A study of 100 consecutive cases of Acute Lobar Pneumonia with special reference to the use of Leucocytic Extract in the Treatment.

by

G. F. Fismer, M.B., Ch.B., F.R.C.S. (Edin.)

m. j. 1913.
Introduction

The material of this Thesis has been drawn from the notes of 100 consecutive cases of Acute Lobar Pneumonia, treated in the Wards of Dr. Lloyd Roberts at the Royal Southern Hospital, Liverpool, during a period of about three years. Many of these cases came under my observation, and were treated by me, during the time that I was House Physician to the Hospital.

I have made a careful study of the cases, and desire also to present notes of some of the more interesting ones; in considering the Treatment, I shall refer specially to the value of Leucocytic Extract in this disease.
In examining various points in the Aetiology, in order to avoid repetition, I have at the same time analysed and tabulated the number of deaths.

<table>
<thead>
<tr>
<th>Sex</th>
<th>Of the 100 cases</th>
<th>deaths</th>
<th>Total deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>83</td>
<td>23</td>
<td>28%</td>
</tr>
<tr>
<td>Females</td>
<td>17</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

Statistics show that the number of males affected, is on an average, twice that of females (Taylor). The very high percentage of males shown above, is accounted for, in part at least, by the proximity of the Hospital to the docks, in consequence of which it receives a large number of patients, almost exclusively males, from ships arriving in the port.

The total mortality (28%) is rather high, but is well understood.
when one analyses the number of deaths with reference to occupation (vide infra). Another factor perhaps, is the high percentage of West African negroes and lascars treated, (20%) and accounting for 6 deaths - i.e. a mortality of 30%. Osler found that the death rate among the negroes in the United States was 30%, which is about 5% higher than that among the white population of the same country.

### Occupation

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Number of Cases</th>
<th>Deaths</th>
<th>Mortality %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seamen</td>
<td>12</td>
<td>5</td>
<td>41.7</td>
</tr>
<tr>
<td>Ships' firemen</td>
<td>21</td>
<td>8</td>
<td>38.1</td>
</tr>
<tr>
<td>Dock labourers</td>
<td>11</td>
<td>3</td>
<td>27.3</td>
</tr>
<tr>
<td>Children at School</td>
<td>10</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other occupations</td>
<td>46</td>
<td>12</td>
<td>26.1</td>
</tr>
</tbody>
</table>

Classifying this table in another way we note:—

<table>
<thead>
<tr>
<th>Category</th>
<th>Cases</th>
<th>Deaths</th>
<th>Mortality %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases from ships arriving in port</td>
<td>33</td>
<td>13</td>
<td>39.1</td>
</tr>
<tr>
<td>Other cases</td>
<td>67</td>
<td>15</td>
<td>22.4</td>
</tr>
</tbody>
</table>
The large number of firemen (21%) is a noteworthy feature, and illustrates well the importance of rapid changes of temperature as a predisposing cause. The exceptionally high mortality in cases from ships arriving in the port can be explained in two ways:

1. The care of, and more especially the nursing of such patients on board ship cannot possibly compare favourably with the treatment available in Hospital.

and 2. which is, in my opinion, a factor of much greater importance—namely, the transport of such cases from the boat to the Hospital, more often than not at a time when the disease is in its most dangerous stage.

**Age**

Let us now examine the ages of the male and female cases respectively. It will be noticed that the percentage of children treated is small, but that is
merely because the accommodation for
children is limited.

<table>
<thead>
<tr>
<th>Ages</th>
<th>Males</th>
<th>Deaths</th>
<th>Females</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-5</td>
<td>4</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>6-15</td>
<td>10</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>16-20</td>
<td>11</td>
<td>2</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>21-30</td>
<td>33</td>
<td>8</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>31-40</td>
<td>14</td>
<td>6</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>41-50</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>51-60</td>
<td>6</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>above 60</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>83</strong></td>
<td><strong>23</strong></td>
<td><strong>17</strong></td>
<td><strong>5</strong></td>
</tr>
</tbody>
</table>

Considering males & females together, we have:

<table>
<thead>
<tr>
<th>Ages</th>
<th>No. of Cases</th>
<th>Deaths</th>
<th>Mortality %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-5</td>
<td>6</td>
<td>1</td>
<td><strong>16.7</strong></td>
</tr>
<tr>
<td>6-15</td>
<td>13</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>16-20</td>
<td>16</td>
<td>4</td>
<td><strong>25.0</strong></td>
</tr>
<tr>
<td>21-30</td>
<td>34</td>
<td>8</td>
<td><strong>23.5</strong></td>
</tr>
<tr>
<td>31-40</td>
<td>18</td>
<td>7</td>
<td><strong>39.0</strong></td>
</tr>
<tr>
<td>41-50</td>
<td>6</td>
<td>3</td>
<td><strong>50.0</strong></td>
</tr>
<tr>
<td>above 50</td>
<td>1</td>
<td>5</td>
<td><strong>41.4</strong></td>
</tr>
<tr>
<td></td>
<td><strong>100</strong></td>
<td><strong>28</strong></td>
<td></td>
</tr>
</tbody>
</table>
Note:
1. Low mortality in children under 5.
2. No deaths in the 13 cases, 0-5-15.
3. Rapidly increasing mortality with advancing age.

Previous Attack

Three cases had had one previous attack:
   one case "  "  three "  "  5
   these 4 cases recovered.
   one case had had three previous attacks and died in the 14th.

Giving a total of five cases, which is probably an under-estimate, because in
the case of negroes and others it was often difficult to get a reliable history
regarding previous illnesses.

Trauma

For "contusional Pneumonia" to occur,
there need not necessarily be a lesion of
the lung. This fact is well brought out
in the following case. The patient, a man,
had been crushed between buffers, and
on admission, examination revealed several fractured ribs on each side. Two days later he developed double Pneumonia. Result, death. The post-mortem examination demonstrated a lesion of one lung, whereas the other had not been injured by the broken ribs.

Seasonal Incidence

To complete a three years’ total, the following table includes 108 cases.

<table>
<thead>
<tr>
<th>Month</th>
<th>No. of Cases</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan.</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Feb.</td>
<td>14</td>
<td>4</td>
</tr>
<tr>
<td>March</td>
<td>15</td>
<td>6</td>
</tr>
<tr>
<td>Apr.</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>May</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>June</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>July</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Aug.</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Sept.</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Oct.</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>Nov.</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>Dec.</td>
<td>16</td>
<td>5</td>
</tr>
</tbody>
</table>

Hence, the number of cases in the months @ October – March = 75
@ April – Sept. = 33

in (1) the mortality was 23, i.e. 30.7%.
in (2) " " " " 7, i.e. 21.2%. 
From the above table it will be seen that, not only is the incidence far greater during the Winter months, but the percentage mortality also appears to be higher in the Winter than in the Summer months.

### Localisation

<table>
<thead>
<tr>
<th></th>
<th>Cases</th>
<th>Deaths</th>
<th>Mortality%</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Right lung</td>
<td>55</td>
<td>14</td>
<td>25.5</td>
</tr>
<tr>
<td>The Left</td>
<td>32</td>
<td>9</td>
<td>28.1</td>
</tr>
<tr>
<td>Both lungs</td>
<td>13</td>
<td>5</td>
<td>38.5</td>
</tr>
</tbody>
</table>

**Note:**
1. The percentage of cases suffering from double Pneumonia is slightly higher than that recorded by W. Fox. (10%)
2. The high mortality in double affections

Of the 13 cases of double Pneumonia, there was
1. involvement of the whole of both lower lobes in 4 cases (3 deaths)
2. " both bases only in 5 cases - (no deaths)
3. " one whole lower + part of other lower lobe in 3 cases (1 death)
4. " R-lower + middle + L-lower lobes in 1 case
Note: -
1. No involvement of either upper lobe in any of these 13 cases.
2. No deaths when only a part of each lower lobe was involved.

The various parts of the lungs affected, in their order of frequency, were as follows:

<table>
<thead>
<tr>
<th>Part</th>
<th>Cases</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right lower lobe, in whole or in part</td>
<td>30</td>
<td>1</td>
</tr>
<tr>
<td>Left</td>
<td>23</td>
<td>6</td>
</tr>
<tr>
<td>Right upper</td>
<td>13</td>
<td>3</td>
</tr>
<tr>
<td>Left</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Rt. upper and Middle lobe</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Whole left lung</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>&quot; Right</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Right lower + middle lobe</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Middle lobe alone</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

The remaining 13 cases were 'double.'

Totalling the corresponding parts of the Right and Left lungs, we note:

<table>
<thead>
<tr>
<th>Involvement</th>
<th>Cases</th>
<th>Deaths</th>
<th>Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. One upper lobe</td>
<td>22</td>
<td>4</td>
<td>18.2</td>
</tr>
<tr>
<td>2. &quot; one lobe</td>
<td>56</td>
<td>14</td>
<td>25.0</td>
</tr>
<tr>
<td>3. &quot; whole lung</td>
<td>7</td>
<td>5</td>
<td>71.4</td>
</tr>
</tbody>
</table>

Note: Very high mortality in 3.
Of the total of 22 apical cases, 5 occurred in Children below the age of ten, all 5 recovered. Of the remaining 17 cases, 4 died. In children below the age of five, out of a total of 6 cases, 3 were apical.

IV  It is not my intention to attempt a full description of the Symptomatology. I have endeavoured to analyse certain of the signs and symptoms, and wish to draw attention to those results which I deem worthy of note. I shall also consider some points of interest in the Diagnosis.

The Temperature.

The temperature remained moderately high throughout the disease in cases. Deaths Mortality

\[
\begin{array}{ccc}
\text{cases} & \text{Deaths} & \text{Mortality}
\hline
59 & 8 & 13.6 \\
104.7 & 22 & 6 & 27.3
\end{array}
\]

(Table continued on next page)
The Temperature (Cont.)

<table>
<thead>
<tr>
<th>Cases</th>
<th>Deaths</th>
<th>Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>4</td>
<td>66.6%</td>
</tr>
</tbody>
</table>

Of the 9 cases which ended fatally, there was a definite history of alcoholism in two; four were over 50 years of age, and one was apparently a case of Afebrile Pneumonia. The remaining three patients, who recovered, were admitted at a late stage of the disease, one with a normal temperature, and in the case of the other two the temperature was on its way down by dyspnea. These three should perhaps not have been included in this class, as there was no record of their temperature prior to admission; however, even with them included, the percentage mortality shows how bad the prognosis is, in this "low type" of Pneumonia.
The Temperature (cont.)

Of the total of 72 cases which recovered, the Crisis (5-16 hours) occurred in 23. = 31.9%.
A protracted crisis (16-30 hrs) = 13. = 18.1%.
The temp. came down by Lysis = 31. = 43.1%.
And lastly, a Pseudo-crisis, observed to occur in = 5. = 6.9%.

In 18 of the 36 cases in which a crisis or a protracted crisis was noted, there was a post-crisis sub-normal temperature; in 9 cases there was a post-crisis rise (above 99.5°F).

Taylor gives the percentage of cases in which the temperature falls by lysis, as over 50, but statistics will naturally vary according to what one considers to be a fall by lysis, as distinguished from a fall by a protracted crisis.
The Rate of Respiration.

Osler, in his "Principles and Practice of Medicine" says "With the fall in the fever, the respirations become reduced almost to normal." The notes of my cases show that in one-half of those in which the temperature had fallen by crisis or protracted crisis, the rate of the respirations remained between 30 and 40, for a period of 12 hours or longer — in some cases for several days — and they remained above 40, for a similar period, in 6 cases out of 36.

When the temperature had fallen by lysis, the respirations kept up between 30 and 40, for 12 hours or longer in 10 cases out of 31, and above 40, in 1 case out of 31.

Hence we see that, after the temperature had fallen — whether by crisis or by lysis — the rate of Respiration in many cases continued at a considerably higher number than the normal, for varying periods.
The Pulse Rate.

In this section I have estimated in each case the maximum pulse rate, which was sustained for a period of 12 hours or longer.

<table>
<thead>
<tr>
<th>Pulse rate</th>
<th>Cases</th>
<th>Deaths</th>
<th>Mortality %</th>
</tr>
</thead>
<tbody>
<tr>
<td>not exceeding 120</td>
<td>40</td>
<td>2 x</td>
<td>5.0</td>
</tr>
<tr>
<td>120 - 130</td>
<td>22</td>
<td>5</td>
<td>27.3</td>
</tr>
<tr>
<td>130 - 140</td>
<td>19</td>
<td>10</td>
<td>52.6</td>
</tr>
<tr>
<td>above 140 in</td>
<td>19</td>
<td>11 x</td>
<td>58.0</td>
</tr>
</tbody>
</table>

- One died of Meningitis, the other case was that of a man at 75.
- The 8 recoveries were all in children (7 below 10 years of age, and one 14 years of age).
- The 11 who succumbed were all adults, hence in this last class the mortality among adults was 100%.

The local physical signs.

The physical signs of Pneumonia were quite definite on admission, in 72% of the cases.
The local physical Signs (Cont.)

group C. In ten cases, which were admitted at a more or less early stage, the physical signs of Pneumonia, or those suggestive of its probable onset, were absent on admission. In reality, the percentage of cases in which there were no local physical signs during the first day or two, or even longer, must have been considerably higher than 10, because we had no record of the early signs in the majority of the cases in group C, as most of them were admitted after the third or fourth day of the disease.

It is worthy of note that all the 10 cases in this group C, recovered; the probable reason for that result being, I should say, if not mere coincidence, the fact of having received efficient nursing at an early stage of the disease, as well as early treatment. Another very important reason is that they were not subjected to the danger of being transported to the Hospital at the time when the illness
The local physical signs (cont.)
was at its height — as happened in so
many of the other cases.
In three of these 10 cases, the
Chlorides were deficient in, or absent
from the urine. This proved a valuable
aid to the diagnosis

Group C. In the remaining 18 cases,
there were on admission, only
such early signs as are suggestive of
the probable onset of Pneumonia — e.g. a
diminution in the intensity of the breath
sounds on one or other side; the breathing
slightly harsher on one side, slightly
impaired resonance over a small area
without any abnormal auscultatory phenomena
or pleuritic friction. Some of these, in themselves,
are of course only evidence of pleurisy,
but pleurisy and Pneumonia so often co-
exist, that one is, in most cases, strongly
inclined to suspect that the case in
question is one of Pneumonia; more especially
when the above signs are considered in
conjunction with others — not in the chest
— which may be present.
Examination of the urine revealed the presence of Albumen at some stage of the disease in 44% of cases. The duration of its presence varied very considerably, in quantity, it also varied, but in most cases only a trace was detected. Of the above 44 cases, 11 died = 25%.

"remaining 32 cases whose urine was tested, 13 died} = 25%.

Four cases died soon after admission and before a specimen of urine could be obtained. From the foregoing figures one is scarcely able to draw any definite conclusions, except perhaps that the presence of a trace of Albumen has little, if any, importance in regard to the prognosis.

As is well known, the quantity of Chlorides in the urine is often found to be markedly diminished in all febrile affections (with the exception of Malaria). This is a more constant feature of Pneumonia than of any other febrile disease; and in no other, except
The Urine. (Cont.)

perhaps typhus and Rheumatic fevers, does such a marked diminution ever occur. In a large percentage of cases (see Table), the Chlorides are entirely absent; R. Hutchinson has shown that this diminution is due to their retention in certain organs, especially the spleen. Their behaviour in Pneumonia is often a most useful aid to the diagnosis, and in several of the cases under my care I was fully able to appreciate the value of this sign.

The Chlorides were absent from the urine at some stage of the disease in 54% of cases, in 32% of cases, in 10% of cases, no such deficiency was noted. The remaining 4 patients died soon after admission, and a specimen of their urine was not obtained.
Herpes Labialis was observed in 11 cases, which is rather a low percentage; that given by other authors varies from 12 to 40%. All the above 11 cases recovered.

In my not very wide experience in the care of negroes (West Africans mostly) and Lascars, I have not seen a case of Herpes Labialis among them.

Délirium.

This was present in more or less marked form in 32%.

It has been contended that delirium is more common in cases of apical Pneumonia than in basal cases, so let us analyse the 32% in which it occurred:

Délirium in basal Pneumonias, 18 cases
  " apical " 10 cases.
  " Pneumonia affecting both base & apex. 4 cases
Delirium (cont.)

Now, putting aside for the moment, the number in which both the apex and base were affected, we find that:

Delirium occurred, in 10 cases out of the total of 22 apical affections, = 45.5%.

& in 18 out of the total of 65 basal"  = 27.7%.

Hence, even from an analysis of 100 cases, one is almost justified in arriving at the conclusion that delirium is far more common in apical than in basal affections.

Of the 18 basal Pneumonias
in which delirium was present 8 44.4%

of the 10 apical, in which it was present 3 30.7%

However, I would be inclined to analyse a much larger number of cases before contending that delirium in basal Pneumonia is a more serious symptom than when it occurs in Apical Pneumonia.
I shall now consider a few points regarding the Alimentary System.

Well marked Constipation was present in 19 cases.

Diarrhoea of varying intensity in 11 cases in 7 of which it began as the patient was approaching the day of the crisis; in two, which were rapidly fatal, the diarrhoea was a marked feature, being evidence of the severe toxæmia; in the remaining two cases it was present from the outset, but was not severe.

Vomiting

Apart from that which occurs in some cases at a later stage of the illness from various causes, I wish to point out the frequency with which vomiting occurs as an early and definite symptom.

Out of a total of 19 children below 15 yrs. vomiting was noted in 4 = 21%.
Vomiting (cont.)

Out of a total of 31 patients over 15 years of age, it was noted in $17 = 21\%$

The patient is not likely to mention this symptom, unless when specially questioned regarding it, owing to the presence of other and far more distressing symptoms, notably pain. The agonising character of the latter and its persistence, not unnaturally tend to make him attach little importance to the vomiting, particularly if it occurs once only. I venture to suggest that this symptom occurring early in the disease — usually soon after the onset of the pleuritic pain — is present in a larger proportion of cases than is generally supposed.

Abdominal Pain.

The pain was distinctly referred to the abdomen in 7 cases. In two, it was left sided; in 4, right sided; and in one it was referred to the umbilical region left side.
Abdominal Pain (cont.)

When abdominal pain is present, and more especially when there is marked rigidity of the abdominal muscles as well, and perhaps vomiting, the diagnosis may be difficult.

Symptoms such as the above are nearly always most severe at the outset, and gradually subside as the Pneumonia advances; it is precisely at the beginning of the illness that the physical signs in the chest are so often absent or indefinite.

The extent to which the onset of Pneumonia may simulate that of an acute abdominal condition, is well illustrated in the case fully described later in this work. If the pain be on the right side, the affection is most likely to be confused with is, of course, Appendicitis, and here one has to bear in mind that a catarhal form of appendicitis may occur coincidentally with Pneumonia.

Halsted records a case in which the
Abdominal pain (cont.)
symptoms strongly simulated those of
acute haemorrhagic pancreatitis, and in
cases of commencing double Pneumonia
the abdominal rigidity and tenderness
may be so generalized as to make
one suspect the presence of general
peritonitis. Here again the physician
must remember that a pneumococcal
peritonitis may be a complication of
Pneumonia.

Meteorism was present in two cases,
both of which ended fatally.

V Prognosis.
Without discussing the
factors which are favourable, as
against those which are unfavourable,
I merely wish to show, in the
description of the following two
cases, how difficult it is to say
at the outset of a case what the
termination will be.
Case 1: The patient, Joseph Johnston, 47 years old, had been ill for three days, and on examination was found to be suffering from pneumonia of the right lower and middle lobes. On the fourth day his temperature, pulse and respirations read thus: 101$^\circ$ 120/40. He had had a very good night, and his condition generally encouraged one to say that, considering all points, the prognosis was as favourable as it could be in a case of the disease in question. He did not sleep well the following night, and when seen at 11 am on the fifth day, appeared somewhat dull and drowsy. The left base now also showed pneumatic consolidation and the chart read 101$^\circ$ 120/40. Signs of meningitis rapidly developed, suppurative arthritis of the right knee joint set in, and he died by 12 noon on the sixth day, so, in a matter of a few hours.
the prognosis was changed from a very hopeful, to an utterly hopeless one.

Post Mortem examination:
There was consolidation of the right lower and middle lobes, and of about half of the left lower lobe. The suppurative arthritis was proved to be pneumococcal, and well marked pneumococcal meningitis was likewise demonstrated. Pneumococci were also found in the blood, post mortem.

But again there are cases which recover, in which, at some stage of the disease, there appeared to be but little hope of a favourable issue; the second case serves as a good example, and as it presents an unusual number of interesting points, I propose dealing with it at some length.
Case II.

Wm. Abernethy, age 19, admitted Dec. 15th 1910.

The patient took ill on the evening of Dec. 12th, complaining of headache and malaise. On the 13th he was suddenly seized with severe abdominal pain, towards the right side, and began to feel sick soon after. There was no rigor. The pain continued all through the night of the 13th, and he slept little if at all. On the 14th he vomited twice, and felt sick most of the day, the pain being still present. The following night the patient slept a little better and he was admitted to Hospital at 3 P.M. on the 15th, his chart then reading 102 2/3.

Examination of the chest—now nearly three full days since the onset of the initial symptoms—revealed no signs suggestive of commencing Pneumonia.

The circulatory system. There was distinct chronic endocarditis of the aortic valve cusps, and a double murmur was audible on auscultation in the aortic area. (The patient had had three attacks of Rheumatic fever.)
Case 2 (cont.)

There was also a systolic mitral murmur, and the pulse presented the features, though not very typically, of the "water hammer" type.

The examination of the abdomen. The pain was somewhat easier than it had been on the previous days, but was now more general over the abdomen, which was also tender, and the muscles were rigid on both sides.

The quantity of Chlorides in the urine did not show the deficiency which is so common in cases of Pneumonia.

A few hours after admission, the abdominal pain came on more acutely again; there was no further vomiting. On examination now, the abdominal wall was not moving with respiration; the muscles on both sides were rigid and "board-like," and marked general tenderness was elicited. No point of special tenderness or rigidity was observed, although these signs were perhaps a little more marked in the upper part
of the abdomen, than in the lower.
The rather high rate of respiration—now 40—, and the absence of a typical abdominal vacie lead me to examine the chest again very carefully, but I was unable to detect any change since the time of the first examination. Although, from the above two signs, I was rather inclined to think that the condition might still prove to be one affecting the chest, rather than an acute abdominal one, the local signs typical of the latter appeared so obvious, that I did not wish to take the sole responsibility. I accordingly called in the Honorary Physician, who saw the case about midnight and admitted the difficulty in arriving at a definite diagnosis, but decided to wait, provided there was no change for the worse before the morning, and then, if necessary, to call in the Surgeon.

At 7 am. on the 16th, on examining the chest again, I discovered a small area
Case II (cont.)

in the left axilla, over which pleuritic friction was audible, and a slight pericardial rub was also detected over the base of the heart. A slight difference in the breath sounds on the two sides was noticed, those on the right side being somewhat harsh.

The two areas over which friction was heard were painted with Liqueur Epispastici, and poultices were ordered to be applied over the blisters. Strychnine and digitalis were ordered as below.

B.

Liq. strychn. hydrochlor. miv
Tinct. digit. miv
Syr. auranti. zi
Ag. ad 3f

Sig. To be taken every 4 hours.

8 p.m. 16th Dec. chart 102° 124/44. The pericardial friction is more distinct tonight, and is heard over a more extensive area, mostly possessing a double, but sometimes a triple rhythm. The pain is still severe, but the
abdomen is less rigid and less tender.
He has slept very little since admission.
17th Dec. 10 a.m. chart 101 5/130 40. The patient had
not slept when seen at 1 a.m., and was then given Morphia 11/6 + atropin sulph 5/180
hypodermically, after which he slept very well. This morning he complains of the
pain radiating to the chest (left side); on percussion, the resonance over both bases is found to be impaired, and on auscultation the breath sounds at both bases are diminished in intensity and there is also distant bronchial breathing on both sides. The abdominal signs are less marked. He has not had an evacuation of the bowels since admission.
Colonel pr II ordered.
Dec. 18 th. Still awake at 2 a.m. Morphia and atropin repeated hypodermically in same doses as last night. He then slept for two hours continuously, & had several short sleeps of about 20 minutes each. The pericardial rub has not spread further. The whole lower lobe on the right side shows definite
Case (w. cont.)

Physical signs of Pneumonia, and the left lung shows similar signs from the level of the inferior angle of the scapula downwards.

20th Dec. Chart $101^\circ \frac{96}{32}$. Slept well the night before last, but was slightly delirious last night. The morphia and atropine injection was repeated, and he slept three hours continuously after it. The pericardial friction is coarse today, and is heard over a more extensive area, spreading towards the apex of the heart. The abdominal rigidity and tenderness have almost gone.

23rd Dec. Chart $100^\circ \frac{56}{32}$. The patient is sleeping well and seems to be holding his own.

24th Dec. Chart $99^\circ \frac{50}{32}$. Pericardial friction heard over a small area only; the area of cardiac dulness is not increased. Last night the pulse became very slow (54) and more irregular than previously. The digitalis was therefore omitted from the mixture, and this morning the pulse, though still slow, is more regular.

25th Dec. Chart $102^\circ \frac{92}{44}$. The pulse is variable,
Case 15 (cont.)

still very slow at times, irregular and occasionally intermittent. The daily quantity of urine is deficient in amount. From this date, the patient very slowly improved. The temperature came down by lyser and was normal on January 6th. The pericardial friction was faintly audible on Jan. 3rd, a little more marked again on Jan. 9th and had disappeared by Jan. 23rd. Resolution progressed slowly in both lungs. The quantity of urine excreted soon regained the normal, and the pulse became much more regular. A small collection of fluid at both bases was diagnosed on Jan. 13th. The back was painted with a mixture of Triodi (31) and Lm. Iodi (31), at the level of the dulness, and the fluid was soon absorbed. On the 23rd Jan. a precordial murmur was noted for the first time, and it became more distinct on the succeeding days. He was allowed up on Feb. 13th, and was discharged on March 3rd 11.
The following complications were noted.

1. Pleural effusion in 9 cases, of which one died.
2. Empyema in 3 cases, one of which died.
3. Pericarditis in 4 cases, two of the latter was a case with purulent effusion in the other three cases, there was no effusion.
4. Suppurative Meningitis in 3 cases, all died.
5. Parotitis, one case, which did not go on to suppuration.
6. Suppurative arthritis, one case, which died.
7. Septicaemia
8. Pronounced Jaundice

In 6 cases there was well marked Bronchitis; three of these were fatal.

In 2 cases Chronic Morbus Cordis existed; both of these recovered, so it appears that the prognosis in such cases is not so unfavourable as might be expected.
VII Treatment.

The 100 cases were treated on the general lines which I shall endeavour to lay down under this heading.

1. General Management of a case of Pneumonia

One of the most important principles to be observed, is to support and husband the strength in every way. The patient must go to bed at once, should be kept absolutely at rest, physically and mentally. The temperature of the room should be about 63°F and good ventilation is most desirable. The bed, so arranged as to give free access to it on either side, ought to possess the two great qualities of a sick-bed, namely smoothness and elasticity. There must not be too much bed-clothing and it is important to have a blanket (not a sheet) next the body.
Treatment (cont.).
The patient should be kept propped up with pillows or by means of a bed rest. It is preferable to have the flannel jacket worn by him, made so as to open at the back, as it can then be changed with greater facility. If it be made to open in front, the patient is inclined, more especially when delirious, to undo it, and so run the risk of exposing his chest unduly. The garments must be changed for warm dry ones, as frequently as the amount of perspiration may necessitate, and at every such change, the skin should be 'rubbed down' well.
When it is desired to examine the back, roll the patient over on to his side; he must not be allowed to turn himself over without assistance, as that causes unnecessary exertion. The cleansing of the mouth and gums requires special care, so as not to add to the toxæmia; frequent treatment with glycerine and borax (or swabs), and weak
Treatment. (cont.)

Solution of sanitas, as a mouth-wash, are most suitable for this purpose. The temperature requires to be taken every four hours, except when it is approaching 104°F, when hourly observations are desirable. If the patient be asleep, it is, of course, most unwise to run the risk of disturbing him, by taking his temperature.

2. Diet.

The importance of getting the patient to take sufficient nourishment, can hardly be over-estimated; in this connection a great deal can often be done by persuasion, and it is the duty of the nurse to exercise a considerable degree of patience. If possible, feedings should be given every two hours (except when the patient is asleep), and the precise amount taken must be carefully noted.

As to the nature of the diet, it should consist chiefly of diluted milk, which
Treatment. (cont.)
may be flavoured with a little weak tea, if preferred by the patient. All fluids given should be warm.
Beef tea and broths may be given at intervals, as also a beaten up egg in milk from time to time. The fluid diet should be suited to the tastes of the different patients; thus some patients refuse milk but take tea or beef tea readily; others do not care for beef tea — and so on. Plain water or a pleasant table water may be allowed freely.

3 Special Treatment

@ Bleeding. "To bleed at the very outset in robust individuals in whom the disease has set in with great intensity and high fever, is a good practice" (Osler). "It seems to be beneficial in various ways — the pain and dyspnoea are relieved, the temperature is lowered, and the toxaemia is lessened."
Special treatment. (cont.)

None of the cases under consideration were bled at an early stage; the few cases in which bleeding was resorted to were those in which delatation of the right side of the heart supervened. The usual method adopted was the application of five or six leeches over the region of the liver or the praecordia, and if it was deemed necessary to draw off more blood after the leeches had dropped off, fomentations were applied over the bites. In the more urgent cases, venesection was performed and $\frac{7}{8}$-$\frac{9}{18}$ of blood were withdrawn from the circulation.

C. Serum Therapy.

When one has given a patient the benefit of all the treatment which is distinctly indicated in the particular case, and when one then feels the hopelessness of doing nothing further, anti-pneumococcic serum may be administered.
Special treatment (cont.)

6. Leucocytic extract. This subject is fully dealt with in the last section.

10. Symptomatic Treatment.

@ For the relief of pain, Dover's powder (SrO) was found very useful in the early stage of the illness. Locally poultices (linseed) were applied in many cases; in others a small area over the seat of the pain was blistered. Poultices must not be too heavy; each time a poultice is changed, the fresh one must be ready and by the bedside, before the other one is removed from the chest. This is necessary in order to prevent further chill. In a few cases the pain was so acute as to require a hypodermic injection of Morphia 0.1% - 0.14% for its relief.

6. To lessen toxaemia. There being as yet no specific product of the bacteriological laboratory, or drug, the means at present at our disposal to lessen toxaemia are the following:—
Symptomatic Treatment (cont.) - To lessen toxaemia.

i. Diaphoresis. When the patient came under observation within two or three days of the onset of the illness, he was given the following diaphoretic mixture, provided always the condition of the circulation warranted it.

B

Spi. aeth. nitrosi ʒf
Sop. Chloroformi mx.
Spi. ammon. aromat. ʒf.
Liq. ammon. acet. ʒiv
Ag. aq. ʒv
Sep. to be taken every 4 hours.

Dover's powder, besides relieving pain and inducing sleep, is a very valuable diaphoretic, and was given in the majority of cases during the first few days of the disease, or so long as active diaphoresis, as judged by the condition of the circulation, was indicated. The hot foot-bath, given in bed, and tepid sponging may also be found useful.
To lessen toxaemia. (Cont.)

ii Catharsis. For this purpose Calomel (\textsuperscript{f}r\textsuperscript{vii} \textsuperscript{i} m\textsuperscript{m}) is of great value and should be given on the first night that the patient is under observation, and on the following morning a saline laxative should be administered. If this treatment be neglected, constipation may give considerable trouble at a later stage, and meteorism may ensue. In order to get the best effects evacuation must be kept up, two or three times daily for two or three days. The use of the bed pan should be insisted on.

iii Diuresis. Bland drinks may be given freely, and such mild diuretics as the citrates or the acetates may be had recourse to, if deemed necessary.

iii Bleeding. By this procedure we diminish the quantity of toxins circulating, but for this purpose it is only recommended in exceptionally acute (asthenic) cases, when they are seen early.

iv The cleansing of the mouth. This is most
To lessen toxaemia. (cont.)

important to prevent auto-infection,
and has already been dealt with.
vi Leucocytic extract. Recent observations
seem to show that this substance has
besides other powers, that of diminishing
the toxaemia.

(C) To prevent or treat Cardiac failure.—
an all-important indication.

To do this it is necessary to understand
what may cause cardiac failure.

1 toxaemia and fever, which generally go
hand in hand. The former has already
been considered. The fever itself is probably
not very dangerous to the heart, unless
it be high and prolonged, and it is in
the latter case that hydrotherapy is of
such great value. In the cases under
consideration, tepid or cold sponging
was ordered whenever the temperature
reached 104°F or higher; besides reduc-
ing the temperature, it also has a quieten-
ing effect and encourages sleep as well as
perspiration.
To prevent or treat cardiac failure (cont.)

Causes. (cont.)

ii. Abdominal distension. To prevent this, much can be done in the early stage by catharsis, but should it occur in spite of preventive care, a turpentine\(37\) enema may require to be given, or a rectal tube passed high up (the distension is frequently colonic) may give relief.

iii. Constant pain, the treatment of which has been described.

iii. Increased resistance to the pulmonary circulation due to the consolidation.

v. Restlessness, sleeplessness, and delirium.

In this connection I am of opinion that, not only is prevention better than cure, but in the majority of cases it is far easier to attain. At the outset there is comparatively seldom any difficulty in ensuring sleep, whereas in the later stages of the disease, hypnotics only too often fail in their action. It is well, therefore, to make sure, from the very beginning, that the patient shall sleep.
Symptomatic treatment (cont) - cardiac failure. Causes (cont).

Here again Dover's powder appears to be a most serviceable drug; it should be given early on the first night the case comes under observation, provided there is no definite contra-indication to the use of opium. At least 10 grains should be administered, and this dose may be followed, in two hours, if necessary, by another 5 or even seven grains. A cup of hot milk or beef tea will often help in sending the patient off to sleep. The function of sleep is of vital importance in Pneumonia, and if insomnia is present in its later stages, and other drugs have failed to take effect, I should have no hesitation in giving a hypodermic injection of 1/600 morphia, combined with 1/200 or 1/400 atropin sulphate to counteract the effect on the heart, provided always that,

1) there is no cyanosis with dilatation of the right side of the heart.
2) that there is no distress of breathing
Insomnia, etc. (cont.)

Thus, many of the cases after say the third or fourth day of the disease, if not asleep by ten or eleven p.m., received a dose of one of the drugs mentioned below, and if this failed to act in about two hours, morphin sulphate and atropin sulphate, in the doses given above, were injected hypodermically. Paraldehyde in 2ji doses was found very useful; in a few cases it was given per rectum in 3ji — 4ji doses. Chloralamide, at least 20x grains, dissolved in brandy.

T תוכיאל 20x grains.

Bromural 5 to 10x grains.

For restlessness and delirium, morphia and atropin are also of great value. Hyoscine hydrobromide (1/200 — 1/100 gr) may be given as an alternative and is often found to be of more service in violent delirium than morphia. The two drugs may, if desired, be given together. It should be remembered that delirium is
Insomnia (cont.)

not infrequently, entirely due to want of sleep.
The following figures are of interest and emphasize the importance of the function of sleep, in relation to the prognosis of 13 patients, who had little or no sleep, either before admission, or in hospital 11 died = 84.6%.
Of the 51 who enjoyed more or less satisfactory sleep throughout the course of the disease, 3 died = 5.9%.
In the case of the remaining 36, the insomnia was not present throughout and of them 14 died = 38.8%.

Hence we see the urgent need, in every case, to prevent, if possible, the loss of it, or to treat the want of it.

The above figures, of course, do not infer even that the insomnia was the direct cause of death in every case.
Symptomatic Treatment. (cont.)

Having now discussed the causes of heart failure, and their prevention or treatment, we come to the treatment of heart failure itself, should it occur in spite of every care in dealing with, or guarding against, its causes.

Strychnine, perhaps the most valuable drug in this connection, may be given early, before the heart shows any sign of failure. Its great value lies in the following facts:

1. It is a profound and prolonged cardiac stimulant.
2. It acts as a general tonic to the nervous system.
3. It helps to prevent abdominal distension.
4. It does not tend to cause serious symptoms of poisoning, although twitching of muscles is sometimes observed after its administration, and is an indication to omit the drug. One should always be on the look out for this sign.

Digitalis, which was found of great service, has the following disadvantages.
Treatment of Cardiac failure (cont).

1. In some patients, even in comparatively small doses, it exerts a poisonous action on the heart, causing irregularity of the contractions, and often marked slowing of the pulse rate. Four such cases were observed.

2. It sometimes causes gastric disturbance - an obvious disadvantage in a disease in which it is so necessary to keep up the patient's strength, by getting him to take sufficient nourishment. This untoward symptom occurred in at least two instances.

3. Suppression of urine may follow its administration, an accurate record of the daily amount of urine, therefore, is essential.

It is necessary to watch carefully for the onset of any of the above toxic effects, as to stop the drug immediately should any one of them occur. In the latter case Strophanthus may be substituted for digitalis; however I do not in any way wish to minimise the value of Strophanthus, as many authorities use it almost exclusively as a cardiac stimulant in Pneumonia.
Treatment of cardiac failure (cont).

When the patient is extremely ill, and especially when the temperature is unusually high, it is little use giving the remedies by the mouth; the patient will then be found to respond far more readily to their action if they be given hypodermically. Digitalin 0.001-0.0015, Strychnine 0.005-0.007, or they may be given together in the smaller doses.

**Adrenalin m.g.** (1-1000 solution) is sometimes given every four hours when there is commencing dilatation of the right side of the heart, but its value would be considerably greater if its effect were not somewhat transitory.

In only two of the 100 cases was it deemed unnecessary to give a cardiac stimulant in one or other of the above forms.

**Alcohol,** in the form of brandy in quantities varying from 3 fls. 2 hourly to 3 fls. 4 hourly, was not given except under the following conditions:

1. In alcoholic patients.
Symptomatic Treatment. (cont.) - alcohol.

2. in delirium.

3. in some of the more severe types, more especially that in which there is a continuously low temperature.

Oxygen gas. In the few instances in which this gas was administered, its effect was, if not beneficial, at all events soothing. I know of several patients who, after having been allowed oxygen inhalation on one occasion, have of themselves requested that they might be given it again. The value of the inhalation of this gas in cases of Pneumonia, seems still to be a matter of doubt, in fact Lorrain Smith suggests that it may under certain conditions be harmful.

Cough was only treated when a marked symptom, or when it caused much pain, usually by Dover's powder or opium in some form.
Symptomatic treatment (cont.).
Ammonium carbonate (in mixture) was only given when expectoration was difficult (28 cases out of the 100). In the majority of cases, its action as a stimulant expectorant was not indicated and as the drug was found in many cases to cause loss of appetite, it was not given for any other purpose.

Diarrhoea, occurring as a critical symptom, requires no treatment, but when early & profuse, causing exhaustion, starch and opium enemata should be given.

When there was delayed resolution, the patient was allowed up, provided the temperature was normal, and gentle exercise was encouraged, thus stimulating respiration & promoting absorption. Iodides were also prescribed.

During convalescence, quinine in some form is an excellent tonic; the sulphate, often combined with the sulphate of iron, being that most commonly employed. Strychnine, and in children, Strychnos Peri iodi, were also found of great value. A generous diet & change of air also promote convalescence.
Treatment with Leucoytic Extract.

Before describing the effects observed in the five cases which were treated with this substance, I wish to refer to the recent work of other authors in this connection, and in so doing I shall make free use of their writings on the subject. (Vide References.)

The injections of living leucocytes or their extracts, have produced such remarkable effects upon artificial microbic infections in animals, by way of prevention and of cure, that within the last few years investigations have been made into the action of similar injections upon infective processes in man.

Pettersson showed that an artificial anthrax infection in guinea-pigs, was either overcome or the animals lived much longer than the controls, if a simultaneous injection of living leucocytes was made into the same area.
Leucocyte extract (cont.)

He performed many experiments of this nature, and investigated the mode of action of these injections. Korshun, Watabiki and Opic have also done good work in this respect.

Hiss and Zinscer performed similar experiments, but worked almost entirely with an extract of leucocytes induced in the pleural cavity of rabbits. Pneumococci and other micro-organisms were administered to respective series of rabbits in lethal doses usually by peritoneal injection. Many of the animals survived, and in every case they lived longer than the controls. They then proceeded to treat several human beings with the extract, and have so far published, among other diseases, seven cases of Lobar pneumonia and empyema, all of which recovered.

Floyd and Lucas treated 41 cases of lobar pneumonia, of which 5 died, and 36 recovered. They report that in a number of cases the disease
Leucocytic Extract (cont.).
was apparently shortened, and there
was noticeable improvement in the
comfort of the patient and in the symptoms
after the injections. The toxæmia was
strikingly lessened, and there was a
lower mortality in cases so treated
than in a similar series untreated
by this method.

Method of procuring the Extract.
The extract used in
my cases was kindly supplied by
D. Moore Alexander, Honorary Pathologist,
Royal Southern Hospital, at whose suggestion,
in fact, the treatment was carried out.
This method of procuring it, is essentially
that of Hess and Linser, who hold that
it is only on the death of the leucocyte that
the protective principles escape.
He proceeds thus:

A sterile 10% suspension
of Mellins food in distilled water is
injected, in amounts varying from
5–10 ccm. according to the size of the animal,
Leucocytic extract (cont.)

into each pleural cavity of a rabbit. The animal is killed 24 hours later and the fluid exudate removed.

To obtain this perfectly sterile, the skin is removed from the thorax, and the ribs are laid bare by cutting away the pectoral muscles. The surface of the ribs and intercostal muscles is lightly scarred over the whole side of the thorax; a 10 cc syringe with a large bore needle is thrust into the pleural cavity through an intercostal space, usually the seventh or eighth, and the fluid removed by suction. With practice it is easy to push the needle through into the opposite pleural cavity, and thus the fluid from both cavities may be drawn off through the one external opening. The fluid should be pale yellow, with a flocculent haze of leucocytes. Any large masses of needle's food must be removed by a preliminary sedimentation. Ten to twenty cubic centimetres is the average amount obtained.
Leucocytic extract. (cont.)
The exudate is rapidly placed in sterile centrifuge tubes and centrifuged until a thick grey deposit of leucocytes appears at the bottom of the tube. The supernatant fluid is carefully pipetted off. Distilled water is then added in equal volume to the deposited leucocytes, which are well broken up with a glass rod. The tubes are placed in an incubator at 37°C for at least four hours; each tube is then tested for sterility, and if sterile, the contents of several tubes are mixed and distributed in 10cc ampoules, which are placed in the ice chest until required.

Leucocytic extract so prepared, will remain effective for at least three months.

Pettersson and others use the method of abdominal injection, which is more dangerous, without perhaps being more effective.
Mode of Action of Leucocytic Extract.

Hess and Zinder say that the beneficial effects obtained by the administration of this substance are due to "the action of digestive substances usually not liberated from the leucocytes, to poison-neutralising, or destroying bodies which act on the endotoxins, and thus relieve the leucocytes of the animal from fatal poisoning, and protect the higher cells of the animal, so that their functions are not deranged."

However, it was D. Thomson who first discovered that the injection of leucocytic extract produced a leucocytosis. In a case of sleeping sickness treated at the Royal Southern Hospital by D. Thomson, under the supervision of Professor Sir R. Ross, (fully described in the annals of Tropical Medicine and Parasitology—wide reference) D. Moore Alexander suggested that leucocytic extract should be given a trial. He thought that this extract
Mode of action. (cont.)

might contain certain substances which would be deleterious to the trypanosomes, or which would neutralise their endotoxins.

In their article, the authors say "To our surprise the effect of an injection of this extract was to produce a very great increase of leucocytes in the blood, on the day following the injection and this was almost the invariable result. In our opinion, it seems to be a far more powerful promoter of leucocytosis than either yeast or nuclein."

Thus on the

<table>
<thead>
<tr>
<th>Date</th>
<th>Leucocyte Count before</th>
<th>L. count next day</th>
</tr>
</thead>
<tbody>
<tr>
<td>19th May</td>
<td>7800</td>
<td>49,000</td>
</tr>
<tr>
<td>24th</td>
<td>6000</td>
<td>17,000</td>
</tr>
<tr>
<td>31st</td>
<td>3000</td>
<td>20,000</td>
</tr>
<tr>
<td>7th June</td>
<td>4500</td>
<td>20,000</td>
</tr>
</tbody>
</table>

after the first injection, there was a sudden and marked improvement in the symptoms.

From the 18th June 100 was injected daily and the count varied irregularly between 9000 and 25000; on the 19th-20th no extract was given, resulting in a fall of the count on the 20th-21st to 4000-3000 per cm³ respectively.
Chart S.

Leucocytes Examined on the Leucocyte Count

Case of Stripping Sickness reported by Major P. Ross & S.

Leucocyte Exceeds 10,000 cells.

Experiments:
- 1cc Leucocyte Extract
- 10cc Leucocyte Extract
- 10cc Leucocyte Extract
- 10cc Leucocyte Extract
- 10cc Leucocyte Extract
- 10cc Leucocyte Extract
- 10cc Leucocyte Extract

Fever Chart:
- 29°C on 18th
- 34°C on 25th
- 38°C on 1st

Date:
- May 19th to 29th
- June 20th to 29th
- July 20th to 29th
- August 15th to 25th
Mode of action (cont).

On the 21st June 1 c.c. was again injected, and on the 22nd the number of leucocytes had risen from 3000 on the 21st to 12,000 per c.mm. After that 1 c.c. was given daily and the leucocyte count varied between 6000 and 22,000 per c.mm., but unfortunately the results were now complicated by the development of an abscess and later by the onset of Pneumonia, from which the patient did not recover.

The accompanying chart shows the above leucocyte variations very well.

Dr. Thomson, in his article on Malana, in the "Annals of Tropical Medicine," further says: "An injection of an extract of leucocytes causes a marked increase in the number of leucocytes in the peripheral blood in a few hours. In the case of malaria which was treated with this substance by Lambert (1909), it was found that the injection prevented the fever from occurring. It is highly probable that this phenomenon was due to the increase in the number of leucocytes following the injections."

The extract made by
Mode of action (cont.)

Alexander consists chiefly of the polymorph variety of leucocytes, and produces after injection, chiefly a polymorph exces. A "mono-nuclear" leucocytic extract is very difficult to obtain, but such a substance would probably not be of much use in the disease which we are dealing with in this work.

Alexander also found that "a marked leucocytosis followed an injection - a phenomenon not mentioned by other workers."

D. Thomson injected into his own forearm (hypodermically) a dose of 15 minims on one occasion. His leucocytes numbered 5,300 per c.mm. before the injection; 24 hours later the count was 9,800 per c.mm.

The above investigations seem to support the contention of H. C. Ross that "the extracts of dead tissues promote the proliferation of living cells."

Alexander concludes his valuable article on this subject, thus: "It appears from these observations, that a new view
Mode of Action (cont.).

May be taken of the action of these extracts. They may in themselves be bactericidal and bacteriolytic to some slight degree, and they may contain natural anti-endotoxins, but they seem to act chiefly as leucocytic stimulants, inducing a huge outflow of cells whose function is to protect the body from infection.

I shall now proceed to discuss the five cases which received this treatment.

It will be seen that three of the five ended fatally—to all appearances a not very satisfactory result; but when one considers that, in four of the cases, the extract was given more or less as a last resource, and that, in one of the two which ended in recovery, the case appeared to all intents and purposes hopeless before the injection, the result appears more encouraging.
Case 1. - Chart B.

Alice West. age 38.

The patient's illness began on the night of the 16th Feb. 11. Admitted on the 17th 21st.

Examination of the chest revealed pneumonic consolidation of the right lower and middle lobes. General condition satisfactory.

Chart 103 120 28.

Feb. 22nd. Slept well last night after Dover's powder gr 8, and a further dose of gr 4 after two hours. She perspired freely. Takes her feedings very well.

Feb. 23rd. Had Dover's powder gr 7 last night, and slept fairly well after it. Continues to take ample nourishment. Pulse bounding, rate 128.

Feb. 24th. Slept little last night, even after morphine gr 1/4 and atropin for hypodermically. So taking her feedings, but seems much less bright this morning.

4 pm. Has become much worse since this morning, and is now markedly toxaemic. She has just been seen
Case 6 (cont.)

by Dr. Lloyd Roberts, who was of the opinion that a fatal issue would not be long delayed, in view of the rapidity of the onset of the severe toxaemic symptoms at 6 p.m. At the suggestion of Alexander 10 c.c. Leucocytic extract was injected into the buttock at 5 p.m., a leucocyte count having been taken at 4 p.m. then numbering 4,000 per c.mm.

Feb 25th: Slept very well last night after Morphia and atropin as before and this morning the toxaemic symptoms are very decidedly less marked. Chart 5 a.m. 100°. 40, 9 a.m. 101° 19. Leucocyte count at 1 p.m. (average of two counts, one by Alexander, the other by myself) = 42,000 per c.mm.

Given another injection of the extract 8 c.c. at 1 p.m.

(The remaining leucocyte counts were done by myself)

10 p.m. Leucocytosis of 30,000 per c.mm.

Feb 26th: Chart 98° 40. Has had crisis (protracted), and her condition
Case O. (cont.)

contrasts markedly with that of the previous days.

Had a third dose of extract, 6 c.c., at 1 p.m. today.
The number of leucocytes today was as follows:

\[
\begin{align*}
11 \text{ a.m.} & = 20,000 \text{ per c.m.m.} \\
1 \text{ p.m.} & = 22,000, \quad " \quad " \\
7 \text{ p.m.} & = 25,600 \quad " \quad " \\
11 \text{ p.m.} & = 31,000 \quad " \quad "
\end{align*}
\]

Feb 27th: General condition shows considerable further improvement.

3 p.m. Leucocyte count = 8,400 per c.m.m.

Feb 28th: 2 p.m. " " 12,000 " "

Studying Chart B, we note following points in this case.

First, the crisis occurred at the end of the 8th day, which may seem a very natural phenomenon, but there are two facts which almost convince us that we were not dealing with a mere coincidence, and that the injection of the extract had had a beneficial effect.
**Chart A** Copied from Osler

Showing the coincident drop in the Fever and in the number of Leucocytes

Contrast

**Chart B**

Black = Temperature 6 hourly
Red = Leucocyte Count
Case 0. (cont.)

@ the severity of the toxaemia before the extract was administered
B the extraordinary rise in the number of leucocytes after the injection—from 4,000 to 14,2,000 per cmm.

In cases of Pneumonia not so treated, the leucocyte count comes down coincidently with the temperature as is well shown in the Chart A (copied from Osler). The latter contrasts markedly with Chart B (and also with Chart C of Case 2), in which, at the time of the crisis, the leucocyte count instead of coming down, is increased to a remarkable degree.

Further, note also in Chart B. That the height of the leucocyte curve was fairly well sustained and rose slightly again after the third injection (6 c.c.), but on the following day it was approximately normal & the next day again a slight rise was noticed.

On March 5th, suspicious signs
Case 1. (cont.)

having developed in the chest, the latter was explored, and half a syringe full of turbid fluid was withdrawn. In this fluid numerous pneumococci were found, and a pure culture of the organism was also obtained from it. The operation was performed on March 6th and a small quantity of sero-purulent fluid was evacuated. The patient ultimately made a complete recovery.

That there was no connection between this commencing empyema and the high leucocytosis recorded after the injections of the extract, is, I think, conclusively proved by the following:

@ 8 days elapsed between the recording of the highest leucocyte count, and the first definite indication of fluid in the pleural cavity; the temperature had been practically normal for 5 days, and did not rise again until March 3rd (101°).

@ Between the dates Feb 27th and 5th March, two counts were taken, and were 7000, 8000 per cmm respectively.
Case 1 (cont.).

Judging by the nature of the fluid removed, the infection of the pleural membranes was probably of very short duration, prior to the date of exploring.

Case 2  Chart C.
Rowland Jones, aet 21.

Illness began on night of Feb. 13th.
Admitted on Feb 15th, suffering from Pneumonia of the right lower lobe.
Feb 16th. Slept well.
Feb 17th. " " and takes feedings well.

9.30 am. leucocyte count = 11,800 per c.mm.
6.30 pm. 10 c.c. leucocytic extract injected into the flank.

9.15 pm. leucocyte count = 7,000 per c.mm.
10 pm. Patient restless, pulse feeble.
Feb 18th. 2:15 am. Leucocytes = 12,000 per c.mm.


11:45 am. Leucocytes = 16,000 per c.mm.
6:45 pm. " " = 16,000 " "...
Case 2. (cont.)

Feb 19th. Crisis yesterday.
7.45 p.m. Leucocytes 10,000 per c.m.m.

Feb 20th. Resolution progressing satisfactorily.
Leucocyte count = 11,700 per c.m.m.

In the Chart of the above case —
Chart C. — note:

@ There appears to have been a drop in the number of leucocytes a few hours after the injection. This is the only instance in which a count was taken soon after a dose of the extract was given, (about 3 hours) and the result seems almost to suggest the possible occurrence of a "negative phase."

@ The leucocytosis on the day following the injection. Thus, here again we see, instead of a coincident drop in the fever and in the number of leucocytes, the leucocyte curve rising decidedly while the temperature is coming down by crisis.

@ The crisis occurred after 4 full days' illness. This reminds us of
Case 2. (Cont.).

Lucas' and Floyd's report in which they were of the opinion, that in some of the 44 cases treated with the extract, the duration of the disease was shortened. However it is well to bear in mind the truth of Osler's words: "How natural, when on the third or fourth day the crisis occurs, to attribute the happy result to the effect of some special medication!"

Nevertheless, when looking at the chart one is impressed with the behaviour of the leucocytes, and this has to be accounted for before one can assert that the occurrence of the crisis on the day following the injection and at the end of the fourth day of the disease, was purely a matter of coincidence.

Case 3. Chart D.

M. McCaffey, aged 39.

The patient took ill on Feb. 28th and was admitted on March 2nd.
Case 3 (cont.).

Suffering from right basal Pneumonia.

March 2nd. Leucocytes = 15,760 per c.m.m.
March 3rd. Had a fairly good night and is taking nourishment well.

2.45 pm. Leucocytes = 9,920 per c.m.m.
March 4th. Became delirious last night; tried to get out of bed.

Pulse very feeble. Pericardial friction present.

12.15 pm. Leucocytes = 12,950 per c.m.m.
5 pm. 10 c.c. Leucocytic extract given
9.45 pm. Leucocytes = 14,400 per c.m.m.

March 5th. Constantly delirious and markedly toxaemic. Pericardial friction heard over a very extensive area.

12 noon. Leucocytes = 30,000 per c.m.m.
5 pm. 10 c.c. Leucocytic extract given.
11.45 pm. Leucocytes = 10,700 per c.m.m.

Death 6.20 am March 6th.

P.M.: Purulent pericarditis.

In this case note again the abrupt rise in the leucocytic count on the day following the injection; the increase appears in
Case 3. (Cont.)
most cases, to be greatest after the first injection, and succeeding ones in some cases have apparently little or no effect on the number of leucocytes. Judging by the result of the post-mortem examination, one could not have expected a different issue in this case.

Case 4. Chart E.
Charles Sarlin, aged 37.
15th Feb. The patient has been under treatment for malaria, and has now developed Pneumonia of the left lobe.
16th Feb. Leucocytes = 25,000 per c.mm.
18th Feb. Patient much worse today, pronounced toxæmia. Leucocytes = 15,000 per c.mm.
19th Feb. 4.45 pm Leucocytes 6,900 per c.mm.
9 pm. 5 c.c. Leucocytic extract given.
20th Feb. Very restless, going down hill rapidly.
2 pm Leucocytes = 4,150 per c.mm.
1 pm. 10 c.c. Leucocytic extract injected.
11.50 pm. Leucocytes = 18,400 per c.mm.
Death 1.20 am. 21st February.
Case 4 (cont.).

In the chart of this case—Chart E—note the progressive fall in the leucocyte curve with the advancing toxæmia. The first dose of the extract, only 5 c.c. did not have any obvious effect, but the second dose (10 c.c.) produced a leucocytosis of 18,400 per c.mm. i.e., a rise of about 11,400 per c.mm. in 11 hours, and it is interesting that this rise occurred very shortly before death.

Case 5. Chart F.

John Davies 59.

The patient was admitted on March 24th suffering from Bronchitis + right basal Pneumonia. Up to the 26th he progressed satisfactorily, but then became suddenly worse. Heart sounds became very feeble and on the 27th the leucocytes numbered 3,000 per c.mm. On the 28th they 14,400.

7 c.c. leucocyte extract was given 6 p.m. 28th.

29th March, 1 a.m. Leucocytes = 15,000 per c.mm.

Death 9:30 a.m.
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**Chart F.**

*Patient: John Davies, Age 59, Admitted March 22, 1918.*

*Note: The chart includes dates and various measurements, but the specific details are not legible due to the quality of the image.*
Case (5) (cont.)

In this case I only wish to draw attention to the rise in the leucocyte count after the injection, and, as in the last case, shortly before death.

Conclusion.

From the effects of leucocytic extract observed in the above five cases, the conclusion one arrives at is that the results are hopeful and encouraging.

Further investigation with this substance requires to be made, before pronouncing definitely on its power of shortening the duration of the disease, and perhaps even on that of lessening the toxæmia, but there is no doubt that its injection produces a very remarkable increase in the number of leucocytes in the blood; and, in view of the generally accepted fact that a low leucocyte count in cases of Pneumonia is a very unfavourable sign, it seems to me to be a new treatment of the disease, which is not only
Conclusion. (cont.)

...rational, but which is decidedly indicated in all cases which show a leucopoenia or a low leucoeytosis.

I venture to advocate its use in all such cases, and if it be not used merely as a last resource, it may possibly reduce to some extent, even if only very modestly, the terrible mortality of this disease which has become the "Captain of the Men of Death."

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