It is felt that the above notes and summary are a strong indication that a routine examination of the sera by the Wassermann test on each admission should be carried out.

The obtaining of sufficient serum causes little or no inconvenience to the patient, the most serious sequela being slight ecchymosis due to "buttonholing" of the punctured vein, which causes no pain, and clears up in a few days.

A positive serum is an indication for the routine examination of the cerebro-spinal fluid.

A positive Wassermann reaction of both serum and cerebro-spinal fluid is confirmation of the diagnosis of general paralysis, and suitable treatment can be initiated.

Those cases in which the serum is positive and the cerebro-spinal fluid is negative have been found to respond successfully to anti-syphilitic treatment.

The Wassermann reactions were carried out at the Pathological Department of the Maudsley Hospital, Denmark Hill, under the direction of Dr. F. L. Golla.

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*The Calcium Content of Serum in Mental Invalids.* By EDWARD ARMSTRONG, M.D., B.Sc., and WILLIAMINA HOOD, B.Sc. From the Laboratories, Crichton Royal, Dumfries.

IN March, 1925, Clark and Collip (1) published a modification of Tisdall's method for the estimation of calcium. They had made extensive use of their method, and claimed that it gave an error of not more than 2%.

In order to test the method, aqueous solutions of calcium chloride of different strengths were made up, and the amount as found by the method in each solution was compared with its known amount. In all 34 estimations were made of 7 solutions, in which the amount of calcium varied from 7 to 13 mgrm. per 100 c.c. Our maximal errors were one of 6% and two of 5%. Including these figures, our average percentage of error was 1·5. Next, in order to ascertain whether the presence of serum influenced the method of estimation, mixtures were made of serum (in which the calcium had been estimated) and of calcium chloride solutions of known strength. The amount found in each mixture was then compared with its calculated amount. Twenty-four estimations were made of 7 mixtures, in which the amount of calcium varied from 9·0 to 12·7 mgrm. per 100 c.c. of mixture. Our maximal errors were one of 5% and two of 4%. Including these figures, our average

percentage of error was 1·5. Having thus satisfied ourselves that a fairly accurate method was available, it was decided to commence work on the calcium content of serum from patients. The question then arose—What is the normal content of serum?

According to Scholberg and Goodall (2):

"Weston and Howard (technique of Kramer and Tisdall) give the calcium content of serum (apparently normal) as 9–12 mgrm. per 100 c.c. Tomasson states that 'like the majority of others,' he finds the normal value of total calcium in serum, with de Waard's method, 9·4–11·3 mgrm. per 100 c.c., mostly towards the upper limit. Only exceptionally in normal persons did he find values less than 10·66 mgrm. 100 per c.c. We are informed by Dr. Stanford that Hirth and Klotz have shown that by de Waard's method too high results are of necessity obtained. De Wesselow gives figures for calcium in the serum of 4 cases (the method of Kramer and Tisdall); these vary from 9·7–10 mgrm. per 100 c.c. Kramer and Tisdall found a calcium percentage in the serum of 10 normal adults of 9·5–10·3 mgrm. per 100 c.c. Kramer and Howland—7 normal adults—give figures of 9·3–9·9 mgrm. per 100 c c. Stewart and Haldane—3 normal adults—from 9·5 to 9·6 mgrm. 100 per c.c."

We used the sera of 13 normal people as controls, with the following results in mgrm. per 100 c.c., one estimation being made in each case: 10·1, 10·1, 10·2, 10·2, 10·3, 10·3, 10·4, 10·4, 10·4, 10·5, 10·6, 10·6, 10·7. From our own work and that of others, we decided to consider normal any figure between 9·0 mgrm. and 11·0 mgrm. per 100 c.c.

The sera of 101 patients were examined, and of each serum two estimations were made, and the average taken. The patients, as in the case of the controls, were on ordinary diets, and the blood was taken between 3 and 4 hours after their latest meal, in most cases breakfast.

The results are summarized in the accompanying table:

| No. of cases. | Mental condition. | Lowest and highest estimation of calcium in mgrm. per 100 c.c. of serum. | Average amount of calcium in mgrm. per 100 c.c. of serum. |
|---|---|---|---|
| 3 | Morosis | 9·7–10·1 | 9·9 |
| 3 | Imbecility | 9·5–10·9 | 10·2 |
| 15 | Melancholia | 9·0–10·9 | 9·9 |
| 9 | Mania | 9·3–10·5 | 9·9 |
| 7 | Stupor | 9·1–10·2 | 9·8 |
| 26 | Primary dementia | 8·4–10·6 | 9·7 |
| 4 | Secondary dementia | 9·8–10·4 | 10·2 |
| 3 | Delusion (unfixed) | 9·8–10·2 | 10·0 |
| 11 | Monomania (fixed) | 9·0–10·6 | 9·66 |
| 2 | Paranoia (fixed and systematized) | 10·3–11·2 | 10·75 |
| 3 | Degeneracy | 9·3– 9·8 | 9·6 |
| 1 | Anxiety psychoneurosis | — | 9·3 |
| 1 | Dipsomania | — | 10·1 |
| 1 | Neurasthenia | — | 9·7 |
| 7 | Epilepsy with psychosis | 8·7–10·8 | 9·6 |
| 3 | General paresis with psychosis | 8·8– 9·1 | 9·0 |
| 1 | Post-apoplectic confusion and aphasia | — | 9·4 |
| 1 | Post-encephalitic depression and dementia | — | 10·0 |

3 cases of morosis, F. 1 and M. 2, aged 33, 26 and 25, gave figures of 9·7, 9·9 and 10·1 respectively.

3 cases of imbecility, F. 1 and M. 2, aged 47, 21 and 52, gave figures of 9·5, 10·2 and 10·9 respectively.

15 cases of melancholia, F. 13 and M. 2, varying in age from 38 to 73 years, gave a range of figures from 9·0 to 10·9, with an average of 9·9 mgrm. per 100 c.c.

9 cases of mania, F. 6 and M. 3, varying in age from 41 to 63 years, gave a range of figures from 9·3 to 10·5, with an average of 9·9 mgrm. per 100 c.c.

7 cases of stupor, F. 3 and M. 4, varying in age from 18 to 61 years, gave a range of figures from 9·1 to 10·2, with an average of 9·8 mgrm. per 100 c.c.

26 cases of primary dementia, F. 8 and M. 18, varying in age from 24 to 80 years, gave a range of figures from 8·4 to 10·6, with an average of 9·7 mgrm. per 100 c.c.

4 cases of secondary dementia, F. 3 and M. 1, aged 57, 48, 52 and 53, gave figures of 9·8, 10·1, 10·4, 10·4 respectively, with an average of 10·2 mgrm. per 100 c.c.

3 cases of " unfixed " delusion, F. 2 and M. 1, aged 37, 47 and 50 years, gave figures of 9·8, 9·9 and 10·2, with an average of 10·0 mgrm. per 100 c.c.

11 cases of " fixed " delusion, F. 7 and M. 4, varying in age from 34 to 70 years, gave a range of figures from 9·0 to 10·6, with an average of 9·66 mgrm. per 100 c.c.

2 cases of " fixed and systematized " delusion, F. 2, aged 50 and 62 years, gave figures of 11·2 and 10·3 respectively.

3 cases of degeneracy or deteriorated personality, F. 1 and M. 2, aged 44, 42 and 56 years, gave figures of 9·3, 9·8 and 9·8 respectively, with an average of 9·6 mgrm. per 100 c.c.

7 cases of epilepsy with psychosis, F. 3 and M. 4, varying in age from 24 to 56 years, gave a range of figures from 8·7 to 10·8, with an average of 9·6 mgrm. per 100 c.c.

3 cases of general paresis with psychosis, all men, aged 53, 41 and 49 years, gave figures of 8·8, 9·1 and 9·1 respectively, with an average of 9·0 mgrm. per 100 c.c.

From the summary it is evident that there is neither a high nor a low calcium content for any particular psychosis. Owing to the onset of spasm in parathyroidectomized animals with low calcium content, it was considered that epilepsy would show a fall in calcium content, but this expectation was not realized.

According to Henry and Ebeling (3), there is a relative increase of calcium in manic states, and a relative decrease in agitated depressed states. We found that the average for manic and depressed cases was the same, but we had no agitated cases of melancholia in our series.

The lowest average is in general paresis, and the highest average in paranoia, but more would have to be done to warrant any conclusion being drawn.

The figures below 9·0 mgrm. per 100 c.c. apply to 2 cases of primary dementia, 1 case of epilepsy with dementia, and 1 case of general paresis with mania. The only case above 11·0 mgrm. per 100 c.c. is a case of paranoia.

Briefly, our results show that the calcium content of blood-serum in mental cases lies within normal limits, and that a high or a low content is not diagnostic of any specific condition.

Our thanks are due to Dr. C. C. Easterbrook for his kind

assistance in diagnosing the cases, for his general interest in the investigation, and for his permission to publish this work.

*References.*—(1) Clark, E. P., and Collip, J. B., *Journ. Biol. Chem.*, 1925, lxiii, p. 461.—(2) Scholberg, H. A., and Goodall, E., *Journ. Ment. Sci.*, 1926, lxxii, p. 51.—(3) Henry, G. W., and Ebeling, W. W., *Arch. Neur. and Psychiat.*, 1926, xvi, p. 48 (abstr. in *Journ. Neurol. Psychopath.*, 1926, vii, p. 169.

## Medico-Legal Notes.

### Rex *v.* Albert Thomas Rudge.

This case was tried at the Monmouth Assizes on November 1, 1926, before Mr. Justice Swift. The prisoner is a farm labourer, aged 29 years. He was accused of murdering a girl named Doris Byard, aged 19 years. He lodged at the house of the girl's mother. He had been engaged to the girl. She had, however, broken off the engagement—a circumstance which appears to have greatly upset him. On September 12 he picked up a gun from a corner, in which he had placed it on the previous evening, went into the orchard, and shot the girl before her mother's eyes. After this he made an attempt at suicide. The facts were not disputed, the defence being that of insanity.

A police constable, who arrested the prisoner, stated that the prisoner had, almost immediately, asked "Is my darling girl dead?" The witness produced a letter, written by the prisoner, and found in the dead girl's possession, in which the prisoner threatened to take his own life. Another constable, who was guarding the prisoner in the hospital, on the day of the crime, stated that the prisoner had said, "We had a row in the orchard, and that got my temper up."

The prisoner gave evidence on his own behalf. He stated that he had no memory of any quarrel in the orchard, nor did he remember taking the gun, or shooting the girl. His memory only returned when he found himself in the hospital. He stated that the letter referred to had only been intended to frighten the girl, and so to induce her to return to him. He had only attained the third standard at school.

The prisoner's father deposed that the prisoner had a cut on his head at the age of 6 months, and, later, an illness which affected his head, and made him "unaccountable for his actions." Dr. S. B. Wyborn, Whitchurch, regarded the whole of the prisoner's family as a little deficient in intellect, but he did not think that the prisoner was insane in the legal sense. Dr. E. B. White, Medical