Persistence of Bacilli in the Throat of Convalescent Diphtheria Patients: A Clinical and Bacteriological Study of 300 Cases.

By

J. Wells McClellan,
M.A., B.S., M.D., C.M.
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In examining the throat of convalescent diphtheria patients at the City Hospital, Edinburgh, as to discharges, I found great irregularities as to the time when the bacilli disappeared. I give the results of clinical and bacteriological investigations into 800 cases, made to determine if possible some cause for these irregularities, and some practical method for regulating the discharge of such patients. The standard aimed at was three consecutive negative results before discharge, but in many cases a lower standard had to be adopted. The points that were investigated are these:

1. The average time when the throat of convalescent patients are free from diphtheria bacilli.
2. How many consecutive negative examinations should be put before a patient is discharged.
3. Patients discharged with bacilli still...
in. Their Throats at the Last Examination.
4. These is the preservation or disappearance of the troubles affected by:
   1. Time. Season.
   2. Age.
   3. Sex.
   4. By the number of days ill before admission to Hospital.
   5. By the condition of the throat as regards
      portion of membrane.
   6. By the amount of membrane first
   7. By the state of disappearance of the
      membrane.
   8. By the condition of the throat in
      convalescence.
5. The Pathology of the Cases Examined:
   this is discussed in the second part of this
   Thesis.

That Diphtheria is an infectious disease
has been known from the earliest time, but it was
not till the specific bacteria of the disease was
discovered by Klebs in 1883 and confirmed by
Leffler in 1884, that the modes of infection
could be properly studied. The view we
was adopted as the result of bacteriological investigations, is that the presence of the Koch-Boeckel bacillus is absolutely essential to the production of diphtheria, and it follows that the infection of diphtheria can only be explained by the case directly or indirectly infected.

With the discovery of a definite organism it was thought that all difficulties respecting the diagnosis of diphtheria would disappear, but it was soon found that clinical and bacteriological evidence did not always agree. Again as bacteriological investigations increased, the discovery of diphtheria organisms in healthy persons, in convalescents, and persons who had been in contact with diphtheria patients, the discovery of diphtheria organisms in healthy persons, and persons suffering from certain mental diseases, the differences in morphology and virulence, etc., multiplied the difficulties connected with the subject, that it is necessary first of all, in dealing with anything connected with diphtheria, to define exactly in what forms the diagnosis of diphtheria has been made.
In this investigation the presence of the bacilli has been determined on morphological grounds, so only those cases are included which on admission to the hospital gave a blood from culture after being treated with anti-Pleisner's stain gave the so-called polar-bodies. I shall refer to the value of Pleisner's stain in Part II.

Probably several cases which did not give this staining reaction were cases of diphtheria, but of 571 cases admitted to the hospital in 1905, 17.2% could not be classified as diphtheria according to this staining method. But while none of these were fatal, all of them showed symptoms of post-diphtheritic paralysis. Many of these cases had been ill for several days before admission. So that might in some instances explain the absence of the bacilli. Since Woodward in his Metropolitan Asylums Report found that 20% of the cases admitted during the year 1875-6 could not from bacterial culture investigation be classified as diphtheria, while Solomon Smith, from the examination of the records of 27 of notified cases, found that 25% were not diphtheria. While there is this
great difference between clinical & bacteriological diagnosis on cases admitted to hospital, there is also a difference of about 5% between the bacteriological cases & what is finally classified by the Hospital authorities as clinical diphtheria. This is an investigation told to the present, when the total number of examinations reaches over 5000, the diagnosis & the determination of the presence or absence of the diphtheria bacillus can only depend on morphology, as it would be impossible to isolate & test the bacillus if the organisms were in a small proportion of the cases.

Previous examinations & determination of the presence of diphtheria bacilli in non-vaccinated diphtheria patients.

Many investigations have been made to determine this point & all these investigations have been made with a view to prevent non-vaccinated patients being a source of danger to the community. Preservation of bacilli is written by some writers as equivalent to destruction of infectivity, but these do not agree with the, even when the virulence of the bacilli
has been proved by injecting into ferric jugs or patients.

Swin Woodhead in his Post-Report Conclusions
Board Report (1876) draws attention to the fact
that in the years 1895-96, out of 12,752 diphtheria patients, 4,052 or 38.7% had diphtheria bacilli in their throat at the last examination. It is true cases only one or two early examinations had been made, so it cannot be said that all the 4,052 had bacilli when they left Hospital. In another letter he finds that for 1895, 762 or 12.8% patients were discharged with bacilli present at the final examination; while for 1876 the numbers were 1,458 or 11.8%. Woodhead is strongly of the opinion that all convalescent diphtheria patients should be isolated, if even slightly suspect diphtheria bacilli remain. He says that in many cases this would involve a detention in Hospital or Institution for an indefinite period, and then to await until such patients for the length of persistence of diphtheria.

Bacilli we see what this period means in some cases. In the years 1895-96 he mentions 226 cases which were isolated.
For more than 100 days. The mean duration of his cases is 52 days, the longest period being 200 days.

In the 1595 cases, one which had antitoxin, 9 had which had no antitoxin, had bacilli present for longer than 200 days; while in the 1596 cases one which had antitoxin was positive up to the 189th day, 9 were without antitoxin up to the 169th day. The majority of the cases appeared to retain the bacilli in their throats for 2 to 9 weeks.

Parks & Beebe

[New York Medical Record 1894]

The cases were examined from three months to 2566 cultures were made. Swabs were taken at short intervals after the complete disappearance of the exudate until the throat was found to be free from bacilli. The second culture was made three days after complete disappearance of the membrane, and then when necessary every 4 or 5 days. The results were as follows:

In 315 cases the bacilli were no longer present 8 days after complete disappearance of the exudate. While in 427 the bacilli persisted for a longer time.
In 201 cases they persisted for 5-7 days: in 57 for 12 days, in 69 for 15 days, in 57 for 3 weeks, in 11 for 4 weeks, and in 5 for 5 weeks. The mean duration was 8 days from disappearance of the membrane: the longest period 49, and the shortest 3 days.

They also mention 11 cases investigated by Yong and Yessen, where the membrane was tested in prison pigs: the mean duration of these cases was 13.6 days, the longest period 2 months, and the shortest 3 days from the time the membrane disappeared.

In the same article they record some cases investigated by Tobiesen. Out of 46 patients discharged from Hospital he found that while 24 were cured free from bacilli, 22 were free. The majority were children between 6-12 years. He says that the stay in Hospital was the same for both classes, so as many free 10 days from the disappearance of membrane as the average time of persistence of bacilli in the class who went out with clean threat.

Walker (New York Hospital Turner 1878) gives an account of a scurmination of 800 convalescent cases. 2500 cultures
were taken. 9 diphteria bacilli were found about as early as the 6th day & present as late as the 32nd week. The average for his cases was 24 days in winter, and 20 days in summer.

Colbrett (Tunnet & Tippins 1891) in dealing with the subject of the presence of bacilli in the throats of convalescent diphteria patients, found that no, or even two, consecutive negative examinations were often followed by the finding of virulent bacilli, as in his results patients were only considered free from bacilli after 3 consecutive negative examinations. The mean duration of his cases was 15 days, the shortest period being 3 days, the longest 43 days, in one case of 108 days.

Graham Smith (Tunnet & Tippins 1891) gives his experiences in two epidemics. In the Colobettia epidemic (1902) the mean duration was 28 days, and the longest period 94 days, three consecutive negative examinations being necessary before discharge.

In the Cambridge epidemic of 1904 the mean duration was 26 days in verified cases, and 30 days in contacts. The length of persistence varied between 8 and 99.
days in infirmary persons, and in contacts
between 122 and 5 days.

We find in various writings mention
made of medical prolonged cases:

- Exonzo: 2 months fully well after 5 weeks.
- Carr: after 7 weeks.
- Belfrutti after 7 months.
- Pollock after 362 days.
- Westnich after 135 days.
- Bowditch after 25 weeks.
- Other cases up to 15 months.

Most of these investigations have been
carried out in laboratories not connected
with hospitals, and while from a strictly
scientific view the results should be the
found for the discharge of convalescent
patients, the practical side of the question
is what hospital authorities have to
face, and that is the reason why I have
investigated the cases in hospitals, noting
their condition when in hospital and on
dischARGE, and watching carefully for any
return cases in connection with these past
cases which build up the reports. I then
make only one or two consecutive infer-
native examinations before discharge.
Of the 300 cases, I have examined, 121 were patients during the months of February, March, April of 1895, but the majority, 79, were in hospital during last winter - October, November, December 1895 and January, February, March 1896. All cases were examined on admission; the examination being repeated next day if the first result was negative. Positive cases were then examined every second day till they were negative on two consecutive occasions, and then at intervals of 3 or 4 days. When a positive result appeared after a negative, the second examination was made two days later. The examinations were made without any regard to the presence or absence of membrane.

Sterile swabs were always used. The swabs were taken at the same hour of day all through the investigation - about 3 p.m. Three from tubes were then inoculated, 4 later, and of the incubator kept running at 37.5°C, thus from culture of 15 hours growth.

In taking the swabs care was taken to have the epithelium well back in the bursa.
When membrane was present, the cord was rubbed over it. When membrane had disappeared, a headache of the whole face was taken.

The following are the details as regards the number of cases:

<table>
<thead>
<tr>
<th>Month</th>
<th>Number of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feb.-March</td>
<td>52</td>
</tr>
<tr>
<td>Apr.</td>
<td>27</td>
</tr>
<tr>
<td>Oct. 1905</td>
<td>47</td>
</tr>
<tr>
<td>Nov.</td>
<td>50</td>
</tr>
<tr>
<td>Dec.</td>
<td>47</td>
</tr>
<tr>
<td>Jan. 1906</td>
<td>57</td>
</tr>
<tr>
<td>Feb.</td>
<td>14</td>
</tr>
</tbody>
</table>

Diphtheria & Scarlet cases (1905-6) 13

Total 300

Over 300 cultures were taken, giving an average of over 10 examinations per case. From the following table it will be seen that 160 cases had from 5 to 10 examinations made, while 140 cases had more frequent examinations, one being examined 32 times.

<table>
<thead>
<tr>
<th>Table I</th>
<th>Cases Examined 15 Times or Less</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Examinations</td>
<td>5</td>
</tr>
<tr>
<td>Number of Cases Examined</td>
<td>30</td>
</tr>
<tr>
<td>Total Examinations</td>
<td>150</td>
</tr>
</tbody>
</table>
Table II

Cases examined more than 10 times

<table>
<thead>
<tr>
<th>No. of cases</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
<th>21</th>
<th>22</th>
<th>23</th>
<th>24</th>
<th>25</th>
<th>26</th>
<th>27</th>
<th>28</th>
<th>29</th>
<th>30</th>
<th>31</th>
<th>32</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of cases</td>
<td>32</td>
<td>22</td>
<td>21</td>
<td>12</td>
<td>8</td>
<td>8</td>
<td>9</td>
<td>3</td>
<td>5</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Totals</td>
<td>352</td>
<td>264</td>
<td>273</td>
<td>168</td>
<td>120</td>
<td>126</td>
<td>153</td>
<td>54</td>
<td>95</td>
<td>40</td>
<td>84</td>
<td>44</td>
<td>23</td>
<td>48</td>
<td>26</td>
<td>34</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1904</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Total number of examinations $1247 + 1904 = 3151$

All the cases except 2 had antitoxin. The initial treatment in the majority of the cases was Physenene, employed in about a footbath by Karasek’s syring. In the Jan.-Feb.-March (1906) cases formic acid was used.

The routine local treatment was

washing with borax-powder & parchment with the following mixture:

- Total: 36 parts
  - Spirit Vini Rect.: 60 parts

Occasionally Porcide of Hydrogen was used.

In a certain proportion of the cases mentioned later on, various antiseptics were used.
The average time at which diphtheria bacilli were found to disappear from the throat was 18.4 days, counting from the day when the bacilli were first detected.

**Table III**

<table>
<thead>
<tr>
<th></th>
<th>Cases</th>
<th>Average Time (Days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feb. 05</td>
<td>52</td>
<td>11.79</td>
</tr>
<tr>
<td>Oct.</td>
<td>24</td>
<td>12.04</td>
</tr>
<tr>
<td>Nov.</td>
<td>36</td>
<td>19.94</td>
</tr>
<tr>
<td>Dec.</td>
<td>45</td>
<td>22.84</td>
</tr>
<tr>
<td>Jan.</td>
<td>40</td>
<td>22.20</td>
</tr>
<tr>
<td>Feb.</td>
<td>49</td>
<td>19.56</td>
</tr>
<tr>
<td>March</td>
<td>14</td>
<td>12.43</td>
</tr>
</tbody>
</table>

**Diphtheria**

<table>
<thead>
<tr>
<th></th>
<th>Cases</th>
<th>Average Time (Days)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>13</td>
<td>20.50</td>
</tr>
</tbody>
</table>

27 out of the 200 cases, or 9%, were discharged with bacilli still in the throat. Further work will be made to this group later on.

I also find the average time of disappearance of some bacilli, as quoted by Graham Smith, with some additional figures from other sources.
<table>
<thead>
<tr>
<th>Number</th>
<th>Name</th>
<th>Days from disappearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Park (1892)</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>more</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>Bridle (1902)</td>
<td>14</td>
</tr>
<tr>
<td>4</td>
<td>Torezin</td>
<td>10 from disappearance of candidate</td>
</tr>
<tr>
<td>5</td>
<td>Cobbe 1901</td>
<td>18 (3 consecutive negatives)</td>
</tr>
<tr>
<td>6</td>
<td>Massachusetts Blood B &amp; Health 1902</td>
<td>27</td>
</tr>
<tr>
<td>7</td>
<td>Graham Smith 1802</td>
<td>25 (3 consecutive negatives)</td>
</tr>
<tr>
<td>8</td>
<td>Woodhead 1876</td>
<td>52</td>
</tr>
<tr>
<td>9</td>
<td>Graham Smith 1877</td>
<td>36 (3 consecutive negatives)</td>
</tr>
<tr>
<td>10</td>
<td>Walsh 1898</td>
<td>22</td>
</tr>
<tr>
<td>11</td>
<td>Penn &amp; Jenny</td>
<td>13 6 from disappearance of candidate</td>
</tr>
<tr>
<td>12</td>
<td>Frankle</td>
<td>18 4 (3 consecutive negatives for 57 of the cases)</td>
</tr>
</tbody>
</table>

Adding 6 days to the figures of Park, Torezin, Penn & Jenny, for the total calculation from the date of disappearance.
of the Student, we get as an average from
three 12 investigations 22.9 days as the time
when Aphthae in buccal tissue from the
throat of Aphthae patients. If we
Exclude Wordsley'sfigures - instead of his
cases, about 226, were detained in hospital
for more than 100 days - we get a lower
figure still namely 20.2 days as
the average time of disappearance.
Where no bacteriologic exam-
ination can be made, we get from these
figures a rough rule for regulating the
discharge of Aphthae patients.
As we shall see later, the average
day on which all student disappears from
the throat is the 5th or 6th day from the
date of admission to Hospital. As we may
reason that 14 days later the average
throat is bacteriologically clean, we may
conclude that a patient cannot be
considered free from infection till at least
3 weeks after the membrane has quite
disappeared.
As the stay in Hospital of Aphthae
patients is between 4 to 5 weeks at
the least, this may explain why
When cases of Diphtheria are practically unknown, the in the years before bacteriological examinations were made.

How many consecutive negative results should be put before a patient is discharged?

Albetti found that in nasal cases two consecutive negative examinations were more than once followed by the finding of latent bacilli. He thought this might be due to the being taken too soon after the application of some antiseptic or possibly due to some bacilli which had reached some of the nasal cavities, descending again to the pharynx. It mentions also that the Boston Board of Health, USA, require two consecutive negative examinations of individuals before they are pronounced free from infection, and for hospital patients three consecutive negatives were required.

Smith also made three consecutive negative results the rule in his investigation, but admits that it is difficult in practice to impose isolation till three
negatives are got, a difficulty which all Hospital authorities experience.

Park and Debé's results were based on 2566 cultures from 749 cases, giving an average of about 3.5 examinations per case.

Wadd's average for the date of disappearance of the bacilli was got from 2500 cultures from 500 examinations, giving only about 3 examinations per case. So it is evident that a number of these investigations use the three consecutive negative results as standard.

In the Edinburgh City Hospital cases each examination was examined on an average about 10 times. The first 50 cases recorded had only an average of about 6 examinations each, so it is in the other 250 cases that an attempt was made to secure 7 possible three consecutive negative results before discharge. In half the cases, 51% we were able to secure this, while 74% of the cases were discharged after 5 or more consecutive negative results; 15 cases were discharged after one negative result, while 27 were discharged with bacilli still in their throats at the
Final examination. The following tables give the result of these examinations.

**Table V**

Number of negative results prior to the discharge of 250 patients.

<table>
<thead>
<tr>
<th>Cases</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>27</td>
<td>Discharged with bacilli still present.</td>
</tr>
<tr>
<td>19</td>
<td>After one negative result.</td>
</tr>
<tr>
<td>51</td>
<td>After two consecutive negatives.</td>
</tr>
<tr>
<td>58</td>
<td>After three consecutive negative.</td>
</tr>
<tr>
<td>25</td>
<td>After four consecutive negative.</td>
</tr>
<tr>
<td>13</td>
<td>After five consecutive negative.</td>
</tr>
<tr>
<td>4</td>
<td>After six consecutive negative.</td>
</tr>
<tr>
<td>1</td>
<td>After seven consecutive negative.</td>
</tr>
<tr>
<td>1</td>
<td>After nine consecutive negative.</td>
</tr>
</tbody>
</table>

250 cases.

Reference will be made later on to the 27 discharged with bacilli still present. The following tables will show that the cases discharged with one negative result or two consecutive negative results had been negative several times and again became positive before the final negative examination. It will be seen that 30.1% of those discharged with one negative result...
had been negative on several occasions before, while of those discharged with two negative results 20% had been negative 4-6 before the final two negative results were got.

Table VI

A. Of 45 patients discharged after one final negative result

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>14 became positive after being 1 time negative</td>
<td>2 times conversely</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>30</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B. Of 51 patients discharged with 2 consecutive negative examinations

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>15 were positive after being 1 time negative</td>
<td>2 times conversely</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>40</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From these tables it will be seen that only 19 patients were discharged who were only once time negative of 10 in the whole of their
examinations: while 11 were discharged with only 2 became convulsive, negative results in all other examinations.

In referring to this same subject in the second part of this thesis, it will be found that in many of these cases where the tachy disappeared after a negative result, the tachy was frequently of the second variety, according to Westroth's types. And that it was only after very careful search that one or two cases of true tachy could be found.

Graham Smith had made the same experience in respect to these irregularities. In the Gilchrist model, after 1 negative result, tachy was found in 11 cases, after 2 consecutive negatives in 10 cases, after 3 consecutive negatives in 1 case, after 4 consecutive negatives in 1 case. While in the Cambridge model of 1854, a single negative followed by the reappearance of the tachy, often for a long period, occurred in 49 cases, after two consecutive negatives in 22 cases, after three consecutive negatives in 2 cases, and after 4 or 5 in 1 case.

Looking at the question of discharge from its practical side, I should say
that two consecutive negative results is the
top standard to adopt. Few municipalities
authorities are willing to increase their burdens
by detaining patients longer than necessary and few
would allow patients to be detained over 100
days. For this reason, the presence of
bacilli in the throat is a threat. Again when we
consider that the presence of Diphtheria
bacilli in a healthy throat is not deemed
sufficient to make that a case of Diphtheria,
we see how difficult it is to enforce the prolonged detention of a con-
venient patient who is now in perfect
health, who is eager to resume his work
when funds are demand or return home,
but who still has some bacilli in
his throat, after being in hospital for
more than 6 weeks.
Patients discharged with bacilli present at the last examination.

Out of the 200 cases recorded, 27 or 9.70 were discharged with bacilli still in their stools.

The following details regarding their cases will be recorded in Latin letters:

<table>
<thead>
<tr>
<th>Sex</th>
<th>15 males</th>
<th>12 females</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>6 under 5 years, 6 between 5-10 yrs, 12 between 10-20 yrs, 5 over 20 yrs</td>
<td></td>
</tr>
<tr>
<td>Remaining days ill</td>
<td>12 had them 3 days ill (or less) before admission, 15 had been ill 4 or more days</td>
<td></td>
</tr>
<tr>
<td>Membrane</td>
<td>2 never had any membrane, in 13 the membrane cleared in 5 days or under, in 12 in 6 days or over</td>
<td></td>
</tr>
</tbody>
</table>

Antitoxin | 10 were cases with only 100 units of antitoxin, 17 had doses ranging from 2000 to 5000 units |

Toxic | 22 out of 27 had enlarged livers in their convalescence |

Number of examinations: These figures have been often. These cases were examined: 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 19, 20, 21, 22, 24. 9 and 16 times.

Antitoxins: Several of the following were tried in each case: 0.00 peterside, 0.00 berberis, 0.00 arsenic, 500 Carbolie and phenose.
1500 cases a year, chromic mud, 
lymphoglandular Chancre or Pyorrhea.

In the above it will be seen that clinically 
many of these cases were of a very mild type —
for 10 had only 1500 units of antitoxin. Antitoxin 
seemed to have little effect on the persistence 
of the bubble, though sometimes of the more 
was tried.

16 of the cases never gave a negative 
result at any time: the other 11 at different 
times gave one or several negative results, it 
that too often a few days before discharge.
The average stay in Hospital of these cases was 
a little over 5 weeks, but several were over 
7 weeks.

There were nearly in all cases special 
reasons for discharging these patients: one 
was an infant 6 months old, an only child. 
16 others were only children, 7 below 4th 
age. Thus several members of a family had 
been in Hospital with 0 phthisia, the presence 
of bacilli did not detain one member much 
longer than the others: — W.P. whose two 
brothers had been in Hospital; A.C. whose 
mother had been a patient; K.M. who had
lost a child in hospital. This youngest boy, also a patient, had been discharged. Mr. B.
only child who had been in hospital for 7
weeks, 41st, in 41st. As for the members of
the family that had been in hospital, W. B. who
came had been a patient & 4 patients whom
bacillus had been found in contact by
temperature & salvarsan.

From none of these 27 cases discharged
with bacilli & their symptoms, have we been
able to trace the return case of diph-
theria.

Return Cases of Diphtheria.

what is meant by "a return case" in connection
with an infectious disease? A patient
just removed from an infectious disease
goes home after being discharged as thoroughly
as possible as regards himself & all his cloth-
ing. Sometimes later another person from
that home is sent to hospital suffering from
the same disease which the convictent
had: this the "return case." If the second
case occurs a minute after the convictent
returned home it is still called a "return case."
Return cases of Scarlet Fever are well known. They occur too often with preventives in use. Return cases of Diphtheria are very rare. In return cases occurred a connection with the 27 cases discharged with laryngeal hoarse in the hospital. In return cases have occurred in this hospital within the last 5 or 7 years. During those years no exact pathological examination was made prior to the discharge of patients. He does not know the organism that goes with Scarlet Fever. He knows that return cases of Scarlet Fever occur. He knows the organism that causes Diphtheria. Hundreds of patients must have been discharged with this organism in their throat. Yet no return cases have occurred.

This can only be explained in two ways:

1. Either the influence of the organism is greatly reduced by the time a patient is ready for discharge.

2. Or that the case in contact with contagious Scarlet Fever must have some immunity.
1. Is the virulence of the organism diminished?

Most of those who have investigated the subject of prevalence of bacilli, have, by experiments on primates and guinea-pigs, proved that the bacilli are constant, sometimes months after all the symptoms of leprosy have disappeared. For a few winters past we have had results for by inoculation of animals. But while many can bring forward this evidence of evidence, few can definitely prove that these long continued preserved cases, are perfectly well, have infected others.

Tuberculosis investigated the results for discharging 66 cases, which still had bacilli in their throats. He could only discover one case, where the evidence seemed to prove that a communicative child had been the cause of leprosy in the further.

Rongorong found, by making culture at various stages after the liquefaction of the disease, that the bacilli gradually lose their virulence.

I am inclined to take the view that if the patient has during the course of the disease, been subject to thorough local antiseptic treatment, any bacilli
left at the time of his discharge from hos-
pital, have their sinuses greatly reduced
and are not likely to infect others. In the
case of patients in this investigation, the
loss of sinus was proved by experiments on
rabbits.

By what time did they come closely in
contact with discharged patients, any
immunity?

Frankly says that about 33% of people
exposed to infection by diphtheria have
become immune in their teens.

Type 9 Diphtheria. From diphtheria
baille is about 33% of contacts.

Poham Smith says the mean
transmission of diphtheria in families
was 51% of infected persons; in more
distant contacts in institutions 40% and in
schools 22%; whereas in the group of
family contacts only 12% had tons diphtheria
baille.

James in the British Medical Journal
1904, reporting on 29 School outbreaks in
London, says the following classes of children


was found, by bacteriological examination, to be spreading diphtheria.

1. actual death cases in all class 80%.
2. Cases from injected homes, presenting no symptoms 12%.
3. Cases of nonattendance after absence for notified diphtheria in 6%.
4. Carries with or symptoms, or demonstrable contact 2%.

He found that 85% of these children were between 5-7 years old. He went on to show that the years of highest incidence of diphtheria are 5-6 and 4-5. There is a slight drop from 5-6, considerable drop from 6-7, further drop from 7-8, and after that the incidence becomes fairly level. So that between the years 5-8 children are passing from a high susceptibility to a state of relative immunity, and therefore many of them may be liable to slight unrecognized attacks of diphtheria. If a child under 5 years be attacked with diphtheria, it will be done with a severe attack and will not remain at school to spread the disease. There was no proof of children
If this age being the source of the spread of diphtheria in any school. If a child over 8 years be attacked and still attend school, at that age has a relatively high immunity. We suppose that many of them do not suffer from future attacks. Between the ages of 5-8 however, if a child attend into diphtheria, a large proportion at that age are useless to an attack as a child from, and the class becomes a source of danger, a few being the place to put the threat recognized as diphtheria, some carrying it home and being excluded in account of diphtheria as the home, and more entering to attend with slight clinical symptoms.

Putting all the above statements together, may be not be able to get from them an explanation of the fact that return cases of diphtheria are very rare. If a case of diphtheria break out in a house, as 51% of close contacts become infected. He may suppose that those most susceptible late the disease in a household form and are removed to
Hospital: possibly followed by disease at a
few days interval, as very often happens.
Suppose that when these patients are dis-
charged from Hospital, they will have some
bacteria present in their throats, are they
likely to cause future cases? They are
certainly not as infectious as when they
were first ill, and the Nuis at home, the
close contacts, but having developed affec-
tion at the first instance, are not
likely to develop it here by coming in
contact with endogenous bacteria carriers.
There may 50% of themselves have bacteria
in their throats. If the bacteria have been
forced to persist in the throats of contacts,
almost as long as a those who have had
an attack of diphtheria.
Influence of Season on Persistence of Bacilli.

As this investigation was carried out mostly in the winter months, little can be said as to the effect of season. But the fact that the average persistence for the months, November, December, and January was 21.6 days, while that for Oct, Nov, Dec, and Jan was 16 days, shows that the bacilli disappear more rapidly in the winter months than in the summer months. About 24 days, being the winter average, 20 days the summer average. The following are the figures for different ages at different seasons:

<table>
<thead>
<tr>
<th></th>
<th>under 2 yrs</th>
<th>2-5</th>
<th>5-10</th>
<th>10-15</th>
<th>15-20</th>
<th>20-24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter</td>
<td>24 days</td>
<td>25</td>
<td>23</td>
<td>23</td>
<td>25</td>
<td>21</td>
</tr>
<tr>
<td>Summer</td>
<td>25</td>
<td>20</td>
<td>19</td>
<td>13</td>
<td>25</td>
<td>19</td>
</tr>
</tbody>
</table>
Influence of Exp on Persistence of Bacilli.

Just as the seems to have little influence, if any, on the occurrence of Diphtheria, so upon it does not in any way influence the time of disappearance of bacilli.

Of the 300 cases investigated, 143 were males, 91.57 were females. Until the average for each month may have varied a little as regards sex, the general average, the average for the total above almost exactly 9 to 1 with the female average. Again in the cases discharged with bacilli found at the last examination, the numbers are fairly equal, 15 males, 12 females.

Table VIII

<table>
<thead>
<tr>
<th>Month</th>
<th>Males</th>
<th>Average</th>
<th>Positive</th>
<th>Females</th>
<th>Average</th>
<th>Post Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feb.</td>
<td>29</td>
<td>14.3</td>
<td>6</td>
<td>20</td>
<td>14.1</td>
<td>12.43</td>
</tr>
<tr>
<td>March</td>
<td>4</td>
<td>14.7</td>
<td>9</td>
<td>14.1</td>
<td>12.43</td>
<td></td>
</tr>
<tr>
<td>Apr.</td>
<td>5</td>
<td>19.5</td>
<td>8</td>
<td>20.1</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td>128</td>
<td>18.33</td>
<td>15</td>
<td>14.6</td>
<td>18.6</td>
<td>12.18</td>
</tr>
</tbody>
</table>
Influence of age on the Persistence of Bacilli

The examination of the lungs of the 300 cases has brought two well-known facts regarding tuberculosis:
1. Tuberculosis specially attacks children under 10 years.
2. The cases occurring in the first 5 years of life are about equal in number to those of the second 5 years.

65% of the cases were under 10 yrs; 20% were between 10 to 15 years; 15% were over 15 years. Of those under 10 years, almost equal numbers were below 5 and 5-10 year groups.

I expected to find that the influence of age on the persistence of bacilli would be hotter in the case of children under 10 years, while it was more intense in those above 10 years, especially above 15 years. There would be a shorter period of persistence as local antituberculous treatment could be carried out more successfully in the older patients.

Below I give tables with 6 age groups, each to compare my results with those of Walsh. At the same time I give a

Another column for each age group, the cases discharged with bacilli still present.
Table IX  Influence of Age on Predisposition.

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Walsh</th>
<th>Fallowfield</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Winter</td>
<td>Summer 2A</td>
<td>Average 15</td>
</tr>
<tr>
<td>under 2 years</td>
<td>24</td>
<td>25+</td>
<td>20+</td>
</tr>
<tr>
<td>2-5 years</td>
<td>25+</td>
<td>20</td>
<td>19.4+</td>
</tr>
<tr>
<td>5-10 years</td>
<td>23-</td>
<td>19-</td>
<td>19.9+</td>
</tr>
<tr>
<td>10-15 years</td>
<td>23-</td>
<td>18-</td>
<td>18-</td>
</tr>
<tr>
<td>15-20 years</td>
<td>25+</td>
<td>25+</td>
<td>15-</td>
</tr>
<tr>
<td>20+ upward</td>
<td>21-</td>
<td>19-</td>
<td>165-</td>
</tr>
</tbody>
</table>

Note: + or - mean above or below the average of each particular series.

From the above it will be seen that the figures for under 2 years are twice above the average; in the 2-5 yo group also twice above the average; in the 5-10 yo group below the average with Walsh, alone in the city hospital cases; while in the 10-15 yo the 20+ upward jumps all are below the general average but in the 15-20 yo jumps any figures above are below the average, & a result which could be accounted for by local antiseptic treatment.

The Cases which left hospital with a cold state in their Throat, 10 were under 10 years, 10 above 10 years, while 7 were between the ages of 10-15 years.
To the Persistence of sickness affected by the length of days a patient is ill before admission to Hospital?

I give below tables showing the percentage number of cases admitted for the different days of illness. It will be seen that more than half the cases were admitted in or before the third day of illness. The knowledge of the day of illness is important as regards treatment: for the earlier antitoxin is used, the better the chance of recovery, & the less antitoxin is needed; while the later it is used, the less is the chance of recovery, & the more antitoxin must be given.

I expected to find the question of persistence to be affected in much the same way: -- the cases coming earlier under treatment clearing up quicker than those which had been ill for some time. The second column of the table gives the averages for the different days of illness & grouped averages for under 3 days, for 4-6 days, & for 7 days. 27 cases out of the thousand were admitted with a history of 6 or more days illness. Some said to be 3 weeks ill, but the averages for these is very irregular.
Table X  Influence of Day of Disease on Persistence.

<table>
<thead>
<tr>
<th>Day of Illness</th>
<th>Initial Cases</th>
<th>Average Day Bacteria Discharged</th>
<th>Cases Discharged</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4.07</td>
<td>23.8</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>25.55</td>
<td>18.9</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>81.5</td>
<td>19.2</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>17.0</td>
<td>18.7</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>10.0</td>
<td>27.6</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>4.4</td>
<td>19.8</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>2.07</td>
<td>15.0</td>
<td>1</td>
</tr>
<tr>
<td>8 above</td>
<td>1.4</td>
<td>15.0</td>
<td>2</td>
</tr>
</tbody>
</table>

Of the cases discharged with bacilli still present, 12 were admitted 6 or before the third day of illness, 15 at a later date. But of the 12 admitted early, a large proportion could not be classified as clinical diphtheria.
Do the persistence of eczema in any way affect by the site of the eruption?

I have tabulated again the percentage of cases according to the part of the trunk affected, and also the average day of disappearance of the cases while patient in discharge.

Table XI  Influence of site of eruption.

<table>
<thead>
<tr>
<th>Percentage of cases</th>
<th>Average day of disappearance</th>
<th>In discharge Not negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right trunk</td>
<td>7.4%</td>
<td>23.7</td>
</tr>
<tr>
<td>Left trunk</td>
<td>13.3%</td>
<td>12.6 (185)</td>
</tr>
<tr>
<td>Back trunk</td>
<td>63.3%</td>
<td>12.6</td>
</tr>
<tr>
<td>Temples &amp; hands</td>
<td>11.4%</td>
<td>16.5</td>
</tr>
<tr>
<td>Temples, inner, feet</td>
<td>10.0%</td>
<td>16.5</td>
</tr>
<tr>
<td>Post, pharyngeal wall</td>
<td>1.4%</td>
<td>14.5</td>
</tr>
</tbody>
</table>

It will be seen that 84.9% of the cases had either one or both trunks affected, and the average time of persistence, for all forms of cases, was about 18.5 days, while 20 of these cases were patient on the last examination. Why the right trunk should be affected less frequently than the left, and the time of persistence and number of still present cases pointed to larger.

In summary 2.
I cannot explain.

So the duration of pneumonia affected by the amount of antitoxin given?

As the dose of antitoxin depends largely on the amount of membrane present and on the number of days the patient has been ill, we would expect to find the results more uniform the same as those for those two conditions were investigated.

I have again given tables, showing in the first column the percentage number of cases receiving the different doses of antitoxin. It will be seen that 55.6% received doses of 5,000 units or under, 9 that about 14 or 4.3% had doses of 11,000 units or upwards.

In the second column is shown the average number of days of pneumonia according to the dose of antitoxin. It will be seen that the cases receiving 5,000 units or under became negative on an average in 18.8 days, while those receiving larger doses of antitoxin— including 14 cases receiving from 11,000 up to 60,000 units—had to wait...
present till a later date, 21.5 days.

In the column is the number of cases not reported or discharged. It will be seen that 10 of these, or 37.5% of the total, had only small doses of antitoxin, 1000 units, which proves that whether there cases might be from the bacteriological point of view, they were mild cases from the clinical point of view.

Waddell made investigations to find if the administration of antitoxin produced the duration of persistence. He found that while 24 days was the average for cases with antitoxin, 25 days was the average without antitoxin—practically no difference.

Only two out of the 500 cases had no antitoxin. I found the average time of persistence for these is 20 days.

Woodhead found in two cases, which had had no antitoxin, bacilli present up to 100 days, and in the other 200 days.

On the whole we may say that antitoxin seems to have little effect in the persistence of the bacilli. For while cases with small doses of antitoxin become clean a little earlier than cases with large doses, this is just another way of stating that mild cases clean up sooner than severe cases.
### Table X.

**Influence of Antitoxin on Peritonitis.**

<table>
<thead>
<tr>
<th>Units of Antitoxin</th>
<th>Half Cases</th>
<th>Average Days</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 units</td>
<td>0.6</td>
<td>23.5</td>
<td>10</td>
</tr>
<tr>
<td>1,000 units</td>
<td>1.3</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>1,500 units</td>
<td>1.9</td>
<td>18.9</td>
<td>10 or 87%</td>
</tr>
<tr>
<td>2,000 units</td>
<td>1.6</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>3,000 units</td>
<td>18.6</td>
<td>18</td>
<td>5</td>
</tr>
<tr>
<td>4,000 units</td>
<td>10.3</td>
<td>17.4</td>
<td>5</td>
</tr>
<tr>
<td>5,000 units</td>
<td>8.6</td>
<td>17.3</td>
<td>3</td>
</tr>
<tr>
<td>6,000 units</td>
<td>8.3</td>
<td>17.3</td>
<td>2</td>
</tr>
<tr>
<td>7,000 units</td>
<td>1.6</td>
<td>26.7</td>
<td></td>
</tr>
<tr>
<td>8,000 units</td>
<td>3.3</td>
<td>17.3</td>
<td>2</td>
</tr>
<tr>
<td>9,000 units</td>
<td>2.0</td>
<td>23.9</td>
<td>21.9</td>
</tr>
<tr>
<td>10,000 units</td>
<td>3.3</td>
<td>27.9</td>
<td></td>
</tr>
<tr>
<td>11,000 units</td>
<td>4.3</td>
<td>13.7</td>
<td></td>
</tr>
</tbody>
</table>
Is the persistence of bacilli affected by the
Time of Disappearance of the membrane?

As many writers have recorded the duration
of persistence of bacilli from the time the mem-
brane disappears, I have put it to examine
the 300 cases to find the average day of
disappearance. I have taken the percentage
number of cases for the different days in which
the membrane disappeared. 7 of 93% had no
trace of membrane left by the 6th day, we may
roughly take the 6th day from the time that
Plethoric was recognized bacteriologically (i.e.
from admission to Hospital) as the average day in
which the membrane disappears.

If we adopt the view that the earliest
hemis is membrane formation is caused by
depilation, and that later, the necrotic
areas are formed, then from putrid teeth
for the growth of bacilli, this will be
plausible. The persistence of bacilli is thought
when the membrane has remained for a
long time, an abundant growth medium
having been prepared for the growth of the
bacilli.

Again many of the cases where the
Thrust has taken a long time to clean, in cases when the membrane has continued to spread even after the administration of antitoxin, a fact that is that thrust loss is time condition especially favourable to the growth of the bacilli.

In the second column, I have given the average duration of persistence according to the day on which the thrust was clean. Dividing these into two groups—those clean on or before the average day, the 6th day, and those on later dates, I see that the bacilli disappeared in the earlier cases as a rule under 18 days, while in thrusts clean after the 6th day, the average duration was about 24 days.

In the third column are the cases which were discharged with bacilli still present at the last examination. Of these, 1 had membrane present; 1 had membrane which disappeared on or before the 6th day, in the remaining 6 the membrane did not disappear till later. As in these latter, the condition of the tissues in convalescence is the only explanation for this persistence.
<table>
<thead>
<tr>
<th>Day on which membrane disappeared</th>
<th>Percentage of cases</th>
<th>Average time</th>
<th>Cases positive in discharge</th>
</tr>
</thead>
<tbody>
<tr>
<td>No membrane</td>
<td>6</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>1st day</td>
<td>1.8</td>
<td>17</td>
<td>1</td>
</tr>
<tr>
<td>2nd day</td>
<td>8.0</td>
<td>11.4</td>
<td>3</td>
</tr>
<tr>
<td>3rd day</td>
<td>10.3</td>
<td>14.6</td>
<td>2</td>
</tr>
<tr>
<td>4th day</td>
<td>15.1</td>
<td>15.2 / 162</td>
<td>3</td>
</tr>
<tr>
<td>5th day</td>
<td>15.7</td>
<td>16.5</td>
<td>5</td>
</tr>
<tr>
<td>6th day</td>
<td>18.7</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>7th day</td>
<td>12.2</td>
<td>22.4</td>
<td>2</td>
</tr>
<tr>
<td>8th day</td>
<td>5.4</td>
<td>20.7</td>
<td>1</td>
</tr>
<tr>
<td>9th day</td>
<td>4.3</td>
<td>28.5 / 267</td>
<td>2</td>
</tr>
<tr>
<td>10th day</td>
<td>2.2</td>
<td>29.9</td>
<td>2</td>
</tr>
<tr>
<td>11th day</td>
<td>2.5</td>
<td>16</td>
<td>1</td>
</tr>
<tr>
<td>12th day</td>
<td>32</td>
<td>27</td>
<td></td>
</tr>
</tbody>
</table>
In the province of Basilea, affected by the
condition of the tenant or innkeeper, especially
as regards enlargement of the tonsils.

It has been shown by many observers that
certain conditions of the tonsils, especially enlarged
tonsils, are predisposing causes to Diphtheria. Many
of the cases admitted to hospital had the tonsils
greatly enlarged in the early stages of the disease,
but the enlargement disappeared later. However,
a large proportion 85% had enlarged tonsils
at the date of their discharge. Many declared
that the enlargement was there before they
suffered from Diphtheria.

Greatly in his investigation into a
Diphtheria epidemic in a school, he worked with
the number of unhealthy children in that school.
Out of 576 children, 455 had unhealthy throats;
101 congested, 201 with enlarged tonsils, and 35
with induration. He compared this with 100
children from a healthy school where there had
been no Known Case of Diphtheria for two years.
Here he found that out of 42 unhealthy
throats, 31 had enlarged tonsils. Leslie
in his examination of School Children
in Edinburgh found that 24.5% had en-


Largely true.

Globally next compared the cases in each school which had different bacilli in their throats. He found that 47.3% of the diphtheria cases in the infected school were children with enlarged tonsils, while 50% of the diphtheria cases in the healthy school occurred in children with enlarged tonsils.

The influence of the throat condition is more emphasized in comparing the percentage of diphtheria occurrence in the healthy throats of the two schools. In the infected school the percentage of children with healthy throats in which the diphtheria bacilli was found was 37.9%, while at the healthy school, the percentage was 6.8% for healthy throats.

An attempt was made in the infected school to isolate these children with bacilli in their throats, but this had to be abandoned later on, and then it was found that 17% of children at first gave from bacilli, but after two weeks from those bacilli 26 out of 51 cases had enlarged tonsils.

I give some very results which prove that independent of bacilli is the condition which favours the formation of the bacilli.
out of 250 cases 103 or 35% had enlarged tonsils. In the table below I give in the second column the average duration of fever time for each month for the cases with enlarged tonsils, which is the fourth column is the average duration for all the cases for each month. The fifth column gives the times of the average of the enlarged tonsil cases over the previous average. It will be seen that the average duration for enlarged tonsil cases was 24.3 days compared with 19.37 for the whole cases, i.e., 4.73 days more.

The most striking figures are those of the thirteenth column, which show that out of the 27 cases which were discharged with break in the throat 22 or 81.5% were cases with enlarged tonsils.

In addition to atropine & various antiseptic treatment various anti-septic were tried - Bismuth & Tannic acid, Iodine, &c. - but these had as little effect in reducing the enlargement as in the anti-septics had in removing the bacteria.

Regler speaking at the British Medical Association meeting at Leicester 1805 in the subject of 'What is Hysterical Dysphonia?'.
as the yielding epithelium to allow the culture. A careful examination showed this was always due to the presence of some unhealthy cellular tissue, with crypts in it. When this was removed, the ulcer could no longer be found. In other cases, it proved adenoid or nasopharyngeal tissue to be the cause of the persistence.

From hospital authorities cannot give this surgical treatment. From a prolonged detention for cases with bacilli still present is often a matter of great difficulty, while it would in the majority of cases, be impossible to get parents to consent to any surgical treatment of their children in a hospital apart for infectious diseases only.
### Table XIV

Cases with enlarged uterus in Correscence.

<table>
<thead>
<tr>
<th></th>
<th>Cases</th>
<th>Patient</th>
<th>Average</th>
<th>Final</th>
<th>Excess</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct.</td>
<td>6</td>
<td>26.6</td>
<td>19.64</td>
<td>7.5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Nov.</td>
<td>15</td>
<td>21</td>
<td>19.94</td>
<td>1.06</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Dec.</td>
<td>25</td>
<td>25.6</td>
<td>22.84</td>
<td>2.76</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Jan.</td>
<td>16</td>
<td>31.6</td>
<td>22.30</td>
<td>9.30</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Feb.</td>
<td>28</td>
<td>21.5</td>
<td>19.55</td>
<td>2.44</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>March</td>
<td>7</td>
<td>15</td>
<td>12.43</td>
<td>5.57</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spring &amp; Early Summer</td>
<td>6</td>
<td>24.5</td>
<td>20</td>
<td>4.50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Average for enlarged uterus</th>
<th>Average for all cases</th>
<th>Excess over average</th>
<th>Proportion of</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>19.77</td>
<td>19.07</td>
<td>0.73</td>
<td>2.2</td>
<td>103</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>27</td>
</tr>
</tbody>
</table>
Is the persistence of Diphtheria affected by local antiseptic treatment?

Before the days of the treatment of Diphtheria by its antitoxin, most attention was directed to the local evulsion, and various caustics and strong antiseptics were used to secure the removal or destruction of the membrane. Since antitoxin has come into use, less attention has been paid to the local evulsion, and such measures as forcible removal of the membrane or the use of strong antiseptics have quite fallen into disrepute, the use of antiseptics is not recommended by some authors.

But it must be remembered that the diphtheria antitoxin serum has no anti-infective properties and that therefore the local lesion should be treated on the same principles as any other infected wound. The chief means for any local treatment are to lessen the comfort of the patient, to clean the affected parts, to remove any loose membrane, to remove causes of products of decomposition, and to help in removing the films after the symptoms have disappeared. Few doubt
The value and necessity of antiseptics as far as the cleansing is concerned, but it is quite in the nature of the prolonged use of antiseptics that much good is produced in the persistence or disappearance of the bacilli.

I give a list next table the results of the use of various antiseptics. It is usually recommended that if one antiseptic seems to have no effect on the bacilli, to change to another, and in all prolonged cases this has been done. It will be seen that no one antiseptic seems to be much better than the others, as far as removing bacilli is concerned. It had also been tried in a number of cases to use the antiseptic only with formal saline. This was after the disappearance of the membrane, but towards the end of some of the difficult cases suddenly became far more frequent. In the use of antiseptics fever was observed later on by an enlargement of the tongue and often also by an increase in the number of bacilli, as shown by culture.

In the value of antiseptics Graham Smith comes to much the same conclusion.
Various methods were tried, but while good
results were got in some cases, others the
antiseptics proved of no help. Other
practitioners have found the same.

It is noted that cephalic bacteria
may sometimes be noticed if a walk is taken
in poor after an antiseptic has been applied.
I have taken walks at all times after local
 treatment, forgetting or resulting—sometimes immediately after,
or in few cases have the bacteria
been about in next day’s culture. Yet their
presence, the lack of animals, might be
explained is likely of that in the view that
I am inclined to take in regards antiseptic
that while they do not help much in re-
 moving bacteria from the tissue, they leave
them unchanged.
Table XV

**Effect of Antiseptics on P. vivax**

<table>
<thead>
<tr>
<th>Antiseptic</th>
<th>Number of Cases</th>
<th>Average Day of Eruption</th>
<th>Positive in Abnormal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Borax and Toluidine</td>
<td>125</td>
<td>17</td>
<td>6</td>
</tr>
<tr>
<td>Carbolic 5% + Phenol</td>
<td>40</td>
<td>21.5</td>
<td>2</td>
</tr>
<tr>
<td>Carbolic, 5% Linnic 11.000</td>
<td>7</td>
<td>29</td>
<td>3</td>
</tr>
<tr>
<td>Lysolyn 5%</td>
<td>26</td>
<td>16.2</td>
<td>2</td>
</tr>
<tr>
<td>Lysolyn + Carbolic</td>
<td>9</td>
<td>22.4</td>
<td>1</td>
</tr>
<tr>
<td>Lysolyn + Chloric hystic</td>
<td>5</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>5% Carbolic + Lysolyn</td>
<td>11</td>
<td>21.8</td>
<td>2</td>
</tr>
<tr>
<td>Lysolyn + Ovad</td>
<td>4</td>
<td>22.3</td>
<td>2</td>
</tr>
<tr>
<td>Ovad 1:1000</td>
<td>5</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Chlorine 1:1200</td>
<td>4</td>
<td>20</td>
<td>2</td>
</tr>
<tr>
<td>Lysolyn, Carbolic, Chloric</td>
<td>3</td>
<td>39</td>
<td>5</td>
</tr>
<tr>
<td>Lysolyn, Phenol, Carbolic</td>
<td>4</td>
<td>43</td>
<td>2</td>
</tr>
<tr>
<td>Lysolyn, Phenol, Toluidine</td>
<td>2</td>
<td>17</td>
<td></td>
</tr>
</tbody>
</table>
Nasal Diphtheria

Several of the 300 cases had nasal as well as faucial diphtheria. Repeated cultures were better from the nose, but the results, as far as presence of the bacilli were much the same in both cases, of course not make special tabulation for the nasal cases. A few of the patients whose throats were positive at the first examination also had bacilli in the nose.

Diphtheria & Scarlet Fever.

15 cases are included in the 300. Some were admitted with the two diseases, others developed one or the other after admission, but in majority case was the disease of peritonsillar phlegmon which different from the other cases of the series.

Reference will be made again to nasal and Diphtheria-Scarlet fever under Bacteriology.
Conclusions.

1. Most cases of Diphtheria are free from bacilli about three weeks from the beginning of the illness, and can be discharged with safety three weeks after the membrane disappears.

2. While it is good to have three consecutive negative bacteriological examinations before discharging Diphtheria patients, this difficulty in carrying this out makes two consecutive negative results the most practical standard to adopt.

3. While every endeavour should be made to fit all cases free from bacilli before discharge, special exceptions must always be made.

4. The fact that return cases of Diphtheria are very rare may be due to (a) either diminished virulence of the bacilli in discharged patients, (b) or to some immunity possessed by them who have to come closest in contact with such patients after their discharge.

5. The duration of persistence is not influenced by sex, nor to any extent
by the amount of antitoxin given, or by the antitoxin used; but the latter seems to influence the disease.

6. The duration of persistence is slightly shortened by season—less in summer than in winter, by increased age, by the early date of illness.

7. Persistence is slightly increased when the lungs are affected.

The chief cause of prolonged persistence is the heart which is enlarged in convalescence.

Interpreted by the heart in convalescence?
Part II

The Bacteriology of the Cases

Investigated.
The first thing necessary to make the results of a series of observations of value is uniformity. This was secured by the observations being made always by the same person (myself), at the same time each day, and by using material prepared always in the same way.

In healing the breaks from the thrush, the third break was always used. Cotton wool was twisted around short metal rods, then was put into clean lead tubes. The tubes plugged with cotton wool and the whole placed in a hot air oven at 150° C for an hour. In healing the breaks, care was taken that no part was touched by the lead, except the part affected; as long as membrane was present, that was swelled: when membrane had disappeared, special attention was paid to the tracts, if enlarged or ragged, thus one a movement of the pieces of the fencer, tracts, or back of pharynx was taken. When the mouth, placed well back in the tongue, there was little chance of touching that organ, except perhaps in the first one or two breaks taken.
from children; but patients soon became accustomed to the examination.

The fluids from the roots were taken each day about 2 p.m. Blood serum tubes were then inoculated by putting the fluids freshly over the surface of the plate in the incubator at 37°C till 9 a.m. on the following day, thus giving 18 hours incubation.

For the pyolysin from the fluids were made in tubes by means of sterilized platinum needles. The films were stained by a modification of Koser's stain and examined by a 4½ in. oil immersion objective. The platinum needle was drawn freely over the whole surface where growth appeared. If this gave a negative result, several examinations were made from different parts of the surface and from different colonies, before the negative result was finally adopted. The cultures were examined each day in any order. The results were entered on a slip of paper and then entered in a book under each name. In this way there was no chance of the knowledge of the last increases in examination results influencing the next report.
The blood-serum tubes were made according to Loeffler's formula: 3 parts of serum got from bullock's blood was added with 1 part of 1% glucose bouillon. Small quantities of this were poured into standard test tubes; these were placed in a planting position in a renn conglutator, and heated up to 95°C. After the tubes were finally conglutated, they were placed in an up-right position in wire baskets, and sterilised by steam three times for an hour each time. I found this method much more satisfactory and certain than the method of slow sterilisation followed by inspiration; and when 20 to 30 tubes are used each day, there is no difficulty in making fresh quantities of serum tubes each week.

Kleiner's stain was used to detect the presence of the Diphtheria bacilli. Many writers claim that Kleiner's stain is unreliable: they say that it does not always give the characteristic plan staining with some true diphtheria bacilli, and that in other cases characteristic staining is got with certain organisms other than the true diphtheria bacilli.
new adopted by Eyre and Hastman in their work on "Ophthalmic Organisms in the insane."

Becton, Carver and Pake (British Ind. Med. 1891) drew attention to the value of Heuser's method. Graham Smith and Cobett both used it. Graham Smith says "nearly all organisms considered on our official forms to be diphtheria, stained well with Heuser's stain or Cobett's modification of it." He says that other bodies were found in nearly all diphtheria bacilli, whereas Hoffmann's bacillus and "H" bacilli were not. This was the result of the examination of over 2,000 cultures.

Andreas too recommends Heuser's stain: he says it is to be preferred to other stains for diagnostic purposes; and while admitting that other organisms may give a somewhat similar reaction, he says "it is very real help in the differential diagnosis between the diphtheria bacillus and some of its nearest allies.

Schleiden in his investigation on the Pseudo bacillus says that Heuser's stain is one of the most important means of di-
Differentiating the diphtheria bacillus from the pseudo-bacillus. In young gram cultures, the so-called Ernst-Heidenrich polar bodies are regularly seen in diphtheria bacilli, but in the pseudo-bacillus, only in old cultures.

Some who have little confidence in Heidenrich's stain prefer to use thioflavine T dye, alone, or along with Heidenrich's stain, paying more attention to the thioflavine T dye results. It is generally admitted, however, that if diphtheria is to be diagnosed on morphological grounds, the results of the Heidenrich's staining are 50% more valuable than when any other stain is employed.

Provided that Loeffler's blood serum is used, that the culture is about 18 hours old, and that the stain is applied for a few seconds, as recommended by Heidenrich, and not for prolonged times, up to a minute or longer. Many who have condemned Heidenrich's stain have allowed me or anyone of these conditions.

Modification of Heidenrich's Stain.

In the beginning of this series of examination, all films from cultures were stained both by Heidenrich's stain, and also by Loeffler's
alkaline methylene blue, and the results fit were almost very clear in the same. I found a difficulty, however, in detecting Diptheria bacilli by Duriez's method, when the few bacilli were present, owing to the faint color of the bodies of the rods when either Brilliant Green or Verovin was used as the counter stain.

After experimenting with various stains I found a counter stain which gave excellent results, made the detection of one or two bacilli easy, and at the same time stained any other other organisms present - bacilli, Hymann's bacillus, Cocci, Diplococci &c. &c. so that they could easily be recognised. The acid - methylene blue of Duriez's formula has proved in this film - which had not been exposed to any heat - the best immediately dried off, & the film dried on blotting paper. First the counter stain was applied for the same time & dried in the same way, & the film was ready for examination.

The counter stain is Picro - Erythrosine. I had got this from the Edinburgh University Pathology Laboratories for staining.
A. Diphtheria bacilli from horse virus culture 18 hours old. Stained by Loeffler's methylene blue.

B. Diphtheria bacilli from same culture stained by a modification of Mucic acid stain.

Note: Other bodies well marked. Bodies of notes well defined.
Sectin. It is made as follows:

1% watery solution of Picric Acid
1% " " of Strychnine

Mix equal parts of the mixture and sufficient Sodium Carbonate to form a slight deposit. Filter before use.

The accompanying photographs will show how well the proper staining is brought out and how also the bodies of the bacilli fall in a faint amount of stain. In addition the pink color given by the strychnine enables the dark blue polar bodies to be easily detected.

The method of drying immediately with blotting paper, I learned at the Hygiene Institute, Hamburg. It makes the process simpler than when the film is washed with water after each stain is applied; the colors are also deeper, while the film is as clear as a washed film. Its heat should be applied to the films.

I have several times found the variety of Spheniaceae bacillae, Call the "Shorter Variety," but careful examination has always shown also some good polar stained rods. In these films when Schaefer's stain
I proved as diphtheric bacilli, any rods that were present could not with any other stain have been admitted as diphtheric rods.

In preparing films I found that knowing conditions, that a perfect emulsion is fit when a dropful of the proto is mixed with water, if the proto be as of staphylococcus bacilli, while if bone diphtheric bacilli be present, the emulsion is not fit for. If the proto be streptococcus, the emulsion is fit, if staphylococcus be present in quantity, a fair emulsion is formed.

I have noticed also when staining the platinum needle is the frame, after preparing a film from a firm proto, that a cracking sound is produced on warming, if the proto plate attached to the needle, contain a fair quantity of diphtheric bacilli. I have found this to constant, that I use in it as the first simple indication as to the presence of diphtheric bacilli, of more value than the appearance of the colonies. Another simple indication is the appearance of the film after staining: if no or very few, diphtheric bacilli be present, the film is of a pure color from theLogothermic.
while if many polar-stained bodies be present, it has a purple colour.

Classification Adopted.

In order to record with ease the results of the different examinations, I adopted Wentworth Classification of epithelial bacilli into 3 groups: (1) granules, beaded, or polar stained rods (2) banded rods (3) club or wavy stained bacilli. These again are subdivided into types according to their size:

Group A, involuted forms, A1 large, A2 solid.

Group C, the long bacillus C granules, C1 banded, C2 solid.

Group D, the short bacillus D granules, D1 banded, D2 solid.

X 2500
The D² type of Westrook is the form which
seems most to belong in its similarity to Heffmann's
bacillus. It is a bacillus with the opposite
extremities flattened & thickened, while the
distal ends are pointed. This description
applies almost equally to Heffmann's bacillus
except that in Heffmann's bacillus the distal
ends are always blunt & the beaded of
the bacillus usually arise, in proportion to the
length. It has an unstained part between
the two opposed members of the pair, but it
is not known whether this is an actual space
between the two bacilli or an unstained
part of one bacillus. Westrook found this
D² variety to be the bacilli as present in a
very severe outbreak of Diphtheria. Cobett &
Speiser of Vienna also found it. I
have found it occasionally, but these were
always on the same film some rods of the
C & D type, and often also found Heffmann
bacilli.

As regards Heffmann's bacillus it will
be seen from the above that it is a short
wedge-shaped rod, firmly arranged in
pairs with the bacini opposite: of the
distal ends flattened. The rods stained
Hermann's Bacillus

A. From blood from culture about 18 hours old stained by Leeffler's Fastazone Blue.

B. From same culture stained by the modification of Heiser's stain.
uniformly. In old cultures, motility sooner or later may be lost. In young, fresh cultures, they do not give the so-called 'stormy' locomotion, while young diphtheria bacilli nearly always do. Experience from cultures enables me to detect the Hofmann bacillus. The accompanying photographs show the Hofmann bacillus as stained by Ehrlich's Methylen Blue, also they are nonmotile and of a more fuscous stain. I shall refer later on to the presence of Hofmann's bacilli in cultures, but the view I have adopted, I think which is now generally held, is that they have no causal relation to diphtheria, while they are constantly present in the throats and noses of healthy people, especially of the poor classes.

General results of the Bacteriological Examination.

The form of diphtheria bacilli found in this series of examinations was the familiar, beaded or funnel-shaped kind. Indeed, this is the form of diphtheria bacillus almost always got in Loeffler's blood-agar, after about 15 hours growth.
Westbrook mentions that this type is usually the most prominent at the onset of the disease; that it may be wholly or in part to the barred or dotted type before the disappearance of the alphabetical organisms, and that dotted types may sometimes be replaced by granular types when convalescence is established and just before the throat becomes clean. But I have seldom found the barred type. The dotted type I have often found, I have frequently as convalescence proceeded, but always with some fusiform or rounded rods. The change I have nearly always noticed is, that the rod type C, that is the long form, is gradually replaced by the type D, the short rod, before the throat becomes clean. A short thick red rod, of the same type as D, but with a fusiform staining, is also found there. It seldom or never appears after the other types have disappeared. I found two that, Cottrell noticed, that one ended often recognise, to measure cultures from the same throat, the same kinds of rods of other organisms, Hofmann's bacillus. I have found this at all
stages of the disease. In the first examination it has often appeared that in cases of almost every type - fatal, severe or mild - as a rule however it is more frequent as convalescence proceeds. It is much more common in fatal cases. Sometimes it was a little difficult to dis-tinguish it from typhus, as it appeared occasionally something like polar staining at one end. In these cases which were never negative, I have rarely found it, so I take its appearance like that of Staphylococci, as a nidus in which the untreated is likely to be born free from diphtheria bacilli.

*Staphylococci.*

There were found very frequently, more frequently than Streptococci. Woodhead says that the presence of Staphylococci always makes the prognosis more serious than if Streptococci are present. I have found this the case, as will be seen from the records of the examination of some fatal cases which occurred when these examinations have been made. Goodall, while denying that Streptococci made the prognosis serious, says
that the worst cases of diphtheria are as a rule those in which almost pure cultures are got. I have found this the case also, but I have also found at times almost pure cultures from cases of "bacilli predisposed diphtheria", that is from the throats of people who have not a symptom of diphtheria. In cases with *Staphylococci* present, I found that the bacilli present much longer than in cases where *Streptococci* are found early. Examples of this are given later on. I have ascertained frequently that when *Staphylococci* are present in abundance, the diphtheria bacilli are often very thin. I again state that the *Staphylococci* from nasal cases often stain very faintly. *Streptococci*.

It is still asserted by some that the presence of *Streptococci* along with diphtheria bacilli is most unfavorable. Martin, Rump, and many American writers take this view. Others says that the organisms most commonly associated with diphtheria bacilli are *Streptococci*, that they are most important as they...
usually are the cause of suppuration in
the lymph glands and of broncho pneumonia.
Andrews does not think the presence of
Streptococci influences the prognosis in
Diphtheria. He says they are the organisms
most abundant in the normal mouth
Secretions, and it would be strange if
they were not frequently found in cultures
from diphtheria throats. He adds, they are
often the cause of secondary septic com-
pliations, such as suppurring glands,
but still it must be remembered that
the diphtheria bacilli are often seen in
suppurating glands and also in the lungs
after death. I have occasionally seen it
in the pus from cervical glands and repeatedly
from the lungs after death.
I have not often found Strepto-
cocci in the early culture from throats,
but in those cases where I did find
them, the duration of persistence of the
diphtheria bacilli was short. As con-
sequences proceeded, I saw diphtheria
bacilli disappeared, and streptococci were
always found. I am inclined
therefore to agree with Andrews.
That in Staphylococci an presence is every healthy mouth, they tended to form frequently in cultures from diphtheria throat, especially as convalescence proceeded.

I have always distinguished between long, strong Staphylococci and what I call short, feathery Staphylococci, about 6 to 8 cocci in this chain. Observing when Staphylococci were abundant, as these often appeared like the outside rows of a bunch of Staphylococci which had become separate.

I have noted in records of cases when Staphylococci appeared early, 2 cases which show that Staphylococci always appeared as diphtheria bacilli disappeared, that is, as the throat returned to a healthy condition.

Diphtheria were frequently present, some of them being ptomaine cocci, as proved by inoculation. Often the diphtheria were in chains. Length and width often appeared. Various rods also were present in any way like diphtheria rods: long thin family shamed. These will form rods into square ends; sometimes arranged in chains; 4 usually as Cm-
Reference proceeded, that there rotate
wood bothis appeared frequently. In
many cases they seemed to be young
Hoffmann bacilli: if the latter were incubat-
ed for another 24 hours, the next examina-
tion showed as a rule good Hoffmann bacilli.
Sometimes they were young diphtheria bacilli,
but in those cases, good roths of the type C
were also present.

Many of what seemed large staphy-
docci and diphtheria both in staining of
the same nature as the polar staining of
diphtheria coels: these were often very
abundant.

Nasal Cases.
The results in these cases differed
from throat cultures in this point. I
have already mentioned. Hoffmann's bacilli
were more frequently in greater abundance. The type of roth was more
often D or barren from D, more rare
often for the same of the other barren
types. Staphylococci were seldom found of
the Staphylococci present. The Staphylococci
family. I give also examples of some
reports of nasal cases.
From a mixed growth on blood serum, 15 hours old. Stained by the modification of Jenner's staining.

Iphithiria rods, with plan staining, are well picked out. While all organisms present are as stained by the erythromic as to be distinctly recognised.
Scarlet-Diphtheria Cases, or Cases of Scarlet Fever which later developed Diphtheria, differed little in bacteriology from ordinary Cases of Diphtheria. Strep.-cocci were not much more abundant. Indeed in the examination of many suspicion-thesis of Scarlet Fever patients, I have found Staphylococci as frequently, or more so, than Strep.-cocci.

Virulence of the Bacilli

Not having a licence which would enable me to carry out experiments to prove the virulence of the bacilli found, I am indebted to Dr. Beartie, of the University Pathology Department, for carrying out this part of the work for me.

Here are listed cultures taken from 5 consecutive patients, whose diphtheria bacilli were more abundant: also a culture of almost pure Staphylococci and as controls, cultures taken from five cases just admitted to hospital. In framing are the details of the different cases.
Case 1.

G.P.  On March 4th, the 37th day of illness, the culture found was of the type C.C.D. along with some cocci. This had been the previous negative result. A rabbit was inoculated from this culture on March 5th. The culture two days later was C.C.D. and a few Staphylococcus 9 diphtheria. 4 7 from this the rabbit was again inoculated on March 7th. The rabbit died on March 9th.

Causes of death. Septic phlegmonous pericarditis. Pneumococci found in the blood. No trace of diphtheria at site of inoculation nor anywhere else.

In days later the patient was discharged with two consecutive negative results.

Case 2.

M.B.  On March 16th, the 32nd day of illness the culture was C.C.D and Staphylococcus. There had never been a negative result since admission. The tonsils were very much enlarged & irregular. On March 5th a rabbit was inoculated & again on March 7th. The rabbit died on March 10th.
Case 3

D.B. On March 4th, the 33rd day of illness, the culture was C.D., some that were Gram positive. In negative results had been got. A rabbit was inoculated on March 5th. The result was fat. Rabbit quite healthy 10 days later.

Case 4

M.M.D. On March 4th, the 36th day of illness, the culture was C.D., Gram positive. In negative results had been got since admission. On March 5th a rabbit was inoculated. The result 10 days later: rabbit alive & healthy.

Case 5

H.S. On March 10th, the 21st day of illness, the culture was C.D. & some Staph. In negative result since admission. Tongue enlarged & irregular. Rabbit inoculated March 11. The result: rabbit healthy 10 days later.
Case 6. To prove Hofmann's bacillus.

J. B. on March 12th, the 14th day of illness, the culture gave almost pure Hofmann bacilli. A rabbit was inoculated on March 12th; as result: died healthy 65 days later.

Case 7. To prove the nature of a fresh case.

J. G. admitted to hospital March 16th. On third day the culture was C & D Typhoid. Few days later, March 21st, a rabbit was inoculated from this culture & died March 25th. A second pig inoculated from the same culture on March 23rd died in 45 hours.

In both cases death was caused by the Typhoid bacillus.

Case 8. To prove the virulence of a fresh case.

L. J. admitted to hospital March 17th. Culture was C & D Typhoid. Few days later a rabbit was inoculated from this; it died 4 days after.

Death caused by Typhoid bacillus.
In 5 cases thus, the bacilli found in convalescent patients who had been from a negative result were found non-virulent to animals. The non-virulence of what is recognized as Hyman's Bacillus was also proved, while the bacilli from two new cases of Diphtheria proved fatal to animals.

It may be said of the first 5 cases that the antiseptic treatment to which they were subjected from the date of their admission to hospital—a period of more than 4 weeks in most of the cases—might account for the absence of virulence. Some of the cases had had no antiseptic treatment the day on which the throat was swabbed, others had been treated, but several hours before the swab was taken. If, however, this loss of virulence were due to the use of antiseptics, this is a strong argument in favour of antiseptics, and a possible explanation of the fact that no similar cases have been known at the hospital for years.

Swabs were taken from the new cases—Cases 7 & 8—immediately on admission to hospital, so that they had no
Antiseptic treatment

The experiments with Heppenstall's bacillus was done simply to confirm the morphological diagnosis of that bacillus.

These investigators have proved the presence of bacilli found in many of their convalescent cases. Perhaps antiseptic treatment had not been too long nor too vigorously carried out. At any rate their experiments proved for these cases that there was no evidence of virulence and no reason why these patients should not be discharged from hospital.
Such results or direct examinations.

These were examined in all cases. After the faint line is incriminated, a smear is made on a slide from the streak; this is stained with Levaditi's Hematoxylin Blue and examined. In almost 70% of these cases, which in culture give pure diphtheria rods, the threads also give distinct evidence of diphtheria. Most of such cases are as a rule marked clinical cases. But in abnormal cases much help is frequently got from the direct examination, especially as regards anthrax.

If the threads be good, anthrax may be given at once without waiting for the culture result, or a large dose may be given at once instead of a small dose, from an aseptically taken culture and told the culture result is known.

Often good pure diphtheria rods are got in the streak slide as seen in the accompanying photograph. At other times good pure curved rods. While any rods, like diphtheria, in a few days begin to form large colonies, are likely to form real diphtheria rods.
Conclusions.

1. For the morphological diagnosis of Diphtheria, Grasser's stain gives the most reliable results.
2. The polar stained, or beaded-rod, is the rod nearly always get in blood serum after 18 hours growth.
3. As bacilli disappear from the throat, the long from C. Of diphtheria bacilli, is usually replaced by the short from D.
4. Hoffman's bacilli is formed in all types of cases, and at all times; but is more frequent during convalescence.
5. In cases with Atrophy cocci present, the diphtheria bacilli persisted longest.
6. When Staphylococci were found early, Staphylococci usually disappeared quickly. Staphylococci were found in nearly every case after the throat was free from diphtheria bacilli.
Part III

Records of the repeated examinations of several cases.
M.C.  after an negative

300° Celsius, 7 days.  6000 unit anti-Brucella.    300° Celsius, 7 days.  6000 unit anti-Brucella.

90° Celsius, 2 days.  6000 unit anti-Brucella.    90° Celsius, 2 days.  6000 unit anti-Brucella.

Dec. 15  PC.  culture of food 9  fruit water.  diplo.  ever.  
  16 culture  C.C.D.  Pint water, Paeloh.  everet.  +  
  15 culture  mottly everet.  negative  
  20 culture  Step.  diplo.  negative  
  24 culture  Step.  diplo.  negative  
  20 culture  Step.  diplo.  Pint water, Step.  diplo.  negative

Jan. 5  culture  C.D.  everet.  Pint water, Step.  diplo.  negative  
  9 culture  D.  everet.  Pint water, Step.  diplo.  negative  
  10 culture  D.  everet.  Step.  everet.  +  
  12 culture  Pint water, everet.  Step.  everet.  everet.  diplo.  negative
Feb 20. Sore, good diet, plant no. 926. Apple: +


14. Culture. CD: Plant rot. 1/4 Staph. Apple: +


19. Culture. CD normal rot. 1/4 Staph: +


23. Culture. CD: Staph. Staph to cords: +


27. Culture. CD: Staph. Plants: +


30. Culture. CD: Plant rot. 1/4 Staph. Apple: +

31. Culture. CD: few. Staph. Cords: +

April 2. Culture. Staph: Staph: Apple: Negative
Dr. C.

1 negative, after 4 negative

Small patch on right temple, present on left. 6000 units actinomyces. Treated at home. No convulsions.

Dec. 15

Swab - Clusters of first 3 red, diplo. cocci.

- 16 Culture: C.D. Stout rod. Staph. - negative
- 15 Culture: mostly cocci, negative
- 20 Culture: Staph. diplo. negative
- 24 Culture: Staph. diplo. negative
- 30 Culture: Staph. diplo. Plant - negative

Jan. 5

Culture: C.D. few. Stout rod. Staph. - negative

- 9 Culture: D. few. Staph. - negative
- 10 Culture: D. few. Staph. - negative

12 Culture: Staph. diplo. - negative

Note: diplo. negative
Case 22

Tonsil reguminal, pharyngitis, patched. 1500 units.
Local treatment 5% Carbolic

Dec. 31 Susc. good from stanned nod., clumping,
one short prot. diplo. cerei.

Jan. 1 Culture C D short prot. staph. long stalks +
6 Culture C D few, short rods. H. G. Staph. stalks +
9 Culture C D Staph. +
12 Culture C D, Staph. colonies. diplos +
15 Culture C D few. H. G. Staph. - +
17 Culture D few, short rods. H. G. Staph. diplos +
20 Culture Staph. diplos. Plant Staph. negative
24 Culture (short rods. H. G. Staph. negative
After two consecutive negative.

Both times, effected, under measurably 5.000 units, inoculated 15 days, done on the 2nd day, with sanguine air in cotton in camerae. Blood present. Carbohydrates & proteins.

Dec 12: Swab, first division of 10%, first short curved 10%. Staphyloc. diploc.

13 Culture C. D. Staph. +

16 Culture C. D. thin pointed rods (shades) Staph. +

20 Culture C. D. few D2 short rods, Staph. Staph. +

28 Culture C. D. all thin, Staph. Staph. +

57 Culture C. rosy C2, some D. Staph. +


Jan 5 Culture C. D. few, Staph. Short Staph. +

9 Culture Short rods. Staph. rods, Staph. negative
Both tonsils enlarged & covered with membrane. wound self-healed. 5,000 units antitoxin. Both tonsils enlarged in convalescence. Lymphoma 75% Carbolic

Feb 13 Swab v/s. pleuric studded r/o in chest, chest 3
Janit node, 7 mm indurated r/o. Staph. diplo.
14 Culture E.D. many C. Y. Plant nodes. Coeci +
17 Culture E.D. faint thick node. Staph. Plant Wrights +
20 Culture Staph. Strept. staph. reacts. Infective
23 Culture Staph. diplo. let react. Infective
27 Culture Staph. diplo. let react. Infective
Mark 4 Culture E.D. Plant node. Staph. diplo. +
7 Culture Staph. Strept. staph. reacts. Infective
10 Culture Staph. staph. reacting. Strept. infective
14 Culture Staph. Staph. diplo. Infective

Discharged.
Early H. G. Horse Cerebrospinal Infection

Both hands & wounds patched: 1,000 units 1st day, 2,000 units 2nd day.

Booysands, Todmorden

Dec. 16 Swab. 3 mm. foul, partial, framed patch. Smudged with
- long faint, thick, delicate, Staple.
  - 17 culture CCID plant roots. Hg. Staple. +
  - 20 culture CD plant roots. Hg. Liver. +
  - 29 culture Plant roots. Hg. Staple. Negative
  - 27 culture roots. Hg. Negative
  - 30 culture CCID Staple. roots +

Jan. 2 Culture. Plant roots Hg. Staple. deep negative
  - 6 culture Staple. Plant roots. write. Negative
  - 8 culture a few plant roots. Staple. Plant.

Staple. Negative
J.W. & conserv. negatives

Right tonsil enlarged & covered with membranes. 2000 units
administration first day, 5000 units second day. Tonsil enlarged
in conclusion. Local treatment — Hopfendie and
Tobol mixture.

Feb 11: Swab: Some film stained nod, long threads in clumps,

Some Paut. rod. Staph.

12 Culture  C.C.D  Staph.  +

16 Culture  C.C.D  Paut. rod.  Staph. diplo. cocci  +

19 Culture  C.C.D  Paut. thuf. rod.  Staph. diplo.  +


26 Culture  C.D  Paut. rod.  H.G. Staph.  +

Mark 2 Culture  C.C.D  Paut. rod.  Some Staph.  +

6 Culture  H.G. rods.  Staph. Paut. Stret. diplo. negative

9 Culture  Paut. rod.  Staph. Paut. Stret. diplo. negative

44 Culture  Staph. Stret. rods diplo. negative

20 Culture  Stret. Paut. rods. negative

Discharged Home.
W.C.

Four consecutive negatives.

Both trunks enlarged & covered: 4,000 units 185 day, 2,000 units second day. Local treatment, lymph con.


22 Culture CD, few Coeei +

24 Culture C, mostly D. Petrif. Petrif. Coeei +


March 5 Culture D. 19th. Petrif. Staph. +

6 Culture Staph. Staph. Negative


17 Culture Good short note. Petrif. Staph. Negative

Mar. 16

Two consecutive negatives.

Fulcheral patch on both trunks. 1500 units. Trunk.

Patches scattered & irregular in endocardium. Bronsonite, March 22.


14 Culture CD, many Short note. Petrif. Staph. +

16 Culture C, few, many Short note. Hg, Petrif. Vitis +

20 Culture C, few, Short note. Staph. Petrif. Short Staph +

22 Culture CD few. Staph. Petrif. +

25 Culture CD Staph.


30 Culture Short Staph., Staph. Staph. Negative


March 1 Culture. C. D. Staph. +


Discharged.
Molds enlarged, ragged, typical membrane. 6000 units antibiotic. Molds large & irregular in convalescent.

B. pyocyaneus, T. cutaneum, C. albicans.


- 25 Culture: C. c per C. per D +
- 25 Culture: C. c per D Staph. +
- 30 Culture: C. c per D Staph. Mint Staph +

Jan 4: Culture:

- 8 Culture: Staph. Pyöura - weak, negative
- 11 Culture: C. per Mint rod. Staph. Act. rods, negative
- 15 Culture: Staph. Pyöura - Act. rods, negative
- 19 Culture: Mint rod, H. 3. Staph. - negative
- 22 Culture: Staph. elipt. Mint Pyöura - negative
K.C.

Set of consecutive negatives


Oct. 15 Read freshly ground salt. Syphilis suspected.

12 Culture blood culture broth. Staph. Strep. Positive


16 Culture C.C.D. 4 Cres.

17 Culture C.C.D. Plant rod.

18 Culture Staph. Strep. Digest. Serum: 1 chronic negative


28 Culture C.C.D. 11y. male. Digest.


Nov. 2 Culture Plant culture. Staph. Staph. Digestive negative

4 Culture Staph. Staph. Digestive negative

7 Culture Staph. Staph.

10 Culture joint blood culture. Staph. Digestive negative

13 Culture joint blood culture. Staph. Digestive negative

16 Culture joint blood culture. Staph. Digestive negative
C. B.

Present case.

Both limbs with weakness. Tongue enlarged & irregular; 4,000 units insulin. 5% Calvin & lymph. Tongue large & raw in convalescence. Paralysis about 28th day.

Jan 10 Poor food intake normally costly. Poor nutrition. Poor rest.

Staph. +/-

- 11 Culture c c D Staph. +
- 13 Culture c c D Staph. +
- 16 Culture H g. Staph. Negative
- 19 Culture H g. Staph. Alpha. Negative
- 22 Culture c c suc. C y plant nod. H g. Staph. +
- 24 Culture Mnt. nod. H g. Staph. Negative
- 29 Culture C y plant lins. nod. Staph. Alpha. Negative

- 9 Culture C c Jw. Staph. Alpha +
- 11 Culture Mnt. nod. Green Staph. Negative
- 14 Culture Mnt. nod. Staph. Alpha. Negative
- 20 Culture C c D Staph. Large alpha +
- 23 Culture C (c) Staph. Alpha +
- 26 Culture C c, C y plant Pts. Staph. +

March 1 Culture C D Mnt. nod. Staph. +
June 4

*No membrane on admission; 1500 units actinon.*

At time of admission in consideration of the treatment.

17 June: 9 a.m. Chemost. +

21 July: 10 Ford Field Chart. Staph. +

11 Culture C. D. Staph. Staph. +


March 1 Culture C. D. Hunt. Staph. +

6 Culture C. D. Staph. +

8 Culture C. D. Staph. +

10 Culture C. D. Staph. +

Large patches on both sides. Good units antibiotic. Inflamed enlarged and irregular in circumference.

Initial treatment - Propyridone, Tetracycline, Curesone.

Dec 13 found good clusters of red, long thin root, Staph. diplo-

16 culture AA few, CCD Staph. +
19 culture CCD short root. Staph. +

22 culture A few, CCD Staph. diplo +
23 culture A few, CCD short root. Staph. +
27 culture CCD Staph. diplo +
30 culture CCD short root. Staph. +

Jan 3 culture CCD short root. Staph. +
9 culture C (few, thick) Staph. Strep. cocci +
11 culture CCD few. Staph. cocci +
12 culture CCD (few & thick) short root, Staph. cocci +
13 culture CCD few, Staph. cocci +
Scarlet & Diphtheria.

18 Culture C (only 2 roths) Staph. Staphets worse +?
19 Culture C C C3 Plant roths. Staph. +
26 Culture a few Plant roths. Htg. Staph. Plant Staphets negative
28 Culture Htg. worse Staph. negative
31 Culture C D few C Plant roths. Staph. Plant Staphets +
Feb 1 Culture Staph. Plant Staphets worse negative
11 Culture Staph. Plant Staphets negative
19 Culture a few Plant Defence roths. Staph. Staphets infective
22 Culture Staph. roths. Plant Staphets infective
A. B. Strept. present

Both tubes enlarged & cured, urine also cured.

800 units antitoxin. Local treatment - bronchitis.

Thot. 3 Hydrogen Peroxide.

Oct 24 Abr. much nod. long, medium, curved +

Thot. Cess. of neph.

25 culture 30°C. 30 days. death +

27 culture Some wedge shaped. nod. Strept. positive

28 culture 30°C. No. Strept. negative

30 culture 30°C. Like. Strept. Staph. positive

Nov. 1 culture Short rod. 30°C. Strept. Staph. negative

3 culture Short rod. 30°C. Agpto. in chain. negative

6 culture Short rod. Strept. diplo. positive

8 culture curved in chain. Staph. Short Strep. Diplo. negative

11 culture Staph. Strept. Agpto. Diplo. negative

14 culture Strept. Staph. few Agpto. Diplo. negative

18 culture Short rod. Strept. Staph. curved positive

23 culture one in two C. Strept. Staph. +

25 culture Strept. Staph. Diplo. Diplo. positive

29 culture Few thick rods. Mot. in chain. 3 days.

Dec: 2 culture Staph. Strept. Agpto. Diplo. positive
Pt. noted very much swollen & cannot wear gold membrane, especially left side, under slight invasion but very recrudescent. Fine dark amateri. Local treatment: Hydrogen Peroxide gargle, Epsom salts & Tinct. Indesleasing of Benzyne CA.

Att. 24 hrs. cultures & upon staining notes. Long stain

1. 25 Culture A C C' D - Short rods, few Pus. +
2. 27 Culture C' C' D - Staphyloc. +
3. 30 Culture C' C' D - Staphyloc. +
4. 1 Culture Staphyloc. Hg. - Dyspepsia in chronic refractive
5. 2 Culture C' C' D (few) Hg. Staphyloc. +
6. 3 Culture - Short rods, Staphyloc. Pus. dyspepsia refractive
7. 6 Culture Staphyloc. +
8. 5 Culture good Staphyloc. Pus. dyspepsia refractive
9. 14 Culture Staphyloc. - Well, dyspepsia chronic, refractive
10. 18 Culture Staphyloc. - Pus. dyspepsia refractive
11. 23 Culture Staphyloc. - Pus. dyspepsia refractive
12. 30 Culture Staphyloc. - Few, dyspepsia refractive
J. W.  Sept 30. present.

Empty empyema treated: labour continued. Small patches of
membrane on both sides. Fetus: Premature.

Thursday.


- 14 Culture: Co. D. Staph. Strept. diplo +
- 16 Culture: Staph. Strept. diplo negative
- 18 Culture: Staph. Pust. Strept. diplo negative
- 21 Culture: Joint food. Staph. Pust. Pust. diplo negative
- 25 Culture: Staph. Pust. Pust. diplo negative

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<th>Date</th>
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<td>. . 27 Cultures</td>
<td>CD Plant thumb. Staph. Apltes +</td>
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<td>March 6 Cultures</td>
<td>CD Stin prot. 14F. Cories +</td>
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<td>. . 19 Cultures</td>
<td>C. Mott. D. Staph. Apltes +</td>
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<td>. . 20 Cultures</td>
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<tr>
<td>April 2 Cultures</td>
<td>Jew Stöhrmann Staph. + Negative</td>
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A.C.

Fenced 9 hard Repellence.

5 months old.

Never negative.

Jan 6. Two ch. mouse, many, curved nose, long thin nose, thick.

More long thin, also thick nose, thick, thick.

7 culture sheet. C. burrunt, few C.D. Other facts +

Some C.D. High words +

10 culture sheet. C.D fine, Staph. Staph. Words +

More C.C.D. Staph. Words +

13 culture sheet. C.D fine, Hunt mite. High. Hunt Mite +

More C.C.O. Hunt mite. Corei. Hunt Mite +


More C.C.D. Hunt mite. Corei +


More C.C.C. Staph.


Fat al Carra.

W.T.

Dec 4 Swab: some root, some thread, some thread, some thread, some thread, some thread, some thread, some thread, some thread.

Dec 5 culture + C'E'D, many short roots. Hufi? +

R.D.

Dec 30 Swab: some root, some thread, some thread, some thread, some thread, some thread, some thread, some thread, some thread.

31 Culture: C'E'D, short roots. Hufi. few Hufi +

C.T.

Dec 31 Swab: some root, some thread, some thread, some thread, some thread, some thread, some thread, some thread, some thread.

1 Culture: C'E'D, short roots +

2 Culture (more) C'E'D, short thread roots +
C. & E.

Fatal Case.

Uterus is covered with membranes, & enlarged.
5000 units 1st day, 10,000 units 2nd day. Local
Treatment: Desenex, Toulon.

culture

Oct. 9  C." D' large cocc. diplo. Staph. joint not +
10  C." D' Staph. diplo. +
11  C." Staph. +
12  D' jar Staph. +
13  C." Staph. large diplo. +
14  C." D' joint not. Staph. diplo. +
16  C." C." Cocc. diplo. +
17  C." C." joint not. joint +

Chili

G. R.

Fatal Case.

15 Culture A. jun, C." D' Staph +

G. F.

Dec. 16 Parab. 23 Clinton pole steam nod, joint thick
not. Staph.?+
17 Culture C." Cocc, Staph. +
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