

Schwarz, who noticed in several cases of nerve relapses, with improvement under treatment, complete euphoria, although examination of the spinal fluid showed that a high cell count and positive Wassermann reaction in the spinal fluid were still present. Hoffmann³⁰ has been able to produce a primary lesion in a monkey by inoculation of the spinal fluid of a case of early secondary syphilis, absolutely free from nervous symptoms. The beneficial result of continued intense salvarsan therapy, which has been noticed by all observers, is well illustrated in Cases 3, 5 and 6.

Syphilitic secondary meningitis, therefore, may occur early in the disease. It may be latent, causing no obtrusive symptoms, over long periods. It is a more frequent complication than we have commonly considered. The so-called nerve recurrences after salvarsan are examples of such a meningitis. In most cases the infection of the nervous system has probably already occurred before the institution of treatment. They represent the development of the disease in a region notoriously difficult to reach with curative agents. The contention that salvarsan predisposes in any way to the development of disease of the nervous system has not yet been established.

FOUR YEARS' EXPERIENCE WITH THE WASSERMANN REACTION IN PRACTICE

A FURTHER REPORT ON CASES TREATED FROM THE STAND-
POINT OF THE WASSERMANN REACTION WITH MER-
CURY ALONE, WITH SALVARISAN ALONE AND BY
THE COMBINED METHOD (SALVARISAN AND
MERCURY). INCLUDING A PRELIMI-
NARY REPORT ON THE NOGUCHI
LUEFEN SKIN REACTION *

B. C. CORBUS, M.D.
CHICAGO

Previous to the year 1907, there was no method of determining when a patient was cured of syphilis. Biologic treatment begun at this time was only experimental, yet it offered a tangible guide in the treatment of this class of cases.

Before the advent of the Wassermann reaction, when a patient placed himself under treatment, he asked, "How long shall I have to be treated before I am considered cured?" He was told that if he was treated for one and one-half years after all clinical symptoms had disappeared, he could consider himself cured and free to marry.

We all know that with the method then in vogue, i. e., that of chronic intermittent treatment, this was a mistake, except in a relatively few cases. Every one of us who has had any experience at all, and especially those of us who have had a large experience with the Wassermann reaction in clinical practice, know how many cases still showed a positive reaction with or without symptoms. A conservative estimate would be one in four cases that showed a negative reaction without parasymphilitic or nervous manifestations, or in other words, a biologic cure.

Attention has been called to the specificity of the reaction by syphilographers and serologists in all civilized countries in their endeavor to confirm the findings

of Wassermann, Neisser and Bruck. Since its introduction there has been no biologic test that has been so universally applied, and likewise so universally abused, as the Wassermann, especially when the laboratory worker failed to confirm the clinician's diagnosis, and as a consequence it has gradually come into disrepute in some quarters. This is more manifest since we know that the reaction is lipoidal in nature, and not a true antibody test, more especially since the advent of salvarsan, as a positive reaction may change to a negative and reverse in a relatively short time.

The organ extract that was at first advocated was prepared by macerating the liver from a case of congenital syphilis in salt solution, and it was considered that in this way an extract containing the specific receptors of the *Spirocheta pallida* (antigens) was obtained. This combined with the corresponding antibodies in the syphilitic's serum and caused fixation of complement.

Later it was discovered by Porges,¹ Meier,¹ Landsteiner,² Mueller,² Poetzl,² Levaditi,³ Yamanouchi³ and Noguchi⁴ that alcoholic extracts of normal as well as syphilitic tissues had the property of deviating complement in the presence of syphilitic serum.

Consequently it appeared that the reaction did not correspond in a biologic sense to that between an antigen and antibody, but was entirely lipotropic. This has recently been most conclusively proved by Noguchi in his cultivation of the *Spirocheta pallida*. He showed that syphilitic serums giving the positive Wassermann reaction by means of lipoidal antigens did not bind complement with the same affinity when the lipoids were replaced by an extract or emulsion of *Spirocheta pallida*, and that it was not possible to intensify the ordinary Wassermann reaction in syphilitic serums by adding to the extract an emulsion of the *Spirocheta pallida*, except in some cases following severe treatment, especially after salvarsan, where we certainly assume a large number of antibodies to be present in a patient's serum.

The question arises then of what specific value as an aid in the diagnosis and treatment of syphilis is this test, especially since it is so vacillating as to be present sometimes in narcosis, scarlet fever, pneumonia, leprosy, tumors, tuberculous cachexia, Hodgkin's disease, myeloid leukemia, frambesia, recurrent fever and occasionally in lead-poisoning, and in certain other protozoal diseases. One can readily see it permits the conclusion that either it is not a specific phenomenon, or that a specific process may be simulated by other phenomena.

W. H. Manwaring⁵ says that "the prevailing explanation that the Wassermann reaction depends on a complement fixation by specific antibodies has only the value of a working theory," and he maintains that:

1. It is possible to produce similar phenomena in which the presence of such antibodies is excluded, as Noguchi has done.
2. The hypothesis that this phenomenon depends on a destruction of complement by proteolytic enzymes may be supported by an equally good explanation.

From the latter the evident specificity of the reaction gains in value and points to the existence of factors in the territory of immunochemistry which have hitherto not been considered. Bauer and Hirsch⁶ show the

30. Hoffmann: Dermat. Ztschr., 1906, xiii, 501.

* Read in the Symposium on Syphilis in the Section on Genito-Urinary Diseases of the American Medical Association, at the Sixty-Third Annual Session, held at Atlantic City, June, 1912.

1. Porges and Meier: Berl. klin. Wehnschr., 1908, p. 731.
2. Landsteiner, Mueller and Poetzl: Berl. klin. Wehnschr., 1908, p. 86.
3. Yamanouchi: Compt. rend. Soc. de biol., Paris, 1907, lxi, 187.
4. Noguchi: Jour. Exper. Med., 1909, xi, 84.
5. Manwaring: Ztschr. f. Immun. Forsch. u. exper. Therap., 1909, iii, No. 4.
6. Bauer and Hirsch: Wien. klin. Wehnschr., 1912, No. 4, p. 153.

TABLE SHOWING RESULTS OF WASSERMANN REACTION IN

No. of Case, Age & Sex.	Diagnosis	Duration	Previous Treatment	Wassermann Before Salvarsan	Salvarsan			4th, 5th, 6th. Date, Gm., Method
					1 Date, Gm., Method	2 Date, Gm., Method	3 Date, Gm., Method	
1—34, M.	Chancre rectum.	4 wks.	None.	2/ 1 /11, +	2/1/11, 0.6, intravenous.	2/6/11, 0.6, intramuscular.	5/20/11, 0.6, intravenous.	.....
2—28, M.	Chancre tonsil w. secondaries.	6 wks.	None.	11/ 5 /10, +	11/7/10, 0.5, intramuscular.	1/23/11, 0.5 intramuscular.	.....	.....
3—20, M.	Chancre penis.	5 da.	None.	4/28/11, —	4/29/11, 0.6, intravenous.	5/4/11, 0.6, intramuscular.	7/1/11, 0.6, intravenous.	7/24/11, 0.6, intravenous.
4—18, M.	Chancre penis.	3 wks.	None.	11/28/10, —	11/28/10, 0.5, intramuscular.	12/11/11, 0.5, intramuscular.	.....	.....
5—26, M.	Secondaries early.	8 mo.	Internal	10/26/10, +	11/28/10, 0.5, intramuscular.	12/1/10, 0.6, subscapular.	4/29/11, 0.6, intravenous.	4th, 6/12/11; 5th, 10/18/11; 6th, 1/23/12; ca. 0.6 intrav.
6—36, M.	Secondaries.	4 yrs.	Internal & rubbings.	12/ 1 /10, +	12/13/10, 0.6, intramuscular.	4/4/11, 0.6, intramuscular.	.....	.....
7—25, M.	Second., etc.	2 yrs.	Internal & rubbings.	11/23/10, +	11/24/10, 0.5, intramuscular.	1/2/11, 0.5, intramuscular.	1/12/12, 0.6, intravenous.	.....
8—40, M.	Secondaries.	4 yrs.	Internal & rubbings.	16/21/10, +	10/21/10, 0.5, intramuscular.	2/13/11, 0.5, intramuscular.	8/7/11, 0.6, intravenous.	4th, 12/8/11; 5th, 4/26/12; ca. 0.6 intrav.
9—28, M.	Secondaries.	5 yrs.	Internal & rubbings.	2/ 5 /11, +	2/7/11, 0.6, intramuscular.	4/25/11, 0.6, intravenous.	6/5/11, 0.6, intravenous.	8/19/11, 0.6, intramuscular.
10—32, M.	Secondaries early.	6 mo.	Internal & rubbings.	1/12/11, +	1/12/11, 0.6, intramuscular.	3/23/11, 0.6, intravenous.	8/11/11, 0.6, intravenous.	.....
11—35, M.	Secondaries.	2 yrs. & 6 mo.	Internal & rubbings.	11/15/10, +	11/17/10, 0.6, intramuscular.	1/12/11, 0.6, intramuscular.	12/1/11, 0.6, intravenous.	.....
12—30, M.	Secondaries.	6 wks.	None.	11/11/10, +	11/18/10, 0.5, intravenous.	11/21/10, 0.6, intramuscular.	8/11/11, 0.6, intravenous.	4th, 11/24/11; 5th, 3/1/12; ca. 0.6 intrav.
13—23, M.	Secondaries.	8 mo.	Internal	19/19/10, +	1/9/11, 0.6, intramuscular.	4/18/11, 0.6, intramuscular.	8/25/11, 0.6, intravenous.	11/14/11, 0.6, intravenous.
14—40, M.	Secondaries.	2 yrs.	Internal & rubbings.	11/ 3 /10, +	11/4/10, 0.5, intramuscular.	1/17/11, 0.6, intramuscular.	7/24/11, 0.6, intravenous.	.....
15—38, M.	Secondaries.	5 mo.	Internal & injections.	11/11/10, +	11/24/10, 0.5, intramuscular.	5/9/11, 0.6, intramuscular.	.....	.....
16—21, M.	Secondaries.	4 mo.	Internal	4/23/11, +	4/24/11, 0.5, intramuscular.	6/7/11, 0.6, intramuscular.	1/9/12, 0.6, intravenous.	4/26/12, 0.6, intravenous.
17—22, M.	Secondaries.	6 wks.	None.	9/ 9 /11, +	9/11/11, 0.6, intravenous.	10/39/11, 0.6, intravenous.	12/23/11, 0.6, intravenous.	3/4/12, 0.6, intravenous.
18—36, M.	.....	4 yrs.	Internal & rubbings.	11/26/11, +	1/18/11, 0.6, intramuscular.	3/18/11, 0.6, intravenous.	8/2/11, 0.6, intramuscular.	.....
19—32, M.	Secondaries.	3 mo.	Internal	10/17/11, +	10/23/11, 0.6, intramuscular.	12/8/11, 0.6, intramuscular.	1/26/12, 0.6, intravenous.	.....
20—31, M.	Secondaries.	6 yrs.	Internal rubbings & injections.	10/18/10, +	10/20/10, 0.5, intramuscular.	12/11/10, 0.6, intramuscular.	9/2/11, 0.6, intravenous.	3/9/12, 0.6, intravenous.
21—38, M.	Secondaries.	14 mo.	Internal	11/ 3 /10, +	11/11/10, 0.5, intramuscular.	1/17/11, 0.6, intramuscular.	.....	.....
22—45, M.	Secondaries.	9 mo.	Int., rubbings salv. subcut.	5/23/11, +	5/25/11, 0.6, intravenous.	6/29/11, 0.6, intravenous.	11/24/11, 0.6, intravenous.	.....
23—26, F.	Secondaries.	6 mo.	Internal	.....	5/18/11, 0.6, intramuscular.	8/4/11, 0.6, intravenous.	.....	.....
24—20, F.	Secondaries.	5 mo.	Internal & injections.	10/18/10, +	10/18/10, 0.5, intramuscular.	11/30/11, 0.5, intramuscular.	.....	.....
25—22, M.	Secondaries.	4 mo.	Internal	3/10/11, +	3/13/11, 0.5, intramuscular.	5/8/11, 0.6, intramuscular.	7/7/11, 0.6, intravenous.	.....
26—45, M.	Gumma.	No history.	None.	4/18/11, +	4/20/11, 0.6, intramuscular.	6/.. /11, 0.6, intravenous.	10/.. /11, 0.6, intravenous.	.....
27—32, M.	Latent.	6 yrs.	Internal.	3/10/11, +	3/18/11, 0.6, intramuscular.	6/12/11, 0.6, intramuscular.	11/17/11, 0.6, intravenous.	3/18/12, 0.6, intravenous.
28—30, F.	Latent.	4 yrs.	Internal.	12/15/11, +	2/11/11, 0.5, intramuscular.	6/12/11, 0.5, intravenous.	11/17/11, 0.5, intravenous.	3/18/12, 0.5, intravenous.
29—26, M.	Latent.	5 yrs.	Internal & rubbings.	5/25/11, +	5/25/11, 0.6, intramuscular.	7/28/11, 0.6, intravenous.	9/22/11, 0.6, intravenous.	4th, 1/22/12; 5th, 4/22/12; ca. 0.6 intrav.
30—48, M.	Latent.	12 yrs.	Internal & rubbings.	7/27/11, +	8/4/11, 0.6, intramuscular.	9/23/11, 0.6, intramuscular.	1/23/12, 0.3, intravenous.	1/27/12, 0.3, intravenous.
31—34, M.	Latent.	10 yrs.	Internal & rubbings; se- vere.	5/ 1 /11, +	5/19/11, 0.6, intramuscular.	9/22/11, 0.6, intravenous.	.....	.....
32—36, M.	Latent.	12 yrs.	Internal & rubbings; se- vere.	1/10/11, +	1/12/11, 0.6, intramuscular.	3/9/11, 0.6, intramuscular.	7/14/11, 0.6, intravenous.	4th, 9/15/11; 5th, 1/26/12; ca. 0.6 intrav.
33—38, M.	Latent.	8 yrs.	Internal & injections.*	6/22/11, +	6/29/11, 0.6, intramuscular.	8/25/11, 0.6, intravenous.	11/24/11, 0.6, intravenous.	4th, 3/20/12, 0.5; 5th, 5/4/ 12, 0.6, intrav.
34—36, M.	Latent.	12 yrs.	Internal & rubbings.	2/ 9 /11, +	2/13/11, 0.6, intramuscular.	5/4/11, 0.6, intramuscular.	1/15/12, 0.6, intravenous.	.....
35—25, M.	Latent.	4 yrs.	Internal & rubbings.	5/18/11, +	5/19/11, 0.6, intramuscular.	8/28/11, 0.6, intramuscular.	11/10/11, 0.6, intravenous.	4th, 2/24/12, 5th, 5/6/12, ca. 0.6 intrav.
36—28, M.	Latent.	4 yrs.	Internal & rubbings.	1/ 5 /11, +	1/5/11, 0.6, intramuscular.	3/5/11, 0.6, intramuscular.	10/21/11, 0.6, intravenous.	3/7/12, 0.4, intravenous.
37—32, M.	Latent.	1 yr.	Salv. intrav. yr. before; no other treat.	6/ 9 /11, +	6/21/11, 0.6, intramuscular.	8/15/11, 0.6, intramuscular.	10/27/11, 0.6, intravenous.	12/18/11, 0.6, intravenous.
38—28, M.	Latent.	4 yrs.	Internal & rubbings.	1/23/11, +	2/16/11, 0.6, intramuscular.	7/24/11, 0.6, intravenous.	11/3/11, 0.6, intravenous.	.....
39—27, M.	Latent.	6 yrs.	Internal & rubbings.	3/16/11, +	12/9/10, 0.6, intramuscular.	4/20/11, 0.6, intravenous.	.....	.....
40—32, M.	Latent.	4 yrs.	Vigorous rubbings.	11/13/10, +	11/17/10, 0.5, intramuscular.	1/12/11, 0.5, intramuscular.	10/30/11, 0.6, intravenous.	.....
41—30, F.	Latent.	4 yrs.	Rubbings & internal.	10/26/10, +	1/17/11, 0.6, intramuscular.	3/10/11, 0.6, intramuscular.	.....	.....
42—29, M.	Latent.	8 yrs.	Rubbings & internal.	2/20/11, +	2/23/11, 0.6, intramuscular.	9/15/11, 0.6, intravenous.	.....	.....
43—26, M.	Latent.	3 yrs.	Rubbings & salvarsan	1/23/11, +	5/28/11, 0.6, intravenous.	7/28/11, 0.6, intravenous.	10/22/11, 0.6, intravenous.	4/10/12, 0.6, intravenous.
44—28, M.	Latent.	7 yrs.	Rubbings & internal.	5/ 4 /11, +	5/4/11, 0.6, intramuscular.	6/19/11, 0.6, intravenous.	9/2/11, 0.6, intravenous.	12/22/11, 0.6, intravenous.
45—26, F.	Latent.	5 yrs.	Rubbings & internal.	5/18/11, +	5/18/11, 0.5, intramuscular.	7/3/11, 0.6, intramuscular.	10/20/11, 0.6, intravenous.	1/15/12 intravenous.
46—30, M.	Latent.	4 yrs.	Internal.	4/14/11, +	5/14/11, 0.6, intravenous.	5/20/11, 0.6, intramuscular.	11/11/11, 0.6, intravenous.	.....
47—42, M.	Inclipient tabes.	1 yr	Internal.	11/28/10, +	1/9/11, 0.6, intramuscular.	3/5/11, 0.6, intramuscular.	10/16/11, 0.6, intravenous.	1/13/12, 0.6, intravenous.
48—45, M.	Cerebrospinal syphilis.	2 yrs.	Internal.	2/ 5 /11, +	2/6/11, 0.6, intramuscular.	5/1/11, 0.6, intravenous.	.....	.....

FORTY-EIGHT CASES OF SYPHILIS TREATED WITH SALVARSAN

Wassermann After Salvarsan				Other Treatment	Last Wassermann	Present Condition
1	2	3	4th, 5th, 6th.			
2/14/11, —	5/9/11, —	8/2/11, —	10/31/11, —	Rubbings and internal treatment; vigorous.	4/23/12, —	No symptoms since primary sore.
11/28/10, +	1/23/11, —	5/9/11, —	.....	None.	3/13/12, —	No symptoms since primary sore.
6/10/11, —	10/31/11, —	2/20/12, —	.....	Rubbings for two months, continuous and vigorous.	4/29/12, —	No symptoms since primary sore.
1/23/11, —	5/1/11, —	8/1/11, —	.....	None.	3/20/12, —	No symptoms since primary sore.
10/22/10, +	1/23/11, +	3/10/11, +	4th, 5/1/11, +; 5th, 5/25/11, +; 6th, 6/30/11, —	Rubbings; vigorous.	1/9/12, —	No symptoms since primary sore.
1/11/11, +	8/1/11, —	12/8/11, —	.....	Rubbings; vigorous; enesol.	3/5/12, —	No symptoms since primary sore.
11/28/10, +	1/11/11, +	3/21/11, +	.....	None.	1/9/12, —	No symptoms since primary sore.
2/11/11, +	8/7/11, +	12/7/11, +	3/2/12, +	Rubbings and internal; vigorous.	4/29/12, —	No symptoms since primary sore.
7/7/11, +	.....	.....	.....	Rubbings and internal; vigorous.	3/15/12, +	Squamous lesion still present on hands.
3/2/11, —	8/9/11, —	.....	.....	Rubbings and internal; vigorous.	4/24/12, —	No symptoms.
1/11/11, +	3/18/11, +	9/27/11, —	.....	None.	11/28/11, —	No symptoms.
11/28/10, +	12/15/10, +	3/8/11, +	4th, 9/18/11, —; 5th, 11/28/11, —	Rubbings and internal.	3/2/12, —	No symptoms.
8/25/11, —	.....	.....	.....	Rubbings; vigorous.	2/12/12, —	No symptoms.
1/17/11, —	3/6/11, —	7/24/11, —	.....	None.	12/1/11, —	No symptoms.
.....	.....	.....	.....	.....	2/5/12, —	.....
9/8/11, —	.....	.....	.....	Rubbings and internal.	1/23/12, —	No symptoms.
10/30/11, +	12/24/11, —	.....	.....	Rubbings.	3/3/12, —	No symptoms.
8/22/11, —	.....	.....	.....	Rubbings.	1/16/12, —	No symptoms.
12/7/11, +	1/16/12, —	.....	.....	Rubbings.	4/19/12, —	No symptoms.
11/11/10, +	12/1/10, +	.....	.....	Rubbings and internal.	3/8/12, +	No symptoms.
4/6/11, +	8/10/11, —	.....	.....	.....	.....	Reports no recurrence.
11/24/11, —	.....	.....	.....	Rubbings; vigorous.	.....	Reports no recurrence.
8/2/11, +	9/22/11, —	.....	.....	Rubbings.	13/22/12, —	No symptoms.
11/11/10, +	12/1/10, +	.....	.....	None.	3/3/12, +	No symptoms.
7/7/11, +	.....	.....	.....	Rubbings; vigorous.	.....	No symptoms.
.....	.....	.....	.....	Hg injections; rubbings.	4/23/11, —	No symptoms.
11/17/11, —	.....	.....	.....	Rubbings; vigorous; internal.	3/19/12, —	No symptoms.
3/11/11, +	.....	.....	.....	Rubbings and internal.	3/19/12, —	No symptoms.
8/1/11, +	9/20/11, —	1/23/12, —	.....	Rubbings.	4/22/12, —	No symptoms.
9/22/11, +	12/13/11, +	1/23/12, —	.....	Rubbings; vigorous.	5/1/12, —	No symptoms.
9/22/11, —	.....	.....	.....	None.	4/19/12, —	No symptoms.
2/18/11, +	4/22/11, +	8/7/11, —	4th, 10/14/11, —; 5th, 12/7/11, —	Rubbings; vigorous.	1/26/12, —	No symptoms.
8/30/11, —	11/29/11, +	2/23/12, —	.....	Rubbings; vigorous.	3/1/12, —	No symptoms.
2/27/11, +	5/4/11, +	6/27/11, —	.....	Rubbings and internal.	1/15/12, —	No symptoms.
8/30/11, +	10/20/11, +	2/6/12, —	.....	Rubbings; vigorous.	5/4/12, —	No symptoms.
3/2/11, +	6/27/11, —	10/20/11, —	.....	Rubbings; vigorous.	3/8/12, —	No symptoms.
9/12/11, —	12/19/11, —	.....	.....	Rubbings; vigorous.	3/8/12, —	No symptoms.
5/1/11, +	8/25/11, —	.....	.....	Rubbings and internal.	11/7/11, —	No symptoms.
4/20/11, —	6/14/11, —	.....	.....	Rubbings.	12/1/11, —	No symptoms.
1/8/11, +	4/22/11, —	9/27/11, —	.....	None.	10/30/11, —	No symptoms.
3/24/11, +	1/30/12, —	.....	.....	None.	4/20/12, —	No symptoms.
9/12/11, +	9/22/11, +	1/30/12, —	.....	None.	4/15/12, —	No symptoms.
7/27/11, +	9/12/11, —	12/7/11, +	.....	Rubbings; vigorous.	4/25/12, —	No symptoms.
6/22/11, +	9/2/11, —	.....	.....	Rubbings; vigorous.	12/22/11, —	No symptoms.
7/7/11, +	10/21/11, —	.....	.....	Rubbings; vigorous.	1/16/12, —	No symptoms.
10/21/11, +	.....	.....	.....	Rubbings.	2/23/12, +	No symptoms.
2/23/11, +	7/7/11, +	10/16/11, —	.....	Rubbings; vigorous.	1/9/12, —	No symptoms.
4/28/11, +	7/7/11, +	11/14/11, +	.....	Internal and rubbings.	5/6/12, —	Gradual improvement of symptoms.

includes also a test for the specific allergic condition of the patients, as is done by the use of the luetin test.

Dr. B. C. CORBUS, Chicago: Benario of Frankfort was the first observer to refute some of the assertions of Finger. He showed that a large percentage of neurorecurrences were in patients in whom the infection had been around the region of the head (the cephalic chancres), and he advises us to give energetic treatment in this class of cases in which there are headaches or anything that would simulate a meningitis. By following out that energetic line of treatment Dr. Ellis has probably cured a great many cases of syphilitic meningitis. I have been asked why I prefer the mercury rubbings in syphilis to any other method of treatment. In a former service I gave about 5,000 injections of mercury, preferably the soluble salts. It was common to see a prompt clearing up of the symptoms clinically, but the patients came back in two or three weeks with recurrences, especially on the mucous surfaces. Fournier long ago showed the danger of giving insoluble salts, as these become incysted. Cases of fatal mercury poisoning are reported in which the patient has fallen on the buttocks, thereby suddenly setting free sufficient mercury to cause toxic effects. Kromayer some years ago tried to introduce a mask to be worn by the patient at night. He believed that in this way he could introduce sufficient mercury into the patient through inhalation to effect a cure. This was not a success. Finger and others have shown that nurses working in wards in which patients were rubbed with mercury became salivated. In other words, they received an inhalation treatment. Following that plan, I have resorted to the following method: I have my patients rub the mercury on the back and front of the chest. They rub every day for thirty minutes. Twice a week they take a warm bath and scrub the mercury off. The patient wears a thin light-mesh undershirt continually under his other shirt, removing it only at the time of his baths. In this way I believe he obtains both an inhalation and an absorption treatment.

THE VALUE OF THE FOUR REACTIONS IN THE DIAGNOSIS AND TREATMENT OF SYPHILITIC DISEASE OF THE NERVOUS SYSTEM *

C. R. BALL, M.D.
ST. PAUL

The four tests which I shall discuss are Nonne's Phase 1 or ammonium sulphate reaction for determining an increase of globulin in the spinal fluid, the method for determining whether or not the lymphocytes are increased, and the Wassermann tests in the blood and in the spinal fluid. A fear has been expressed that by a multiplication of reactions the practice of medicine will eventually be reduced to a rule of three. Much¹ says of the Wassermann reaction that it controls the clinic and, on the other hand, is controlled by the clinic. This is true of all other reactions. Their significance must be construed in accordance with the clinical facts.

Nervous syphilis presents a great variety of symptoms, none of which can be said to be characteristic of it more than of some other disease, as multiple sclerosis or brain tumor.

The four tests are valuable as aids to a correct diagnosis for this reason.

NONNE'S PHASE I AND LYMPHOCYTOSIS

Nonne's Phase 1 consists in bringing equal parts of a hot saturated solution of ammonium sulphate which has been allowed to cool and spinal fluid together in a test-

tube. If at the instant the two fluids come in contact or within a period of three minutes thereafter a cloudiness or opalescence appears in the tube, the reaction is recorded as positive; a cloudiness appearing after three minutes should be regarded as of no value whatever. The reaction may be read as slightly or strongly positive, depending both on its quickness of appearance and on the degree of opalescence.

The significance of Phase 1 when positive is regarded by Nonne as proof of an abnormal condition of the spinal fluid and consequently of the existence of an organic disease of the nervous system, which may or may not be of a specific character.

Phase 1 and lymphocytosis do not always occur together, and when they occur singly each has its own particular diagnostic value.

When occurring alone, Phase 1 simply speaks for an organic lesion of the nervous system. In all affections of the nervous system of specific origin this reaction is rarely absent. It may occur, however, in a large number of organic conditions which are non-specific in character.

In my own experience during the past year, in eight cases of general paresis Phase 1 was positive in all, as well as in five cases of cerebrospinal lues, three cases of tabes and two cases of tuberculous meningitis. In two cases of brain tumor of non-specific origin it was negative in one at the first puncture and positive in the next puncture after a further development of the disease; in the other case it was positive from the beginning.

In one case of multiple sclerosis, one case of old age apoplexy, and one case of tumor of the spinal cord, the reaction was likewise positive.

In nine cases of neurasthenia, eight cases of manic-depressive insanity, one case of dementia præcox and one case of pernicious anemia without cord symptoms, the reaction was negative.

In the eight cases of general paresis and two cases of tuberculous meningitis the positives were all strong. The strongest positive, however, was presented by the case of spinal tumor. In one of the cases of neurasthenia there was a history of a previous syphilitic infection dating back twenty years.

It will thus be seen that in all of the organic conditions of syphilitic origin Phase 1 was positive, and in the organic conditions of non-syphilitic origin there was only one negative, the brain tumor, which later became positive.

Lenhart says the normal number of lymphocytes in a cubic millimeter of spinal fluid is five or six, and that over nine is abnormal. Various methods have been utilized for the determination of the lymphocytes, but the one proposed by Fuchs and Rosenthal seems to be the most scientific. It consists in counting the lymphocytes in a special counting-chamber in the same manner as the white blood-corpuscles are counted.

Apfelt found lymphocytosis in 40 per cent. of his cases of syphilis in which the nervous system was unaffected, while Phase 1 was always negative. He regards Phase 1 as an important means of differential diagnosis in individuals with a specific history between beginning tabes and paresis on the one hand and cerebral neurasthenia on the other.

In all of my eight cases of general paralysis the increase in lymphocytes was marked, averaging fifteen or more to the cubic millimeter. In three of the five cases of cerebrospinal lues there was a lymphocytosis. In one case the number in 3 c.mm. was twenty-seven at one count and twenty-nine at another, so if one could

* Read in the Section on Nervous and Mental Diseases of the American Medical Association, at the Sixty-Third Annual Session, held at Atlantic City, June, 1912.

1. Much.: Die Immunitäts Wissenschaft.