Is the Serum-Diagnosis of Pregnancy possible by Abderhalden's Method?

A Thesis for M.D.

By

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M.D. 1915
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Is the serum-diagnosis of pregnancy possible by Abderholden's methods?

Introduction.

A very extensive literature now exists dealing with the question at the head of this paper and with the general question of defensive ferment in the blood-serum.

Abderholden was led to investigate for the presence of defensive ferments in the serum of pregnant women by observations of Schmoll and Veit (Abderholden p. 91) on the presence of chorionic villi in maternal blood. Abderholden had for a long time been successfully demonstrating the presence in blood-serum of ferments that attack and break down foreign substances introduced parenterally into the body, whether (an albuminious, carbohydrate or fatty nature.

The observations of Schmoll and Veit led Abderholden to test the serum of pregnant women for ferments that would break down placenta. In this he was successful in a very large number of cases.

* All references are under author's name at the end of the paper. Page references refer to Abderholden's book.
His provisional theory of the origin of the ferments is that they are derived from the leucocytes (Abderhalden p. 80) and perhaps from the red cells and platelets. Metabolism in the placenta being too rapid to allow time for complete reduction of the product of the placental cells, this ammunous substance, circulates in blood and stimulates the leucocytes to produce antagonistic ferments.

Having heard a little about Abderhalden's work, I determined to investigate for myself its application to the diagnosis of pregnancy — in the hope both of establishing the specificity of the ferments in one particular case and of demonstrating a useful aid in the diagnosis of pregnancy.

I wish to acknowledge here my debt of gratitude to the London Hospital authorities and to Dr. Parson for permission to carry on the work in the Hale Clinical Laboratory at the Hospital, and to Dr. Gamovskiy, who has worked under Professor Abderhalden at Halle and who most generously instructed me in the technique and guided me through the investigation.
After examining 44 sera (22 pregnant and 22 non-pregnant) I was somewhat disappointed to find the results in the pregnant cases imperfect and in the non-pregnant cases very doubtful in more than 75% cases. I then read a large number of the papers on the subject and found my own results confirmed in many of them and more especially in those that would bear critical scrutiny. My conclusions are therefore almost entirely negative.

It is scarcely necessary to say that throughout this paper all results given are the result of tests with plasma as the substrate.
The Technique.

There are two methods used by Abderhalden:

1) **Dialysis**, which by a chemical test with the dialysate observes the activity of the blood-ferments in splitting tissue-albumins into peptones, poly-peptides, etc. The dialysing tube let through the latter group of substances, but not the albuminines.

2) **Optical**, which by a change in the spectroscope reading observes the effect of the blood-ferments on peptones prepared from the tissue-albumin.
Dialysis

The essential steps may be tabulated as follows

A. Preparation of Serum

1. With a wide short needle, attach to a short (3 in., ½ in.) piece of rubber tubing, stab direct into a vein (preferred by the subject in a pneumatic arm-band alone) at the antecubital fossa, and allow 20 or 30 c.c. of blood to run direct into a sterile centrifuge tube.
2. Let blood stand for two hours, or until clotting is well formed. (This takes 2-3 hours.)
3. Centrifuge at moderate speed for 15 minutes.

Pipe off serum.
Centrifuge at high speed for 5 minutes.
Serve off serum, leaving one-half a c.c. at the bottom containing the few remaining corpuscles.

B. Preparation of Organ

1. Remove blood clot from the fresh placenta. Remove cord, membranes and large vessels.
2. Cut up into small cubes.
3. Keep washing in running water. With the aid of fingers rub each small piece off the smaller blood vessels and reject the latter.
4. Pound in a mortar and wash freely in a fine sieve, until white (This takes 2-3 hours).
The Techniques

3. the weight of the organ.
Test 5 cc. of this liquid (filtered) with 1 cc.
of ninhydrin (1% solution) for 1 min. by boiling
If a violet color is
obtained, repeat the
boiling several times
with increasing lots of
water until there is
no color change with
ninhydrin.
Store the organ in distilled
water, covered with toluene.

C. Performance of an Experiment
1. Take half a gram of the organ with
acetate precautions from the stock bottle
and test it as in B.3 alone, till negative.
2. Take a dialysing tube (No. 5-79A Schleicher
+ Schüll 1 liter) from previously killed
stiff with sterile gauze and place it in an
empty Erlenmeyer flask, a rubber
which is here given.

Egg albumin is used to test impermeability to
albumin. The dialysate is tested with the biuret
test. All tubes giving positive result are thrown away.
Silk filters are then used to filter out the amino acids.

* Egg albumin is used to test impermeability to
albumin. The dialysate is tested with the biuret
test. All tubes giving positive result are thrown away.
Silk filters are then used to filter out the amino acids.
Dry the organ on filter paper and put it in the dialysing tube.
3. Take 10 c.c. or 1.5 c.c. of serum and place it in the same dialysing tube.
4. Sanitise the hands to remove sweat, epidermic scales and bacteria. Lift out the tube with forceps protected with muslin tubing (sterile) and wash the upper half of the tube inside and then the lower half of the tube outside, first with tap water and then with distilled water.
5. Place the washed tube in another Erlenmeyer flask containing 20 c.c. of distilled water. Cover the serum and the water with toulol.
6. Cover the whole with a sterile watch-glass and place in an incubator at 37°C for about 16 hours.
7. Throw away the contents of the dialysing tube; wash it in running tap water for 30 minutes; allow it to stand in distilled water for 10 minutes, then place it in boiling distilled water for 5 seconds. Repeat 3 times.
8. Take 10 c.c. of the dialysate with a pipette (a different one for each Erlenmeyer flask) and put it in a test-tube. Add 0.2 c.c. of ninhydrin solution and boil with a dry sterile boiling-stick for 1 minute precisely.

A violet coloration within 30 minutes is counted a positive result, if a control experiment with serum only shows no violet or a less intense violet color than the first tube. It is well to have a second control consisting of organ with serum heated for 30 minutes at 60°C to inactivate the ferment; this of course should give a negative result.
The Technique.

The Optical Method.

Preparation of Serum. As before.

Preparation of Peptone.

A lengthy process of hydrolysis of the albumin by means of sulfuric acid, and subsequent neutralization by means of barium carbonate is performed. This is fully described in Abrahamson's book. The dry substance obtained is dissolved in 0.9% sodium chloride solution and in that degree of concentration which gives a polarization rotation of about 0.75°.

The solution is stored in a sterile bottle and covered with toluol.

Performance of an experiment.

The polariscopic tubes hold 2.0 cc. of liquid. Equal parts of serum and peptone solutions (about 1.0 cc. each) are mixed in a sterile tube, and then poured into the polariscopic tube. This is dried in an incubator at 37°C and then quickly transferred to the incubator attached to the polariscopic tube. This holds 6 tubes on a plate capable of rotation so that each tube can be successively brought into the line of vision.
The incubator is heated by electricity to 37°C.

The reading is taken at once and again in about an hour — when little if any change should have taken place — and again after about 16 to 24 hours.

The limit of error in reading is about 0.02°C (in practice the error difference between successive readings is rarely over 0.01°C); hence any change of over 0.04° is regarded as a positive result. Positive results generally show a change of 0.05° to 0.08°.
The Technique

Source of Error

1. Contamination of the dialyzing tube with the hand or non-stem tissue etc.
2. Presence of blood in the organ or its cell constituents in the serum. Abdenheiden (p. 127) lays great stress upon this, but Leitch (Brit. med. Journ. 1914, ii. 333) gives good reason for believing its importance to be much over-estimated by Abdenheiden.
3. Presence of non-hydrin-reacting substance in the serum due to blood being taken from a non-fasting patient.

But this could affect the control equally. Leitch (bid) gives 17 cases where blood was taken less than 4 hours after food and tested against cancer tissues. Of these, 3 were cancer cases; 2 reacted positively, 1 negatively; 14 were non-cancerous. 1 was +, 13 were –; i.e. only one could be put down to the atom cause and that one is statistically speaking cancelled by the negative cancer cases.

4. Incomplete breaking up of the organ in its preparation, followed by more breaking up just before filling into the dialyzing tube.
5. Tap-water getting into the dialysing tube during washing.
6. Soiling of pipette with salivum.
7. Improper washing of dialysing tube, leaving minute portion of the tube organ in the tube shown to tubers, and hence bacterial decomposition. Or, insufficient督导, allowing projection of tissues along it - with the same result.
8. Bacterial infection or haemolytic jejus serum.

II. Errors giving a false negative result.
1. Putting organ into dialysing tube in wet state: consequent dilution of serum turning a weak protein into a negative result.
2. Distilled water getting into dialysing tube in washing.
3. Use of distilled water with an acid or alkaline reaction - gas by destructive of the blood ferments.
The Technique

III. Errors that may act either way.
1. Use of dialyzing tubes that allows diffusion at unequal rates.
2. Unequal boiling of the test-tubes in the final operation.

Remarks on the causes of error.
The above 14 are by no means all the possible causes of error, but 10 of them (I. 1, 4, 5, 6, 7, 8, II. 1, 2, 3, III. 3) may be overcome by anyone with adequate training and due care in carrying out the work.

Two (I. 2, 3) are only avoided with very great difficulty, but reasons are given above (or referred to) which lead one to believe that they are not so important as Alderholtz and some authors believe.

The other two (III. 1, 2) are very difficult to avoid and III. 1, especially may prove on further investigation to be inseparable.

My reasons for this statement are these — no doubt all careful workers follow Alderholtz's direction and test their dialysing tubes from time to time with some protein and group together those which dialysate
show equal coloration was noted with
methylin: — but, suppose it should turn
out that a second test with salt in the
following immediately on the first gives
a different result (unusual coloration when
before it was equal), and a third test
a different result again. Some of the
experiments of Leitch (loc. cit.) suggest
this possibility and I have heard from
an unpublished source that this
variability has been found to occur.

If this should be confirmed we should
be bound to conclude at least that the
methylin test was not a suitable
one for this class of work and therefore
another test must be found, and at
least that the dialysing tubes were too
variable in permeability to give any
practical value to the method.

With regard to III 2 (unusual colour) a
difference of 15 seconds (at 20°C) is said to
be enough to cause a distinct difference
in the colour. If this is so, which
personally I rather doubt, it is in my
opinion a fatal objection to the method as
carried out by Aderholden. Curiously, he
seems to object to the obvious way out of
The Technique

the difficulty, the use of a water-bath into
which all the tubes are simultaneously
plunged by a simple piece of apparatus
and from which they are all removed
together. Even then there is the objection
that the inevitable slight differences in
the thickness of the glass of the test-tubes
will cause slightly different rates of heating
of their contents up to boiling point owing
to the poor conductivity of glass, enough
to make a difference if the reaction is
as uncertain as some believe.

It will be noticed that no sources
of error in the optical method are
given. The reason is that almost all
errors in technique lead to obscuration
in the serum and hence no results
at all.

Very few authors use the optical
method, but it is worth while to call
attention to the results of those few: out of
364 cases reported by Freund & Deakin,
MacBriain, Schaffer and Jamnisky, 70
gave false results (about 19%).
Cases investigated by myself.

I examined 44 cases, 22 pregnant and 22 non-pregnant. I used in every case, where sufficient serum was obtained, both the dialysing and optical methods. These are represented respectively by D and P.

The results were as follows:-

Pregnant sera. Of 16 cases, 11 were D + P +, 4 were D +, 1 was P +

Purpuric sera. Of 6 cases (2 on the 1st day of purpura, 1 on the 2nd day, 2 on the 10th day and 1 on the 17th day*), 1 was D +, 1 was D +, P +, 1 was D + P +, 1 was D + P -, 2 were D - P -.

Non-pregnant sera. (See Appendix)

Of 16 septic cases, 1 was D - P -, 1 was D -, 3 were D - P +, 3 were D + P -, 2 were D + P T, 5 were D + P +, 1 was D +.

Of 5 non-septic cases, 2 were D - P -,
1 was D + P -, 1 was D + P +, 1 was P +.

One normal male was D - P +.

These results may be tabulated as follows:-

* Underholmer says (p. 95) that purpuric sera are purpuriic up to a period varying from the 14th to the 21st day. Others give 10-15 days.
**Table A. Results of 44 cases. Both methods.**

<table>
<thead>
<tr>
<th></th>
<th>Number of Cases</th>
<th>Correct</th>
<th>Incorrect</th>
<th>Doubtful</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Pregnan</td>
<td>16</td>
<td>16</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2 Puerperal</td>
<td>6</td>
<td>1</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Sum 1 &amp; 2</td>
<td>22</td>
<td>17</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>3 Septic</td>
<td>16</td>
<td>2</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>4 Non-septic</td>
<td>5</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>5 Normal</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Sum 3, 4 &amp; 5</td>
<td>22</td>
<td>4</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Totals</td>
<td>44</td>
<td>21</td>
<td>8</td>
<td>15</td>
</tr>
</tbody>
</table>

The "doubtful" column shows those cases where the two methods gave opposite results, except in one case where two diagnoses gave opposite results and the smear was positive.

In order to compare the accuracy of the two methods, the following table is added: it shows an approximately equal proportion of failure.

**Table B. Comparison of the two methods.**

<table>
<thead>
<tr>
<th>Method</th>
<th>Number of Cases</th>
<th>Correct</th>
<th>Incorrect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dialysate method</td>
<td>43</td>
<td>27</td>
<td>16</td>
</tr>
<tr>
<td>Polarization method</td>
<td>37</td>
<td>23</td>
<td>14</td>
</tr>
</tbody>
</table>
This shows approximately an equal percentage of failures (about 38%) in the two methods.

The number of times in which they disagreed is shown in Table A as the "doubtful" cases, viz.: 15 out of 44 or 34%.

If only the dialyser method had been used, the results would have been as in Table C. This enables comparison to be made with other workers' results, since most of them used only this method.

Table C: Results of 42 cases. Dialyser method only.

<table>
<thead>
<tr>
<th></th>
<th>Number of cases</th>
<th>Correct</th>
<th>Incorrect</th>
<th>Doubtful</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pregnant</td>
<td>15</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>Non-pregnant</td>
<td>6</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Sum of 1 and 2</td>
<td>21</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Saphe</td>
<td>16</td>
<td>11</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>Non-saphe</td>
<td>4</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Sum of 3, 4, 5</td>
<td>24</td>
<td>14</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>Normal</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Sum of 1, 2, 5</td>
<td>42</td>
<td>15</td>
<td>1</td>
</tr>
</tbody>
</table>

* This figure would very likely have been increased if two more dialyses had been used in all cases, instead of one only.
The Literature

1. Gross Results.

I have abstracted figures and notes from a large number of papers, many of which are for one reason or another of little or no value. But in order not to bias judgement in favour of any own results I just list the mass of figures as they were obtained without any criticism. They are the sum of the results of 33 papers taken as they came with rejection of new except in one or two instances where the author's first results were bad from faulty technique.

Of 3351 cases, 2268 were pregnant: further
1083 were non-pregnant.

Of the 2268 pregnant 2156 gave a positive result,
112 gave a negative result (4.9%).

Of the 1083 non-pregnant
792 gave a negative result
291 gave a positive result (27%).

This even in the uncertain state of the test I have in the case of pregnant sera about
5% of errors, and in the non-pregnant sera the failure are 20 numbers (27%) as to
The literature

lead to grave doubts about the present value of the method.

2. Results of 13 selected papers (p. 27)

It will be seen by a glance at Table 5 that the results of these papers are worse than the mass results. They have not been chosen with this in view, but because the authors give enough detail to allow a judgement of their value to be made.

The following details give an indication of the reasons which led to their selection. It will be noted that special attention has been paid to the kind of cases included in the non-pregnant series. Quite normal sera may be expected to give contain few or no defensive ferment.

Others, especially expectant maligant, contain ferments which, if not specific, may react with placenta. Possibly some of the apparently excellent results obtained on some occasions are due to the use of only quite normal sera as controls.

Veit describes his 5 cases fully: 4 were ovarian and 1 was tubal pregnancy. Schimper and Henderson examined two series of cases, the first of 287 cases (results -
one failure out of 157 pregnant cases and 41 failures out of 80 non-pregnant cases.

They state that the reason for their failure in the first series was that they found it impossible to wash placenta absolutely free from blood with their so-called Freiburg water, but succeeded in their second series through using half saline water or 0.9% saline solution.

They also give a list of their non-pregnant cases in the second series, 9 out of 39 being acute (Abstrakti), gonorrhoea 22 in the subject of non-pregnant disease. 18 were quite normal.

Freund and Braun's non-pregnant cases were not normal, though only few in number. They had 1 failure at 9/13.

They used both methods, and the results of the two corresponded very well numerically. Wenner and Winiczanka worked for a year at the method. They examined 4 swine, 2 cases of 110, 100, 40 and 22 respectively. The first series is rejected, as they found the technique to be faulty. The results in the swine best.
Of the non-pregnant cases, a large number were not normal.

Of the first serin of 22 only 4 were included in my figures: in this serin they were not content with one dialysing the sera for serum with placentae and serum only, but used serum for each. Thus in 22 cases, e.g., they used 6 tubes each. Of the serum with placentae tests, 4 were positive, 2 negative; of the serum only tests, 8 were positive, 3 negative. Similar unsatisfactory results were found all through these 22 cases.

Lederer spent 10 days with Pregnon Abraham, learning his technique, after previous failures, and states emphatically that he followed all the detailed directions of Abraham.

He gives an account of his non-pregnant cases 7 were normal. Results, all negative.

14 had cancerous Jaundice, 10 +, 4 -.

31 gynaecological diseases.

Mostly inflammatory, 11 +, 20 -.

Of 14 cases of which extra-uterine pregnancy was in question at the time, only 4 were afterwards proved to be pregnant, but 10 gave a positive result.
Williamson gives the diagnosis of his 8 non-pregnant cases. All were abnormal. The 2 cases were cases of inflammatory disease.

Aschner gives the diagnosis of his 59 non-pregnant cases.

Of 14 carcinomas 7 were 6 were D+ [Of these 6, 3 were P-]

Of 23 adrenal disease 6 were +
Of 4 interitis 3 were +
Of 5 chlamactini 1 was +
Of 4 myomatous 6 chorionic, all were negative.

Schauf gives some indication of what his non-pregnant cases were.

Of 23 tumours, 9 were + 2 dialysati
deform.
Of 36 normal, 2 - + 5

His results with the optical method were better, but he does not give so many particulars of the cases: there were 2 failures out of 65.

Behne examined 130 cases in two series of 70 and 60 respectively. He states that the technique was imperfect in the second series, but the results being slightly worse than before the first series, is included in any table.
Dear Sir,

I have just been informed by a reliable source that there is a small but significant number of cases in our area where the symptoms observed in the initial cases are not present in the subsequent cases. This suggests a possible change in the pathogen responsible for the outbreak.

I have attached copies of the relevant lab reports and medical records for your review. The figures indicate a decrease in the number of cases per week, which is a positive trend.

I am in contact with the local health authorities and will continue to provide updates as necessary.

Yours sincerely,

[Signature]

P.S. We have received reports of improved treatment protocols that may be effective in preventing further spread.

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[Appendix]

1. Lab Report 1
2. Medical Record 1
3. Surveillance Data

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[Notes]

- The current case count is 38, down from 50 in the previous week.
- The vaccination rate is 70%, with an uptake of 85% in high-risk areas.
- The contact tracing team has identified over 1,000 potential contacts.
The Literature

Syphilis; 2 had diabetes, 2 were normal.
Of seriu 57, 17 the 17 negative had melania, 1 had gonorrheal arthritis; 15 were non-repuls. 7 the 2 positive both were
normal, one male and one female.
Of seriu 6, 2 of the 45 negative were repuls,
7 of the 4 positive, 1 was repuls, the other
3 normal females.

The cases from the second paper are not
included in table D because details are not
given, but two things are interesting:
1) the authors after long experience with
acromegaly care still have 8% failure
with 73 non-pregnant cases. (2) the
control which were the sera were
inactivated by heat were all negative.

Baron examined 11 carcinoma cases with placenta;
7 were negative; 4 positive.

Garmonsey's results are those obtained
after a long preliminary period during
which all results were rejected.
It gives details of every case. He used
both methods in every case when
enough serum was obtained. Cases where
the results of the two methods or of two
The Literature

different ferments differ as excluded from my table—there were 9 pregnant and 10 non-pregnant under this head.

His non-pregnant cases are a very miscellaneous group taken at random from general hospital wards and from a mental asylum. A few examples of his results may be given: of 8 cases of malignant disease, 6 were +, 2—; of 6 cases of insanity, 3 were —, 1 + (4.2%);

The fractures and two sprains were positive:

Of 3 cases of various skin disease, 1 was +, 2—;

Of 3 normal cases, 1 was +, 2—.

His results are particularly instructive because in many cases he used more than one substrate. This gives most various results from which it is difficult to deduce any law except that the ferments are not specific.

I may add that Lister worked for a time at Ball's with Abbe, himself.

Leitch worked at the method for 18 months and rejected the results obtained during the first 9 months. (Incidentally, his results were more favourable to the method in the
first three in the second nine months.
He used the dialyser method only.
He gives particulars of every case — diagnosis, amount of serum used, degree of reaction obtained in tests and controls.
He made some very interesting test experiments, and was then and some able theoretic criticisms to support negative conclusions.

<table>
<thead>
<tr>
<th>Cases</th>
<th>Pregnant</th>
<th>Non-pregnant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Result+</td>
<td>Result-</td>
</tr>
<tr>
<td>820</td>
<td>735</td>
<td>85</td>
</tr>
</tbody>
</table>

Table D shows that many painstaking observers who give a sufficient account of their work to enable an impartial reader to judge of its value obtain results that give even in pregnancy 10% of failures and in non-pregnant cases such a high percentage (38.2) as to not a positive result of all practical value.
Septic and Malignant Cases.

As bearing on the theoretical explanation of the poor results shown in Table D it may be of interest to select from these 13 papers those cases that are either infected with bacteria ("septic") or the subjects of malignant disease, i.e. those whose serum contains defensive ferment, if some sort of something on Allmanden's theory, and then to see what percentage of positive results we find in these cases with albumen.

<table>
<thead>
<tr>
<th>Observer</th>
<th>Septic Cases</th>
<th>Malignant Cases</th>
<th>Total Cases</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schlinkert</td>
<td>5</td>
<td>0</td>
<td>9</td>
<td>These 31 were &quot;healthy inflammatory.&quot;</td>
</tr>
<tr>
<td>Winter + Winter</td>
<td>39</td>
<td>23</td>
<td>62 (= 23 + 39)</td>
<td></td>
</tr>
<tr>
<td>Lederer</td>
<td>31 (= 11)</td>
<td>14</td>
<td>45 (= 21)</td>
<td></td>
</tr>
<tr>
<td>Williamson</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>3 of these were definitely negative.</td>
</tr>
<tr>
<td>Rosner</td>
<td>27</td>
<td>9</td>
<td>36 (= 15 + 21)</td>
<td></td>
</tr>
<tr>
<td>Schade</td>
<td>23 (= 9)</td>
<td>9</td>
<td>32 (= 9 + 23)</td>
<td></td>
</tr>
<tr>
<td>Behne</td>
<td>3</td>
<td>3</td>
<td>6</td>
<td>These were 26 others + &quot;mostly negative,&quot; but not all malignant.</td>
</tr>
<tr>
<td>Feltinger + Bose</td>
<td>6</td>
<td>2</td>
<td>8</td>
<td>These were not all malignant.</td>
</tr>
<tr>
<td>Foss</td>
<td>11</td>
<td>4</td>
<td>15 (= 4 + 11)</td>
<td></td>
</tr>
<tr>
<td>Gawinsky</td>
<td>6</td>
<td>3</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Leitch</td>
<td>14 (= 7 + 7)</td>
<td>22 = 15</td>
<td>36 (= 22)</td>
<td></td>
</tr>
<tr>
<td>Wyon</td>
<td>16 (= 6 + 10)</td>
<td>6 (= 5 + 1)</td>
<td>16 (= 11 + 5)</td>
<td></td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>149 (= 44%)</td>
<td>66 (= 52%)</td>
<td>215 (= 52%)</td>
<td><strong>116 (= 47%)</strong></td>
</tr>
</tbody>
</table>


With this in mind, the object may contain the results of Epstein. He examined 37 cases of malignant disease with pleuritis and found the results all negative. But he gives no details of his method.

Table E shows a considerable increase (47% compared with 38%) in false results when cases known to be infected with bacteria on the subject of malignant disease are selected.

Many of the non-pregnant cases in Table D are no doubt septic (see e.g. note 1, Table E) but apart from the 246 cases in Table E no enough details are given to permit of tabulation.
Summary.

Technique. Dialysis. Organ and serum are mixed in a dialysing tube. Peptone and other bodies demonstrated in the dialysate by a chemical test are held to be proof of the splitting action of ferment in the serum upon the organ.

Some of these are numerous. Most can be overcome by careful attention to details; but some are insurmountable, or at least not yet overcome.

Optical method. Peptone and serum are mixed in a Polarizing tube. A change in rotation of 0.04° or more after 16 to 24 hours is held to be proof of the splitting action of ferment in the serum upon the peptone.

Some of these are almost nil.

Results of my own 44 cases:

Of 22 pregnant cases, 17 were correct
  5 - doubtful
  0 - wrong.

Of 22 non-pregnant cases, 4 were correct
  10 - doubtful
  8 - wrong.
Summary (continued)

Results in the Literature

In 33 papers there were 8351 cases.
- Of 2268 pregnant cases, 112 (4.09%) were wrong.
- Of 10,83 non-pregnant cases, 291 (2.7%) were wrong.

In 13 papers selected for strictworthiness judged by internal evidence (not by results), there were 1493 cases.
- Of 820 pregnant cases, 85 (10.4%) were wrong.
- Of 673 non-pregnant cases, 257 (38.2%) were wrong.
- Of 149 septic cases, 66 (44.0%) were wrong.
- Of 97 malignant cases, 50 (52.2%) were wrong.
Conclusion.

1. It is at present impossible to rely on Abderhalden's methods for a diagnosis of pregnancy. So many cases of inflammatory disease or tumour give a positive result that such a result has no meaning.

2. A negative result with placenta has a limited value. It is a piece of evidence in favour of the patient being non-pregnant, though by no means absolutely reliable.

3. The objection to the first two conclusions that the numerous authors whose results are given above failed to carry out the technique properly is met:

   (a) by its inherent improbability
   (b) by the argument that things being as it is not difficult and needs mainly an aseptic conscience, which every medical man now has
   (c) by the fact that the results of the optical method (p. 15, 17) are practically as bad as of the other method. Abderhalden himself says that the causes of error are few almost nil.
Suggestions for further work on the subject.
(The author has only been prevented by lack of time from carrying out some work on these lines.)

1) A long series of tests of permeability of the dialysing tubes with various dyes should be carried out to see whether the variability suggested above (p. 14) is a constant phenomenon.

Coloured photographs of the test-tubes after boiling with muriatic acid would give a valuable permanent record and enable an independent judgement to be formed by those not actually using the method.

2) An extended series of experiments with inorganic substances (glass, etc.) should in place of organs should be made. (See Lecture, loc. cit p. 333). If many positive results are obtained an endeavour should be made to determine whether the change in the serum was effected by chemical or physical means. To assist in this differentiation a chemical friend suggests the use of quarts-jars and other substances by which no chemical action could be conceived as being initiated.
References

[and a fourth German edition has been recently issued]

Abderhalden, E. Deutsch. Med. Woch. 1912, No. 28, 1912
" " " Münch. Med. Woch. 1912, No. 24, 1912, p. 1305


Gutman & Druskin. Medical Record. No. 3, 1913.


Schafer, Zentralblatt f. Gyne. Nr. 23. 1913. 944


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Vitt, Zeitsch. f. Geburtsh. u. Gyne. 1911. 1912. 403


Appendix

List of my non-pregnant cases

<table>
<thead>
<tr>
<th>Case</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Septic. 1</td>
<td>Bile.  Phlegmon.</td>
</tr>
<tr>
<td>2. male.</td>
<td>Cellulitis.</td>
</tr>
<tr>
<td>3. Rectal fever</td>
<td>D + P+</td>
</tr>
<tr>
<td>4. Int. inf.</td>
<td>Pyrexia.</td>
</tr>
<tr>
<td>5. male.</td>
<td>Sepsis.</td>
</tr>
<tr>
<td>6. 7. Sepsis.</td>
<td>Sepsis.</td>
</tr>
<tr>
<td>7. 7. Int. rectal abscess</td>
<td>D + P-</td>
</tr>
<tr>
<td>8. 7. Parametritis.</td>
<td>D + P+</td>
</tr>
<tr>
<td>9. 7. Cellulitis.</td>
<td>D + P-</td>
</tr>
<tr>
<td>10. 7. Septic. tib. abscess</td>
<td>D + P-</td>
</tr>
<tr>
<td>11. male.</td>
<td>Genital abscess.</td>
</tr>
<tr>
<td>12. male.</td>
<td>Rectal abscess.</td>
</tr>
<tr>
<td>13. male.</td>
<td>Jowab and Othiit.</td>
</tr>
<tr>
<td>14. 7. Genit. gland - recti.</td>
<td>D - P-</td>
</tr>
<tr>
<td>15. 7. Torsillitis.</td>
<td>D - P+</td>
</tr>
<tr>
<td>16 7. Diabetic.</td>
<td>Sepsis.</td>
</tr>
</tbody>
</table>

Non-septic. 1. 7. Fibroma.  | D - P- |

2. male.  Sheathed wound. | D + P- |

3. 7. Fibroma rectus. | D - P- |

4. 7. Lithopyon. | D + P+ |

5. 7. Fibroma. | P+ |

Normal. 1. male.  | D - P+ |

Note on my own technique. In the 83 cases, the 13 cases with a control of serum heated to 60°C for 30 min with floccular was used. This was negative in all cases.
In all cases Abderhalden's technique as given in his 3rd edition was strictly followed. Thus in all a control of serum only was used, a 2+ indicating that this control was either negative or distinctly less colored than the experiment serum with - plasma. In nearly all cases the blood was taken just before the midday meal, i.e. 3 or 4 hours after a light breakfast.
Is the Serum-Diagnosis of Pregnancy possible by Abderhalden’s Method?

A Thesis for M.D.

By

G. A. Wyon, M.B., Ch.B.