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T H E

WASSERMANN SERO - DIAGNOSIS

o f

S Y P H I L I S

i n

200 Cases of INSANITY.

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March, 1912.



The 200 Cases dealt with here, were all cases of Certified Insane Patients and were investigated at Stirling District Asylum, Larbert, by the kind permission of Dr. R.B. Campbell, Physician-Superintendent of that Asylum.

In all cases, with the exception of a few in which the cerebro-spinal Fluid was also tested, the Material on which the Wassermann Reaction was carried out was the Blood Serum, and, unless otherwise stated, all results and quoted percentages are given for Sera.

Before going on to Technique, it might not be out of place here to give a few notes on the development of Reaction. No attempt will be made to describe the nature of so complicated and imperfectly understood a reaction: only a few points which bear on the Technique here used, will be given.

The foundation for the whole test was given in 1905 by Schaudinn, who demonstrated the organismal cause of Syphilis to be the Spirochaete Pallida. This organism, though it has never been obtained in pure culture, has been proved beyond doubt experimentally, to be the true cause of syphilis. Now since 1899 the Method of Bordet and Genou, that is, the fixation of complement test, had been used in many other diseases such as Typhoid, as a means of diagnosis. In 1906 then, Wassermann, Neisser and Bruck "1" applied this same reaction to syphilis, and it is called the 'Wassermann Reaction'. The reaction was that of complement fixation or absence of haemolysis, and, in the case of the Wassermann Reaction, is an absolutely naked eye test.

This absence of haemolysis is used to demonstrate the presence of antibodies existing in the blood to a certain organism, in this case, the Spirochaete Pallida.

Take the parallel case of a patient suffering from Typhoid. The complement fixation "1" is used to diagnose thus:-

After the Serum of the Typhoid patient had been heated for $\frac{1}{2}$ hour at 55° C. to destroy the Complement, and then mixed with an emulsion of Typhoid Bacilli, there will be a bio-chemical change on account of the homologous antibodies formed to the Typhoid Bacilli and there will take place a deviation of complement or absence of haemolysis.

In a patient not suffering from Typhoid, no such antibodies will have been formed in the Serum, therefore no reaction will take place and haemolysis will occur.

The same may be said to take place in a syphilitic serum, but there are certain differences.

Now Wassermann, Neisser and Bruck "2", who first demonstrated the reaction in its application to Syphilis, could not in the first place get an emulsion of Spirochaetes, as the organism has not yet been obtained in pure culture. They therefore used what they considered the next best thing and it was an extract of a syphilitic liver (an organ which is very rich in Spirochaetes.)

They then tried the effect of a mixture of this syphilitic liver extract and a syphilitic patients serum on a guinea pig's complement: the effect was, that complement was deviated and haemolysis did not take place: This, of course, was not the case when the serum of a non syphilitic was used. Now these Workers, working on the analogy of the typhoid complement fixation, thought the reaction depended entirely on the Spirochaetes in the Syphilitic Liver acting along with their antilodies in the syphilitic serum.

This, however, is just when the Wassermann Reaction differs from the others.

Here, it is interesting to note that many of the best workers still keep to this method of using syphilitic Liver Extract and condemn all others.

Many workers, however, use methods depending on the modification which is just to be mentioned.

In 1907 Yamanouchi & Levaditi "3" and others, found that a syphilitic liver was not necessarily for the success of the Reaction and that an alcoholic organ extract would serve the purpose equally well: other observation "4" showed that there were many lipid compounds which also would act equally well.

It is with this method of alcoholic organ extract that the Reaction here has been carried out.

Thus the application of Bordet & Genou's principle is distinctly different in syphilis from other diseases to which it has been applied. This makes its nature all the more complicated and less easily understood.

Though this Reaction is so obscure and though there are some biological factors, at present quite unknown, which may render the reaction atypical, still it has been clearly proved to be a most useful and practical method of diagnosing syphilis whether acquired or congenital.

TECHNIQUE USED.

This was a modification of the original method by Plaut, and modified still more by Dr. Ivy McKenzie. "6".

By this method the exact amount of complement deviated, is measured in terms of haemolytic doses.

In all cases tested, exactly the same method was carried out and an aseptic Technique was used throughout.

Many of the cases were tested twice over and at least all the cases which gave a positive reaction and those which were in the least doubtful were retested.

With each set of Serums tested, controls were set up: that is, the sera of a known syphilitic and of a known non-syphilitic were tested along with the unknown sera.

This is absolutely essential both for comparison purposes in the reading of the reaction, and to be sure that no factor has in any way obscured the Reaction.

If these controls did not give absolutely definite results, that batch of sera was discarded.

The following will be described in order:-

- I. The Reagents used and their Preparation.
- II. The Method of Carrying out the Reaction.
- III. Method of determining whether the Reaction is Positive or not.

I. THE REAGENTS used and their PREPARATION.

- (a) Serum of cerebro spinal Fluid of Patient who is to be tested.
- (b) Complement = fresh guinea pig serum.
- (c) Antigen = alcoholic extract of guinea pig's liver.
- (d) Haemolytic System (1. OxBlood corpuscles.
(2. Immune body:
(ox, rabbit.

(a) SERUM of PATIENT.

The veins having been congested by a turn of bandage and a tourniquet round the upper arm, and, the skin rendered as aseptic as possible, a sterile needle was introduced into the median-cephalic or basilic vein, and about 10 cc of blood allowed to escape into a sterile test tube: **Less** blood would be sufficient but it is much more practical to take enough to enable 2 tests to be done without having to bleed the patient again; Put aside to clot and in about 6 hours separate the clot from the side of the tube with a platinum wire: after from 12-36 hours the serum is pipetted off and centrifuged.

The complement is then immediately inhibited by incubating the serum for 1 hour at a temperature of 55° - 60° C.

In the case of cerebro spinal Fluid this is unnecessary as no complement is contained, but it should be obtained aseptically and centrifuged to get rid of cellular elements and blood.

If obtained carefully and the aseptic technique all through carried out, the sera will keep for weeks if put in a cool place, or better, on ice.

(b) COMPLEMENT.

This is obtained in the fresh Guinea-pig's Serum; At first I used animals of 6 months old, to get, as I thought, a larger quantity of blood; but, having through necessity to use younger ones I found that from an animal of 6 weeks old, I could get as much blood; and also, I found, that with these young animals the haemolytic dose on the whole is smaller than with the older animals: therefore the serum went farther.

The guinea-pigs neck was rendered as sterile as possible, the vessels cut, and the blood caught in a sterile measure cylinder with a wide glass funnel dipping into it.

After

After 12 hours the clot was separated from the edge of the glass with a platinum wire, as more serum is got thus. After 24-48 hours it was pipetted off and centrifuged.

After 72 hours this serum is useless - it must be used from 12-72 hours after it is shed for after this its deviating power passes off.

(C) ANTIGEN.

This was an alcoholic extract of newly killed guinea-pig's liver. The fresh liver is minced and 1 part of it and 4 parts of 96% alcohol are shaken up together and placed in an air tight specimen Jar. The jar is shaken twice daily for four days, at the end of which time it is strained through filterpaper and is ready for use.

Prepared thus, the reagent will keep for months.

The extract after being made, must first be tested to see if it is a good one for working with. Test it by setting up a series of 21 tubes in each of which is .3 cc sterile normal saline solution, with varying doses from .0025 cc to .02 cc of complement: add .5 cc non immunised blood corpuscles.

If the extract is lytic on its own, that is if it lysed corpuscles without the addition of Immune Body it is of no use and must be discarded.

Extract as used in Reaction, that is, an emulsion of Guinea Pig Alcoholic Extract.

To every 1 part of Extract 5 parts .85 sterile Salt Solution was used.

Have the saline in a cylinder, and gently run the extract down the side so as to form a layer on the top of the fluid.

The cylinder was then gently rotated so as to mix the two solutions - if this is done slowly a much more turbid emulsion is got which is far more efficient and delicate.

(D) HAEMOLYTIC SYSTEM.

- (1) ox blood corpuscles.
- (2) Immune Body.

The ox blood was got from the local butcher and with as aseptic precautions as possible.

The blood was caught in a sterilized Bottle containing glass beads. Immediately the Bottle was filled, the lid was put on and the bottle shaken while the blood was still hot. In this way it was thoroughly defibrinated.

The

The defibrinated blood was then well washed by centrifuging 3 times, with twice its volume of .85 Na. Cl. Solution.

The 3 cc of this deposit was added to 97 cc of .85 Na. Cl. and by this means a suspension of corpuscles was got.

The immune Body* was then added. This was the Serum of a rabbit which had been repeatedly injected with ox blood corpuscles:

To the 100 cc of suspension of washed blood corpuscles 5 times the minimum haemolytic dose was added. (the minimum haemolytic dose being the amount of this rabbit's serum which is just sufficient to lyse 1 cc of a 5% suspension of ox blood corpuscles in presence of an excess of complement after 1 hour at 37°C.)

After the Immune Body was added, the now immunised corpuscles were incubated at 37°C for $\frac{1}{2}$ hour: $\frac{1}{2}$ hour after leaving the Incubator they are ready to use in the Reaction.

II. METHOD of CARRYING OUT the REACTION.

The various reagents prepared, were now got together.

- (a). the inhibited Serum or non-inhibited Cerebro Spinal Fluid.
- (b). the 24-72 days' old guinea pig serum.
- (c). the immunised blood corpuscles suspension.
- (d). the emulsion of alcoholic organ extract.

As the object was to accurately measure the quantity of complement in terms of haemolytic doses, the first thing in every experiment was to find the haemolytic dose of the complement-containing serum of the Guinea Pig.

* I am much indebted to Dr. W. Muirhead, who, through the kind permission of Dr. G.M. Robertson, Physician Superintendent of the Royal Asylum, Edinburgh, has supplied the Laboratory of this Asylum with Immune Body.

The proceeding to find the haemolytic dose is as follows:-

A set of 21 tubes is set up, in each of which is .3 cc Na. Cl. solution and to each is added complementin doses as below. The Complement (guinea pig's serum) is diluted 1 in 3 parts of Na. Cl. to allow of it being more accurately and easily pipetted - It is, however, the concentrated dose of the serum that is given below.

Test tubes in each of which is .3 cc Na Cl solution		
1. + .0025cc complement	8. .006 cc.	15. .0095cc.
2. + .003 cc. "	9. .0065cc.	16. .07 cc.
3. + .0035cc. "	10. .007 cc.	17. .012 cc.
4. + .004 cc. "	11. .0075cc.	18. .014 cc.
5. + .0045cc. "	12. .008 cc.	19. .016 cc.
6. + .005 cc. "	13. .0085cc.	20. .018 cc.
7. + .0055cc. "	14. .009 cc.	21. .2. cc.

Then into each Tube was put .5 cc of the immunised Corpuscles. These Tubes were then incubated for $1\frac{1}{4}$ hours at 37° C and shaken every $\frac{1}{4}$ hour.

At the end of that time they were carefully examined, and the first tube that was completely lysed, that is, whose contents, naked eye, were completely clear, was fixed as the minimum haemolytic dose. That is, the smallest dose of Guinea pig complement sufficient to lyse .5 cc Immunised Blood Corpuscles after 1 hour at 37° C.

This I found to average about .006 cc - .009 cc - the minimum haemolytic dose.

Having tested for and found the minimum haemolytic dose, the next thing done was to test the sera.

TESTING of the SERA.

9 tubes were used for each patient.

(a) Into the 1st 6 were put:-

1. .3 cc emulsion of guinea pig liver extract.
2. .025 cc of Patients' own Serum or .5 cc Cerebro Spinal Fluid.
3. Varying doses of complement generally 3, 7, 10, 15, 20, and 30 doses respectively.

(b) Into the last 3 were put:-

1. .3cc .85 Na Cl Solution.
2. .025 patient's serum or .5 cc Cerebro Spinal Fluid.
3. Doses of complement, always, 1,2,& 3 doses.

These last three Tubes are set up for the purpose of finding how many doses the Serum absorbs of complement on its own.

(c) With each experiment there was also set up, 6 Tubes, each containing .3 cc emulsion of organ Extract. To each were added respectively 1, 2, 3, 4, 5, & 6 doses of complement.

This is so as to record how many doses of complement the extract absorbs on its own.

(d) With each experiment the complement was again tested: 4 Tubes were set up, in each of which was .3 cc Na. Cl. Solution. The doses just above and below what had already been determined as the minimum haemolytic dose were added, and unless they co-incided with the result already obtained, the experiment would be faulty and have to be discarded.

Sets of Test Tubes a, b, c, & d, were then incubated for $1\frac{1}{2}$ hours at 37° C without shaking.

At the end of that time they were taken out and to each tube was added .5 cc immunised blood corpuscles.

The Tubes were then incubated for $1\frac{1}{4}$ hours at 37° C, and shaken every $\frac{1}{4}$ hour.

At the end of that time they were taken out, and the Experiment was finished. It only remained for the results to be read.

III. METHOD of DETERMINING whether the REACTION is POSITIVE or NOT.

It is well to read off the result immediately the experiment is completed, and again, to read it the following morning and compare results.

In doubtful cases it is much easier to read off in the morning because the sediment has by that time fallen.

It is a purely naked eye reading and we judge by the clearness or turbidity, or turbidity and sedimentation of the fluid.

Lysis is said to have taken place when the fluid is clear. Absence of Lysis is what takes place in a syphilitic serum.

It was considered to be a positive result, that is a positive Wassermann Reaction, if the Patient's Serum in presence of Extract absorbed 5 doses or more of complement in excess of what was absorbed by the sum of the extract + serum on their own.

200 Patients were tested, and, with a few exception, the serum only was investigated

87 women.

113 men.

Of the whole 200 Cases (63 were Positive = 31.5% Pos
(137 were Negative = 68.5% Neg.

Positive = 31.5% (9% women
(22.5% men

Of the 63 Positive (18 women
(~~43~~ men.

Of the 137 Negative (70 women.
(67 men

Of the 63 Positive, 34 were General Paralytics.
that is, 31.5% over all Cases were positive.

14.5% of all other ^{Classes of} insanity were positive
after deducting General Paralytics.

The Cases have been taken under the following heads:-

Table I.	General Paralysis of the Insane.	33 Cases.
"	II. Dementia Praecox.	20 Cases
"	III. Feeble-minded Forms.	31 Cases
"	IV. Delusional Insanity	31 Cases
"	V. Manic depressive Insanity	
	(a) Melancholia	26 Cases
	(b) Mania	36 Cases
"	VI. Acute Confusional Insanity	9 Cases
"	VII. Acute Delirious Insanity	7 Cases
"	VIII. Primary Dementia	5 Cases
"	IX. Spinal Cases	3 Cases

T A B L E I.

Cases of GENERAL PARALYSIS:

+ = Positive.
 o = Negative
 - = not investigated

No. of Case.	Age.	Sex.	Duration.	Wasser- mann Blood Serum.	Wasser- mann C.S.F.	Ross Jones. C.S.F.	Cyto- logi- cal. C.S.F.
1.	33.	F.	4 years	+	+	+	+
2.	57.	F.	14 months	+	-	-	-
3.	44.	F.	6 years	+	-	-	-
4.	46.	F.	4 years.	+	-	-	-
5.	50.	F.	2 years.	+	+	+	+
6.	36.	F.	1 year.	+	-	-	-
7.	50.	F.	20 months	+	-	-	-
8.	42.	M.	18 months	+	-	+	+
9.	47.	M.	2 years	+	+	+	+
10.	46.	M.	18 months	-	+	+	+
11.	48.	M.	2 years	+	-	-	-
12.	31.	M.	12 months.	+	-	+	+
13.	41.	M.	18 months	+	-	+	+
14.	30.	M.	3 years	+	-	-	-
15.	38.	M.	6 years.	+	-	-	-
16.	41.	M.	20 months	+	-	-	-
17.	57.	M.	12 months	+	-	-	-
18.	45.	M.	12 months	+	-	-	-
19.	47.	M.	18 months	+	+	+	+
20.	39.	M.	7 months.	+	-	-	-
21.	33.	M.	3 months.	+	-	-	-
22.	53.	M.	9 months	+	-	-	-
23.	38.	M.	6 months	+	-	-	-
24.	26.	M.	2 years.	+	-	-	-
25.	41.	M.	2 months.	+	-	-	-
26.	35.	M.	6 months	+	-	-	-
27.	40.	M.	6 months.	+	-	-	-
28.	39.	M.	4 years	+	-	-	-
29.	45.	M.	5 years.	+	-	-	-
30.	42.	M.	14 years	+	-	+	+
31.	41.	M.	7 years	+	-	+	+
32.	38.	M.	2 years.	+	-	-	-
33.	40.	M.	3 years.	+	-	+	+

Positive Wassermann = 100%.

POINTS of INTEREST in the HISTORY of CASES
in

Table I.

General Paralysis of the Insane.

- Case 1. In 3rd stage: there is a history of Alcohol and loose morals but no further history was obtainable.
Post Mortem showed typical lesions of General Paralysis of the Insane.
- Case 2. In late 2nd stage: History of Alcohol and loose morals: no further history can be obtained: there is a scar of an old ulcer on the right leg: she states, that her husband had syphilis some years ago.
- Case 3. In late 2nd stage: there are no children, and no history of miscarriages: her husband, she states, is a man of loose morals: he has the appearance of a 1st stage G.P.I.
- Case 4. In late 3rd stage: No history of Syphilis: History of Heredity:- one sister and a paternal aunt insane: all her brothers and sisters are neurotic.
Post Mortem refused.
- Case 5. In late 3rd stage: History of Alcohol: had tertiary specific sores on her fingers.
Post Mortem showed typical lesions of G.P.I.
- Case 6. In early 2nd stage: No History of miscarriages: only one child, 5 years ago, which died aged 3 days old.
Mother suffered from Melancholia.
- Case 7. In early 3rd stage: History of Alcohol: one miscarriage, two children previous to it: no further history.
- Case 8. In late 2nd stage: This patient has now been treated for about a year with Ford Robertson's polyvalent anti serum. There is a History of Alcohol and a maternal cousin was insane.
His wife ^{IS AN} was invalid, and, from her history, there seems little doubt that she also suffers from G.P.I.: no history of miscarriages. There are 2 children, who show no stigmata of syphilis: the elder, a girl, of 16 years gives a negative Wassermann Reaction; but the younger, a boy, aged 10 years gives a positive Reaction.

- Case 9. In late 2nd stage: was being treated at the time of testing with Ford Robertson's polyvalent serum given intra spinally and by vaccines, given intra-muscularly.
He was in the Army and there is a History of Alcohol but no further information can be got.
Post Mortem showed typical lesions of G.P.I.
- Case 10. In late 2nd stage: was treated for 9 months with Ford Robertson's serum by intra-spinal and intra-muscular methods.
He was in the army, and, though no History of Syphilis was admitted, he had, on admission, a very large tertiary syphilitic ulcer on the leg and a great deal of thickening of the underlying bone.
Post Mortem showed typical lesions of G.P.I.
- Case 11. In Early 2nd stage: has been treated for over a year by Ford Robertson's serum, intra-muscularly.
Syphilis 20 years ago: also History of Alcohol and Heredity: father died in an Asylum, cousin insane and all his people neurotic.
- Case 12. In late 3rd stage: was treated for some months with Ford Robertson's serum.
No History can be investigated.
- Case 13. In early 3rd stage: was treated with Ford Robertson's serum; he was in the Army: No History can be got.
- Case 14. In late 2nd stage: Alcoholic history but nothing further could be got out of patient.
Post Mortem showed typical lesions of G.P.I.
- Case 15. A stationary General Paralytic.
No History of any kind can be obtained.
- Case 16. In 2nd stage: has just had a remission.
No further history admitted.
- Case 17. In early 2nd stage:
No History admitted except that a paternal uncle was "queer".
- Case 18. In early 2nd stage.
Syphilis 10 years ago: alcoholic history.
- Case 19. In late 2nd stage.
History of Alcohol only.
- Case 20. In early 3rd stage:
Syphilis 10 years ago, also of alcohol and excesses.
- Case 21. In late 1st stage:
Syphilis 11 years ago, also alcoholic.

- Case 22. In early 3rd stage:
Only history got, was that an uncle was
insane.
- Case 23. In 2nd stage:
History of Alcohol: No History of Syphilis
could be got. Patient's wife and eldest
child, both give a negative Wassermann
Reaction.
- Case 24. In early 3rd stage:
Syphilis 3/ years ago and alcoholic excess.
- Case 25. In 1st stage:
All History denied.
- Case 26. In 1st stage: he was in the Army: no History
can be got.
- Case 27. In 1st Stage.
Syphilis 19 years ago.
- Case 28. In late 2nd stage: no history.
- Case 29. In 2nd stage: no history.
- Case 30. A stationary General Paralytic: duration of
14 years. no history.
- Case 31. A stationary General Paralytic, 7 years.
No History.
- Case 32. In early 1st stage:
Syphilis 16 years ago for which he under-
went treatment for about a month with
mercury.
Alcoholic excess.
- Case 33. A stationary General Paralytic: History
of Syphilis 6 years ago and alcoholic
excess.

SUMMARY of TABLE I.

GENERAL PARALYSIS of the INSANE.

33 Cases (7 women.
(26 men.

All gave a Positive Wassermann = 100%.

SUMMARY of HISTORIES

in

Table I.

1. In 10 Cases directly or indirectly syphilis was admitted = 30.3%
2. In 22 Cases a History of Alcohol was got = 60.6%.
3. In 6 Cases a History of Heredity was got = 18.1%

It is interesting to note that out of these 33 cases only 10 patients admitted syphilitic infection. Some no doubt denied it deliberately, but I think, in many cases, the patients were absolutely unaware of the infection, and shows what remarkable carelessness these patients show regarding their bodies.

It is interesting to note the large amount of alcoholism among the patients

60.6%

Also the distinct evidence of Heredity

18.1%

These two causes are probably predisposing causes to G.P.I. All syphilitis do not suffer from G.P.I. so there must be something which predisposes to the condition. This may be a brain, which is already unstable through heredity, or one that has been rendered so by alcoholic excess.

It does not seem as though the Bacillus Paralyticus were the additional cause as 7 of the cases mentioned here, were thoroughly treated with the serums *without reacting.*

EXAMINATION of the CEREBRO SPINAL FLUID

Unfortunately in only 5 cases of G.P.I. was this tested by Wassermann Reaction.

And in only 9 cases was it examined chemically by Ross Jones' Test and Cytologically.

In every case it was found that a positive reaction was given.

Some wellknown workers "9" hold that the Cerebro Spinal Fluid gives a more marked reaction than the serum, while others "10", "11", "12", hold that the serum gives a very much more constant and marked reaction.

PLAUT "10" holds strongly that the reaction is shown more surely and regularly in the Serum than in the cerebro spinal Fluid.

REMARKS

on
the

BEHAVIOUR of the SERA.

These 33 cases were not just picked cases, which gave a positive reaction, but every case that was tested. They were, as is seen from the Table, cases of from a few months up to 14 years duration.

In every case the number of doses of complement absorbed was recorded, but it could not be said, that the intensity of the reaction bore any relation to the stage of the disease, or to the class of Insanity. There was a very wide range in amount of complement absorbed. Positive Cases absorbing from 6 - 30 doses of complement.

In testing the same patient's serum on different occasions, I found the reaction never varied. It was always either positive or negative, as the case might be. There was, however, considerable variation of amounts of doses absorbed in these positives or negatives, possibly this is due to some bio-chemical factor as yet unknown.

REMARKS

by

WELLKNOWN WORKERS.

PLAUT "10" and other Writers have proved that no higher percentages have been got in any other manifestation of Syphilis than in General Paralysis of the Insane. As high a percentage is only reached in the active primary stages.

PLAUT "10" believes that the Serum in every case of G.P.I. reacts positively - he admits that exceptions do occur, as exceptions do in every Bio-chemical reaction, but these are so very rare as to be of no practical importance in his results.

The deducts them, from the uniform behaviour of the sera, that if there has been syphilitic infection, then the patient cannot possibly suffer from G.P.I.

If a negative result is got, we then can at once exclude G.P.I.

A negative result in the Study of Insanity is therefore more important for diagnostic purposes than a positive one. If the patient gives a positive reaction he may be suffering from General Paralysis or from some other cerebral manifestation of Syphilis. He may, on the other hand, be suffering from a psychosis which has nothing to do with the syphilitic infection.

If he gives a negative result, then, at least General Paralysis of the Insane can be excluded safely.

PLAUT "10" also has found that there is no relation between the intensity of the reaction and the severity of the symptoms.

BOAS "13" Wassermeyer & Bering "18" agree with him. Marinesco "15" also states that the positive reaction in G.P.I. is got from the first and never changes.

Marie and Levaditi "23" flatly contradict this, and say that in early cases a negative result is given and in grave manifestations a positive reaction is given. Smith Henderson and Candler "20" agree with them.

SOME INTERESTING PERCENTAGES.

SERUM:-

PLAUT	"10" gets	100%	positive results.
BOAS	"13" gets	100%	positive results.
Lesser	"14" gets	100%	positive results.
Marinesco	"15" gets	100%	positive results.
Norne	"16" gets	100%	positive results.
Foerster Bonn	"17" gets	100%	positive results.
McKenzie and Browning	"8" get	96%	positive results.
W. Muirhead	"21" gets	94.5%	positive results.
Wassermeyer & Bering	"18" get	90-95%	positive results.
Heubner	"19" gets	90-95%	positive results.
Smith Henderson & Candler	"20" get	86.6%	positive results.
Scholberg and Goodall	"24" get	75.5%	positive results.
Noguchie	gets	65%	positive results.

Table II.
Cases of Dementia Praecox.

+ = Positive.
0 = Negative.

No of Case.	Age.	Sex.	Duration.	Form of Disorder.	Wasserman Serum.
1.	36.	F.	5 years.	Hebephrenia.	0.
2.	22	F	5 years	Dementia paranoides	0
3.	26	F	5 years	Hebephrenia	0
4.	40	F.	14 years	Dementia paranoides	0
5.	44.	F.	22 years	Dementia paranoides	0
6.	29	F.	3 years	Hebephrenia	0
7.	31.	F.	13 years	Hebephrenia.	0
8.	27.	M.	2 years	Katatonía.	0
9.	28.	M.	4 years	Hebephrenia	0
10.	29.	M.	2 years	Hebephrenia	0
11.	33	M.	16 years	Katatonía	0
12.	22.	M.	6 months	Hebephrenia.	0
13.	24	M.	2½ years	Katatonía	0
14.	20	M.	2 years	Hebephrenia.	0
15	44	M.	10 years	Katatonía	+
16.	35	M.	5 years	Dementia paranoides	0
17.	31	M.	12 years	Dementia paranoides	0
18.	37	M.	16 years.	Dementia paranoides	+
19.	21	M.	3 months	Hebephrenia.	0
20.	39	M.	6 years	Dementia paranoides	0

Positive Wassermann = 10%.

Summary of Table II.

Cases of DEMENTIA PRAECOX.

20 Cases { 7 women
 { 13 men.

Positive Wassermann - 2 - 10%.

In the 2 cases which gave a positive result no signs or History of Syphilis could be obtained.

Points of Interest in the History of Cases in Table II.

History of Alcohol was got in 4 cases:-
Cases 8, 10, 15 and 17.

History of Heredity was got in 4 cases:-
Cases 2, 5, 8, and 15.

Case 2, an uncle died in an asylum.
Case 8, 2 maternal uncles in asylums.
Case 15, Father committed suicide, Maternal
uncle in an asylum.
Case 5. Sister insane.

No further History of any kind obtained.

R E M A R K S.

I have been able to find little literature on Wassermann percentage in this class of Insanity. The few that were obtained are as follows:-

Reviart, Breton and Petit "26" got percentage of
26.3% positive

Morton "27" got 100% negative results.

Marie "25" got 100% negative results.

Scholberg and Goodall "24" 100% negative results.

W. Muirhead "21" 100% negative.

TABLE III.

Feeble minded FORMS.

+ = Positive

o = Negative.

No of Case.	Age	Sex.	Duration.	Form of Disorder.	Wassermann Serum.
1.	23.	F.	Congenital	Imbecile.	+
2.	27.	F.	Congenital.	Imbecile	+
3.	24	F.	Congenital	Imbecile	o
4.	37.	F.	Congenital.	Imbecile.	+
5.	21.	F.	Congenital.	Epileptic Imbecile	o
6.	22.	F.	Congenital	Epileptic Imbecile	o
7.	17.	F.	'14 weeks'	Imbecile	+
8.	45.	F.	Congenital.	Cretinoid Imbecile	+
9.	37.	F.	Congenital.	Imbecile.	o
10.	29.	F.	Congenital.	Imbecile	+
11.	27.	F.	Congenital.	Imbecile.	o
12.	44.	F.	Congenital.	Imbecile.	+
13.	28.	F.	Congenital.	Imbecile.	o
14.	32.	F.	Congenital.	Imbecile.	o
15.	37.	F.	Congenital	Epileptic Imbecile	o
16.	50.	F.	Congenital.	Epileptic Imbecile	o
17.	19.	F.	Congenital	Imbecile.	o
18.	37.	M.	Congenital.	Epileptic Imbecile	o
19.	17.	M.	Congenital.	Imbecile	o
20.	18.	M.	Congenital.	Epileptic Imbecile	o
21.	17.	M.	Congenital.	Epileptic Imbecile	o
22.	17.	M.	Congenital.	Cretinoid Imbecile	+
23.	22.	M.	Congenital.	Imbecile	o
24.	40.	M.	Congenital	Imbecile	o
25.	65.	M.	Congenital	Imbecile	o
26.	41.	M.	Congenital.	Imbecile	o
27.	40.	M.	Congenital.	Imbecile.	+
28.	67.	M.	Congenital	Imbecile	+
29.	32.	M.	Congenital	Epileptic Imbecile	o
30.	55.	M.	Congenital.	Imbecile.	o
31.	26.	M.	Congenital	Imbecile.	o

Positive = 32.25%.

SUMMARY of TABLE III.

Feeble minded FORMS.

31 Case (17 Females
(14 Males.

Positive Wassermann in 10 cases = 32.25%

POINTS of INTEREST in the HISTORY of CASES which gave
a positive Reaction.

- Case 1. This patient was dumb: had typical Hutchinson's teeth and the nasal bridge was markedly sunken.
No History was able to be traced in this case.
- Case 2. In this case through patient has always been an imbecile there is probably no congenital syphilis: There was a distinct History of Syphilis 7 years ago.
History of Heredity here: a sister died in an Asylum.
- Case 3. No stigmata of syphilis and no history can be traced.
- Case 7. Patient is absolutely deaf, has typical Hutchinson's teeth and is blind the result of interstitial Keratitis.
Patient's mother had 2 miscarriages, then 2 dead-born children - the next is patient, the first living child.
History of Heredity: Grandmother's 2 Brothers in asylum.
- Case 8. A cretinoid imbecile but no syphilitic stigmata. No History can be got regarding her.
- Case 10. A very degenerate looking imbecile but no syphilitic stigmata are present:
No History can be elicited.
- Case 12. Patient is deaf but not absolutely so: has Hutchinson's teeth, a markedly depressed nasal bridge and interstitial Keratitis.
Her mother was insane. No further history can be got.
- Case 22. A cretinoid imbecile: no stigmata of syphilis are present and no history whatever can be obtained.
- Cases 27 & 28. No stigmata of syphilis.
No History can be obtained.

Of the negative cases little History was got,
merely the following:-

Case 5. Mother & Father alcoholic.

Case 6. Step sister died of spinal meningitis.
Case 16. Sister insane.
Case 19. Mother insane, suffered from Melancholia.

REMARKS on TABLE III.

Feeble minded Forms.

The percentage got here is a fairly high one
=32.25%.

In only 3 of the 10 cases were the physical stigmata of syphilis present. In the other 7 cases there was nothing, unless indeed the mental condition, to suggest congenital syphilis.

It is probable that the Wassermann Reaction in this class will show that a very great deal more Feeble mindedness than we at present imagine, is caused by Congenital Syphilis.

It is interesting here to note that Boas "28" states that the Wassermann reaction in the case of Congenital Syphilis is very constant and is, as a rule, strong as compared with that of acquired.

PLAUT "10" quotes some interesting literature on this subject, all with the object of showing that the percentage of Congenital Syphilitics among the Feeble-minded is much greater than we at present think. He quotes largely from Fournier who is very emphatic in stating that congenital syphilis is responsible for those merely 'backward' children, who develop late and show limited intellect. Kowalewsky and Kraemer also, Plaut states, have proved that Congenital syphilis is responsible for many of the merely highly strung neurasthenic children, who could not be termed imbecile: Nonne, also, holds the same view. Huebner puts the percentage of congenital syphilis among idiots at 25%. Reviart Breton and Petit "26" at 30.1% Plaut himself at 44% among imbeciles.

Other percentages were:-

Scholberg and Goodall "24" got among imbecile
4% positive.
W. Muirhead "21" got 100% negative results.
V. Kaffka. "30" got 100% negative results.
Dean "29" got 15.4% positive results.

T A B L E IV.

Cases of Delusional Insanity.

+ = Positive.

o = Negative.

No of Case.	Age.	Sex.	Duration.	Wassermann Serum
1.	41.	F.	7 years.	0
2.	34.	F.	3 years.	0
3.	45.	F.	3 years.	0
4.	44.	F.	6½ years	0
5.	61.	F.	13 years.	0
6.	44.	F.	7 years.	0
7.	60.	F.	34 years.	0
8.	43.	F.	12 years.	0
9.	36.	F.	6½ years.	+
10.	32.	F.	9 years	0
11.	44.	F.	4½ years	0
12.	38.	F.	7 years.	0
13.	61.	F.	30 years.	0
14.	56.	F.	6 years.	0
15.	50.	F.	Since Childhood.	0
16.	51.	F.	4 years.	0
17.	47.	F.	10 years.	0
18.	46.	F.	3 months.	0
19.	41.	F.	4 years.	0
20.	36.	M.	2 years.	0
21.	39.	M.	10 years.	0
22.	52.	M.	1 year.	0
23.	47.	M.	10 years.	0
24.	34	M.	6 years.	+
25.	48.	M.	15 years.	0
26.	55.	M.	18 years.	0
27.	57.	M.	34 years	0
28.	57.	M.	10 years.	0
29.	52.	M.	7 years.	0
30.	64.	M.	6 years.	0
31.	28.	M.	6 months.	0

Positive = 6.4%

S U M M A R Y

of

T A B L E IV.

Cases of Delusional Insanity.

31 Cases. { 19 women.
 { 12 men.

Positive 2 Cases = 6.4%.

POINTS of INTEREST

in the

Histories
in

Table IV.

Of the 2 Cases which gave a positive reaction

Case 9. a married women, denied infection and no history of miscarriages etc could be got.

Case 24. Admitted Syphilis 7 years ago, also alcoholic excess.

History of Alcohol was got in 5 Cases:

Cases 15, 24, 25, 26 & 28.

History of Heredity was got in 7 Cases.

Case 6. Sister insane.

Case 8. Maternal cousin insane.

Case 13. Sister insane, Brothers 2 daughters insane.

Case 14 Maternal Cousin died in Asylum.

Case 18. Paternal Aunt insane.

Case 19. Maternal Uncle committed suicide.

Case 27. Sister in an Asylum, Mother neurotic.

R E M A R K S

on

Table IV.

I have been able to find no literature whatever on percentage of positive Wassermann Reactions in this class of Insanity.

It has been a belief however for long that in this class of Insanity Syphilis is very common: but this table would not help to prove this.

The percentage here got is extremely low as compared with other Classes of Insanity.

Of course in this Table women preponderate and, (going on the assumption that Syphilis is more common in men than in women) this might help to bring the percentage so low: had the number of men been greater, probably the average would have been slightly higher.

T A B L E V.

Manic-Depressive Insanity (a) Melancholia.

+ = Positive.

o = Negative.

No of Case.	Age.	Sex.	Duration.	Nature of Disorder.	Wassermann Serum.
1.	30	F.	9 months	Agitated melan.	0
2.	39.	F.	5 years.	Agitated melan.	0
3.	61	F.	6 years	Agitated melan.	0
4.	52	F.	2 years	Melancholia climacteric	0
5.	33	F.	8 years	Sub-acute Melan. obsessional	0
6.	36	F.	3 months	Recurrent Melancholia	0
7.	54	F.	3 months	Melancholia climacteric.	0
8.	43.	F.	3 months	Melancholia climacteric	0
9.	37	F.	9 months	Melancholia.	0
10.	46.	M.	2 years	Recurrent Melancholia.	0
11.	72.	M.	6 months.	Acute Melan. (senile)	0
12.	67.	M.	3 months	Simple Melan. (senile)	+
13.	42.	M.	3 months	Recurrent Melancholia.	0
14.	46.	M.	3 months.	Acute Melancholia	0
15.	35.	M.	9 months	Acute Melancholia	0
16.	32.	M.	6 months	Acute Melancholia.	0
17	28.	M.	6 months	Acute Melancholia.	+
18.	24	M.	6 months.	Acute Melancholia.	0
19.	60.	M.	15 months.	Acute Melancholia.	0
20.	38.	M.	3 months	Acute Melancholia.	0
21.	30.	M.	6 months	Acute Melancholia.	+
22.	36.	M.	9 months	Recurrent Melancholia.	0
23.	36.	M.	11 years	Chronic Melan. (demented)	0
24.	47.	M.	7 years	Chronic Melan.	0
25.	37	M.	14 years	Melan(Demented)	+
26.	62.	M.	5 years	Chronic Melan. (demented)	+

Percentage of Positive Wassermann 19.23%.

SUMMARY of TABLE V.

(a) Cases of Melancholia.

26 Cases (9 women
(17 men.

Positive 5 men = 19.23%

Of those which gave a positive result

- Case 12. Man aged 67, who denied syphilitic infection: he was very depressed, but also showed slight Dementia : although there was considerable depression, it is possible that we were dealing with a Primary Dementia caused by a syphilitic endarteritis rather than a pure melancholia.
- Case 17. Admitted infection 6 years ago. History of Alcohol.
- Case 21. Denied infection: he was in the Army and * suffers from paroxysmal haemoglobinuria.
- Case 25. No History whatever could be got.
- Case 26. No History whatever, but there is present an old tertiary specific ulcer of the leg.
- Case 12. This is probably more of a primary Dementia where syphilitic endarteritis is present.

The other four cases are probably non-syphilitic psychoses - the syphilis having nothing to do with the mental state whatever.

* It is interesting to note that Browning and McKenzie "8" in examining 3 cases of ideopathic paroxysmal haemoglobinuria, two cases of which were children, found that all three gave a positive result.

POINTS of INTERSET in the HISTORY
of
Table V. a.

History of Alcohol obtained in 8 Cases:

Cases 10, 13, 14, 17, 20, 21, 22 & 23

History of Heredity in 4 Cases:

Case 1. Sister insane.

Case 2. Maternal Cousin and uncle insane.

Case 14. Father alcoholic mother and all family very
neurotic. Maternal cousin insane.

Case 18. Brother insane.

I have been able to find no literature of
the Wassermann Reaction in this Class of Insanity.

T A B L E V.

Manic- Depressive Insanity. (b) Cases of Mania.

+ = Positive.
o = Negative.

No of Case.	Age.	Sex.	Duration.	Nature of Disorder.	Wassermann Serum.
1.	49	F.	12 months	Mania(demented)	0
2.	56	F.	4 years	Chronic Mania	+
2.				(demented)	
3.	55.	F.	6 months	Recurrent Mania	0
4.	49.	F.	7 months	" "	0
5.	31.	F.	18months	Chronic Mania	
				(demented)	0
6.	70.	F.	5 months.	Recurrent Mania.	0
7.	51.	F.	8 months.	Recurrent Mania.	0
8.	50.	F.	8 months.	Recurrent Mania.	0
9.	36.	F.	6 months.	Recurrent Mania.	0
10.	49.	F.	7 years.	Chronic Mania.	0
11.	46.	F.	17 years.	Recurrent Mania	
				(demented)	0
12.	31.	F.	5 years	Chronic Mania	
				(demented)	0
13.	59.	F.	19 years.	Mania(demented)	0
14.	30.	F.	6 months.	Recurrent Mania.	0
15.	30.	F.	9 months	Recurrent Mania.	0
16.	39.	M.	9 months	Acute Mania.	0
17.	31.	M.	6 months.	Acute Mania.	0
18.	72.	M.	42.	Mania(demented)	0
19.	39.	M.	6 months.	Acute Mania.	0
20.	24.	M.	9 months.	Acute Mania	+
21.	33.	M.	6 months	Acute Mania.	0
22.	36.	M.	5 months.	Acute Mania	+
23.	50.	M.	6 months.	Acute Mania.	0
24.	48.	M.	3 months.	Recurrent Mania.	+
25.	32.	M.	3 months.	Recurrent Mania.	0
26.	18.	M.	6 months	Acute Mania.	0
27.	49.	M.	6 months.	Acute Mania.	0
28.	17.	M.	2 months.	Acute Mania.	0
29.	32.	M.	6 months.	Recurrent Mania.	0
30.	66.	M.	3 years	Mania(demented)	0
31.	35.	M.	14 years.	Mania(demented)	0
32.	71.	M.	18 years.	Mania(demented)	0
33.	47.	M.	2 years.	Mania(demented)	+
34.	49.	M.	6 months.	Acute Mania.	+
35.	53.	M.	4 years.	Chronic Mania.	0
36.	28.	M.	2 months.	Mania.	+

Percentage of Positives = 19.44%.

S U M M A R Y

of

T A B L E V.

(b) Mania.

36 cases (15 women.
(21 men.

7 Positive - 19.44 %.

Manic Depressive Insanity { Melancholia:Positive=19.23%.
{ Mania :Positive=19.44%

Points of Interest
in the History of Cases in Table V. b.

Of those which give a Positive Wassermann Reaction :-

Case 2: Syphilis is denied, but there are many old scars on face and body, which are typically tertiary Specific ones.

Case 20. History of Alcohol, all other History denied.

Case 22: Syphilis, 10years ago, History of Alcohol.

Cases 24, 33 and 34. No History of Syphilis, but History of Alcohol.

HISTORY of ALCOHOL in 11 CASES.

Cases, 16, 20, 21, 22, 23, 24, 29, 31, 33, 34 & 36.

HISTORY of HEREDITY in 10 CASES.

Case 1. Father in Asylum.

3. Sister in Asylum

4. Father insane.

9. Sister insane.

13. Mother and Sister in Asylum.

14. Mother's side all neurotic.

15. Sister in Asylum: Uncle & Aunt neurotic.

10. Brothers and other relatives insane.

28. Maternal uncle insane.

30. Father in Asylum, one sister insane.

I have not been able to find any literature of Wassermann Reaction in this class of Insanity; it is interesting to note the similarity of the percentages of positive results in Mania and Melancholia.

It is also interesting to note the strong History of Heredity and Alcohol.

T A B L E VI.

Cases of Acute Confusional Insanity.

+ = Positive.
o = Negative.

No of Case.	Age.	Sex.	Duration.	Wassermann Serum.
1.	27	F.	8 months.	o
2.	30.	F.	13 months.	o
3.	39.	F.	2 months	o
4.	31.	M.	3 months.	o
5.	32.	M.	2 months.	o
6.	41.	M.	6 months.	o
7	24.	M.	8 months.	o
8.	30.	M.	<u>6</u> months.	o

Positive 0%
i.e. Negative 100%.

S U M M A R Y

of

T a b l e VI.

Cases of Acute Confusional Insanity.

8 Cases { 3 women.
 { 5 men.

all negative = 100% negative.

History of Alcohol obtained in 2 Cases:

Cases 5 & 7.

History of Heredity in one Case:

Case 8, Brother insane.

I have not been able to find any literature of percentages of Wassermann Reaction in this class of Insanity.

T A B L E VII.

Cases of Delirious INSANITY.

+ = Positive.
o = Negative.

No of Case.	Age.	Sex.	Duration.	Wassermann Serum.
1.	28.	F.	3 months.	0
2.	51.	F.	4 months.	0
3.	31.	F.	18 months.	0
4.	38.	F.	3 months.	0
5.	42.	M.	2 months.	0
6.	21.	M.	4 months.	0
7.	26.	M.	6 months.	0

Wassermann = 100% negative.

S U M M A R Y

of

T a b l e VII.

Cases of Delirious Insanity.

7 Cases { 4 women
 { 3 men.

All gave a negative reaction. = 100%

History of Alcohol was got in 4 cases:

Cases 4, 5, 6 & 7.

History of Heredity in 1 case:

Case 7, Father insane.

TABLE VIII.

Cases of PRIMARY DEMENTIA.

+ = Positive
 - = Negative.

No of Case.	Age.	Sex.	Duration.	Wassermann Serum
1.	64.	F.	4 years.	0
2.	66.	F.	2 years.	0
3.	44	F.	5 years	+
4.	30.	F.	3 months	+
5.	66.	M.	5 years.	0

Positive = 20%.

POINTS of INTEREST in HISTORY of CASES

in Table VIII.

Of the two cases which were positive

Case 3: A very strong history of Alcohol: she has suffered from peripheral neuritis: there is a typical syphilitic History of Miscarriages.

Case 4. A strong history of Alcohol, History of Syphilis 6 months ago - possibly infection took place earlier, as her youngest child aged 3 years is suffering from an interstitial keratitis. History of Heredity is got here also: Both parents are alcoholic, one sister is insane and the others of the family are neurotic.

Of the other Cases no History could be obtained except in the case of Case 5: Heredity: Brother and aunt insane.

R E M A R K S.

In the case of Primary Dementia here mentioned cases 3 & 4, I should say, differ distinctly from the other 3 cases.

These two cases are both in comparatively young people aged 44 years and 30 years, and both, as has been seen, give a positive Wassermann.

These cases, I should say, are more of the nature of Cerebral Syphilis. The Primary Dementia here is probably caused by changes in the vessels which are syphilitic in character - a syphilitic endarteritis.

Cases 1, 2, & 5 are those of patients who are all over 60. The primary Dementia here is that caused by altheroma of the arteries: these 3 cases give a negative result.

It would be interesting to carry out the test on all arterio-sclerotics: it would be found without doubt that many were really suffering from a syphilitic endarteritis.

I have been able to find no literature of percentages of Wassermann Reaction in this Class of Insanity.

T A B L E IX.

Cases of Nervous Disease.

No of case.	Age.	Sex.	Duration.	Disorder.	Wassermann Serum.
1.	39.	F.	5 years.	Disseminated Sclerosis.	0
2.	43.	F.	9 years	Bulbar Paralysis.	0
3.	37.	M.	5 years.	Progressive Muscular Atrophy.	+

Case 1. Note the comparatively long duration: no history of heredity or alcohol and negative result.

Case 2. Sister suffers from a similar paralysis: negative result.

Case 3. Brother suffers also from Progressive muscular atrophy.
History of heredity, mother alcoholic. family all neurotic: paternal uncle insane. Positive result here is got through no history of syphilis can be traced.

CONCLUSIONS ARRIVED AT from RESULTS.

1. Since over the whole 200 Patients tested, 31.5% gave a Positive Reaction, there is certainly some connection between Syphilis and Insanity, but whether this is a cause or only a predisposing cause we do not yet know.
2. In General Paralysis of the Insane the Reaction is always present - and therefore if the patient has never suffered from Syphilis he cannot suffer from G.P.I.
3. The positive reaction is got in the very early stages of G.P.I. and has also been shown here to be got in remissions, late stages, and cases of as long duration as 14 years.
4. The reaction never changes. once it is positive it remains always positive. A negative result at least excludes General Paralysis of the Insane.
5. There is no relationship between the stage of the disease and the severity of the symptoms, to the intensity of the Reaction: the intensity of the reaction in positive cases varies enormously.
6. There is no relationship between the intensity of the reaction in positive cases to the different classes of Insanity. The reaction in the different individuals varies so widely that no grouping can be made.
7. Table II. Cases of Dementia Praecox, shows that Syphilis bears little or no relationship to this class of Insanity.

8. Table III shows 32.2% of positive results: this shows that congenital syphilis certainly bears some relationship to Imbecility, probably more than is at present generally suspected: In $\frac{2}{3}$ of these positive results the patients showed no stigmata of syphilis, and therefore congenital syphilis had not been suspected beforehand.
9. Table IV Cases of Delusional Insanity, shows only 6.4% of positive results. This would tend to show that Syphilis, which was thought at one time to be present in most cases, has little relationship to this Class of Insanity.
10. Table V. Cases of Manic Depressive Insanity shows in Melancholia 19.23% of positive results, and in Mania 19.44% of positive results. These percentages almost co-incide and it would seem from the fairly high proportion of positives, as if this were at least a predisposing cause in this class of Insanity.
11. Table VI, Cases of acute Confusional Insanity, and VII, cases of Delirious Insanity, which give 100% negative results tend to show that Syphilis bears no relationship to these classes of Insanity.
12. In Cases of Primary Dementia 40% gave positive results. Probably more cases of this class than are at present supposed will be found to be syphilitic in origin: No doubt many of the arteriosclerotics are not simple cases of such, but are really cases of syphilitic endarteritis affecting the cerebral vessels.



