The Sachs-Georgi test for syphilis.

Comparison between the Wassermann and Sachs-Georgi reactions.

Since 1900 when Wasserman Neisser and Bruck discovered the complement deviation test for syphilis, this reaction in some modification or another has been very extensively employed throughout the world for the recognition of syphilitic disease. A voluminous literature has grown up dealing with the occurance of the reaction in all stages of syphilis and, after numerous modifications of the original technique, the test has become firmly established as a most reliable method of diagnoses. Many attempts have been made to simplify the reaction, but in spite of these the test is reliable only, when carried out in a most careful fashion and with numerous controls. Such is the complexity of the test and the variability of the separate reagents, that the Wassermann reaction still remains a test which can only be mastered by those who have skilled laboratory knowledge, particularly of serological work. Owing to these difficulties and in the search for the fundamental differences upon which the recognition of syphilitic and normal sera depend, many attempts have been made to establish in other ways the differences between the serum in syphilis and that of the normal individual. The Wassermann reacting substances having been found to be resident in the globulin fraction of syphilitic sera, it followed that attempts would be made

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to show that syphilitic sera differ from normal sera in regard to the amount of the globulin fraction (I) but the difference if it exists, is too small to be estimated in any practical fashion. MacDonagh in I9I9 stated that distinction could be made between syphilitic and non-syphilitic sera by the use of acetic acid which, in certain amounts, caused more rapid and abundant protein precipitate in syphilitic sera than it did in normal sera. Early in the investigation of the Wassermann reaction it was noted by Porges and Meier(2) that certain lipoid constituents, particularly lecithin, were apparently precipitated by syphilitic sera. Several observers have attempted to measure the physical state of mixtures of sera and lipoid, but the ~~ch~~ chemical or physical alterations are of so delicate a nature, that no reliable information has been acquired on which any theory of the reaction could be built, or from which a practical test for syphilis could be deduced. The belief that the Wassermann test depends upon the interaction of globulin and lipoid, associated with an alteration in the physical state of the lipoid has grown up and, it is held by many that the absorption of complement in the test results from the physical state of the new lipoid-globulin compound which results from the contact of syphilitic globulin and lipoid emulsion. Such alteration in the physical state of the lipoid-globulin mixture, could only be demonstrated by the absorption of complement, which constituted the Wassermann test, but in I9I8 Sachs and Georgi (3)(4) showed that by the use of a suitable antigen, it was possible to demonstrate that syphilitic sera caused visible alteration in the ~~em~~ emulsion state of the lipoid, whilst normal sera had no such action. These authors found that syphilitic sera under certain conditions caused flocculation and precipitation of certain lipoid emulsions,

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andthe reaction was found to correspond so closely with the Wassermann reaction that the test was advocated by them as a substitute for the Wassermann test.

Technique of Sachs and Georgi.

An alcoholic extract of bullocks heart is made, using I gram. of heart muscle to each 5c.c. of 96% alcohol. I00cc. of this heart extract is mixed with 200cc. of 96% alcohol and I3cc. of I% cholesterin. (alcoholic solution). This cholesterinised extract is diluted with normal saline before the test as follows:
To one volume of the mixture one volume of normal saline is rapidly added and then four volumes of saline added more slowly, in such a way as to make an emulsion which is opalescent but not turbid.
The serum of the patient, inactivated at 56° C. for 30 mins., is diluted I in I0 with normal saline, and to Icc. of diluted serum is added .05($\frac{1}{2}$cc.) of emulsion prepared as above. In this original paper Sachs and Georgi recommend that the results should be read at the end of two hours incubation at 37°C. and I8 to 20 hours at room temperature, but in their second paper (5) they recommend that the tubes should be incubated at 37°C. for I8 to 20 hours and read immediately on removal from the incubator. A positive reaction is one in which there is a flocculation or precipitation visible to the naked eye or with the aid of a small hand lens.
The reaction has been examined by few in this country but by a considerable number of Continental observers. The general consensus of opinion appears to be that in the Sachs-Georgi test we have a valuable and accurate method of serological diagnosis of syphilis, and that it compared well with the Wassermann reaction.

The Wassermann and Sachs-Georgi reactions showed an absolute correspondance in 94.94% out of 2770 cases(Sachs and Georgi): in 95.2% out of I65(Plaut): in 85% out of 594(Schroder). Logan(7) in a series of 686 sera examinations finds a considerable number of discrepancies. He used the original technique of Sachs and Georgi and tried various antigens including bullocks heart extract. In many of his tests he used an opalescent emulsion which I have found to be less reliable than more turbid ones. Tanaguchi(6) finds discrepancies arising in 27 cases out of a total of 296 cases. Marcora(8) examined 30I sera by the Wassermann and Sachs-Georgi methods and got absolutely corresponding results in 93.6%. He states that the discrepancies are explained by ill marked reactions which he therefor concludes are of little value. Dekenga and Platenga(9) examined several hundred sera by the Wassermann and Sachs-Georgi methods. They state that in sera with a definate positive Wassermann, Sachs-Georgi was invariably positive but occasionaly exceptions occured. In sera with a weak positive Wassermann, Sachs-Georgi was repeatedly negative. They also state that negative Wassermann and positive Sachs-Georgi findings were to be met. They find that as the result of treatment Sachs-Georgi becomes negative before the Wassermann. They conclude therefor that the test is only reliable if carried out in conjunction with, or as a control to, the Wassermann. Ariazzi and Pico(IO) in a series of 240 cases got the same results in ~~90~~%. 95.43% with the two tests. Murstad(II) in his series of 3I4 cases gets the same results in 90%. Neukirch(I7) examined 958 sera of which 642 were from the medical clinic and were regarded as old syphilitic cases, whilst 3I6 from the skin clinic were regarded as new cases. In the former group he got paralell results in 84.4%

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whilst in the latter the results corresponded in 86.5%. He finds that the Sachs-Georgi reaction corresponds better with the Wasserman in early syphilis than in the late cases. In opposition to the results of Blumenthal(I6) he finds that out of 24 cases of pulmonary tuberculosis only 3 gave a positive Sachs-Georgi, and these three also gave a positive Wassermann. Neukirch believes that with bettering of the extract and changes in the experimental conditions, such as temperature and salt content, the test will eventually be of great value.

The apparent simplicity of the Sachs-Georgi test as compared with the complexity of the Wassermann appealed to me as a general practitioner and I decided to make myself familiar with the technique and to investigate the reaction in a series of cases and compare the results with those of the Wassermann reaction. Working in the laboratory of the Pathological department of Aberdeen University I have examined 50I sera, obtained from the venereal clinic and wards of the Aberdeen Royal Infirmary, and City Hospital for infectious diseases and phthisis. In addition I have examined 30 cerebro spinal fluids by the Sachs-Georgi and Wassermann methods. The technique I have followed was exactly the same as that used by Tanaguchi and described by him in a recent paper. In dealing with the cerebro spinal fluids there appears to be considerable reluctance on the part of many medical men to draw off spinal fluid and on account of this fact my numbers were limited which otherwise would not have been the case. All the sera previous to the performance of the Sachs-Georgi test had been examined by the Wassermann reaction by Dr. Duncan in the laboratory of the Aberdeen Royal Infirmary. He used Boas original technique, but the results of these examinations were not made known to me until the Sachs-Georgi reactions were completed and readings

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had been made. Wassermann reactions were repeated on a number of sera, as indicated on the right hand side of Wassermann column of tables. These tests were performed by myself by the technique of increasing doses of complement. (Browning, Cruickshank, and McKenzie) It will be seen from the accompanying tables that by this latter method I was able to detect some weak positives which had apparently been missed by the Boas method. The sera in which this occured were the following: No. 82, I59, I6I, I9I, 237, and 423.

It will be observed that very considerable numbers of the cases from which the blood was derived, were cases which had been under treatment and on account of this fact the Sachs-Georgi reaction has been put to a very severe test and one to which the Wassermsnn reaction in its early days was not submitted. Primary and early secondary cases, according to these records, would appear to give the most satisfactory results as regards treatment. Tertiary cases, even after prolonged treatment,, still remain positive to Sachs-Georgi and even when there are no clinical manifestations.

In the series of 50I cases which I have examined the technique of Tanaguchi(6) has been used. This is as follows:

Antigen: A I0% alcoholic human heart extract was kept as a stock mixture. The heart muscle having been finely minced and allowed to stand in the alcohol, it gradually settled to the bottom, allowing the clear supernatant fluid to be pipetted off. One cc. of this extract was diluted with 0.5cc. absolute alcohol. To one cc. of this diluted extract 0.05cc. of I% alcoholic solution of cholesterol was added. One part of the cholesterolised extract was then mixed with five parts of normal saline by the "Double" method, namely: One cc. saline was added quickly to one cc. extract, shaking vigorously

during the process: this solution should be turbid and should be left standing for I5 minutes at least, at room temperature, and then a further amount of four cc. of physiological saline was rapidly added, shaking again during the process.

Sera — Sera(within 7 days after withdrawal of the blood) were tested after standing at least three hours at room temperature subsequent to heating 30 minutes at 56 C. (as recommended by Munster).

Procedure: The incubator method of Sachs and Georgi was employed. Instead of using only one tube containing 0.Icc. of serum, as recommended by Sachs and Georgi, two tubes containing 0.Icc. and 0.05cc. of serum respectively were used, as it has been observed (Tanaguchi) that in strong positively reacting sera, a zone phenomenon occurs. To each of two tubes containing 0.5cc. of emulsion, a volume of onecc. consisting respectively of 0.Icc. and 0.05cc. of serum, diluted with saline was added and mixed by slight shaking. The tubes were then incubated overnight (I8 to 20 hours), at 37°C.

Controls: To distinguish precipitate from turbidity due to growth of organisms in the fluid, a control was set up of 0.Icc. of serum with I.4cc. of alcoholic salt solution. This, in my opinion was hardly necessary. Controls were set up at the same time of known positive, weak positive, and known negative sera, in order to test the reacting power of the antigen. Results were designated −, +wk, +, ++, +++ ++++; ±= a doubtful reaction.

The process may be summarised shortly as follows:

Icc Antigen
0.5cc. Abs. Alcohol. } Soln., A.

Icc. of soln. A
0.05cc. of 1% Cholesterol } Discard 0.05cc. of mixture.

Icc. salt soln.
(15 mins. interval.)
4cc. salt soln. } Soln., B.

To each series of tubes add respectively:

(1) 0.1cc. serum 0.9cc. salt soln. Dilution of 1 - 10
(2) 0.05cc. serum 0.95cc. salt soln. Dilution of 1 - 20 } Soln., C.

To each tube add 0.5cc. of solution B (emulsion).
Allow to stand 18 to 20 hours at 37 C and read immediately on removal from incubator.

In determining the result of the reaction, the presence or absence of a precipitate in the second tube (containing 0.05cc of serum) was principally taken into account. When, however, the tube showed merely a suspicious reaction, the result in the tube containing 0.1cc. of serum was compared with the controls. If the latter tube showed precipitation, while the corresponding tube in the negative control showed none a positive result was recorded. In the sera showing a marked positive reaction in addition to the formation of a precipitate, there was distinct clearing of the fluid. It was also found that in the case of sera giving a doubtful reaction, if these were read after standing at room temperature for 4 hours, precipitation was more marked. It is thus advisable in suspicious cases to repeat the reading after an interval of 4 hours in addition to the reading taken immediately after incubation.

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The negative control must of course be observed likewise. In strong positive sera a distinct flocullation may be distinguished after incubating for 5 hours at 37°C. The following table serves to show the zone phenomenon above referred to. Four known positive sera and two known negative sera were tested in dilutions ranging from I in 5 to I in I60.

No.	I-5	I-I0	I-20	I-40	I-80	I-I60
I	++++	++	—	—	—	—
2	++	+++	++++	+	—	—
3	++++	+++	++	—	—	—
4	—	—	—	—	—	—
5	—	—	—	—	—	—
6	—	++	+++	±	—	—

Sera Nos. I,2,3,&6, were known positives, Nos. 4&5, were known negatives. The zone phenomenon is shown in sera Nos. 2 and 6. In preparing the emulsion I have found the best results to be got after mixing the various reagents in three times the amounts mentioned above, and in proportion to the number of sera to be examined. For example, if there are 70 sera to be examined I require 35cc. of emulsion. I therefor make the emulsion in two separate lots and mix them on completion. If larger quantities

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are used it is difficult to get the emulsion turbid enough. In my experience the more turbid the emulsion, the more accurate are the readings. It was customary for me to make up the emulsion before performing the tests and allow it to stand over night. (I5-I8 hrs.) I also observed that after allowing the tubes to stand for 48 hrs. at room temperature after removal from the incubator, and shaking gently, in the case of weak positive sera, a distinct white precipitate rose from the bottom of the tube. This was not observed in the case of negative sera.

In carrying out the tests I may state that the sera were tested in large batches each week, so that the results were obtained in groups of 60, 70, or 90. Repetitions of the discrepancies between the two reactions were carried out both for the Wassermann and the Sachs-Georgi.

The following are the tables giving certain details of each case so far as these were obtainable.

No.	Wasserman.	Sachs. 1-10	Georgi. 1-20	NOTES.
1	++++	++++	+++	Infected 3 years ago. Treated.
2	-	-	-	Spirœs present on 26/1/21. Papulosqua-:mous Syphilide. Wasserman -. after provocative injection.
3	++++	++++	+++	Primary 5 years ago. Tertiary signs.
4	-	-	-	Secondary treated 1½ courses Na.B. W+ July 1920.
5	-	-	-	Vaginitis no clinical evidence of Syph^{s}
6	-	-	-	No clinical evidence of Syph^{s}
7	-	-	-	Tertiary treated W + 8/9/20
8	-	-	-	Secondary treated W + 30/1/1920
9	-	-	-	Secondary treated W + 5/2/20
10	-	-	-	Secondary treated W ± 16/1/20
11	-	-	-	Secondary treated W + 9/6/20
12	-	-	-	Secondary treated W + 29/10/20 Primary 1912. Frequent recurrences.
13	-	-	-	Secondary treated W + 25/11/20
14	-	-	-	Epithélioma of Penis.
15	++	++	+	Secondary treated. Repeated recurrences.
16	-	-	-	Balanitis 6 months ago. No clinical signs of Syph^{s}
17	-	-	-	Secondary treated. W + 3/7/20
18	-	-	-	Arteric Sclerosis.
19	-	-	-	No clinical evidence of Syph^{s}.
20	-	-	-	Secondary treated. W + 16/12/20
21	-	-	-	Secondary treated. W + 1/9/20
22	-	-	-	Clinical history indefinite.
23	++++	++++	++++	Secondary untreated.

No.	Wasserman.	Sachs. 1-10.	Georgi. 1-20.	NOTES
24	-	-	-	Secondary treated W + 26/6/20
25	-	-	-	Adenitis. No other signs. Reported to have had Syph in Army 2 years ago.
26	++++	+++	++	Secondary undergoing treatment.
27	-	-	-	Clinical history indefinite. Reported to have had Syph. No clinical evidence.
28	+++	++	+++	Reported to have had Syph in 1919. No clinical evidence now.
29	-	-	-	Acute Nephritis.
30	-	-	-	Anaemia.
31	-	-	-	Osteomyelitis.
32	+++	-	-	History of Locomotor Ataxia. Treated.
33	- —	++	+	Secondary treated W+ 5/2/1920
34	- —	++	+	History of repeated abortions. No clinical evidence of Syph.
35	-	-	-	No clinical evidence of Syphs.
36	-	-	-	No clinical evidence of Syphs.
37	++++	++++	++++	Late Secondary Untreated
38	-	-	-	Secondary treated. W + 8/9/20
39	-	-	-	Secondary treated W + 16/1/20
40	-	-	-	Reported to have had syph 4 years ago. No clinical sighs.
41	-	-	-	Exposed to infection 3 weeks ago. No clinical signs.
42	-	-	-	Secondary treated.
43	-	-	-	Early Primary 5/12/20 Treated
44	-	-	-	Female - Lesious Nil - Husband had Syph.
45	-	-	-	Female - Lesious Nil. Husband had Syph.

No.	Wassermann.		Sachs. 1-10.	Georgi. 1-20.	NOTES.
46	-		-	-	Boy. 8 Congenital Syph under Hg. treatment.
47	-		-	-	Secondary treated.
48	-		-	-	No evidence of Syph.
49	-		-	-	History of having had Syph 10 years ago. Had Hg treatment then. Lesions Nil.
50	-		-	-	Chronic Interstial Nephritis.
51	-		-	-	Mitral incompetence.
52	-		-	-	Diabetes Mellitus.
53	-		-	-	Aortic Regurgitation.
54	-	-	++++	+++	Case of suspected Aneurysm. W repeated by myself and found -ve S.G. twice definitely +ve in both dilutions.
55	++++		++++	+++	Late Secondary Untreated.
56	-		-	-	Ununited fracture of femur.
57	++++		++++	++++	Congenital Syph. Interstitial Keratitis ~~Nephritis~~. Untreated.
58	-		-	-	Primary. Has had 2 courses treatment.
59	±	±	+	-	Secondary. Had one course treatment New.
60	-		-	-	Secondary treated W+ 16/9/20.
61	-		-	-	Exposed to infection. No clinical signs.
62	-		-	-	Secondary treated W + 16/9/20
63	-		-	-	Secondary treated W + 11/12/20
64	-		-	-	Secondary treated W + 5/2/20
65	±	±	++	++	Primary Jany 1921 Spires -ve Under treatment Rewassermanned by myself and reported doubtful.
66	-	-	-	-	No evidence of Syph.

No.	Wassermann.	Sachs. 1-10.	Georgi. 1-20.	NOTES
67	++	+	++	Headache Deafness W + 1/7/20 No clinical signs. Treated.
68	+	+++	+++	Early Secondary. Undergoing treatment.
69	-	-	-	General Adenitis. Tubercular ?
70	-	-	-	Acute Phthisis.
71	-	-	-	Chronic Fibrosis of Lung.
72	-	-	-	History of Syph. No clinical signs.
73	-	-	-	Gonorrhoea.
74	-	-	-	Vaginitis.
75	+++	+++	+++	Secondary treated.
76	-	-	-	No history of Syph.
77	-	-	-	Chronic Phthisis.
78	++	+	+++	Secondary treated.
79	-	-	-	Pneumonia.
80	-	-	-	Ulcer of leg.
81	-	-	-	No evidence of Syph.
82	-	++ +++	++	Secondary (early) Rewassermanned and found +ve.
83	-	-	-	Primary Had 2 courses treatment W + 5/2/20.
84	+++	++	+	Primary a month ago. Spir^{cs} Under treatment.
85	-	-	-	Clinical Primary Syph. Infection 1 month ago. Under treatment.
86	++	++	+	Primary 1 month ago. Under treatment.
87	-	-	-	Gonorrhoea.
88	-	-	-	No evidence of Syph.
89	-	-	-	Skin eruption. ? Syph.

No.	Wassermann.	Sachs. 1 - 10.	Georgi. 1 - 20.	NOTES.
90	±	++	++	Primary in 1919. Had 2 courses of treatment. W + 12/6/20.
91.	-	-	-	Secondary treated.)
92	-	-	-	Secondary treated.) Had given W + on previous occasions.
93	-	-	-	Secondary treated.)
94	++++	++	++	Primary Nov 1920. Untreated. Def clinical signs. Had gonorrhoea as well.
95	+++	++	++	Tertiary. Had 2 courses treatment.
96	+++	+++	+++	Chronic ulcer in R leg. Gonorrhoea 30 years ago. No history of Syph. Had 1 course treatment.
97	+	+	+	No signs of Syph. Had 4 courses As and Hg. W + since July 1919. History of gonorrhoea.
98	-	-	-	Tonsilitis.
99	-	-	-	Cleft palate. Syphic ?
100	++	++++	++++	Secondary. Untreated
101	-	-	-	History of having had Syph 2 years ago in Army. Treated. No clinical signs.
102	-	-	-	History of gonorrhoea.
103	-	-	-	History of repeated abortions.
104	-	-	-	Chronic ulcer of leg.
105	-	-	-	Secondary. Treated.
106	-	-	-	Secondary Treated.
107	++	+++	+++	Tertiary Treated. Had ? courses N. A. B.
108	-	-	-	Sub acute Phthisis.
109	-	-	-	Cerebro spinal Meningitis.
110	-	-	-	Meningism.
111	-	-	-	Secondary Treated.

No.	Wassermann.	Sachs 1-10.	Georgi. 1-20.	NOTES
112	-	-	-	Secondary Treated.
113	-	-	-	Secondaby Treated.
114	-	-	-	Secondary Treated.
115	-	-	-	Gonorrhoea. Adenitis.
116	-	-	-	History of Syph 3 years ago. Treated.
117	-	-	-	Balanitis.
118	-	-	-	Ulcer of Labium.
119	-	-	-	Primary Under treatment.
120	-	-	-	Secondary. Treated. W +? 5/9/20.
121	-	-	-	Acute Miliary Tuberculosis.
122	-	-	-	Cancer of Rectum.
123	-	-	-	Pernicious Anaemia.
124	-	-	-	Acute Adenitis of Rt groin. No history of Syph.
125	-	-	-	Early Primary. Had full course of treatment.
126	-	-	-	Child 4 Months. General Adenitis.
127	-	-	-	Secondary Treated.
128	++	+++	++	Locomotor Ataxia.
129	++	+++	++	Keratitis (Syphic ?)
130	-	-	-	Headache Deafness. No evidence of Syph.
131	-	-	-	Secondary Treated.
132	++	+++	++	Congenital Syph.
133	-	±	-	Secondary Treated W+ 8/11/20.
134	++	+++	+++	Gumma of leg.
135	-	-	-	Primary. Had 1 course treatment.
136	-	-	-	Early Secondary Treated.

No.	Wassermann.		Sachs 1-10.	Georgi 1-20.	NOTES
137	-		-	-	No evidence of Syph.
138	-		-	-	Had Syph 5 years ago. Treated. No clinical signs of Syph.
139	-		-	-	Vaginitis.
140	-	*	-	-	Ulcerations of Vulra. No clinical signs of Syph.
141	-		-	-	Secondary Treated.
142	-		-	-	Myocardial Degeneration.
143	-		-	-	Mitral incompetence.
144	-		-	-	Diabetes Mellitus.
145	-	*	-	-	Ulcer (Chronic) of leg.
146	-		-	-	Scarlet Fever.
147	±	+wk.	+	+	Secondary Had 1 course treatment.
148	-		-	-	Secondary Treated W 6/11/20.
149	-		-	-	Early Primary Treated.
150	-		-	-	Secondary. Had 3 courses treatment W + 1 month ago.
151	-		-	-	Secondary Treated.
152	±	+wk.	-	-	Female. Had Syph 7 years ago. Treated. No evidence of syph clinically. Husband had syph.
153	++	++	++	-	Children of above woman. Both have
154	++	++	-	-	definite signs of congenital syph.
155	+++		+++	+++	Late Secondary . Had 2 courses treatment
156	-		-	-	
157	-		-	-	No history available.
158	-		-	-	
159	-	+wk.	++	++	Early Secondary.Infected 8 weeks ago.

No.	Wassermann.		Sachs. 1-10.	Georgi. 1-20.	NOTES.
160	±		+++	++	Primary Untreated.
161	±	++	++++	++++	History of gonorrhoea in September 1920. Has secondary signs. Untreated.
162	-	—	+	±	Syph in September 1919. Treated W+ 24/3/20.
163	-	—	-	-	History of gonorrhoea 1 year ago. No evidence of Syph.
164	-		-	-	Primary. Treated. Spir+ ~~Pellidi~~ 29/9/20.
165	-		-	-	General Adenitis. Tubercular ?
166	-		-	-	Early Secondary Treated.
167	-	—	±	-	Syph in September 1917. Treated W+ 12/12/19.
168	++++		++++	+++	Secondary Untreated.
169	++++		++++	+++	Secondary Untreated.
170	-		-	-	No History available.
171	-		-	-	
172	-		-	-	
173	-		-	-	
174	-		-	-	
175	-		-	-	
176	-		-	-	
177	-		-	-	
178	-		-	-	
179	+++		+++	+++	Tertiary Untreated.
180	++		+++	++++	Syph 4 years ago, Tertiary signs. Untreated.
181	-		-	-	Secondary. Undergoing Treatment
182	-		-	-	Secondary. Treated.

No.	Wasserman.		Sachs. 1-10.	GEORGI 1-20.	NOTES
183	-		-	-	Rodent Ulcer.
184	-	—	+	+	Primary Treated W+ 7/1/21.
185	-	—	-	-	Ranula.
186	-		-	-	Primary Treated.
187	-		-	-	Secondary Treated.
188	++++		++++	++++	Tertiary No Treatment.
189	+		+++	+++	Ulcer of leg, No Treatment. No history of Syph.
190	-		-	-	Adenitis.
191	-	+wk.	+++	+	History of sore on penis 1 year ago. No treatment.
192	-		-	-	Secondary Treated.
193	+		+++	++	History of Syph 2 years ago. No Treatment.
194	-		-	-	Fibrosis of Lung.
195	-	—	+	+ -	History of gonorrhoea several years ago. No history of syph. A.R.pupil present.
196	-		-	-	Primary Treated.
197	-		-	-	Primary Treated.
198	+++		+++	+++	Syph 10 years ago. Dermatitis & Calositi-es
199	+++		+++	+++	Glossitis. Keratitis.
200	+++	+++	++	+	Syph in 1916. Treated. Secondary symptoms following reinfection.
201	-		-	-	Ulcer in leg. No history of syph.
202	-		-	-	Tonsilitis and hair falling out. No history of syphilic infection.
203	-		-	-	Primary Under Treatment.
204	+		++	-	No signs of syph. History of 2 miscarriages.

No.	Wassermann.		Sachs. 1-10.	Georgi. 1-20.	NOTES.
205	+		+	++	No signs of syph. History of 1 miscarr--iage.
206	++		++	+	Adenitis and Anaemia.
207	+		+++	++	Secondary signs in July 191 . Had 4 courses of treatment.
208	+		+	-	History of syph 5 years ago. Untreated.
209	-		-	-	Primary Treated.
210	-		-	-	Secondary Treated.
211	+++		+++	+++	Primary 12 years ago. Glossitis & Adenitis. 1 course treatment.
212	-		-	-	Secondary Treated.
213	-		-	-	Meningitis.
214	+++		+++	++	Tertiary. Had 3 courses of treatment.
215	-		-	-	Gonorrhoea. Recent infection.
216	-		-	-	Primary Treated.
217	-		-	-	Primary Under treatment.
218	-		-	-	Secondary. Treated.
219	+	++	+	-	Old Tertiary W+16/12/1920. After treatment ulcer in point of penis ? recurrence.
220	-		-	-	Osteomyelitis.
221	+	+++	+	-	Husband No 152. Had Syph 5 years ago and treated.
222	+++		+++	++++	Primary 2/6/20 Treated Adenitis now present.
223	-		-	-	Secondary Treated 4/11/20
224	-		-	-	Do 6/12/20
225	-		-	-	Primary Under treatment.
226	-		-	-	Chronic Phthisis.

No.	Wassermann.	Sachs. 1-10	Georgi. 1-20.	NOTES.
227	-	-	-	Tonsilitis.
228	-	-	-	Secondary Treated.
229	-	-	-	Gonorrhoea.
230	-	-	-	Primary Under treatment.
231	++++	++++	+++	Secondary Untreated.
232	-	-	-	Epithelioma of penis.
233	-	-	-	Secondary Treated.
234	-	-	-	Anaemia.
235	-	-	-	Acute Nephritis.
236	-	-	-	Marasmic child.
237	-	+wk.	++	++ Sub acute Nephritis. No history of Vinereal Disease. No clinical manifestations.
238	-	-	-	Exposed to infection. No clinical signs.
239	-	-	-	Secondary Treated.
240	-	-	-	Early Primary Treated.
241	-	-	-	Early Secondary Treated. ~~Secondary.--Had 3 courses treatment.~~
242	-	-	-	Secondary. Had 3 courses treatment.
243	-	-	-	Pernicious Anaemia.
244	+	+wk.	+	- Syph 6 years ago. Partially Treated.
245	+++		+++	++ W. 19/1/21. Primary sore in penis. Recurrence.
246	-	-	-	All secondary and treated each/
247	-	-	-	
248	-	-	-	
249	-	-	-	
250	-	-	-	

No.	Wassermann.	Sachs. 1 - 10	Georgi. 1 - 20.	NOTES.
251	-	-	-	) each has had +^W on a previous occasion.
252	-	-	-	)
253	-	-	-	)
254	-	-	-	Acute Phthisis.
255	-	-	-	Female had 1 miscarriage.
256	-	-	-	Gonorrhoea.
257	-	-	-	Gonorrhoea.
258	-	-	-	Early Primary Treated.
259	-	-	-	Gonorrhoea.
260	-	-	-	Marasmic child. ? Syphic.
261	+	+	-	Female with Anaemia. Child born before marriage is normal. History of 3 miscarriages since marriage. Husband has Syph.
262	+	++	+	Secondary Under Treatment.
263	-	-	-	Phthisis.
264	-	-	-	Dark pigmentation of chest & abdomen.
265	-	-	-	Secondary Treated.
266	+++	++++	++++	Tertiary. Gumma at roof of nose. Untreated.
267	-	-	-	Sub acute Phthisis with Adonitis in groin.
268	-	-	-	Gonorrhoea.
269	-	-	-	Balanitis with ulcer on penis.
270	-	-	-	Secondary Treated.
271	-	-	-	Primary Treated.
272	+	+	-	Secondary Treated +^W 3/11/20
273	-	-	-	Vaginitis.

No.	Wassermann.	Sachs. 1-10.	Georgi. 1-20.	NOTES.
274	-	-	-	Gonorrhoea Opthalmia.
275	-	-	-	Marasmus with slight Adenitis.
276	-	-	-	Cirrhosis of Liver.
277	++++	++++	++++	Secondary Syph Untreated.
278	+	+	±	Late Secondary Treated.
279	-	-	-	Arthritis.
280	-	-	-	Secondary Treated.
281	-	-	-	Secondary Treated.
282	-	-	-	Secondary Treated.
283	+	-	-	Early Primary. First symptoms 1 Month ago. No Sp. P. found in sore.
284	-	-	-	Primary. Sp. P. 2/11/21
285	-	-	-	Ulcer at angle of eye.
286	-	-	-	Diabetes Mellitus.
287	-	+	±	Primary in 1901. Treated.
288	-	-	-	Tonsilitis.
289	-	-	-	Cleft palate.
290	-	-	-	Repeated miscarriage. Tubercular disease of hip joint.
291	-	-	-	Cerebral Spinal Meningitis.
292	-	-	-	Ulcer on Vulra.
293	-	-	-	Acute Phthisis.
294	-	-	-	Adenitis of groin. No history of Syph.
295	-	-	-	Child with general Adenitis.
296	-	-	-	Early Primary.
297	-	-	-	Parenchymetous Nephritis.

No.	Wassermann.	Sachs, 1-10.	Georgi. 1-20.	NOTES.
298	-	+	+	Syph 1 year ago.Treated with 606. General Adenitis +W. 2/11/20.
299	-	-	-	Secondary Under Treatment.
300	-	-	-	Early Secondary after 1 course 914 W+9 weeks ago.
301	-	-	-	History of Syph 2 years ago. Treated.
302	-	-	-	Headache and deafness. No symptoms of Syph.
303	-	-	-	Epithelioma of penis.
304	-	-	-	Secondary Treated.
305	-	-	-	Early Primary Treated.
306	-	-	-	Primary under Treatment.
307	-	-	-	Secondary Treated.
308	-	-	-	Primary Treated.
309	-	-	-	Gonorrhoea (Chronic with Arthritis)
310	-	-	-	Marasmic child.
311	-	-	-	Suspedted Typhoid.
312	-	-	-	Secondary Treated.
313	-	-	-	Secondary Treated.
314	-	-	-	Secondary Treated.
315	-	-	-	History of Syph 3 years ago. Treated.
316	-	-	-	Balanitis with Adenitis.
317				General Septicaemia
318	-	-	-	Early Primary Under Treatment
319	-	-	-	Pernicious Anaemia.
320	-	-	-	Disseminated Sclerosis.
321	-	-	-	Early Secondary Under Treatment.
322	-	-	-	Secondary Treated. +W. 8/11/20.

No.	Wassermann.	Sachs. 1-10.	Georgi. 1-20.	NOTES.
323	-	-	-	Primary Treated.
324	-	-	-	History of Syph 2 years ago. Treated.
323	-	-	-	Primary Treated.
324	-	-	-	History of Syph 2 years ago. Activily Treated.
325	++++	++++	++++	Tertiary Treated +W. 10/12/20 No Treatment for 6 months.
326	-	-	-	Gonorrhoea.
327	-	-	-	Anaemia with Adenitis.
328	++++	++++	++++	Repeated miscarriages. No clinical signs of syph.
329	-	-	-	Early Secondary Under Treatment.
330	-	-	-	Do. do.
331	+++	+++	++	Ulcer on lip from which T.B. have been isolated. History of Syph.
332	++	+++	+++	Primary 1913. Under Treatment.
333	-	-	-	Marasmic Child.
334	-	-	-	Primary 1917. Had several courses of treatment.
335	-	-	-	Marasmic child.
336	+++	+++	+++	Congenital Syph with clinical symptoms.
337	-	-	-	Anaemia.
338	-	-	-	Marasmic child.
339	+++	+++	+++	Early Secondary Untreated.
340	-	-	-	Primary Treated.
341	+++	++	+	Perforation of nasal septum. Other Tertiary signs.
342	+++	+++	++	Congenital Syph with clinical signs.

No.	Wassermann.	Sachs.- Georgi.		NOTES.
343	-	-	-	Early Primary with Gonorrhoea.
344	-	-	-	Ulceration of Penis.
345	-	-	-	Primary Treated.
346	-	-	-	Early Secondary Under Treatment.
347	-	-	-	Leukaemia. with Adenitis.
348	-	-	-	Exposed to infection 1 month ago. No clinical signs.
349	++	++	+	Early Secondary Untreated
350	-	-	-	Secondary Treated. +ve W 4/1/21.
351	-	-	-	Gonorrhoea.
352	-	-	-	Balanitis & Paraphimosis.
353	-	-	-	History of exposure to infection. No clinical signs.
354	-	-	-	Marasmic child.
355	-	+	-	Early Secondary ~~Secondary~~ Primary 2 months ago. Untreated.
356	+++	+++	++	History of repeated miscarriages. Husband has syph.
357.	-	-	-	Pneumonia.
358	-	-	-	Acute Phthisis .
359	-	-	-	Bronchiectasis.
360	-	-	-	Adenitis of groin. No clinical signs of syph.
361	++	++	+	History of Syph 7 years ago. Keratitis.
362	-	-	-	Secondary Treated.
363	-	-	-	Secondary Treated.
364	+++	++++	+++	Tertiary Under Treatment.
365	-	-	-	Primary Under Treatment.

No.	Wassermann.	Sachs.- Georgi.	NOTES.
366	+	-	Early Secondary. Had 1 course treatment.
367	-	-	Vaginitis.
368	-	-	Marasmic child.
369	-	-	Chronic Osteomyelitis.
370	-	-	Gonorrhoea.
371	-	-	Secondary Treated.
372	-	+++ ++	Late Secondary. Had 1 course 914 +W. 11/11/20.
373	-	-	Early Primary. Infected 4 weeks ago.
374	+++	++++ +++	Tertiary. Primary 10 years ago. and treated with Hg
375	-	-	Varicose Ulcer in leg.
376	-	-	Mitral Stenosis with arterial degeneration.
377	-	-	Adenitis.
378	-	-	Chronic Nephritis.
379	-	-	Scarlet Fever.
380	-	-	Tonsilitis.
381	-	-	History of Influenza followed by falling out of hair. No clinical signs of syph.
382	-	-	Friedrichs Ataxia.
383	-	-	Secondary Treated
384	-	-	Secondary Treated.
385	-	-	Primary Under treatment.
386	-	-	Cancer of Colon.
387	-	-	Septicaemia.
388	-	-	History of Syph 2 years ago. Treated

No.	Wassermann.	Sachs. 1-10.	Georgi. 1-20.	NOTES.
389	-	+	-	Gastric Ulcer. General Adenitis.with Tonsilitis. History of possible infection.
390	-	-	-	Secondary Under treatment.
391	+	-	-	Haemoptosis ? Tubercular. No clinical signs nor history of Syph.
392	-	-	-	Cirrhosis of Liver c Enlarged spleen.
393	-	-	-	Lymphadenoma.
394	-	-	-	Tumour of Cerebellum.
395	-	-	-	Pernicious Anaemia.
396	-	-	-	Primiary treated +W. 16/1/21.
397	+	+	±	Secondary Under treatment.
398	+	-	-	History of repeated abortions. No clinical signs of Syph.
399	-	-	-	Primary treated.
400	+	+	-	History of repeated abortions. No clinical signs of syph.
401	+++	++++	+++	Secondary Untreated
402	-	-	-	Secondary Treated.
403	-	-	-	Secondary Treated.
404	-	-	-	Secondary Treated.
405	-	-	-	Primary under treatment.
406	-	-	-	Cerebro spinal Meningitis.
407	-	-	-	Marasmic child with adenitis.
408	+++	+++	++	Secondary Untreated .
409	+	++	+	Tertiary Treated with several courses 914 K.I. and Hg.
410	-	-	-	Early Primary Untreated. Sore in penis for 10 days.

No.	Wassermann.	Sachs. 1-10.	Georgi. 1-20.	NOTES.
411	-	-	-	Secondary Treated.
412	-	-	-	Secondary Treated.
413	+++	+++	+	Early Secondary Untreated.
414	-	-	-	Marasmic child.
415	-	-	-	Old fibrosis of lung. Adenitis.
416	-	-	-	Gonorrhoea 5 years ago. Arthritis.
417	-	-	-	Secondary Treated.
418	-	-	-	Secondary Treated.
419	++	+++	+++	Tertiary Untreated.
420	++	+++	++	Cerebral tumour.
421	-	-	-	Primary Under treatment.
422	-	-	-	Female with no clinical symptoms. Husband has syph.
423	-	+ wk.	+++	+++ Secondary. Had 1 course of treatment.
424	-	-	-	- Had syph 2 years ago. Treated. No clinical signs of syph.
425	+++	++++	++++	Secondary Untreated.
426	-	-	-	Primary Treated.
427	-	-	-	Sedondary Treated.
428	-	-	-	Secondary Treated.
429	++++	++++	++++	Tertiary Under treatment.
430	+	++	+	Secondary after 2 courses 914 & Hg
431	++	+	+++	Congenital Syph (5th member of family)
432	-	-	-	Secondary Treated
433	-	++	++	Primary with clinical signs.
434	++	+++	+++	Secondary Untreated.
435	-	-	-	Tonsilitis.

No.	Wassermann.	Sachs.- Georgi. 1/- 10.	1/- 20.	NOTES.
436	-	-	-	Marasmic child.
437	-	-	-	Encephalitis. Lethargica.
438	++	+++	++	Late Secondary Untreated.
439	-	-	-	History of gonorrhoea. No clinical signs of syph.
440	-	-	-	Early Secondary Under treatment.
441	-	-	-	Gonorrhoea with Adenitis.
442	+	++++	++++	Secondary Treated.
443	-	-	-	Primary Under Treatment.
444	++++	++++	++++	Secondary Untreated.
445	-	+++	+++	Early Primary Untreated.
446	-	-	-	Secondary Treated.
447	-	++++	++++	Early Secondary Untreated. Clinical signs present.
448	+++	+++	++	Congenital syph. Untreated.
449	++++	++++	++++	Tertiary Untreated. Primary 8 years ago.
450	+	+	+++	Late Secondary. Had 3 courses treatment.
451	-	-	-	Primary under treatment.
452	-	++	+	Late Secondary. Had 2 courses treatment.
453	-	-	-	Early Secondary under treatment.
454	-	-	-	Secondary Treated.
455	+	+++	++	Anaemia. Husband has Syphic History.
456	+++	++	+	Congenital Syph Untreated.
457	-	-	-	Marasmic child.
458	-	-	-	Acute Phthisis. History of Gonorrhoea.

No.	Wassermann.	Sachs - Georgi. 1-10.	1-20.	NOTES.
459	+	+++	++	Late Secondary. Treated (1 course)
460	-	-	-	Secondary Treated.
461	-	-	-	Secondary Treated.
462	-	-	-	Primary under treatment.
463	-	-	-	Gonorrhoea with Arthritis.
464	++	++	+	History of repeated abortions. Husband reported to have had Syph.
465	-	-	-	Ulcer of leg.
466	-	-	-	Adenitis of groin.
467	-	-	-	Primary Treated.
468	-	-	-	Secondary Treated.
469	-	-	-	Secondary Treated.
470	-	-	-	Secondary under treatment.
471	+	+	+	Tertiary. Had 4 courses of treatment.
472	+	++	+	Early Secondary Treated.
473	-	-	-	Primary under treatment.
474	+++	++	++	Congenital Syph with clinical signs.
475	++++	++++	+++	Tertiary with gumma of mouth.
476	-	-	-	Disseminated Sclerosos
477	-	-	-	Encephalitis Lethargica.
478	-	-	-	Meningitis.
479	-	-	-	Chronic Phthisis.
480	-	-	-	Secondary after 4 courses treatment +ve W. 10/10/20.
481	-	-	-	History of Syph 5 years ago. No clinical signs.
482	-	-	-	Had 1 miscarriage. No clinical evidence of Syph.

No.	Wassermann.	Sachs. 1-10.	Georgi. 1-20.	NOTES.
483	-	-	-	Secondary treated.
484	-	-	-	Secondary treated.
485	-	-	-	Marasmic child.
486	-	-	-	Acute Nephritis.
487	-	-	-	Fibroid of Uterus.
488	++	+	++	Congenital Syph untreated.
489	-	-	-	Secondary treated.
490	-	-	-	Secondary treated.
491	-	-	-	Secondary treated.
492	-	-	-	Secondary treated.
493	-	-	-	Secondary treated.
494	+++	+++	++	Tertiary Untreated.
495	-	-	-	Female with no clinical evidence of Syph. Husband has Syph.
496	-	-	-	Female with no clinical evidence of Syph. Husband has Syph.
497	-	-	-	Primary under treatment.
498	-	-	-	Early Secondary after 2 course 914.
499	-	-	-	Had Syph 2 years ago. Treated.
500	-	-	-	History of exposure to infection. No clinical signs.

CEREBRO SPINAL FLUIDS.

No	Wasserman	Sachs – Georgi			NOTES.
		1cc	.5cc	.25cc	
1	+	+++	+++	+++	Locomotor Ataxia. (Coull)
2	–	–	–	–	Optic Atropy. (Wright)
3	–	–	–	–	Cerebral Tumour. (McRobbie)
4	–	–	–	–	Cerebral Tumour. (Gibb)
5	? + –	–	–	–	(Husband has Locomotor Ataxia. (Ransome)
6	–	–	–	–	Encephalitis Lethargica.
7	+	+++	+++	+++	Locomotor Ataxia.
8	–	–	–	–	Disseminated Sclerosis.
9	–	–	–	–	Paraplegia.
10	–	–	–	–	Optic Atropy & Nephritis.
11	–	–	–	–	G.P.I. Treated intrathecally over prolonged period.
12	+	++++	++++	++++	Gumma of brain.
13	–	–	–	–	Encephalitis Lethargica.
14	–	–	–	–	Mengism ? Syphc.
15	–	+++	+	–	Acute Phthisis.
16	+	++	+	–	G.P.I. Treated.
17	–	–	–	–	Cerebro Spinal Meningitis. (Convalescent)
18	–	–	–	–	Disseminated Sclerosis.
19	–	–	–	–	Diffuse Cerebritis following Puer-perium.
20	–	–	–	–	Acute Cerebro Spinal Meningitis.
21	–	–	–	–	Locomotor Ataxia. Thoroughly treated both intraneubely & intrathecally.
22	–	–	–	–	Case of primary Chancre. Treated.
23	–	–	–	–	Encephalitis Lethargia.

CEREBRO SPINAL FLUIDS.

No	Wasserman	Sachs 1cc	- .5cc	Georgi .25cc	NOTES.
24	-	-	-	-	Severe headache with high blood pressure.
25	-	-	-	-	Normal fluid.
26	-	-	-	-	Cerebro Spinal Meningitis.
27	+	+++	+++	+	Cerebral Tumour.
28	-	-	-	-	Optic Atropy.
29	-	-	-	-	Meningism.
30	-	-	-	-	Tubercular Meningitis.

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Discrepancies between the Wassermann and Sachs-Georgi tests in 500 cases.

No.	W.	S-G.	NOTES.
32	+	-	History of L. Ataxia. Treated 606 & Hg.
34	-	+	Repeated abortions. No clinical signs of syph-ilis.
54	-	+	Suspected aneurysm of the aorta. Wass. and S-G. repeated twice.
I33	-	+	2ndary. Syph. Had 2 courses 9I4 & Hg.
I52	+	-	Syph. 7 years ago. Treated. Husband has Syph
I53	+	-	Children of I53. Both are congenital syphics
I54	+	-	
I62	-	+	Syph. in Septr. I9I9. Treated. Wass.+ve. I2-I2-I9.
I67	-	+	Syph. in Septr. I9I7. Treated. Wass.+ve. I2-I2-I8.
I84	-	+	Primary. Treated. Wass.+ve. 7-I-20.
I95	-	+	Gonorrhoea several years ago. A.R. pupil.
283	+	-	Primary. Spirochaetes -ve.
287	-	+	Primary I90I. Tertiary signs present.
298	-	+	Syph. I year ago. Treated. Wass.+ve. II-II-20.
355	-	+	Secondary. Primary 2 months ago. Untreated.
366	+	-	Secondary. Had I course of treatment.
372	-	+	Secondary. Treated. Wass.+ve. II-II-20.
389	-	+	History of possible infection. (syphilitic.)
39I	+	-	Haemoptysis. ? Tubercular. No clinical evidence of syph.
398	+	-	Repeated abortions. No clinical evidence of syphilis.
433	-	+	445Primary. Untreated.
445	-	+	Primary. Untreated.
447	-	+	Secondary. Untreated.
452	-	+	Secondary. Treated.

The results of the comparison between the Wassermann and the Sachs-Georgi reactions show very close parallelism: thus, out of 500 cases examined, discrepancies were noted in 24 which is equi-valent to 4.8%. An absolute correspondence was observed in 476 ~~cas~~ cases which is equivalent to 95.2%.

SERA.

Wass.-ve. and Sachs-Georgi -ve.	WaSS.+ve and Sachs-Georgi +ve.	Wass.+ve and Sachs-Georgi -ve.	Wass.-ve and Sachs-Georgi +ve.
367	I09	8	I6

CEREBROSPINAL FLUIDS.

23	5	I	I

Of the discrepancies in those showing positive Wassermann and negative Sachs-Georgi six were from cases of undoubted syphilis one was a doubtful syphilitic, and one was not syphilitic.
Of those giving -ve. Wassermann and +ve. Sachs-Georgi, I3 were undoubtedly syphilitic and 3 were doubtful syphilitics.
Of the 8 cases giving +ve. Wassermann and -ve. Sachs-Georgi, four (Sera Nos. I52, I53, I54, and 43I.) were from 4 members of the same family. The mother was reported as having had syphilis several years ago and had, then, been vigorously treated. The husband has syphilis at present and is undergoing treatment. The 3 children (Nos. I53, I54, and 43I.) are all congenital syphilitics. In regard to serum 43I a zone phenomemon was distinctly noted. In the case of the other 3 it was impossible

/to

to procure fresh serum in order to test again in higher dilutions. It is possible that had higher dilutions been made in testing these particular sera they would have shown positive results, but it is also possible that in this family group of sera something of the nature of a protective colloid was present which interfered with precipitation.

It would appear unlikely that there was any essential difference between the nature of the two reactions. Tanaguchi states that," It is clear that the Sachs-Georgi reaction shows with certain sera a result intermediate between positive and negative, just as occurs with the Wassermann reaction.(I3). As regards the relative advantages of the two tests from the practical standpoint, the Sachs-Georgi reaction suffers from the greater difficulty of distinguishing between negative and suspicious or weakly positive reactions, since slight differences in the state of flocculation of the suspension cannot be sharply distinguished. On the other hand there is the advantage that the variable factor of the complement containing serum is eliminated."

Although the Wassermann and Sachs-Georgi reactions are probably dependant upon the same general physical conditions certain differences between the two reactions have been noted. Georgi(I3) Munster(I4) and Neukirch(I5) have found that heated sera give more intense precipitates than unheated sera, whereas it is well known that in regard to the Wassermann, fresh sera deviate more strongly than do the same sera after heating. These results suggest the existence in fresh sera of a thermolabile substance which interferes with the formation of

precipitate

precipitate in the Sachs-Georgi test. Neukirch has found that fresh guinea pig's serum posesses the property of diminishing the amount of precipitate which is formed. Tanaguchi has corroborated this and demonstrated that complement has a lytic effect on the precipitate. It is possible that the deviation or absorption of complement in the Wassermann reaction is due to the using up of complement in this way.

I found on centrifuging the precipitate in the case of a definate positive and taking the supernatant fluid and boiling, that there appeared to be some diminution in the amount of coagulable protein, as compared with a definate negative when treated in the same way, suggesting that the precipitate in the Sachs-Georgi test had removed part of the protein from the serum-lipoid mixture. I considered that it would be interesting to try to find out whether the globulin was absorbed from the serum dilution by the precipitate in the Sachs-Georgi reaction. With this end in view I performed the following tests with rather conflicting results. Several positive sera giving a marked precipitate with Sachs-Georgi were diluted I in I5, with a I in I8 alcoholic salt solution. The positive Sachs-Georgi tests with these sera were centrifuged to remove the precipitate and the clear supernatant fluids were treated with an equal bulk of saturated ammonium sulphate, in order to precipitate the globulin. The control sera, in alcoholic salt solution were similarly treated, the same bulk of fluid being used as the bulk of supernatant fluid from the Sachs-Georgi test of the same serum. The amount of globulin in each was then estimated by noting the degree of turbidity.

No.	Sachs-Georgi	Control.
I.	Distinct turbidity	Trace turbidity.
2.	" " .	" " .
3.	Trace " .	Distinct " .
4.	Distinct " .	Trace " .
5.	Trace " .	Distinct " .
6.	" " .	" " .
7.	" " .	" " .
8.	" " .	" " .
9.	" " .	" " .
IO.	" " .	" " .
II.	" " .	" " .
I2.	" " .	" " .
I3.	" " .	" " .
I4.	Distinct " .	Distinct " .

A series of tests was set up to compare the efficiency of a freshly prepared emulsion with one prepared eight days previously. The freshly prepared emulsion gave definate and distinct results with the known sera whilst the older emulsion gave several of the weak positive sera as negative. In the case of the strong positive sera the reaction was not so well marked, and the clearing of the fluid was less distinct.

	Fresh antigen		8 days old antigem.	
	0.1cc.	0.05cc.	0.1cc.	0.05cc.
Strong positive serum.	++++	+++	++	—
Weak positive serum.	++	+	—	—
Negative serum.	—	—	—	—

In dealing with the cerebrospinal fluids, as will be seen from the table, I used three dilutions namely Icc., 0.5cc., and 0.25cc. in 0.5cc. emulsion, saline being added when necessary in order to keep the total volume constant at I.5cc. The table which contains the results of the examlnations of the cerebrospinal fluids is self explanatory. With reference to cerebrospinal fluid number I5; this fluid was removed from the spinal canal after death. There was no clinical evidence of syphilis. It was not possible to procure a sample of blood for examination. The Sachs-Georgi test was repeated several times on this fluid and each time was positive. It has been stated by Blumenthal(I6) that the Sachs-Georgi reaction is frequently positive in sera from cases of pulmonary tuberculosis and this spinal fluid would appear to support this view. The case was one of a youth of I9 who was admitted to the phthisical ward of Aberdeen City Hospital a fortnight before he died, suffering from acute phthisis involving both lungs. The Wassermann reaction with this fluid was negative. With reference to cerebrospinal fluid number 5: this was taken from a case which showed no clinical evidence of syphilis but the patient's husband had had syphilis many years ago and was now suffering from locomotor ataxia. The Wassermann in this case was very weakly positive, but the Sachs-Georgi was repeatedly negative. These are the only discrepancies in my very short series and neither can be regarded as serious. Neukirch(I7) examined 45 cerebrospinal fluids. Out of I5 cases of clinical syphilis 8 were positive to both tests, 4 were positive to the Wassermann and negative to Sachs-

/Georgi

Georgi, and 3 were negative to both. He concludes that the Wassermann is the more delicate test for spinal fluids, but he gives no details of the amounts of fluid which he used in performing the Sachs-Georgi tests. He admits that the series is too small upon which to pronounce full judgment.

CONCLUSIONS.

In a series of 500 sera and 30 cerebrospinal fluids upon which the Sachs-Georgi test was performed, correspondence with the Wassermann was found in 95.2% of the serum tests, and in 93.4 % of the spinal fluids. The great majority of the sera employed in this investigation were from cases of syphilis which had been submitted to active and prolonged anti-syphilitic treatment. Weak and doubtful Wassermann reactions were therefor frequently encountered, and the correspondence of the Sachs-Georgi with the Wassermann in this high percentage of cases is noteworthy and speaks highly for the utility of the test as a diagnostic measure in syphilis. Of the discrepancies the Sachs-Georgi was more frequently positive with negative Wassermann, than was the reverse. Of the former group the majority were undoubted cases of syphilis which had at remote or distant dates given positive Wassermann reactions. Among the latter group giving positive Wassermann and negative Sachs-Georgi an interesting family group was met with. The conclusion has been formed that the Sachs-Georgi reaction, carefully carried out, particular attention being paid to the preparation of the

/emulsion

emulsion, is a reliable test for the diagnosis of syphilis. The simplicity of the reaction as compared with the complexity of the Wassermann is greatly in favour of the Sachs-Georgi test, and makes it possible for an intelligent practitioner with some laboratory experience to recognise syphilis whilst waiting for the result of the standard test, namely the Wassermann.

In many respects the test bears a resemblance to the colloidal gold test of spinal fluid, of which I had the opportunity of seeing a considerable number in the laboratory. Both are precipitation tests, probably dependant on the action of the globulin upon the colloidal state of the reagents. According to Munster(I4) acids increase the precipitating effect of syphilitic sera in the Sachs-Georgi, whereas alkalies decrease it, an effect which is also obtained with the colloidal gold test.

The importance of making a sufficiently turbid emulsion might be again emphasised, as it is possible to get emulsions of differing turbidity with the same reagents. My best results were obtained with the more turbid mixtures whilst the less turbid ones gave difficulty in reading. Instead of good visible flocculation the flocculi were scanty and tended to coalesce to form stringy clots which were easily broken up by shaking. With good emulsions the results were clean cut with the majority of strongly positive sera, and the only difficulty was was in reading the finer degrees of flocculation.

The simplicity of the reaction, the fact that the reagents are always available so that no delay occurs in puting up the test, which also takes little time as compared with the

/Wassermann

Wassermann, should all commend the Sachs-Georgi reaction to those interested in the serological diagnosis of syphilis.

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