from his post of ill-paid army surgeon at the age of twenty-three, to rise rapidly to the first rank in literature, long before he could have suffered from the monotony of medical life. Poets of a lesser rank on both sides of the water could undoubtedly be reckoned in large numbers by those more learned than myself.

Smollett, who for many years throre only moderately as a practitioner, held for a time the position of the first of English novelists.

Akenside, who is described in the Encyclopædia as an “acute and learned physician,” and who was made, for political reasons, physician to the queen, and his political works included in an edition of the British poets, had an unsympathetic character and a sarcastic style which prevented the success to which his learning and ability entitled him.

On this side of the water one has but to mention the names of Holmes and of Mitchell as worthy the highest honors in both professions. It is said that Mitchell asked Holmes’ advice,—being much the younger man,—as to adopting literature as a profession and was advised against it, which has been a great gain to neuropathology, certainly with no corresponding drawback on the other side of his work. The work of Mitchell has been of the best, but he will probably be remembered, even among the novel readers of his own profession, for his work on “Injuries to Nerves” and his “Fat and Blood and How to Make Them,” more than for his novels.

I do not think Holmes was ever more than a moderately successful practitioner, but soon became, outside of his specialty, almost exclusively a literary man, never, however, losing his interest in medical science. It was said that he himself claimed more credit for his work on the contagiousness of puerperal fever than for anything else he had done.

In the broad field of letters, where he so frequently and delightfully appeared as physician, essayist, social critic, and philosopher, where pseudo-science was ruthlessly punctured, medieval theology and medieval medicine good-naturedly satirized, and where too confident youthful enthusiasm was good-humoredly rebuked, he was inimitable. If he had a weakness on this field it was in his inability to resist the temptation to sacrifice scientific accuracy to an epigram. I was fortunate enough to hear that address to the Massachusetts Medical Society which deeply wounded some of his less progressive brethren, but which has been incorporated into so much of present-day practice; a recent re-reading only increases my respect for its sound sense and scientific accuracy as well as its rhetorical charm.

NOTES OF A CONFERENCE ON THE MEDICAL AND SOCIAL ASPECTS OF SYPHILIS OF THE NERVOUS SYSTEM.

HELD AT THE PSYCHOPATHIC HOSPITAL,

MAY 27, 1915.

V.

Mental Features of Congenital Syphilis.*

BY J. H. Baseley,

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AND

H. M. Anderson,

Social Worker, Psychopathic Hospital.

CONTENTS.

I. The Mental Phenomena in General Mental States as Related to Congenital Syphilis.

II. The Mental Phenomena in Sixty Congenital Syphilitic Children Compared with Sixty Non-Syphilitic Children.

III. The Mental Phenomena in Families with Congenital Syphilitic Children.

IV. Conclusions.

The purpose of this paper is to draw attention to the pathological mental phenomena in congenital syphilis. For a long time there has been a more or less generally recognized group of mental conditions that were ascribable to this factor in heredity, but of late years there has been a more specific recognition both of the disease and its immediate connections. Very many of these abnormal mental conditions are acquired early and before the brain has completed its development. Others are of a less tangible nature and have not been definitely associated with syphilis. If one considers the four main types of abnormal states; namely, psychoses, feeble-mindedness, delinquency, psychoneuroses, one can trace something more than the former indefinite associations. Many of these conditions come in middle life and are ascribable to some endogenous factor. The grounds on which feeble-mindedness is related to syphilis are many and have for a long time been recognized. Delinquency can be ascribed to syphilis only as the two

* Being S. B. I, Contribution whole number 124 (1915.20).

(Bibliographical Note.—The previous contribution by Donald Gregg, entitled “A Few Economic Facts of the Syphilis Problem from the Psychiatric Side.” Boston Medical and Surgical Journal, Vol. clxxii, No. 25, p. 921.)
are connected with some kind of emotional instability or some psychopathic inferiority. The percentage of delinquents who are actually feebleminded is probably around 15 or 20, but outside of this there must be a larger group of 30 or 40% which is connected somehow with constitutional psychopathic inferiority. At the most, it would be extravagant to say that more than 30% of the delinquents could be connected with congenital syphilis. In regard to the endogenous psychoses and the psychoneuroses, there is good ground for definite causal relation. Mott has pointed out that it is the tendency of such a psychosis as dementia praecox to die out of the race, as its earlier appearance in successive generations causes the stock to cease to propagate. But as this psychosis seems to be on the increase, there must be some extraneous factor producing it anew. This factor, he suggests, may be syphilis. Meggendorf comes to a similar conclusion after a somewhat protracted study. Freud states that in more than one-half of the severe cases of hysteria, compulsion neuroses, etc., which he had treated by psychotherapy, he positively succeeded in demonstrating that the fathers had gone through an attack of syphilis. He expressly adds that the children who before marriage; they had either suffered from syphilis. In regard to the endogenous psychoses and the psychoneuroses, there is good ground for definite causal relation. Mott has pointed out that it is the tendency of such a psychosis as dementia praecox to die out of the race, as its earlier appearance in successive generations causes the stock to cease to propagate. But as this psychosis seems to be on the increase, there must be some extraneous factor producing it anew. This factor, he suggests, may be syphilis. Meggendorf comes to a similar conclusion after a somewhat protracted study. Freud states that in more than one-half of the severe cases of hysteria, compulsion neuroses, etc., which he had treated by psychotherapy, he positively succeeded in demonstrating that the fathers had gone through an attack of syphilis. He expressly adds that the children who before marriage; they had either suffered from syphilis. Thus the presence of the Hutchinson-fores is more definite and accurate, and has added much to our diagnostic ability. On the basis of these three methods of examination, viz: the laboratory tests, the physical stigmata, and the positive family history, it is possible to make the following division in cases of congenital syphilis:

Group 1.

a. Those with a positive spinal fluid which would include such types as juvenile general paresis, juvenile tabes dorsalis, epilepsy and cerebrospinal syphilis. 
b. Those with a negative spinal fluid including such types as optic atrophy (optic tabes), epilepsy and hydrocephalus.

Group 2.

a. Those in which the blood is positive and the physical stigmata are present. 
b. Those in which the blood is positive and the physical stigmata are absent. 
c. Those in which the blood is negative but the physical stigmata are present and the family history is positive.
d. Those in which the blood is negative and the physical stigmata are absent but the family history is positive.

One could not expect to find different types of mental conditions corresponding to this grouping, but this grouping is serviceable in indicating the degree of physical and mental disturbances and allows a more definite determination than we have hitherto used in the study of a group of this disease. Different cases might be cited to show the abnormal or deteriorated mental symptom in the individuals in these groups but the variations on the mental side are too numerous to parallel the laboratory and physical determinations.

In order to ascertain how the mentality of congenital syphilitics compared with non-syphilitics, some 440 hospital cases were gone over and it was found there were 60 under 15 years of age who could be put down as definite congenital syphilitics. Along with these, 60 non-syphilitic cases were taken for the sake of comparison. In every case the laboratory tests had been made, a male was matched with a male, a Russian with a Russian, and one of 10 years with another of 10 years, and in the whole series of 120 there were only three instances where it was impossible to match for age, sex and nationality. There were nearly a dozen instances in which a choice between two was possible, but in every such case the latest was taken, since in these the examinations are more thoroughgoing. The 60 congenital syphilitics
were found to group as follows, and it was purely a chance that they turned out to be 30 males and 30 females:

**GROUPING OF 60 CONGENITAL SYPHILITICS BASED ON LABORATORY FINDINGS**

<table>
<thead>
<tr>
<th>I. Fluid</th>
<th>M</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Positive</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>b. Negative with Phys. Stig.</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>II. Serum</th>
<th>M</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Positive</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>b. Positive with Phys. Stig.</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>c. Negative with Phys. Stig.</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>d. Negative with Family History</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

**ii.**

The comparative mentality of these 60 syphilis with 60 non-syphilis is shown in the following summarized statistics in regard to development, diagnoses, defects in sense organs, defects in mental processes, and delinquencies.

In regard to development, it seemed best to take the Binet age, since these cases go back nearly three years and in every case the Binet had been done, whereas the Point Scale had been applied only in the last year. The average age of the syphilis and non-syphilis was, of course, the same, namely, 10.3 years. The average Binet age of the syphilis was 6.2 and of the non-syphilis 7, so that the deficiency among the former was 4.1 years as compared with 3.3. Next, the school grades were considered and among the syphilis there were 36 cases of backwardness in school as compared with 24 cases in the non-syphilis.

The diagnoses were considered either feebleminded, which was taken to be a mentality below 12 years, or at least two years below the actual age, along with indications of feeblemindedness on family, social, economic and moral lines; or retarded, which meant not sufficient to be called feeble-minded yet behind the actual age, and of these cases some eventually became feeble-minded; or defective, which meant neither of the above but a subject having some special defects in the larger mental processes which came to the front in the examination; or normal; or supernormal. The results of the 120 individuals differentiated on these grounds are as follows:

<table>
<thead>
<tr>
<th>Defects</th>
<th>Syphilis</th>
<th>Non-Syphilis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feebleminded</td>
<td>29</td>
<td>25</td>
</tr>
<tr>
<td>Retarded</td>
<td>19</td>
<td>12</td>
</tr>
<tr>
<td>Defective</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Normal</td>
<td>6</td>
<td>14</td>
</tr>
<tr>
<td>Supernormal</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

| 60 | 60 |

Next, the defects in the sense-organs of vision and hearing and the development of speech were considered, since any handicap in these manifests itself in the mental development. In regard to speech there were nine syphilis compared with none in the non-syphilis. The fact of this disproportion and the preponderance of speech defects over vision and hearing give some support to a point recently put forth by Dr. Walter B. Swift in the Pediatric Society meeting for April, to the effect that there was a distinctive voice sign in congenital syphilis. This he characterized as having a certain roughness and harshness, and a certain inability to go from a low to a high pitch, and return. He emphasized the characteristics and this examination shows the frequency of defects in speech in congenital syphilis. A tabular view of the defects found in the 120 children is as follows:

The Three Types | Syphilis | Non-Syphilis |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Speech</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>Vision</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Hearing</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Plural Defects in One Individual

| None | 43 | 55 |
| One Only | 11 | 3 |
| Two | 2 | 2 |

From this table one might say that in the congenital syphilitic individuals there are more apt to be plural defects.

For the sake of comparing the defects in the mental processes these were divided into the four groups: receptivity, imagination, affectivity and thought. Receptivity was taken to include perception, elementary association, range of observation and discrimination. Imagination was taken to cover memory proper, analytical ability, learning ability, planning ability and imagination. Affectivity was taken to cover suggestibility, volition, concentrated attention and emotional instability. Thought was taken to cover reasoning, judgment, comprehension and apperception. These results are represented below:

<table>
<thead>
<tr>
<th>Defects in Mental Processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Four Types</td>
</tr>
<tr>
<td>Receptivity</td>
</tr>
<tr>
<td>Imagination</td>
</tr>
<tr>
<td>Affectivity</td>
</tr>
<tr>
<td>Thought</td>
</tr>
</tbody>
</table>

Plural Defects in One Individual

| None | 12 | 12 |
| One Only | 15 | 21 |
| Two | 18 | 14 |
| Three | 9 | 10 |
| Four | 5 | 2 |
| Five | 1 | 1 |

| 60 | 60 |

The results indicate that in the mental processes as in the special organs just considered, in the syphilis there are more apt to be plural defects in one individual.

The delinquencies were treated under three groups, individual, property and society. Individual delinquencies were considered to be those of truancy, stubbornness, incorrigibility,
lying and sex. The property delinquencies were considered to be larceny, destruction, setting fires and breaking and entering. The society delinquencies were considered to be disorderly conduct, contentiousness, fighting, carrying concealed weapons, assault with intent to do bodily harm and minor offences. The results of this treatment are represented in the following table:

**DELIQUENCIES.**

<table>
<thead>
<tr>
<th>The Three Types</th>
<th>Syphilitics</th>
<th>Non-Syphilitics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Property</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Society</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Plural Delinquencies in One Individual</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>24</td>
<td>32</td>
</tr>
<tr>
<td>One Only</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Two</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Three</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Four</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Five</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>60</strong></td>
<td><strong>60</strong></td>
</tr>
</tbody>
</table>

The same inference is apparent in the delinquencies as in the other defects, namely that the syphilitics are more apt to manifest plural delinquencies in one individual than are non-syphilitics.

If one looked over these results to note the instances where the syphilitics were inferior, equal or superior from the mental and social point of view to the non-syphilitics, one would find that there are twenty instances of inferiority, six instances of equality and six instances where the syphilitics are more favored. In summarizing, one could rightly say that in the 120 individuals under 15 years, all of them presenting acute social problems and all standing on the same ground except for this one factor of congenital syphilis, those that come in such a group present the greater social problems.

iii.

In many cases it is possible to outline a definite family pathography in regard to congenital syphilis. The picture before and after the syphilitic invasion is generally a contrast between normal mental development and under-development with early deterioration. For the sake of emphasizing this before and after picture of the mental development four families are taken from among the records of children looked up in Section iii.

In the first family the father and mother represented normal development and intelligence to all appearances. The first child is a living male of 16 who is exceptionally bright. The second is a living female of 9, who is exceptionally bright. The third is a living female of 7, reported by her school teacher as being exceptionally bright. The fourth child is a living female of 6, who came after the infection. Her mental age is that of a 3-year-old child and in the past two years she has grown progressively worse. The neighbors say she has changed in "character, disposition and mind," and her school teacher says she is as different from what she was as "dark is from light." The fifth child was a female that died at 9 months. The sixth child is a living male of 3 with characteristic physical ailments and slight retardation in mental development. The seventh child is a living female of 11-2 years, and the eighth child is a living male of 3 months. These latter two appear normal as yet.

In the second family the father and mother are normal physically and of average intelligence. The first child is a female of 12, who measured on the Binet 12, and on the Point Scale 15. She is reported from school as exceptionally bright. Then there came the infection, and this was followed by one miscarriage. The third child is a female of 11, who is feebleminded, measuring on the Binet 81-5, and on the Point Scale 8.3. This birth was followed by another miscarriage.

In the third family the father suffers from alcoholic deterioration and tuberculosis, and the mother is apparently normal. The infection in this case was followed by a female now living at 10 years of age, who is mentally two years retarded and suffers from cerebrospinal syphilis. The second child is a living female of 7, who is one year retarded in mental development. The third is a female of 5 years, one year retarded and suffering from congenital syphilis. The fourth child is a living female of 3 years, apparently normal as yet.

In the fourth family the father is 62 and suffers from gonorrhea. The mother is 46 and has not been well since marriage. The infection was followed by a male child who died at 11 months of diphtheria. The second child was a male who died at 18 months of pneumonia and scarlet fever. The third child was a male who died at 22 years of tuberculosis. Throughout his life he suffered from convulsions. The fourth child was a male who died at 20 of pneumonia. The fifth child is a male living at 18 with juvenile general paresis and mental deterioration. The sixth child, a female, is living at 16 with cerebrospinal syphilis and mental deterioration. The seventh was a still-birth at 8 months. The eighth was a female child who died at 14 months with spinal meningitis and convulsions. This child was followed by a miscarriage at 3 months.

iv.

The results of this study can be set forth as follows:

1. There is increasing authority for considering the endogenous psychoses and the psycho-neuroses to be the last offshoots of luetic heredity.
2. The laboratory findings afford the best
classifications of congenital syphilis and there are six possible groups on this serological basis.

3. Of children under 15 years constituting social problems, the congenital syphilics constitute the more serious problems. Among them there are more cases of backwardness in school, there is more feeble-mindedness and retardation, there are more defects in the mental processes (with the one exception of affectivity), there are more delinquencies, there are more defects in vision, hearing, and speech. And if we consider the single individuals with one or more defects, then in the syphilics there are more individuals with plural defects in the mental processes, there are more individuals with plural delinquencies, and there are more individuals with plural defects in the two main sense-organs and in speech.

4. In families where the syphilitic infection makes its appearance the before and after picture in the mental development of the children is clearly delineated. In two families the earlier children were exceptionally bright in school. Then there came the syphilitic invasion and the following children are feeble-minded in early youth and show a rapid deterioration of mentality. In another family the infection was followed by two children who are victims of cerebrospinal syphilis and two children who appear normal as yet, but three of the four children are retarded in mental development, two at least two years, and one one year. In another family of nine children the infection was followed by miscarriages, still-births, and early deaths until today but two of the nine children are left, and one of these is a victim of general paresis with mental deterioration and the other a victim of cerebrospinal syphilis with deterioration.

We are indebted to Dr. H. C. Solomon for the determination of the syphilitic and non-syphilitic individuals and families.

VI.

Diagnostic Value of Lange's Gold Sol Test.
(Based on 500 Examinations of the Spinal Fluid.)

By Harry C. Solomon, M.D., Boston,
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Hilmar O. Kopef, B.S., Boston,
Interne, Psychopathic Hospital,
and
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Interne, Psychopathic Hospital.

Three years have elapsed since Lange published his original communication on the colloidal gold test for cerebrospinal fluid. At this time he made a number of suggestions as to its diagnostic value. Several workers following him have confirmed many of his findings. This communication is a survey of the results obtained at the Psychopathic Hospital with this test during a little more than a year in the examination of the cerebrospinal fluids from 500 patients, a number of whom have had several punctures. One hundred and thirty-five of these fluids were reported in the Boston Medical and Surgical Journal, December 10, 1914.

We will not discuss the technic of the test as this will be found ably described in several of the articles, the references to which are appended. It may be well, however, to call attention to some difficulties and precautions. At times it is with the utmost difficulty that a satisfactory solution is obtained. One prepares the agents as usual and yet the resulting solution is not as it should be. No reason is found for this, and after numerous tests in which no change in technic is made, a perfect solution is obtained. One must be careful in the selection of a solution, as certain solutions which look right will not give satisfactory results; that is, a solution may be too sensitive or not sensitive enough. Thus, an over-sensitive fluid will give strong reactions with fluids from apparently negative cases, and a too stable fluid will not give sufficiently strong reactions. In order to be certain of one's results, it is necessary to run controls with every new solution, using at least one known negative and one known strongly positive fluid; if this is not done one cannot feel confident of the results obtained.

Stated briefly the following diagnostic results have been claimed for the gold sol test:

1. General paresis gives a typical reaction, the so-called "paretic" reaction.
2. Syphilitic cases give a reaction in low dilutions ranging from 1/10-1/320, called the "syphilitic zone."
3. Tuberculosis meningitis and brain tumor with inflammatory products in the fluid give strong reactions outside the "syphilitic zone," that is, in the higher dilutions.
4. Purulent meningitis gives a reaction differing from syphilitic meningitis.
5. The test will often give the only evidence of syphilitic involvement of the central nervous system in latent syphilis.
6. Fluids from normal patients or from patients having no inflammatory conditions of the central nervous system will give negative reactions.

The test is performed with ten dilutions of spinal fluid ranging from 1/10-1/5120 and the color change of the reagent varies from the
negative red through red-blue, blue-red, blue, lilac to colorless, depending on the amount of colloidal gold precipitated. These results may be plotted, using the dilutions for the abscissa and the color range for the ordinate. Or more simply, one may indicate the results by numbers, calling the negative red 0, the red-blue 1, the blue-red 2, the blue 3, the lilac 4, and the colorless 5, placing these on a horizontal, the ten divisions of which represent the ten dilutions.

Using this latter scheme, the "paretic reaction" would be represented as

\[
5 5 5 5 5 4 3 1 0 0
\]

That is to say, the reaction has gone to its full intensity in the tubes of lowest dilution, running through a number of dilutions and then disappearing. This reaction may run through a lesser or greater number of tubes, but in order to be accepted as "paretic" it must begin with its full intensity in the first tube of the series.

The "syphilitic zone" includes the first five to six dilutions, that is the dilutions of 1/10 to 1/160 or 1/320. In tuberculous meningitis and brain tumors, etc., the reaction then should be something as follows:

\[
\begin{align*}
1 2 4 & 4 2 1 0 0 0 0, \\
3 3 3 & 2 1 0 0 0 0 0, \\
0 0 0 0 0 1 & 3 3 1 0, \\
0 0 1 2 & 3 4 3 2 0
\end{align*}
\]

It may show other types of reaction, the essential points being that the reaction occurs in the lower dilution but does not run to its maximum possible intensity in the first one or two tubes.

Tuberculous meningitis and brain tumors give a reaction in which the height of the curve is outside the "syphilitic zone."

\[
0 0 0 0 0 1 3 3 1 0, \\
0 0 1 2 3 4 3 2 0
\]

An entirely negative reaction causes no color change throughout.

\[
0 0 0 0 0 0 0 0 0 0
\]

The reaction is due to the presence of abnormal albuminous material, or possibly the presence of an excessive amount of the normal. The test is based on the empirical fact that the colloidal gold may be used for qualitative albumen determinations, depending on differing reactions, according to dilutions. The normal quantity and quality of cerebrospinal fluid albumen gives no reaction with the solution as used. The presence of a color change or positive reaction indicates a change in the albumen content. So in any case in which there is a variation from the normal content may be expected to give a reaction, and this reaction will depend rather on the quality of the albumen than on its quantity. Thus in the case of a purulent meningitis with enormous quantities of albumen, the reaction was but very slight and only in the higher dilutions, while in another case giving but a small excess of albumen but in a case of general paresis, the reaction was a typical paretic one. It is to be assumed then that various disease conditions cause the formation of different kinds of albumens, that is, there is a different albumen in the fluid in tuberculous meningitis than in general paresis. If this is the basis of the test there is nothing a priori against several different diseases causing the same reaction.

It is our purpose to analyze the results of the tests of the 500 patients in the light of the above-mentioned contentions and to offer such criticisms and conclusions as seem warranted from the series. In a test of such an empirical nature this group is quite small, but as it is larger than any other we have been able to discover in the literature it may have some value. In each case here reported the diagnosis is that made after considering the various clinical symptoms and laboratory tests. In practically every instance, in addition to the gold sol test there is a blood serum Wassermann reaction, spinal fluid Wassermann reaction, cell count, Nonne-Apel test, globulin test, and Mestrezat albumin test.

ANALYSIS OF RESULTS IN 500 CASES.

Group I. Clinical diagnosis. Syphilitic involvement of central nervous system, including general paresis, cerebrospinal syphilis, tabes dorsalis, juvenile cerebrospinal syphilitic disease, Erb's spinal paralysis, "paresis sine paresi."

1. General paresis ................. 118 cases
   \(\text{(a)}\) Typical "paretic curve" 114 "
   \(\text{(b)}\) Atypical curve ...... 4 "

In three of the four atypical curves the curve was a very close approximation of the "paretic," being of that type, 4443332211. In one it differed markedly, 2223310000, resembling the "cerebrospinal syphilitic" curve.

In addition it is to be noted that slight changes have been found in the form of the curve in several cases punctured at intervals. This is quite frequent in cases receiving intravenous injections of salvarsan or intradural therapy, but also occurs in others.

Percentage giving typical reaction ........ 96.6% 
Percentage giving almost typical reaction ... 2.63% 
Percentage giving atypical reaction .......... 0.87% 

2. Cerebrospinal syphilis ............ 11 cases
   \(\text{(a)}\) "Syphilitic zone-non-paretic" 8-9 "
   \(\text{(b)}\) "Paretic curve" ............ 1-2 "
   \(\text{(c)}\) Negative reaction ............ 1 "

One case which gave "syphilitic zone-non-paretic curve" on first examination gave the typical "paretic curve" on a second examination 4 months later. The "paretic curve" case gave this reaction on 4 successive fluids over a period of 3 weeks, but after several weeks' treatment with mercury presented an essentially negative fluid to the other tests and the following gold sol reaction: 0011100000. The case giving the negative gold sol reaction had other spinal fluid tests negative, but a positive blood serum Wassermann,—headache, ptosis, strabismus, diplopia.
of Adolf Meyer\textsuperscript{17} that the gold sol test is the basis of our conception of general paresis. Bearing this warning in mind, we find that of the 114 cases diagnosed as general paresis all but one, or 99.17\%, give the "paretic reaction," so it seems safe to believe that in the vast majority of instances the cases which do not give this reaction will not prove to be paresis. But, unfortunately, the converse does not seem to be true, for cases other than paresis may give the typical "paretic reaction." Thus of the 11 cases diagnosed cerebrospinal syphilis there are two which give this reaction. On one the diagnosis was confirmed by the fluid tests becoming negative under treatment by injections of mercury salicylate, the other showing at one time the lighter reaction and later the full "paretic reaction." Eleven cases are too few to give percentages that have any value, but it is of some interest to note that one case which showed positive Wassermann reaction in serum and fluid, a pleocytosis of slightly more than 100, an excess of albumin and globulin and a gold reaction of 111000000 came to autopsy three days later and was shown to be a typical cerebrospinal syphilis. (This case should be kept in mind as it is referred to below in discussing the "light reactions.")

Our series contains only 5 cases of tabes dorsalis. One of these again gave the paretic reaction, a finding that has been observed by others. It must be remembered that it is possible that this case may be developing tabo-paresis.

There are six cases of congenital syphilis, giving evidences in the fluid of inflammatory involvement of the central nervous system. Four of these give the "paretic reaction," two do not, but give a lighter reaction. Five of the six cases merit the diagnosis of juvenile paresis, while in the sixth, which did not give the paretic reaction, there might be some question whether the parenchymatous cerebral structures were affected. At any rate one case diagnosed juvenile paresis did not give the paretic reaction.

There are seven cases showing no other evidence of syphilis and having negative Wassermann reactions in both spinal fluid and blood serum, but which give the "paretic reaction." These seven cases are our minds are conclusive evidence that this reaction does not necessarily mean general paresis nor even syphilis. It may be noted that each of these seven was a case in which organic changes in the central nervous system were undoubtedly in progress, and six of them showed marked excess of albumin and globulin in the fluid.

From these 149 cases we feel justified in offering as a tentative conclusion that general paresis cases will in the vast majority of instances, especially if more than one sample of fluid is tested, give the "paretic curve," but that this curve may be given by the fluids from cases of syphilitic involvement of the central nervous system other than general paresis and also by fluids from non-syphilitic cases, so that the "paretic curve" by itself is not sufficient evidence of paresis or even of syphilis. If, however, a fluid giving a positive Wassermann reaction does not give a "paretic curve" or one closely approximating it, it is strong presumptive evidence that the case is not one of general paresis. Thus the reaction has considerable value at times in the differentiation of certain cases of cerebrospinal syphilis and tabes dorsalis from general paresis.

The next point to be considered is the meaning of reactions in the "syphilitic zone," that is, reactions taking place in the first five or six tubes, or in the dilutions of 1/10 to 1/200. As has been seen, it is in these dilutions that the fluids from cases of cerebrospinal syphilis and tabes react, and it is outside of this zone in the higher dilutions that the fluids from purulent meningitis, tuberculous meningitis, brain tumor, etc., characteristically react, hence the assumption has been made that fluids reacting in the lower dilutions spelled syphilis in the subject. And as a certain percentage of the cases from which this reaction was obtained showed a positive Wassermann reaction in the blood, it was stated that this gold sol reaction in the "syphilitic zone" might indicate a syphilitic involvement of the central nervous system, and might be the only evidence of it. Thus the reaction of fluids from the Mongolian idiots in this zone has been offered as evidence that the condition is a result of syphilis.\textsuperscript{99}

Reference to Groups III and IV discloses about 40\% of the cases having negative spinal fluid Wassermann tests showing reaction in this zone, and the percentage is as high in the cases whose blood serum reacted negatively as in those where it was positive. It is true that the reaction is not very strong in the majority, that is, most of the reactions only ran as high as "1." Due to the finding that so many fluids, which to the usual tests are negative, give this gold sol reaction, it has been held by some that this high reaction should not be considered. Thus Flesch\textsuperscript{12} found 50\% of his supposedly normal fluids giving some reaction, so that he was prone to consider that these reactions should not be considered positive unless the reaction was "3." But as about 60\% of the fluids which were expected to give entirely negative reactions did give such a negative reaction, it seems that the color changes, even though not very marked, do mean positive reactions. In support of this idea we find that in a fair percentage of these cases there is a very slight globulin test, or a small increase of albumin or both. In a few the sugar content of the fluid varied considerably from the average. These findings seem to bespeak a not entirely negative spinal fluid. But more to the point in considering these light reactions is that many of the known inflammatory conditions give just this type. Thus the autopsied
case of cerebrospinal syphilis, mentioned above, although showing marked products of inflammation in the fluid, gave a lightest possible reaction. Tabes and cerebrospinal syphilis frequently give these light reactions, but finding other tests positive in these cases we do not hesitate to call this reaction positive. Also cases of purulent meningitis and tuberculous meningitis likewise may give the weak changes. So we believe that these small changes do have a significance, but that we do not know what it means. But it is further found that a small percentage of the negative cases give a fairly strong reaction in this zone. We therefore conclude that there is no justification for making a diagnosis of syphilis on account of a gold sol reaction in the lower dilutions unless supported by other tests. The term syphilitic zone we consider a misnomer.

Our cases of brain tumor (10) and tuberculous meningitis (5) are too few to give any important percentages. These two conditions, according to the literature, give reactions in higher dilutions than the syphilitic cases, although at times it is stated, the reaction may occur in the lower dilutions. Our results, as may be seen from the charts, bear this out fairly well, so that it may be stated that the fluids from cases of brain tumor or tuberculous meningitis will usually give reactions in higher dilutions than the syphilitic cases and thus a test offers a helpful point in differentiation.

For the remainder of the conditions examined, no conclusions of diagnostic value seem justified.

CONCLUSIONS.

1. Fluids from cases of general paresis will give a strong and fairly characteristic reaction, especially if more than one sample is tested, in the vast majority of cases.

2. Very rarely general paresis fluid will give a reaction weaker than the characteristic one.

3. Fluids from cases of syphilitic involvement of the central nervous system other than general paresis often give a weaker reaction than the paretic, but in a fairly high percentage of cases give the same reaction as the paretics.

4. Non-syphilitic cases may give the same reaction as the paretics; these cases are usually chronic inflammatory conditions of the central nervous system.

5. When a syphilitic fluid does not give the strong "paretic reaction" it is good presumptive evidence that the case is not general paresis, and this test offers a very valuable differential diagnostic aid between general paresis, tabes and cerebrospinal syphilis.

6. The term "syphilitic zone" is a misnomer, as non-syphilitic as well as syphilitic cases give reactions in this zone, but no fluid of a case with syphilitic central nervous system disease has given a reaction out of this zone, so that negatively it may be used, and any fluid giving a reaction outside of this zone may be considered non-syphilitic.

7. Light reactions may occur without any evident significance, while a reaction of no greater strength may mean marked inflammatory reaction.

8. Tuberculous meningitis, brain tumor and purulent meningitis fluids characteristically, though not invariably, give reactions in higher dilutions than syphilitic fluids.

9. The un-supplemented gold sol test is insufficient evidence on which to make any diagnosis, but used in conjunction with the Wassermann reaction, chemical and cytological examinations, it offers much information aiding toward the differential diagnosis of general paresis, cerebrospinal syphilis, tabes dorsalis, brain tumor, tuberculous meningitis, purulent meningitis.

10. We believe that no cerebrospinal fluid examination is complete for clinical purposes without the gold sol test.

REFERENCES.


(Series to be continued.)