proportion to the degree of emotional tension present. The product is known as the hyperglycaemic index. Their results have been supported and correlated by Lockwood^{2,3} in studies of the psycho-galvanic reflex and of the blood cholesterol levels. It is the purpose of this communication to show that the degree of emotional tension or, as it is here called, the measure of equilibrium with environment, can be equally well decided by a water excretion test based on that described by Beaumont and Dodds⁴ as used by Strauss Graunwald. A table showing the relation between the results of water excretion tests and the hyperglycaemic index in fourteen patients is included.

That the renal water excretion is a sensitive index of renal function is well known, but it is so easily affected by nervous influences that its value as an ordinary clinical test is impaired. Addis and Watanabe⁵ have pointed out the variable water excretion from hour to hour and day to day in normal subjects on a constant water intake, while Goodall and Scholberg⁶ have remarked on the low urinary excretion figures shown by many psychotics.

For the water excretion test as used in this investigation the patient is completely starved from 5 p.m. to 4 a.m., when the bladder is emptied. During the next fifteen minutes one pint of water is drunk and the total quantity of urine excreted by 7 a.m. is measured, catheterization being resorted to where necessary. A normal person excretes one pint of urine during this period, perhaps more, but oftener something less. Since renal function is less active by night than by day, it must be noticed that bedtime for patients here considered is 7 p.m., and that the ordinary ward work commences at 5 a.m. Occasionally the test was performed from 9 a.m. to midday after a night's starvation, but no great differences were observed following the change of time. The following results were obtained.

In sixteen patients with melancholia the average water excretion obtained was 5 ounces during the first month after admission, whereas when convalescence had set in the average was 14 ounces. The increase in these patients was slow, and the average time taken to approach normal figures was eight months. In simple uncomplicated de-

pression with retardation the average rise in the excretion figure in six months was from 13 to 21 ounces, while two cases of depression without retardation or agitation, whose only fear after six months was that they might be sent home, gave increased readings from 15 to 17 ounces.

Similarly, early manias averaged excretions of 4 ounces, those ill after two months 6 ounces, those convalescent after this time 12 ounces, and recovered cases 23 ounces.

These figures contrast strikingly with the excretion rates in three placid imbeciles and four simple senile cases. In the former the average excretion in the first week was 13 ounces, and after three months it was 15 ounces, while in the latter a decrease from 15 ounces to 14 ounces was shown in six months. These seven patients were equally at home in any environment if not ill treated.

The following table (Table I) illustrates a series of sugar curves and water excretion tests obtained from fourteen patients.

TABLE I

Case	Day after Admission	Sugar Levels in Mg. %				Water Test	Duration of Illness	Diagnosis	Clinical Measure of Emotional Tension
		Fasting	2-hourly	Highest	H. I.				
1	3rd 4th 15th 19th	— 97 97 —	— 74 79 —	— 123 112 —	— — — —	oz. 10 — 19*	4 weeks	Melancholia agitated	+ — — —
2	4th 8th 15th 30th	— 95 — —	— 180 — —	— 180 — —	— 100 — —	7 — 11 15	4 "	Confusional	++ ++ + —
3	6th 8th 43rd 47th	90 — — 80	115 — — 77	115 — — 130	100 — — —	— 7 15 —	23 "	Mania with some confusion at first	++ ++ — —
4	11th 43rd 49th 95th	— 106 — 110	— 132 — 103	— 153 — 137	— 56 — —	7 — 13 —	Improving after 17 weeks	Melancholia	++ + — —
5	11th 16th 180th 185th	105 — — 98	115 — — 80	144 — — 135	26 — — —	— 10 20 —	Convalescent after 1 year	Melancholia	+ + — —
6	3rd 15th 43rd 45th 53rd	— 93 107 — —	— 143 125 — —	— 154 125 — —	— 80 100 — —	4 — — 6* 4*	Remains acutely agitated	Melancholia	++ ++ ++ ++ ++
7	13th 25th 177th 179th	— 82 94 —	— 118 78 —	— 132 125 —	— 72 — —	10 — 28 —	30 weeks	Mania, recurrent	+ + — —
8	2nd 15th	— 72	— 88	— 134	— 26	15 —	14 "	Melancholia	— —
9	41st 45th 56th 59th	— 80 — 88	— 100 — 90	— 105 — 118	— 80 — 7	2 — 13 —	16 "	Mania with confusion at first	++ ++ — —
10	3rd 7th 20th	— 78 —	— 113 —	— 130 —	— 34 —	4 — 13	11 "	Melancholia agitated	++ + —
11	100th 115th 116th	— 107 —	— 81 —	— 150 —	— — —	8 — 12*	17 "	Melancholia	++ + —
12	5th 16th 28th	— 99 —	— 148 —	— 165 —	— 74 —	5 — 7	8 "	Mania with delirium at first	++ ++ ++
13	2nd 57th 130th 135th	— 80 — 85	— 128 — 78	— 145 — 128	— 74 — —	4 — 18 —	23 "	Melancholia agitated	++ ++ — —
14	5th 15th 27th	— 81 —	— 139 —	— 162 —	— 71 —	4 — 12	9 "	Mania with confusion at first	++ ++ +

H. I. = Hyperglycaemic index of McCowan and Quastel.

* These results were obtained between 9 a.m. and midday.

+ = Rough measure of emotional tension as observed clinically, where ++ = well marked, + = present, and - = absent.

There is a fairly general agreement between the two tests. Case 1 in this table illustrates the value of these estimations. This patient made two attempts at suicide

on the two days prior to admission, the first by drowning and the second by gas. Clinically she appeared to improve rapidly, but suicidal patients are often very deceptive. Because of the satisfactory results obtained from the sugar curve and the water excretion tests, however, she was discharged twenty-six days after admission without ill result.

As a measure of equilibrium with environment, though not of cure in any particular case, the water excretion test is also of use in other psychoses. Thus in eight schizophrenics and non-systematized delusional insanities the average excretion between the third and seventh days was 7 ounces. After three months, in those still solitary and unoccupied, the average was 9 ounces, while in those engaging in occupations it was 19 ounces. The talkative, self-sufficient paranoid types were the first to show normal excretion figures.

Four cases of puerperal insanity showed an average excretion of 4 ounces between the third and twelfth days. In those unimproved after one month the average was 3 ounces, while cured cases averaged 22 ounces.

Seven senile paranoid patients with fairly well preserved personalities showed an increased excretion from 6 to 17 ounces in two months, at which time they were becoming rapidly adapted to their new surroundings and engaged in light occupations.

In an endeavour to ascertain the cause of these results an agitated melancholic patient was kept on a strictly fluid diet for ten days; the total intake of fluids and the time at which taken were charted, together with the amount of urine passed and the time at which it was voided. In Table II the result is shown, days being divided into quarters of six hours each.

TABLE II

(The fluid intake in successive periods of six hours is shown in lines marked A, while the urinary excretion is shown in lines marked B. The amounts are given in ounces.)

A	...	—	30	13	10	—	20	30	10	—	30	10	8	—	20	30	10	—	30	15	10
B	...	10	—	25	2	6	8	10	—	5	20	20	—	10	10	10	—	22	—	10	—
A	...	—	30	30	10	—	30	10	10	—	40	20	10	—	35	15	20	—	50	20	20
B	...	16	4	10	—	15	12	10	—	12	10	17	10	13	1	8	—	12	6	23	—

During the ten days 641 ounces of fluid were taken and 346 ounces of urine were passed, a little over half the fluid intake. Study of Table II shows that a corresponding half volume of urine is passed roughly six hours after the fluid intake. Thus during this period a water test was performed, the water being given at 9 a.m. At midday a total of 4 ounces had been excreted, but at 2.30 p.m. 10 ounces more urine were passed. It would seem, then, that there is a delay in water excretion in states of emotional tension, and that this is the partial explanation of the results recorded.

CONCLUSIONS

1. A water excretion test for the measure of equilibrium with environment is described and a comparison with the hyperglycaemic index is made.

2. It is suggested that the results obtained are due to the delay in water excretion in states of emotional tension.

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Memoranda

MEDICAL, SURGICAL, OBSTETRICAL

EMBOLISM OF THE ABDOMINAL AORTA ASSOCIATED WITH AURICULAR FIBRILLATION

Mr. A. H. Winchester's and Mr. A. J. Hawes's accounts in the *British Medical Journal* of February 18th and April 15th respectively induce me to record the following recent case.

The patient, F. G., aged 53 years, was admitted to hospital on March 20th, 1933, complaining of difficulty in breathing. He did not look seriously ill, but his radial pulse and cardiac action showed an "irregular irregularity," suggesting auricular fibrillation. Brachial blood pressure, 120/80 mm. Hg. He had been under treatment in 1931 with attacks resembling angina pectoris; his brachial blood pressure at that time was always somewhat low, varying between 95/50 and 105/80 mm. Hg. His blood serum gave negative Wassermann and Meinicke reactions. He said that during the earlier part of the great war he had been in hospital with severe rheumatism for six weeks. He had been formerly a great smoker.

On the morning of March 22nd he was suddenly seized with severe pain in the left lower limb. The whole left lower limb became pale, and there was some mottling in the thigh; no pulsation could be felt in the foot or at the groin, and no oscillometric movement could be obtained in the calf or thigh. In the right lower limb, however, though I could feel no pulsation in the arteria dorsalis pedis, there was some definite pulsation in the femoral artery at the groin, and slight oscillometric movement could be obtained—scarcely 1/2 at the calf and 1 in the thigh. There was no pain complained of in that limb. An embolus lodged at the bifurcation of the aorta was diagnosed.

Dry gangrene of almost the whole of the left lower limb followed. On April 15th the patient complained of pain in the right leg, and no pulsation could be felt in the right femoral artery at the groin. A few days later there was cyanotic discoloration of the right foot, which, however, did not become actually gangrenous before the patient's death on May 15th.

The necropsy showed sclerosis of coronary arteries, aorta, and iliac arteries. There was ante-mortem thrombus in the right and left auricles and in both ventricles. An embolus had been arrested ("riding") at the bifurcation of the abdominal aorta; the right common iliac artery had not been completely blocked, but there was occlusion of the right popliteal artery. There were likewise embolic infarcts in the lungs, kidneys, and spleen.

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HAEMOGLOBINOMETERS AND HOW TO CHECK THEM

Every clinical pathologist in his routine work does a large number of normal blood counts: sent him because pallor is mistaken for anaemia. I noticed in 1922, working among war pensioners, that at Hb 100 the red cell count was nearer 6 than 5 millions per cubic millimetre. Whence then springs the legend that at Hb 100 the red cell count ought to be 5 millions per cubic millimetre? It is, I think, because (1) the expression 50,000 Hb/R is easy to evaluate; and because (2) haemoglobinometers lose their tint, so that isolated readings are liable to be too high.

The haemoglobinometer ought to be checked on receipt from the manufacturers and from time to time during use. Those who work among children have early warning that a standard is losing its tint when they get readings of 90 and over, since such readings are seldom found in children apart from polycythaemia—heart lesions, for example. But with adults there is no such warning, nor when the Hb appears to be over 100 is, in general, any surprise felt.

I set myself, in 1927, the problem: Does any—and if so what—relation exist between the Hb percentage and