

4. It is evident that reference to liver function does not afford an explanation of the blood phenomena in our series. The reaction is a general one and is not confined to the capillaries.

5. The effect of the administration of adrenalin and thyroid was to cause a reversal of the action with milk in cases which previously gave a marked leucopenia. No such reversal occurred with these drugs in cases which had given a leucocytosis after milk. Atropine caused a leucocytosis 10 minutes after injection in 10 patients who previously gave an abnormal reaction to milk. This leucocytosis quickly fell to normal, and the remainder of the curve over 2 hours followed fairly closely the normal hunger curve.

B. *Mental Defectives and Hæmoclasis.*

1. In a series of 300 mental defectives of dangerous and violent propensities a typical hæmoclastic crisis occurred in 163 cases (54%). The degree of mental defect does not appear to influence the result, the number of positive cases being about the same at all mental age-levels. In patients showing mental disorder (200) supervening on mental deficiency the correlation was higher in dementia præcox (74%), manic-depressive psychosis (60%), delusional and persecutory types (60%). Six cases of chronic gastritis in the series were positive. In 4 patients who had suffered from encephalitis lethargica 3 gave a positive hæmoclastic crisis and 1 was negative. Of 31 epileptics, 17, or 55%, gave a positive reaction.

2. In 3 cases of a psychopathic type with a marked anxiety component, only one gave a positive hæmoclastic crisis. This suggests that anxiety states do not necessarily cause a reversal of the blood formula after ingestion of milk.

3. It is probable that psychic disorder is accompanied by a reversal of the normal reaction to milk, and that this is quite independent of the proteopexic function of the liver.

(¹) For the literature on this subject the reader is referred to papers by Robertson in numbers of this Journal for July, 1925, and July, 1926.

A Biochemical Study of the Blood and Urine in Mental Disorders.

By B. REID, M.B., Ch.B., Assistant Medical Officer, Whittingham County Mental Hospital.

THIS work has been undertaken with the object of disclosing metabolic deviations which might aid in the ætiology or diagnosis of the psychoses, especially in cases of dementia præcox, epilepsy, melancholia and secondary dementia.

That departures from the normal body chemistry may give rise to abnormal mental states is well known. This is evident in the increased nervous irritability, the excitement and sometimes depression characteristic of hyperthyroidism. It is thus reasonable to suppose that disturbances of metabolism may result in an auto-intoxication and so bring about mental symptoms. An attempt has been made therefore to examine conditions, *e.g.*, latent jaundice, abnormal nitrogen metabolism, etc., which in their extreme forms do cause mental changes, and, by means of suitable laboratory tests, to determine any variations from the healthy state.

In a paper on "Blood Chemistry in Mental Diseases," Bowman (1) concluded that the average findings for blood non-protein nitrogen, dextrose, uric acid and chlorides were normal for all types of mental diseases except psychoses with cardio-renal disease and general paralysis. On the other hand, Loney (2), in a study of the nitrogenous constituents of the blood, found that in the depressed groups, represented by the retarded phase of manic-depressive insanity, the simple deteriorating *præcox* cases and the involution melancholias there is an appreciable increase in the undetermined nitrogen. In the present investigations the purpose has been to include as many of those function tests which are now so extensively used in general hospital practice.

Latent jaundice.—The Van den Bergh and the Fouchet tests of the blood-serum have been relied on to detect latent jaundice. The Fouchet test is particularly delicate, and gives a positive reaction with a dilution of 1 in 60,000 bilirubin in the blood. Pathological amounts of urobilinogen have been tested for in the urine by means of Ehrlich's aldehyde reaction. These tests have been done on 36 cases of epilepsy, 39 cases of dementia *præcox*, 18 cases of melancholia, 18 cases of secondary dementia, and 5 cases of imbecility or other deficiency. In no case was a positive result given to the blood test, and although a few patients showed abnormal amounts of urobilinogen in the urine, for all practical purposes these can be discounted. There would thus appear to be nothing in the nature of a poisoning of the system by bilirubin pigments.

Fat metabolism.—The fats are decomposed in the liver before their consumption in the tissues, the process being one of desaturation of the fatty acid molecule. As a result of the incomplete metabolism of fats by the liver, β -oxybutyric acid is produced, which diminishes the alkalinity of the blood and tissues—to a condition of acidosis. The adipopexic power of the liver is got by means of the lipase test of Lowenhart. This depends on

the fact that in liver disease the power of the blood to split up ethyl butyrate is increased. McNee is satisfied as to the value of this test of liver function, and it has been carried out in the cases under investigation. The result of this examination has been to show that there is no apparent abnormality in the fat metabolism—the normal value lies between .2 and .3.

Sugar metabolism.—The blood-sugar has been estimated in each case by Folin and Wu's method, and sugar was also tested for in the urine. The dextrose examinations have been made in the fasting state only, the blood being taken in the morning before breakfast. In 39 cases of dementia præcox the fasting levels varied from 66 mgrm. to 130 mgrm.; in 36 epileptics from 69 mgrm. to 113 mgrm.; in 18 melancholics from 75 mgrm. to 145 mgrm.; in 18 cases of secondary dementia from 81 to 105 mgrm. The averages are as follows: Melancholia 99, dementia præcox 89, epilepsy 85, secondary dementia 90.

The large majority of cases showed normal findings.

Protein metabolism.—The blood-urea by McLean's method and the blood non-protein nitrogen by the method of Folin and Wu, are both calculated in mgrm. per 100 c.c. The average results have been as follows:

	Non-protein nitrogen.	Urea.
Epilepsy. . . .	29	12
Dementia præcox . . .	30	14
Secondary dementia . . .	25	15
Imbecility	36	13.5
Delusional insanity. . . .	27	12
Melancholia	43	13

The normal figures are non-protein nitrogen 25–35 mgrm. per 100 c.c. and urea 10–15. It will thus be seen that normal readings obtain except in the melancholics. 18 cases of melancholia were examined, and the non-protein nitrogen estimations were found to be higher than the normal in 14. This is in keeping with the work of Loney, who reported similar findings, and who put forward the theory that an unknown toxic amine might be present in the circulation of markedly depressed patients. In the cases I examined the urea content of the blood was found to be normal, and Loney in his series of cases found that all the known nitrogens of the blood were normal, the excess presumably being due to some undetermined nitrogenous constituent. Absolute proof that such toxic amines are the cause of depression cannot of course be given until some method is found for isolating them quantitatively. That there may be some

relation between melancholia and amines is a possibility that is suggested by results at present.

Intestinal stasis.—Coincident with intestinal stasis there is an increase in intestinal fermentation. Routine tests for this condition are few. Excess of indican suggests increased intestinal fermentation, and therefore this test has also been carried out. A small proportion of cases showed an excess of indican in the urine. Since in most of the cases examined special attention is given to ensure a regular action of the bowel, it is, as the results showed, unlikely that intestinal stasis would be prominent.

In each case the blood and urine specimens were taken before breakfast.

CONCLUSIONS.

1. No abnormality in the results of the Van den Bergh test, the fasting blood-sugar, the lipase test or the indican test of the urine were found such as might suggest an auto-intoxication from metabolic disorder.

2. In the depressed patients an increase of the non-protein nitrogen content of the blood was found, which might support the theory of Loney that there exists a relationship between certain toxic amines and melancholia.

Details of the examination of individual cases are omitted for reasons of space, but they may be had on application to the author.

I am indebted to Dr. R. M. Clark, Medical Superintendent, for permission to publish these results, and to Mr. A. H. Fann, Chief Laboratory Assistant, for his valuable help.

References.—(1) Bowman, K. M., *Amer. Journ. of Psychiat.*, ii, No. 3, January, 1923.—(2) Loney, J. M., *ibid.*, iv, No. 1, July, 1924.

*An Investigation into the Fragility and Solubility of the Red Blood-cells in Mental Disease.** By MARGARET SCORESBY-JACKSON, M.D.Durh.

[ABRIDGED.]

INTRODUCTION.

THE objects of this investigation were to find out in what respect the resistance to hæmolysis of the red blood-corpuses differs in mental disease from the normal, and to make a contribution towards the elucidation of pathological mental states and their relationship to pathological states of organs of the body other than the brain.

* A thesis accepted for the degree of Doctor of Medicine of the Durham University.