Epilepsy: Etiology and treatment from the point of view of a toxemia

by:

Alexander Spalding Mackie Peebles M.B.
There are no classes of sufferers more deserving of our sympathy or our endeavors to alleviate their condition than those who labour under epilepsy. The uncertainty of the attacks, the dangers which they are prone to in the course of their operation, or indeed at any time render them worthy of our most strenuous efforts to relieve or not to cure. In many cases, the serious damage to the brain caused by the continuance of the disease; the alteration in the moral tone, mental power of the sufferer all tend to render them the most sufferers of all diseased humanity. Medical surgical means have been tried ad infinitum. Drugs, past descriptions have at one time or another been vaunted as having a beneficial effect on this condition, the true nature of which is still one of the many unsolved problems.
of the medical world.

Many theories have been advanced as to the pathogenesis of the disease, hoping thereby to lead to a rational or radical form of treatment.

Of late years the theory that epilepsy is a manifestation of some toxin, either the result of chemical changes occurring in the system due to fermentative metabolic changes, or else a toxin of bacterial nature which by its action on the cells of the brain causes the disease, has gained much support. Dr. Jean-Henri Fabre, of the Pasteur Institute, and others, have shown the cause of the disease, the toxin, and its source.

Others have shown that the urine possesses an abnormal toxic power in this relation the work done by Félix, a French observer, is worthy of note.
The toxicity of the current changes in the blood have also been extensively studied by many able authorities, and although we have gained much in knowledge regarding the disease, we are still uncertain as to the real causes or causes which are the chief factors in the production of this condition.

Cerri, an Italian observer, has laid claim to a certain measure of success by treating this disease by means of serum injections. The serum being obtained from the blood withdrawn from a person suffering from this disease. This serum, so obtained being injected into the person from whom the blood was obtained or into another individual similarly afflicted.

Cerri holds the view that some change occurs in the blood or its withdrawal from the body. This change giving the serum a potency against the same which it did not possess while in the circulation of the blood.
The person suffering from epilepsy.

Whether this change is of a chemical or of a bacteriological character is a disputed question, although the latter view is I believe the more frequently accepted one.

From a study of the temperature curve rate, changes in the leukocytes from an article by Mr. Bro in which he states the fact that he has isolated an organism or organisms from the blood of patients suffering from epilepsy, I have adopted the theory that epilepsy is a toxic disease, the toxins producing the disease being toxins of a bacteriological character.

In making these investigations I have adopted the following methods of observation.

A. Recording from day to day over a period of months before during or after treatment the total number of leukocytes per cubic millimeter of blood.
B. Recording the percentages of the different varieties of leucocytes, for similar days, during similar periods as the numerical counts were recorded.

C. The temperature pulse rate were both taken twice daily at similar times each day, morning, evening.

D. Injecting serum derived:
   1. From the patient under treatment
   2. From another patient suffering from epilepsy
   3. From a non-epileptic patient

E. Injecting a similar dose as those of serum, distilled water, this substance being chosen on account of its inert properties both chemical and bactericidal.

F. All epileptic seizures, whether of the nature of grand mal or petit mal were recorded as were any mental changes which occurred during.
Condition.

6. Attempting to isolate organisms from the blood of epileptic patients.

I have worked in all five cases, all suffering from idiopathic epilepsy, or with the exception of one mentally impaired to a marked degree.

The method adopted for counting leucocytes was that recommended by Cole. Fields not squares being counted. A Zeiss haemocytometer was used, the ordinary red blood corpuscle pipette being the one used. In no case was the number of fields counted less than thirty.

For the differential examination the method recommended by Prof. Reichman was the method adopted. The varieties counted were the polymorphonuclear, the mononuclear, lymphocyte, and eosinophile leucocyte.

In every instance over less than
200 leucocytes were counted. The percentages were calculated from that number. To obtain as far as possible a digestion leucytosis or any other complication to ensure a uniformity in all cases, the blood was taken from the lobe of the ear at a definite time each day viz. just prior to the mid-day meal. The blood films were made on slides not coated slips.

Mode of obtaining the semen:
The blood was obtained from either the median basilic or median cephalic veins, the method of paracenti being as follows. The patient's arm, at the elbow was thoroughly washed with a 2% solution of lypsol, the skin having been previously cleansed with ether or absolute alcohol. The part was then wiped dry with antiseptic absorbent cotton wool. A broad bandage was next applied
round the upper arm, this being
put on sufficiently tight to cause the
veins to stand out prominently, but
not so tightly as to restrict the
flow of blood through the arteries.
A drop of pure carbonic acid was
then applied over the vein selected,
either a glass rod or a cork being
used to apply the acid: as soon
as the skin became anaesthetic, the
white appearance it exhibited proving when
this occurred, an exploring needle,
(immunuated exploring needles of medium
calibre were used) was plunged boldly
into the vein.
These needles were previously sterilised
by exposure to a temperature of 100° C.
in a steam steriliser, for one hour.
This method is flawless. With careful
aseptic precautions I was able to do
no unpleasant sequelae beyond a small
superficial necrosis due to the action
of the carbonic acid. This necrosis is,
if one might use the term, an
aseptic necrosis.
In no case was there any evidence of suppuration or other unpleasant symptom. By this method considerable quantities of blood can be obtained with little or no risk or inconvenience to the patient.

The secret of getting a continuous flow of blood is to fill well into, but not through, the vein as near a central vein as injection forms which stops the flow. The needle must also be thoroughly clean both mechanically and surgically clean, as any foreign body such as a minute particle of dirt or dried blood clot causing clotting of blood in the needle — as the venous pressure is low, the result is a cessation of blood flow through the needle.

At first I obtained the serum from the blood by defibrinating the blood by whipping it with a silver fork, then straining it through muslin. Recently I adopted the more simple method of allowing the blood to flow...
into a conical bottle and after 24 to 48 hours decanting the serum which had been expressed by contraction of the clot.

The bottle into which the blood was allowed to flow was formerly rendered sterile by exposure to a temperature of 100°C for an hour; the vessel into which the serum was placed was similarly treated, by adopting these antiseptic precautions the serum kept quite aseptic for days without the addition of any antiseptic substance.

For injecting the serum an ordinary serum syringe was used, it being sterilized by means of steam, the needle being treated in a similar manner.

In the attempts to isolate organisms similar precautions were adopted, of an aseptic character as were used while withdrawing blood to obtain serum.
The needles used were sterilised for a longer period viz. 2 hours. 
Quantities of blood varying from 5 to 10 cc were withdrawn. 
The first quantity of blood which 
came through the needle was rejected. 
The remaining blood was allowed 
15 plus to a flask containing 
200 cc. a nutrient broth. The 
nutrient broth prior to the blood 
being added to it having been 
sterilised for 1/2 hour daily for three 
successive days. Then having been 
immergen for 48 hours at a temperature 
of 37° C. 
The pieces into the broth was now 
sterilised and only opened once for 
examination at the end of 72 hours 
usually or before that time, if 
mentioned that bacteria were 
present in the fluid. 
The cultures were then 
made from this broth in 6 
agar media. The piece of 
blood was then entirely discarded.
as we found that it became contaminated by frequently opened.

All the patients limited were in ordinary, asylum diet, bromide of potassium which they had previously been taking was stopped. In some cases were required no medication of any sort were given.

Case 1

C. A. male at 19 years
Occupation: laborer
Admitted: January 12th, 1901
Diagnosis: Epilepsy. Since birth
Diagnosis of present attack of mental deterioration: his days.
Family History: father is a confirmed drunkard.
Personal History:
Patient has been epileptic from birth but his present attack has lasted for a few weeks. His days, he being in a condition of amnesia.
Prior to the onset of this acute attack, patient had never exhibited any mental symptoms of a violent character, but since suddenly he had been irritable and difficult to do with at home. He had always been lazy and indifferent as to his work, his moral tone was not of a high order. He was able to read with fair success.

For years he had been treated by means of bromide of potassium and in admission showed a well marked bromide acne.

The fits from which he suffered were all of the nature of grand mal that always been severe in character.

Physical condition:
Patient is well developed, heart lungs
remain healthy.

Mental state on admission:
Patient is in a condition of acute
maniacal excitement, incoherent, noisy,
ringing. Platonic requires to be
monitored to prevent him injuring
himself or others.
Under treatment which consisted of large doses of chloral hydrate he became more manageable and at the end of 24 hours though slightly dazed, was quite rational and amenable to reason.

From this date until May 29th 1902 patient had six acute manic attacks similar to that which he had on admission and all of as a severe character.

These attacks lasted from 24 to 72 hours, during which time under the influence of chloral patient was quite unmanageable.

There was no periodicity about these attacks they coming on at irregular intervals or always following a more than usually severe number of epileptic seizures.

The longest interval between the attacks was from March 1901 to September 1901.

The number of fits which preceded these attacks I have been unable to learn with the exception of the attack in May.
which came on after a series of epileptic fits nine in number all of a severe character and all occurring in a space of 24 hours.

The following table shows the date's duration of these attacks of mania since admission up to 5 May 1902.

<table>
<thead>
<tr>
<th>Date</th>
<th>Duration of attack</th>
</tr>
</thead>
<tbody>
<tr>
<td>March 1901</td>
<td>72 hours</td>
</tr>
<tr>
<td>September</td>
<td>42 hours</td>
</tr>
<tr>
<td>October</td>
<td>48 hours</td>
</tr>
<tr>
<td>December</td>
<td>48 hours</td>
</tr>
<tr>
<td>February 1902</td>
<td>72 hours</td>
</tr>
<tr>
<td>May 1902</td>
<td>48 hours</td>
</tr>
</tbody>
</table>

Treatment by means of 

was begun in May 29th 1902, but, prior to that date his temperature was taken twice daily as was his pulse, his leucocytes were counted daily both numerically and qualitatively. The number of epileptic seizures he had were all recorded for a period of 21 days. 

The following is a copy of the
Temperature chart for this period. The number of epileptic fits and pulse rate are shown on the same chart. The epileptic fits are shown in red ink and the number which occurred each day being recorded under the date on which they occurred.

His temperature as seen from the above chart ranged from 97.6°F in the evening of May 2nd to 100°F in May 12th at which time he had three fits. From this date to May 16th he had 35 severe epileptic seizures culminating in an attack of acute mania on the 16th of May. During this period with the exception of the morning of May 15th, the temperature ranged between 99°F and 100°F, dropping to normal at the
At the onset of the meningo-encephalitic attack, the pulse rate remained above the normal for the space of 24 hours which followed the attack of menings. The pulse rate followed closely the temperature curve although never exceeding a 100 beats per minute.

Closely coinciding with these clinical phenomena certain definite changes were observed in the blood. The leucocytes rose from 14,000 for cubic millimeter of blood in the morning to 23,000 in the 10th May, then decreasing again in number but never reaching the normal standard which figure I have taken as 6,000 to 10,000 for cubic millimeter of blood.

In the differential counts changes in the relative proportions of the different varieties of leucocyte also occurred. The polymorphonuclear varieties of leucocyte showing a relative increase as compared with the other varieties.

From the following table which shows the counts for this period...
A gradual increase in the polymorphonuclear variety coincident with the onset of the maniacal attacks is seen.

<table>
<thead>
<tr>
<th>Date</th>
<th>Total No.</th>
<th>Percentage</th>
<th>Percentage</th>
<th>Percentage</th>
<th>Percentage</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total No.</td>
<td>Neutrophils</td>
<td>Lymphocytes</td>
<td>Eosinophils</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>May  9th</td>
<td>14000</td>
<td>61.5%</td>
<td>15.5%</td>
<td>21.5%</td>
<td>1.5%</td>
<td></td>
</tr>
<tr>
<td>May 10th</td>
<td>17000</td>
<td>77.5%</td>
<td>7%</td>
<td>15%</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>May 11th</td>
<td>15000</td>
<td>73.5%</td>
<td>6%</td>
<td>20%</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>May 12th</td>
<td>21000</td>
<td>72%</td>
<td>7%</td>
<td>20%</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>May 13th</td>
<td>20000</td>
<td>68%</td>
<td>14.5%</td>
<td>17%</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>May 14th</td>
<td>18000</td>
<td>72%</td>
<td>10.5%</td>
<td>16.5%</td>
<td>2%</td>
<td></td>
</tr>
<tr>
<td>May 15th</td>
<td>28000</td>
<td>77.5%</td>
<td>7.5%</td>
<td>15%</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>May 16th</td>
<td>22000</td>
<td>89%</td>
<td>4.5%</td>
<td>6%</td>
<td>1.5%</td>
<td></td>
</tr>
</tbody>
</table>

On May 19th blood serum obtained from an epileptic patient, who at that time was suffering from a severe number of epileptic seizures, was injected in 2 c.c. quantities subcutaneously. The injection was made in the flank as being the place where least any trouble arose would be least likely to cause the patient any marked inconvenience. The method of obtaining the serum is described.
This quantity was injected daily for a period of 14 days, there was no local effect produced beyond a transient redness of the skin produced I think by the process of leaching of the part prior to injection of the serum. This redness only lasted a few hours. During this period patient had in all nine epileptic seizures, but it was noted that they had become less severe in character. That the period of stupor, confusion which succeeded the attacks was decreased; patient rallying from the attacks much sooner than he had previously done.

The same amount of serum injected was now increased to 3 cc. Blood serum derived from the blood of the same epileptic patient as had previously been administered was then which was used. This quantity was injected daily for 8 consecutive days, in the space of time patient had 7 epileptic attacks, the total number of attacks
therefore being eighteen, since treatment by means of blood serum had been commenced.

The last seven attacks however, instead of being of the nature of grand mal, resembled in the character of petit mal, there were no convulsions present, patient simply becoming unconscious for a space one to three minutes. This period of unconsciousness was followed by a period of stupor, or confusion which persisted for a varying length of time.

During the period of unconsciousness patient's muscles were in a state of rigidity but no convulsions either of a tonic or a clonic character were noted.

This alteration in the nature of the attacks is the more noteworthy owing to the fact that patient had never since his admission been exhibited any alteration in his epileptic symptoms they are having been seven small marked instances of grand mal.
The curve in the temperature chart, showing number of specific attacks, quantity of semen injected, temperature curve, pulse rate, from the date in which blood semen was first injected up to the present time.

During this similar period, a total enumeration of leucocytes was made daily with the exception of 13th to 16th June 14th. A differential enumeration was likewise done. The following table shows the figures for this dating from May 29th to June 20th.
<table>
<thead>
<tr>
<th>Date of Count</th>
<th>Total No. from C.M. &amp; M.</th>
<th>Percentage of Polymorphs</th>
<th>Mononuclears</th>
<th>Lymphocytes</th>
<th>Eosinophils</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 29th</td>
<td>13,000</td>
<td>73.5%</td>
<td>9.5%</td>
<td>17.5%</td>
<td>.5%</td>
</tr>
<tr>
<td>&quot;  30th</td>
<td>22,000</td>
<td>56%</td>
<td>14%</td>
<td>26%</td>
<td>1%</td>
</tr>
<tr>
<td>&quot;  31st</td>
<td>20,500</td>
<td>66.5%</td>
<td>14%</td>
<td>18%</td>
<td>1.5%</td>
</tr>
<tr>
<td>June 1st</td>
<td>14,000</td>
<td>72%</td>
<td>10%</td>
<td>17%</td>
<td>1%</td>
</tr>
<tr>
<td>&quot;  2nd</td>
<td>16,000</td>
<td>55%</td>
<td>12%</td>
<td>32%</td>
<td>1%</td>
</tr>
<tr>
<td>&quot;  3rd</td>
<td>13,000</td>
<td>62%</td>
<td>11%</td>
<td>26%</td>
<td>1%</td>
</tr>
<tr>
<td>&quot;  4th</td>
<td>14,000</td>
<td>65%</td>
<td>9%</td>
<td>25%</td>
<td>.5%</td>
</tr>
<tr>
<td>&quot;  6th</td>
<td>14,250</td>
<td>56%</td>
<td>8.5%</td>
<td>33.5%</td>
<td>2%</td>
</tr>
<tr>
<td>&quot;  9th</td>
<td>12,000</td>
<td>72%</td>
<td>7.5%</td>
<td>20%</td>
<td>.5%</td>
</tr>
<tr>
<td>&quot;  10th</td>
<td>16,000</td>
<td>63%</td>
<td>12%</td>
<td>24%</td>
<td>1%</td>
</tr>
<tr>
<td>&quot;  11th</td>
<td>13,000</td>
<td>65%</td>
<td>17%</td>
<td>27%</td>
<td>1%</td>
</tr>
<tr>
<td>&quot;  14th</td>
<td>17,000</td>
<td>59%</td>
<td>12%</td>
<td>29%</td>
<td>1%</td>
</tr>
<tr>
<td>&quot;  15th</td>
<td>23,000</td>
<td>66%</td>
<td>9%</td>
<td>24%</td>
<td>1%</td>
</tr>
<tr>
<td>&quot;  16th</td>
<td>13,000</td>
<td>55%</td>
<td>7.5%</td>
<td>37%</td>
<td>.5%</td>
</tr>
<tr>
<td>&quot;  17th</td>
<td>16,000</td>
<td>59%</td>
<td>10%</td>
<td>30%</td>
<td>.5%</td>
</tr>
<tr>
<td>&quot;  18th</td>
<td>19,000</td>
<td>57%</td>
<td>10.5%</td>
<td>21%</td>
<td>1.5%</td>
</tr>
<tr>
<td>&quot;  19th</td>
<td>24,000</td>
<td>59%</td>
<td>5%</td>
<td>32%</td>
<td>1%</td>
</tr>
<tr>
<td>&quot;  20th</td>
<td>19,000</td>
<td>58%</td>
<td>5%</td>
<td>33%</td>
<td>1%</td>
</tr>
</tbody>
</table>
The preceding table is disappointing in as much as there is no change of a type which we could trace to a specific cause, i.e. the polymorphonuclear cells in spite of the marked clinical improvement in the condition of this patient.

As is seen in the above table, the leucocytes are a constantly present factor in his condition, the injection of blood serum having had no effect on reducing the number of leucocytes of blood.

At the close of these observations, I now pursued my observations on different lines but prior to commencing any other form of observation, I allowed a period of 21 days to elapse, obtaining patient continually during that time.

During this period of 21 days patient had no attacks either of the nature of acute malarial or of chronic malarial, a decided improvement in his condition...
which improvement I attribute to the blood serum injected fortnightly.

At the termination of this period I was begun by injecting antitetanically in doses of 200 blood serum obtained from blood derived from the patient himself.

This quantity was injected daily for five days but as the epileptic attacks again returned the dose of blood serum injected was increased to 300 this quantity being injected daily for 16 consecutive days.

During this time patient had in all eighteen epileptic attacks, all of the character of grand mal, and in all single instance did any of the attacks return in any way to those of the nature of petit mal.

The following temperature chart shows rises in the temperature curve of a character very suggestive of some toxic cause, so that became bearing a definite relation to the epileptic attacks rising during a
series of epileptic seizures - then tending to fall for the attacks diminishing.

I examined the patient regularly. I could find no physic cause to explain the rise of temperature, his lungs been quite ordinary except being as far as one was able to learn quite healthy.

I have exhibited the chart short
enoughly as it shows in a graphic manner the point to which I refer, but the following chart extending over a much larger space of time also shows, although we so graphically perhaps, the same alternation of temperature curve in association with the number of epileptic attacks.
During these observations a daily count of the total number of leucocytes per cubic millimetre of blood was made. The total numbers varied from 16,000 to 22,000 per cubic millimetre of blood. There were no changes of any import to be noted as a result of the different inclusion of the leucocytes for the same period, the figures following closely those already given.

My next step was to stop all treatment, a period of nine weeks being allowed to elapse during which time patient had no treatment of any sort. I was anxious to ascertain if patient would improve or relapse again with the cessation of all treatment.
During this period patient had at irregular intervals a series of epileptic seizures all of the nature of grand mal. The total number of attacks patient had during this time was 35. He showed no symptoms of an aura mental character, there being only a slight amount of mental aberration which was of a transient character.

The following table shows the number of attacks recorded per week during this period of nine weeks:

<table>
<thead>
<tr>
<th>Week ending</th>
<th>Number of attacks</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 12th</td>
<td>7</td>
</tr>
<tr>
<td>19th</td>
<td>1</td>
</tr>
<tr>
<td>26th</td>
<td>1</td>
</tr>
<tr>
<td>September 2nd</td>
<td>7</td>
</tr>
<tr>
<td>9th</td>
<td>10</td>
</tr>
<tr>
<td>16th</td>
<td>5</td>
</tr>
<tr>
<td>23rd</td>
<td>9</td>
</tr>
<tr>
<td>30th</td>
<td>5</td>
</tr>
<tr>
<td>October 7th</td>
<td>0</td>
</tr>
</tbody>
</table>
The number of leucocytes in white blood cells also the percentage calculation of different varieties showed little or no alteration during this period. To avoid a large number of figures which are in themselves confusing, I append only the figures obtained in the last two days per week.

<table>
<thead>
<tr>
<th>Date of Count</th>
<th>Total No. of Leucocytes per cm$^3$ of Blood</th>
<th>Percentage of Polymorphonuclear Variety</th>
<th>Percentage of Mononuclear Variety</th>
<th>Percentage of Neutrophil Variety</th>
<th>Percentage of Eosinophil Variety</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 12 19 2.6 15,000</td>
<td>62.5</td>
<td>10.9</td>
<td>25.5</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>16,500</td>
<td>70</td>
<td>5</td>
<td>24</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>18,000</td>
<td>66</td>
<td>13.5</td>
<td>19</td>
<td>1.5</td>
</tr>
<tr>
<td>September 2 9 17,000</td>
<td>69</td>
<td>9</td>
<td>17</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14,000</td>
<td>63</td>
<td>9</td>
<td>17</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>20,000</td>
<td>65</td>
<td>13</td>
<td>21</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>60</td>
<td>9</td>
<td>30</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>65</td>
<td>8</td>
<td>24</td>
<td>1.0</td>
</tr>
<tr>
<td>October 9 19 19,500</td>
<td>61</td>
<td>8</td>
<td>29.5</td>
<td>1.5</td>
<td></td>
</tr>
</tbody>
</table>

The temperature chart for the same time showed similar variations in the temperature curve as those seen in preceding charts. The temperature...
ranging between 98°F and 100°F, the
variations of temperature following in a
corresponding manner as frequently the
numeral 'epileptic' attacks, rising
according to the number of attacks.

I must begin the observations on
other lines injuncting simultaneously
in similar doses as those in which
the blood serum had been injected
distilled water.

This substance was chosen as being
an indifferent substance chemically,
thereby obviating the introduction of any
substance which in virtue of its chemical
properties might by either its local
effect or by its general action produce
an increased hemoptysis or in any
other manner introduce complications or
failures not ours observations.

Distilled water was therefore injected
continuously daily for a period of
fourteen days, as in the case of
the treatment by means of blood serum.
200 was the daily dose. During this period patient had 14 enemias all of the nature I ground mix.

The only other change I note that falls to be recorded during this time was a relative increase in the proportion of the eosinophile leucocyte, the percentage rising on one occasion to 50. of the total number counted as compared with a total of 1% of the number counted the previous day.

This rise of eosinophiles was associated with a decrease of the polymorph-nuclear variety leucocyte.

The increase however was not maintained the figures for the next day being more in accordance with those obtained previously.

I am inclined to view this as merely a coincidence what bears me out in this view is the fact that on the day in question patient was complaining of some gastric irritation.

A careful search for parasites of the intestine was kept but with negative result.
The appended chart shows the temperature, pulse rate, and the number of epileptic attacks patient had during the period that distilled water was injected subcutaneously.

No apparent benefit having resulted from this form of treatment it was now discontinued & injections of blood serum were again given. As at the commencement of these observations, the blood serum was derived from the patient whose blood serum was that which was just used.

This time blood serum was injected daily for seven consecutive days in quantities of 20 cc daily. During this time for the next four days patient had no attacks either of grand mal or petit mal.
Within the absence of epileptic attacks during this period, was a more
tendancy of the blood serum injected. I cannot say but the fact remains that on the cessation
of treatment the attacks again manifested themselves occurring almost daily, for
a period of fourteen days on which no treatment was adopted. Patient having
experienced epileptic fits in this space of time. Unfortunately, owing to press, no
blood counts were made during the period in which there were no epileptic
attacks.

The above is the temperature chart for this period. It is worthy of note
that the variations are not so marked as seen in the previous copies of

Temperature charts, the temperature at this time never exceeding 99° F.

Treatment was now discontinued for 21 days — at the end of this period I adopted a new line of observation by injecting blood serum obtained from the blood of a non-epileptic patient. The serum chosen was a serum suffering from dementia the result of long continuous mental disease. This serum exhibited no symptoms of epilepsy, nor had any such symptoms ever been noticed in this case.

By this observation I hoped I might ascertain if the serum derived from the blood of an epileptic patient possessed any inhibiting effect on the disease per se or if the benefit of any produced was due to the moral effect produced as the result of injections.

I injected this non-epileptic blood serum if I might so term it for 14 consecutive days 2 cc being injected intermittently daily.
In this space of fourteen days, patient had in all ten attacks of grand mal.

This came proved no change in the temperature curve; there were no important alterations in either the total number of leucocytes per c.e. mm. of blood or in the percentage calculation of the various varieties of leucocytes.

Again, treatment was discontinued for a period of 21 days, during this period patient had 27 epileptic seizures, all of the nature of grand mal.

At the end of this period of 21 days, I again began treatment, using again blood serum derived from the blood of the patient, who had first supplied the blood serum. This being the third time a series of injections of blood serum derived from his blood had been made. In this instance as well as in the preceding occasions on which his blood serum was used, the effect was beneficial more marked perhaps in
this occasion than previously.

Quantity of 2cc were injected daily for fourteen days + in this time patient had only four epileptic

erizes + of them four two occurred in the day on which treatment was

begun + the next day the other nine days later these figures

show a marked improvement in the

preceding number of attacks. It bears

out the fact, taking the figures of the

number of attacks patient had when

under treatment by means of serum

derived from the blood of other patients

than this particular person as also

noting the improvement following the

injections of blood serum derived from

this source, that the blood serum

of this patient possesses an important

power or potency which rendered it

antidote to the epileptic attack or series of attacks. Serum
derived from patients in blood possessed no such

power + it did so it was of a very minor degree of potency.
The improvement in this patient's condition, judging this improvement by the remaining number of fevers, was maintained. For the next month following the last crisis, if injections patient had only nine epileptic seizures.

From May 1902 till the present time March 1903 patient has exhibited no mental symptoms of acute character. He has not become manic-depressive, although he has shown transient attacks of mental elevation for very mild type only very rarely.

In spite of the improvement in his condition he still has a leukocyte which during the past month has ranged from 14,000 to 21,000 per cubic millimeter of blood. The percentage calculation of the different varieties still shows a diminution relatively of the polymorphonuclear variety of leukocyte—a relative increase in the lymphocyte variety.

At present patient feels improves well.
 Plays football generally enters into the amusements of the asylum. This moral tone has improved somewhat but this may be due to the routine discipline of asylum life.

Summarised shortly I think the more important points in patient's case are:

1. Absence of any further attacks of acute maniacal excitement.

2. Diminution of the number of epileptic attacks while under treatment by means of injection of blood serum derived from the blood of another epileptic patient.

3. Relapsing again on discontinuance of the injection of this blood serum.

4. Little or no benefit produced in patient's condition, judging this benefit by the number of epileptic fits patient had while under treatment from:

   a. Injection of blood serum obtained from patients own blood.

   b. Injection of blood serum obtained from the blood of a non-epileptic.
patient.

5. The absence of any toxic effect on the result of injecting blood serum.

6. The constantly present leucocyte rise on the increase in the number of leucocytes in acute melena in blood in association with an epileptic attack.

Taking the average number of leucocytes in health, excluding of course a physiological leucocytosis as the result of digestion, as from 6000 to 10,000 for acute melena of blood, patient always exceeded this number even when free from any epileptic attacks.

7. The percentage counts of the various varieties of leucocytes also showed variations from the average found in healthy individuals, the polymorph number variety being relatively diminished in number with an increase in the mononuclear and
lymphoedematous varieties as a rule.

The injections of blood serum produced no alteration in this percentage calculation of the different varieties.

The variations seen in the temperature curve, an increased temperature being in most instances closely related to the epileptic attacks.

The alteration in the nature of the attacks seem only at the commencement of the observations the attacks changing from those of grand mal to those known as petit mal.

The improvement becoming so early apparent as the result of serum injections, usually between 7 days and 14 days.

The best family history of the patient is worthy note his father being a confirmed alcoholic.
Case 1
A. T., male, age 34 years
Occupation: Labourer
Admitted: July 16th 1878
Diagnosis: Congenital epilepsy with imbecility.
Duration of epileptic attacks: Since birth.

Family History: Father insane.

Personal History:
Patient is a congenital imbicile who suffers from epilepsy. He was sent to this institution because he had become defective in his habits, having become dirty and untidy.
For years he had been treated by administration of bromide of potassium. His epileptic fits had always been severe or had nearly all been nocturnal in habit.

Physical Condition: Patient is a tall, undeveloped, unhealthy-looking man. Clear; very nervous and slightly in character but no evidence of tubercular disease.
Mental condition:

Patient is much expected mentally, can neither read nor write; memory for both recent past events bad. On admission he was dazed, confused, looking. He had been treated since admission with bromide of potash, 50 mg being given at bedtime.

Engel's bromide 

ether 

also been tried with no resulting benefit. The attacks from which he suffered were all of the nature of grand mal varied from one up to thirty two in the 24 hours no day elapsing without the occurrence of one or more epileptic attacks.

Serum treatment was commenced in this patient on June 15th last.

Prior is that being done, patient's temperature was taken twice daily, his leucocytes for white mononuclear cells estimated daily, or a percentage of the different varieties.
Vancouver was calculated, as were the number of epileptic attacks patient had during a period of three weeks prior to the commencement of treatment by means of blood serum injections.

I should add, however, that during this period prior to treatment by means of blood serum injections being commenced, patient was depleted of blood at irregular intervals to supply blood serum for injections in the succeeding following cases.

The following is a copy of the temperature chart showing the variation in temperature number of epileptic attacks and pulse rate during this period.
The temperature ranging from 97.2-7.5
99.4°F the pulse rate from 65 for
minute to 103 beats for minute.
In this period patient had six
epileptic attacks during the day
and 12 attacks during the night.
Concurred with these clinical phenomena
certain changes were observed in the
blood as in the preceding cases.
The following table gives the total
number of leukocytes per one millimeter of
blood and the percentage calculation
for this period of 21 days.

<table>
<thead>
<tr>
<th>Date of Commencement</th>
<th>Total No. of Leukocytes</th>
<th>Percent of Leukocytes</th>
<th>Percent of Neutrophils</th>
<th>Percent of Monocytes</th>
<th>Percent of Lymphocytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 25th</td>
<td>17,000</td>
<td>56%</td>
<td>10%</td>
<td>33%</td>
<td>2.0%</td>
</tr>
<tr>
<td>. 29th</td>
<td>16,190</td>
<td>77%</td>
<td>4%</td>
<td>13%</td>
<td>3.0%</td>
</tr>
<tr>
<td>. 30th</td>
<td>23,500</td>
<td>59%</td>
<td>19%</td>
<td>21%</td>
<td>1.0%</td>
</tr>
<tr>
<td>. 31st</td>
<td>30,000</td>
<td>49%</td>
<td>10%</td>
<td>39%</td>
<td>2.0%</td>
</tr>
<tr>
<td>June 1st</td>
<td>15,000</td>
<td>65%</td>
<td>13%</td>
<td>21%</td>
<td>1.0%</td>
</tr>
<tr>
<td>. 2nd</td>
<td>20,000</td>
<td>62.5%</td>
<td>10.5%</td>
<td>26%</td>
<td>1.0%</td>
</tr>
<tr>
<td>. 3rd</td>
<td>16,100</td>
<td>63%</td>
<td>9%</td>
<td>17%</td>
<td>1.5%</td>
</tr>
<tr>
<td>. 4th</td>
<td>19,000</td>
<td>66%</td>
<td>13.5%</td>
<td>19%</td>
<td>1.5%</td>
</tr>
<tr>
<td>Date of Count</td>
<td>Total No. of Leucocytes per cubic mill.</td>
<td>Percentage of Polymorphonuclear Variety</td>
<td>Percentage of Mononuclear Variety</td>
<td>Percentage of Lymphoid Granulocytes Variety</td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>---------------------------------------</td>
<td>----------------------------------------</td>
<td>----------------------------------</td>
<td>-------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>June</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>13500</td>
<td>60</td>
<td>22</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>16150</td>
<td>60</td>
<td>22</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>28000</td>
<td>60</td>
<td>22</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>20500</td>
<td>56</td>
<td>17.5</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>22000</td>
<td>66.5</td>
<td>14</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>16000</td>
<td>73</td>
<td>5.5</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>15250</td>
<td>51</td>
<td>18</td>
<td>30.5</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>15000</td>
<td>48</td>
<td>12.5</td>
<td>38.5</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>16000</td>
<td>50</td>
<td>12.5</td>
<td>37</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>17000</td>
<td>66</td>
<td>6.5</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>25000</td>
<td>41</td>
<td>32.5</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>32000</td>
<td>51</td>
<td>20</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>21500</td>
<td>60</td>
<td>10</td>
<td>38.5</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>26400</td>
<td>65.5</td>
<td>14.5</td>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>

The changes of importance, as compared with the average as seen from the above table, consist in a persistent leucopenia, with a diminution of the polymorphonuclear variety. Leucopenia, in a few instances, a relative large increase in the number of mononuclears.
variety. Leucocytes. The percentage calculation of this variety working out in one instance was 32.5 per cent. The total number of leucocytes counted.

I now began treatment by means of injections of blood serum. Serum obtained from the blood of the preceding case was injected entertained in quantities of 2 cc for 14 consecutive days.

During this period patient had 97 attacks of chills and 3 of the attacks being during the day the remainder occurring during the night. There were no changes of any import observed in the total number of leucocytes for cubic millimeter of blood during this period. The number ranged between 14,000 to 30,000 for cubic millimeter. The temperature curve also showed variation between 97.4°F - 99°F.

I should have added that the differentiated count of the number
Lancet was still cleared a relatively low number of leukocytes and cells but the only point noted is the fact that the highest amount of leukocytes lancet was 12 per cent. of the total number counted. The lymphocyte and net cell showed an increase corresponding to the decrease of the polymorphonuclear variety of leukocyte.

I now increased the amount of serum injected up to 3 cc blood derived from the preceding case being still used.

This quantity was injected daily for seven days. During this time patient had 32 epileptic attacks, ten of which occurred during the day.

The severity of the attacks was in no way lessened nor was there any tendency for the attacks to persist to the type known as petit mal as was the case in the preceding patient.
The following is a copy of patient's temperature chart for the latter part of this period.
Observation was made 3cc of blood serum was being injected.

The only notable point in the above is the line 97.8 on July 6th.

The following table shows the changes in the blood number. Examples for cubi millimeters of blood and the relative proportions of the different varieties of white blood cells during this time period.

The point to be noted is which I have already referred being the diminution of the relative proportion of the mononuclear variety of cell.
<p>| Date of | Total No. of | Percentage of | Percentage of | Percentage of | Percentage of |</p>
<table>
<thead>
<tr>
<th>Council</th>
<th>cells in g</th>
<th>Polymorphonuclears</th>
<th>Lymphocytes</th>
<th>Monocytes</th>
<th>Eosinophils</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 3.</td>
<td>16200</td>
<td>63.5%</td>
<td>12.5%</td>
<td>22.5%</td>
<td>1.5%</td>
</tr>
<tr>
<td>4.</td>
<td>23000</td>
<td>78%</td>
<td>5%</td>
<td>15%</td>
<td>20%</td>
</tr>
<tr>
<td>5.</td>
<td>18000</td>
<td>63%</td>
<td>12%</td>
<td>24%</td>
<td>10%</td>
</tr>
<tr>
<td>6.</td>
<td>13800</td>
<td>59%</td>
<td>12%</td>
<td>28%</td>
<td>10%</td>
</tr>
<tr>
<td>7.</td>
<td>14500</td>
<td>68%</td>
<td>8%</td>
<td>23%</td>
<td>10%</td>
</tr>
<tr>
<td>8.</td>
<td>15500</td>
<td>65%</td>
<td>10.5%</td>
<td>23%</td>
<td>10%</td>
</tr>
<tr>
<td>9.</td>
<td>14500</td>
<td>67%</td>
<td>9%</td>
<td>23.5%</td>
<td>.5%</td>
</tr>
<tr>
<td>10.</td>
<td>16500</td>
<td>64%</td>
<td>8%</td>
<td>27%</td>
<td>10%</td>
</tr>
</tbody>
</table>

I was discontinued treatment for a space of five days at the end of which time I began my observations again, but on this occasion I injected blood serum derived from the blood of the patient himself.

I commenced by giving quantities of 3 cc subcutaneously for a period of seven days, the injections being given daily.

In this space of time patient took no epileptic attacks during the day and...
64 during the night time. On one occasion the number of fits patient had during a space of 12 hours was 22 all being typical instances of grand mal.

The quantity of blood serum injected was was increased to 40c daily, serum derived from his own blood being that which was injected. This quantity was injected for seven days, the result obtained was however very disappointing as during this time patient had no less than 15° epileptic fits, 64 occurring during the day and 23 in the night time.

Injections of distilled water, also injections of blood serum derived from a non-epileptic patient, were made as in the previous case but with no result worthy of recording.

In spite of the large number epileptic fits patient had, he never exhibited any symptoms of mental disorder of the chronic epileptic manic with the exception of one attack in July, which
however was of a very transient character only lasting a few hours. Patient however was irritable and bad temper occasionally.

During the period patient was under treatment or also during the succeeding months blood was withdrawn from his veins at various intervals to supply blood serum for injection into the other cases of the series. The exact amount as withdrawn I am unable to state, but what I desire to note is the fact that the number of epileptic seizures gradually became fewer and at length finally ceased entirely.

This ablation of blood may have by the ablation of protective bodies eliminated their reproduction and also their reproduction so leading to an increased antitoxic or individual property in the blood.

Ellis' proposition is suggested by Dr. Grünbaum in his lectures on the disease.
This diminution of the number of epileptic seizures will be more evident when we study the following records which show the number of attacks patient had up to the time of the complete disappearance of the epileptic fits.

During August 1902, patient had a total of 276 epileptic seizures. For the first week in September the number equalled 21, the remaining three weeks contributing 96 attacks a total of 117 for the month as compared with 276 the previous month.

For October the total number equalled 293 an increase over August.

From the end of October up till November 16th, the date on which the attacks disappeared, patient had 118 attacks.

On the 16th November the attacks ceased and for a period of 72 days patient had no symptoms of epilepsy, a circumstance unique in his case as since admission
it was unusual for 24 hours to elapse without the patient being subject to one or more attacks of grand mal. During this period of 72 days no sedatives or any kind were administered. A quantitative and qualitative count of the leucocytes were made at intervals during this period of remission. Invariably the total number of leucocytes per cubic millimetre of blood was in excess of the average, the number ranging between 14,000 and 20,000. The percentage calculation of the different varieties of leucocytes showed no change when comparing the figures with those previously given in this case. The temperature however never exceeded 98.8° F. At the expiration of this period the attacks gradually increased in number again the onset being quite sudden in character.
Summarised briefly the points which seem to me worthy of note are:

1. The large number of apoplectic attacks at the diencephalic level of their appearance.

2. The constantly present leucopenia, even during the period of freedom from attacks.

3. The relative diminution of the polymorphonuclear variety of leucocyte, with the increase in a few instances of the mononuclear variety. The percentage of mononuclear cells reaching 32.5% of the total number enumerated, in one instance June 16th.

4. The variations of temperature.

5. The negative results of piperazine uracil.

6. The sudden cessation of the attacks, the absence of any indication of the disease for a period of 72 days.
1. The absence of will in an exception any maniacal symptom.

2. The hereditary tendency, that patient learned under 16 mental disease his father being insane.

Case 
B. C. female, aged 25 years
Admitted - August 26, 1901
Duration epilepsy - Since birth
Duration frequent attacks of acute mania - 10 days

Family History - Father a confirmed drunkard.

Personal History: "Patient has been subject to epilepsy since birth. She suffering from both grand mal and petit mal. Since puberty the attacks of the disease have been closely allied to her menstruation periods becoming more numerous at these times."
Patient has been treated for many years by means of administration of bromide of potash with little or no resulting benefit.

Her temper has always been of an irritable kind, passionate yells were not infrequent. She has since probably exhibited hysterical symptoms of an emotional kind.

In August 1900 patient was admitted to this institution in a state of acute manic-depressive excitement, which continued, however, only persisted for a few days after which she became quite rational and after 2 months residence her patient was discharged as recovered mentally, but still suffering from epilepsy.

From the date of her discharge till the next of the present attack patient has remained quite well mentally.

The present attack of mania from which she suffered on admission was characterized by incoherence, delusions...
Recovery, the attack resembling in every particular the previous one. Appropriate treatment of the attack began to pass off from that date. Aug 1901 until the time patient came under observation in May 1902. She was quiet, rational and normal in behaviour. There was no indication of a return of her maniacal condition.

A fact worth noting perhaps about this case is that her intelligence is of a much higher order than that of the previous cases. She can read and write well as she received a fair education.

Treatment by means of blood suction was begun in May 24th 1902 but as in the other cases under observation her temperature was taken twice daily and also a count of the leucocytes for acute middle of blood, along with a percentage calculation of the different varieties.
The following is a copy of the temperature chart for this period.

The important point in the above chart, comparing it with the temperature charts of the preceding cases, is the fact that the temperature never rose above 99.6°F, the number of epileptic attacks having no association with the temperature curve. The attacks of epilepsy influencing the rise of temperature in no way.

In the same space of time the number of epileptic seizures which patients had were ten, four being of the nature of petit mal — a diet then known as grand mal.
Associated with these phenomena certain definite changes were observed in the condition of the blood. There was present a constant increase in the number of leucocytes per cubic millimetre of blood, the number ranging from 12,000 to 23,000 per cubic millimetre of blood. The percentage calculation showed as a rule a diminution in the relative number of polymorphonuclear cells, the same change being noted in the previous cases. The number of neutrophilic leucocytes was found to be the majority of the cells in an excessive proportion, reaching in one instance 23.5% of the total number of leucocytes counted. This increase was more constantly present than in any of the preceding cases.

There was no eosinophilia present during this period. The lymphocytic variety of leucocytes showed with one exception in May 25, 1926, a steady...
The following table shows the figures for the period under discussion.

<table>
<thead>
<tr>
<th>Date of Count</th>
<th>Total No. of Cubic m.</th>
<th>Percentage of Polymorphonuclear Lymphocytes</th>
<th>Eosinophile Lymphocytes</th>
<th>Percentage of Mononuclear Lymphocytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 9th</td>
<td>12,000</td>
<td>63.5%</td>
<td>7.5%</td>
<td>28.5%</td>
</tr>
<tr>
<td></td>
<td>13,750</td>
<td>70%</td>
<td>9%</td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td>14,000</td>
<td>65%</td>
<td>10%</td>
<td>24%</td>
</tr>
<tr>
<td></td>
<td>23,000</td>
<td>66%</td>
<td>9%</td>
<td>24%</td>
</tr>
<tr>
<td></td>
<td>14,500</td>
<td>66%</td>
<td>10%</td>
<td>22.5%</td>
</tr>
<tr>
<td></td>
<td>12,500</td>
<td>72%</td>
<td>7.5%</td>
<td>20.5%</td>
</tr>
<tr>
<td></td>
<td>12,700</td>
<td>70%</td>
<td>12.5%</td>
<td>15%</td>
</tr>
<tr>
<td></td>
<td>12,400</td>
<td>61.5%</td>
<td>12.5%</td>
<td>24.5%</td>
</tr>
<tr>
<td></td>
<td>16,000</td>
<td>63%</td>
<td>23%</td>
<td>23%</td>
</tr>
<tr>
<td></td>
<td>13,000</td>
<td>62%</td>
<td>21%</td>
<td>27%</td>
</tr>
<tr>
<td></td>
<td>21,000</td>
<td>62%</td>
<td>19%</td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td>13,000</td>
<td>60%</td>
<td>14%</td>
<td>25%</td>
</tr>
<tr>
<td></td>
<td>18,000</td>
<td>63%</td>
<td>12%</td>
<td>34%</td>
</tr>
<tr>
<td></td>
<td>20,000</td>
<td>57.5%</td>
<td>7.5%</td>
<td>33.5%</td>
</tr>
<tr>
<td></td>
<td>17,000</td>
<td>67.3%</td>
<td>12.8%</td>
<td>23.6%</td>
</tr>
<tr>
<td></td>
<td>16,000</td>
<td>68.5%</td>
<td>7.5%</td>
<td>23.5%</td>
</tr>
</tbody>
</table>

Note: The figures are approximate and subject to natural variation.
Treatment by means of injection of blood serum was now begun.
The serum used was that derived from the blood of the preceding case.

This blood serum was injected intravenously in quantities of 2 c.c. daily for a period of 14 days. The results obtained were decidedly encouraging in this time period had only one epileptic attack which occurred on the fourth day on which blood serum was injected.

The temperature curve during this period exhibited an interesting phenomenon. Although never rising above 98.6°F, there was a distinct evening rise in temperature for a space of seven days. This evening variation, although not marked was still very suggestive of a mild toxemia. There were no local manifestations at the point of injection of the blood serum.

To illustrate this point graphically, I append a copy of the temperature
chart for this period. The change to which I refer being seen between the dates June 1st and June 7th, but being most marked during the first part of June.

The daily enumeration of the number of leucocytes per cubic millilitre of blood, during this period, was not the only thing that the irregularity of temperature above referred to may have been due to a toxic condition as on the dates, in which the rise of temperature was most marked, the leucocytes reached the highest point it attained during this period; associated with this numerical increase however there was a diminution of the relative number of polymorphonuclear cells.
The following table gives the figures for this period, shows the changes to which I refer.

<table>
<thead>
<tr>
<th>Date of Count</th>
<th>Total No. of Leucocytes per Cmm</th>
<th>Percentage of Leucocytes</th>
<th>Percentage of Polymorphonuclears</th>
<th>Percentage of Lymphocytes</th>
<th>Percentage of Mononuclears</th>
<th>Percentage of Eosinophils</th>
<th>Erythrocytes (Mill.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 1 30th</td>
<td>15900</td>
<td>67</td>
<td>18</td>
<td>23.6</td>
<td>0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>12800</td>
<td>70</td>
<td>5</td>
<td>21</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>13750</td>
<td>63.0</td>
<td>7.5</td>
<td>28.5</td>
<td>0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>June 1 3rd</td>
<td>19400</td>
<td>54</td>
<td>16</td>
<td>29</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>17000</td>
<td>59</td>
<td>12</td>
<td>28</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>19000</td>
<td>56.5</td>
<td>16.5</td>
<td>26</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>13780</td>
<td>59</td>
<td>12</td>
<td>28</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>12450</td>
<td>60</td>
<td>19</td>
<td>20.5</td>
<td>0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>14000</td>
<td>55</td>
<td>19</td>
<td>25.5</td>
<td>0.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The amount of blood serum injected was now increased to 3 c.c. daily, this quantity being given for a period of ten days. The blood serum was derived from a similar source, viz., from the preceding case, as their previously injected. During this space of ten days patient had in all three attacks of grade mere June fever, and
In total of eight epileptic seizures during ten days. This increase in the number of attacks was due, probably, to the fact that the patient was menstruating at the time the injections were made. The menstruation period lasted for seven days. She had an attack of giddiness, fainting, or partial loss of activity during this time. There were no changes to be noted in the temperature curve; the highest point reached being 98.6°F. Hematologically, the leucocytes were still in excess, ranging from 12,000 to 16,000 per cubic millimeter of blood. The differential count, however, showed a relative diminution of the mononuclear variety of leucocyte as compared with that obtained in the majority of the previous counts. The following table gives the percentage calculation of the different varieties of leucocyte at this period. The figures for alternate days being those given.
<table>
<thead>
<tr>
<th>Date of Count</th>
<th>Percentage of Polymorphonuclears</th>
<th>Percentage of Mononuclears</th>
<th>Percentage of Lymphocytes</th>
<th>Percentage of Eosinophils</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 12th</td>
<td>61</td>
<td>5</td>
<td>20</td>
<td>1.0</td>
</tr>
<tr>
<td>14th</td>
<td>68</td>
<td>6</td>
<td>25</td>
<td>1.0</td>
</tr>
<tr>
<td>16th</td>
<td>62</td>
<td>6</td>
<td>30</td>
<td>2.0</td>
</tr>
<tr>
<td>18th</td>
<td>64.5</td>
<td>9</td>
<td>26</td>
<td>1.5</td>
</tr>
<tr>
<td>20th</td>
<td>66.5</td>
<td>6</td>
<td>27</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Treatment was now discontinued for seven days - during that time patient had his attacks of grand mal. Observation was now begun again but in this instance serum derived from the blood of another epileptic was used. Case #2 by this serum being the serum from whom the blood was withdrawn. The blood serum of this patient was injected automatically in the following doses - for the following number of days:

- 3 c.c. daily for four days.
- 3 c.c. daily for the succeeding four days.
- 4 c.c. daily for the next four days.

Treatment extending over a period of twelve days, patient receiving during this...
Time 36 cc of blood serum.

The following was the result:

During period 0 number of rat = 2, petit mal
0 " " " nil
0 " " " 1 grand mal.

A total of three attacks in 12 days.

The next time period being due in four days I was endeavourd to ascertain if by injecting blood serum prior to the next menstruation I could prevent the attacks of petit mal which occurred concomitantly with menstruation.

With this object I viewed I injected 5 cc of blood serum obtained from the blood of Case 1 in the canine, daily for the intervening four days between the date at which menstruation was likely to occur.

The result was however negative. There were no attacks of petit mal or petit mal during the time blood serum was injected but with the commencement of menstruation the attacks again appeared.
The menstrual period lasted seven days. In this time, patient had 2 attacks of grand mal and 6 petit mal. His injections were given during the time menstruation lasted.

On the cessation of menstruation treatment was again commenced. 3 c.c. blood serum from the same case being injected daily for ten consecutive days, in that time there were no attacks of petit mal.

I now discontinued treatment for seven days with the object of trying to ascertain if the absence of attacks was in any way due to the injection of blood serum and likewise to observe if the blood serum conferred any lasting immunity. Patient however in this period had a attack of grand mal.

I again at the end of this time, injected in quantities of 3 c.c. daily for seven days blood serum derived from a similar case and in this time patient had two attacks
petit mal.

Two days from this date mentioning again began and during this mentioned period patient had in all four attacks one grand mal and three petit mal. An improvement as compared with previous times.

I now discontinued treatment for 28 days and in that time patient had only one attack of grand mal and four attacks of petit mal an improvement as compared with previous months since the observations were begun.

The following table shows the number of epileptic attacks patient had per month since observations commenced.

<table>
<thead>
<tr>
<th>Number</th>
<th>No. of attacks</th>
<th>Total number of fits per month</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>2nd</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td>3rd</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>4th</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>5th</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Patient had exhibited no mental symptoms during the five months she was under observation. Beyond a slight irritability at times + stupor after a severe attack of grand mal. She was in good physical health & slept well.

Patient was discharged to the care of her friends at the end of another 21 days during which time she had only had 2 attacks of petit mal + 1 attack of grand mal.

A week prior to her discharge from the institution her leucocytes were counted daily both numerically + qualitatively. There was still a leucopenia present; the number of leucocytes per cubic millimeter of blood ranging between 12000 and 18000 during this time.

The differential count still showed a relative diminution, as compared with the average healthy individual, of the polymorphonuclear leucocytes. The leucocyte cells never exceeded 9%.
of the total number counted, the lymphocytes
were in excess of the average number
the increase being in proportion to the
diminution of the polymorphonuclear cells.
There was no eosinophilic focus.

This case was not treated by means of
injections of distilled water nor was
serum derived from the human blood
injected as in the preceding cases.
Unfortunately the improvement was
not maintained, patient being
readmitted a fortnight from the date
of discharge in a state of acute
mania which however only lasted
for a few days which had been
preceded by a large number of
epileptic seizures, the exact number I
have been unable to learn.
At present patient is quite rational
but still subject to attacks of both
grand mal & petit mal.
The important points in the preceding case which seem worthy of note from the point of view of comparison with the other cases described are:

1. The presence of both grand mal and petit mal.

2. The relation of the attacks to the menstrual periods.

3. The constantly present leucopenia.

4. The diminution of the polymorphonuclear variety leucocyte with the relative increase at the same time of the lymphoid cells.

5. The non-toxic effects of the injection of blood serum.

6. The benefit derived from the injection of blood serum.

7. The abnormal temperature present.

8. The family history, her father as well as her grandmother alcoholic.
9) The relapse wit a condition found in
numeral excitement so soon after her
discharge from the asylum.

Case 17

E. M.: Female, age 23 years
Admitted: August 6th 1899
Duration epilepsy: Since birth.
Family history: No hereditary tendency
acknowledged.

Personal history:
Patient has been subject to epilepsy
since birth, but as far as we have been
cold to ascertain from her friends, the
number of epileptic attacks have become
more frequent recently.
Patient was sent to this institution
because her friends were unable to
manage her at home, she being
subject to post epileptic loss of self
control.

State on admission:
Physical condition: Beyond a small
rash on face due to an infectious
In bronchitis of tuberculum, there is nothing
noted.

Mental condition:

Patient is demented

little memory for either past or
present events.

She can only answer simple and
direct questions, is unable to read
or to write.

She from epilepsia from which she suffers is grand mal. She
fits are always severe in character.

I should add that patient suffers
from amanithora, she never having
mentacited since admission, nor for
some years preceding.

Treatment by means of injections of
blood serum were commenced in this
case in October 1902, as in the
preceding cases' a record of the
temperature, pulse, number of fits
and a daily count of the number of
leucocytes in four cubic mm. blood as well
as a percentage calculation of the different
varieties of leukocytes was kept for a period of three weeks prior to the commencement of treatment.

The following table shows the changes in the numerical quantitative counts of the leukocytes during this period. I have only given the figures for alternate days in the latter part of the table.

<table>
<thead>
<tr>
<th>Date</th>
<th>Total No.</th>
<th>Percentage</th>
<th>Percentage</th>
<th>Percentage</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cell Count</td>
<td>Leukocytes</td>
<td>Polymorphonuclear</td>
<td>Monocytes</td>
<td>Lymphocytes</td>
</tr>
<tr>
<td></td>
<td>(x1000)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oct. 3rd</td>
<td>21000</td>
<td>70</td>
<td>9</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>19000</td>
<td>62</td>
<td>11</td>
<td>26</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>17000</td>
<td>66</td>
<td>6</td>
<td>27</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>15500</td>
<td>57</td>
<td>8</td>
<td>23</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>20000</td>
<td>72</td>
<td>6</td>
<td>21</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>16000</td>
<td>70</td>
<td>5</td>
<td>24</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>17800</td>
<td>67</td>
<td>10.5</td>
<td>21</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>15000</td>
<td>69</td>
<td>9</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>19000</td>
<td>73</td>
<td>8.5</td>
<td>21</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>16200</td>
<td>74</td>
<td>7.5</td>
<td>18</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>18500</td>
<td>69</td>
<td>7</td>
<td>23</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>19700</td>
<td>63</td>
<td>11.5</td>
<td>22.5</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>16500</td>
<td>67</td>
<td>8.5</td>
<td>23</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>24000</td>
<td>70</td>
<td>8</td>
<td>20</td>
<td>2</td>
</tr>
</tbody>
</table>
From the preceding table, the presence of a constant leukoebwsis, as in the other cases of the series is seen, but in this instance the frequency of polymorphonuclear cells is higher in the majority of the counts than was usually found. There is likewise here no increase in the number of mononuclear cells, a fact also noted in the former cases.

The lymphoebwsis variety of leukoebwsis was present with perhaps one or two exceptions in a fairly normal proportion. There was no eosinophic predominance.

For a corresponding period the temperature as the following chart shows ranged from 96°8 to 99°4.

The following is a copy of the temperature chart for this period. The fever rose during the same time ranged between 84 beats per minute to 100 beats per minute.

The number of epileptic attacks patient had during this space of three weeks was eighteen. The dates on which they
Treatment by means of injecting a blood serum derived from the blood of an epileptic patient was now commenced. The patient from whom the blood serum was obtained was a T. Case it of this series. This blood serum was injected subcutaneously for 14 consecutive days, the quantity injected daily being 2 c.c. The number of epileptic seizures patient had while under treatment for this third listed seizure. All were of the nature of grand mal.
The number of leucocytes for which millimetre
plotted during this time ranged
between 14500 and 24000.
The differential counts showed no
marked variation in the percentage
calculation from those given in the
previous table. The polymorphonuclear
cells still were present in a relatively
high proportion never falling below
69.7% of the total number of leucocytes
counted. The mononuclear cells
in the same period did not exceed
8.57%.
Treatment was not discontinued for
three days owing to lack of blood
serum. On the resumption of
treatment at the end of this time
the quantity injected was increased
to 300, the blood serum being
derived from the same source as
previously.
This amount was injected daily
for seven consecutive days.
The number of epileptic seizures
patient had during this seven days
was only two, giving a total of nine
epileptic attacks from the date on
which sodium injections were begun
up to the present—an interval of
twenty-four days.
When we compare these figures
with the number of attacks patient
had during the 25 days she was
under observation prior to the
commencement of treatment by
injections of blood serum, the
benefit is very striking. The number
for that time being eighteen.
One has learned to take into
consideration in making this comparison,
the fact that bromide of potassium,
with which patient had been treated
for years was suddenly stopped
and the sudden stoppage of this nerve
sedative may have caused an
increase in the number epileptic
attacks.
The benefit produced therefore, by
injections of blood serum, may have
been more apparent than real, judging
this benefit or improvement by the number of epileptic attacks patient had. This fact however remains to be noted viz. that on the cessation of treatment by means of injections of blood serum the number of epileptic attacks again showed an increase as compared with the number which occurred during the time blood serum was injected.

Two days were now allowed to elapse at the end of that time blood serum derived from another patient subject to epilepsy was injected. The patient on this occasion being G. A. Case 1 in this series. The blood serum derived from this source was injected in quantities of 3cc for seven consecutive days. At that time patient had four epileptic attacks. A space of seven days was now allowed to elapse during which time no injection was given or during
which interval the number epileptic attacks was seven.

Observation was begun in different doses blood semen obtained from the blood of a non epileptic patient being injected. This blood semen was given daily in 5 cc quantities for seven days in which time patient had five epileptic attacks. The amount blood semen injected was increased to 3 cc daily. This quantity was injected daily for seven days during which time patient had seven epileptic attacks giving therefore a total nine attacks in these fourteen days during which blood semen derived from a non epileptic was injected. This number epileptic attacks is equal to the number patient had in 24 days during which time blood semen derived from Case I was injected. These figures tending to bear out the fact that the latter semen was possess of some power.
Inhibiting the attacks.

Following the observations made in Case 1 distilled water was now injected daily in quantities of 3 cc for seven days — during this time patient had no attack of epilepsy.

It endeavored to ascertain if the benefit produced by the lessening of the number of attacks seen in the occasions on which blood serum derived from case 1 was injected was due to any particular property possessed by that blood serum or was only a coincidence injections with blood serum derived from that source were again begun. Injections were given daily for ten days and in that period patient had only one epileptic attack which occurred on the ninth day on which injections of blood serum were made.
For the purpose of still investigating the comparative value of the two sera that derived from the blood of Case I was now in 200 quantities for seven days. The number of attacks patient had in this time was five.

Blood serum derived from Case II was now injected again 200 being injected daily for seven days or in this time patient had two attacks frequently we in the fourth the other in the fifth day of treatment. These figures appear suggestive. They apparently bear out the fact that the serum derived from the blood of Case II was more powerful as an inhibitory agent in lessening the attacks than was the serum derived from the blood of a person who was not subject to epilepsy.

The following table shows these results more graphically certainly perhaps.
<table>
<thead>
<tr>
<th>Serum from Case</th>
<th>Duration of Treatment</th>
<th>No. of attacks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case 1/1</td>
<td>21 days</td>
<td>9</td>
</tr>
<tr>
<td>&quot;  1/2</td>
<td>10 days</td>
<td>1</td>
</tr>
<tr>
<td>&quot;  1/3</td>
<td>7 days</td>
<td>2</td>
</tr>
<tr>
<td>Case 1/4</td>
<td>7 days</td>
<td>4</td>
</tr>
<tr>
<td>&quot;  1/5</td>
<td>7 days</td>
<td>5</td>
</tr>
<tr>
<td>Non. epileptic</td>
<td>14 days</td>
<td>9</td>
</tr>
<tr>
<td>distilled water</td>
<td>7 days</td>
<td>4</td>
</tr>
</tbody>
</table>

The number of epileptic attacks which the patient had during the times no injections were given were:

(a) Prior to commencement of injection for a period of 21 days = 18 attacks
(b) Seven days between the injection of blood serum derived from case 1 which serum derived from the blood of a non-epileptic patient = 7 seizures.

The total quantities of blood serum injected was as follows:

Blood serum derived from Case 1/1 = 930 cc
Blood serum derived from Case 1/2 = 350 cc
Blood serum derived from non-epileptic = 380 cc
Amount of distilled water = 21 cc.

The quantity of blood serum derived from
the blood of Case ii, injected, is in excess of the amount injected which was derived from other sources, but if one excludes the first period of 21 days and compares the figures for similar lengths of time during which similar quantities were administered, the different aspect the results arrived at are in favour of the blood serum derived from the blood of Case ii.

Treatment was now discontinued and the following table shows the number of attacks patient had during a period of five weeks following the date on which treatment was discontinued.

<table>
<thead>
<tr>
<th>1st week after cessation of treatment</th>
<th>Epileptic attack</th>
</tr>
</thead>
<tbody>
<tr>
<td>2nd week</td>
<td>4</td>
</tr>
<tr>
<td>3rd week</td>
<td>3</td>
</tr>
<tr>
<td>4th week</td>
<td>4</td>
</tr>
<tr>
<td>5th week</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>
Associated with these clinical phenomena there were no changes to be noted in the temperature, pulse rate, or in the number of leucocytes for entire millimetric blood, or in the relative proportion of leucocytes counted. The leucocytes still remained above the average amount, varying from 13,000 to 31,000 per cubic millimetric blood.

It is evident that in the dementia from which the patient is suffering, the dementia is of a progressive nature. As I have previously mentioned, the patient suffered from amnesia. The attacks came on at irregular intervals, these intervals having no relation to the periods at which menstruation normally might be expected to appear.

There were no symptoms of a maniacal nature to be noted during this period of observation.
Summarized briefly the important points in the foregoing case seem to be:

1. A constantly present leucocytosis.
2. The differences were in the various percentages of the different varieties of leucocytes, showed a relatively large percentage of the polymorphonuclear variety. Leucocytes, with no marked increase in the number of mononuclear cells as compared with the previous cases observed.
3. The oscillations of the temperature curve.
4. The increase in the pulse rate.
5. The number of beats per minute rarely falling below 80.
6. The inhibitory power excited in the alimentary tract by blood serum derived from the blood of Case II.
7. The slight benefit apparently produced by the injections of blood, serum derived from the blood of Case II.
8. The absence of results on these occasions on which
a. Blood serum derived from a non-epileptic patient was injected.
b. Distilled water was injected.
c. The demented condition of the patient.
d. The absence as far as we are able to learn of any hereditary tendency to the same in this particular case.

Case 

T. R. male, aged 42 yrs.
Occupation: painter.
Admitted: October 8th, 1876.
Duration epileptic: Since patient was fourteen years ago.
Duration of previous attack of mental excitement: A few days.

Family History:

3. An uncle died insane.
6. Elder brother neurotic.
8. Another brother epileptic treated in this institution for some years.
Personal History:
Patient had never exhibited any symptoms previously until he attained the age of fourteen years, when patient met with a slight accident and as his friends called received a greater fright than any injury.
This was followed by a series of epileptic attacks all of the nature of grand mal. These attacks have gradually increased in frequency and also in severity particularly of late years.
After a more than usually severe series of attacks patient has become impulsive followed by a stuporous state.

Condition on admission:
The following is an extract from the case books of the asylum.
Smaller condition: Nothing noted, no evidence of phthisis.
Mental state:
Patient is in a condition of stupor but prior to admission he had been
early manic stage all self control, very incoherent.
She had been treated at home with
drug doses of bromide of potassium.
Two days after admission he relapsed.
As a delirious condition at night, large
and low blood content retention of
urine required to be fed.
After bromides were administered, the
constipation retention urinary were
relieved under this regime associated
with nourishing food patient gradually
recovered, became quite rational.
From that time till the present
date patient has been in fair
physical health, has exhibited no
further manifestations of acute mental
disturbance beyond a certain amount
of postictal irritability of tenderness after
an unusually severe number of
epileptic attacks.

/
Observations on this patient were begun on September 24th, 1902, or 21 days from this date injections of blood serum were begun.

As in the preceding cases, the number of leucocytes per cubic millimetre of blood was estimated daily, a curve of the different varieties being made. The temperature, pulse rate, number of epileptic attacks recorded.

The following table shows the number of leucocytes per cubic millimetre of blood, and also the percentage error for this time. From this table it will be noted that there was a maximum present leucocytes, the lowest figure being 14,000 for cubic millimetre of blood, the highest figure being 30,000 leucocytes per cubic millimetre of blood.

The foregoing curves show a diminution relatively, in the majority of cases, of the polymorphonuclear cells, with a corresponding increase in the number...
of lymphocytes.
In only one instance was the mononuclear variety of lymphocytes present in excess of the average number, they equalling 14° of the number quoted.

<table>
<thead>
<tr>
<th>Date</th>
<th>Total No.</th>
<th>Percentage of Total</th>
<th>Percentage of Mononuclear</th>
<th>Percentage of Lymphocytes</th>
<th>Percentage of Eosinophils</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sept</td>
<td>24°</td>
<td>265,000</td>
<td>67.5°</td>
<td>8.5°</td>
<td>22.5°</td>
</tr>
<tr>
<td></td>
<td>25°</td>
<td>30,000</td>
<td>69</td>
<td>4</td>
<td>26</td>
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<tr>
<td></td>
<td>26°</td>
<td>24,000</td>
<td>66.5°</td>
<td>5°</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>27°</td>
<td>14,900</td>
<td>72</td>
<td>5°</td>
<td>20.5°</td>
</tr>
<tr>
<td></td>
<td>28°</td>
<td>16,000</td>
<td>62</td>
<td>6.5°</td>
<td>48.5°</td>
</tr>
<tr>
<td></td>
<td>30°</td>
<td>22,000</td>
<td>66</td>
<td>4°</td>
<td>39</td>
</tr>
<tr>
<td>Oct</td>
<td>1°</td>
<td>30,000</td>
<td>71</td>
<td>8.5°</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>2°</td>
<td>22,000</td>
<td>61.5°</td>
<td>6°</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>3°</td>
<td>16,000</td>
<td>64.5°</td>
<td>9°</td>
<td>26.5°</td>
</tr>
<tr>
<td></td>
<td>4°</td>
<td>20,000</td>
<td>59</td>
<td>14°</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>5°</td>
<td>17,000</td>
<td>60</td>
<td>4.5°</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>6°</td>
<td>20,000</td>
<td>63.5°</td>
<td>6°</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>7°</td>
<td>19,000</td>
<td>65.5°</td>
<td>5.5°</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>9°</td>
<td>21,000</td>
<td>76</td>
<td>5°</td>
<td>18.5°</td>
</tr>
<tr>
<td></td>
<td>10°</td>
<td>15,000</td>
<td>72</td>
<td>5°</td>
<td>21.5°</td>
</tr>
<tr>
<td></td>
<td>12°</td>
<td>20,000</td>
<td>65.5°</td>
<td>7°</td>
<td>26</td>
</tr>
</tbody>
</table>
The temperature during the same space of time, unlike some of the preceding cases, showed no striking variation. The highest point it attained was 99.4°F; the lowest was 97°F. The pulse rate was recorded 82 beats per minute.

The number of epileptic attacks patient had was 14. There was no rise in temperature recorded in association with the attacks of epilepsy. The following is a copy of the temperature chart for this interval.
Observations on the effect of treatment by means of injections of blood serum were now begun.
The serum injected was that obtained from the blood of an epileptic patient, the particular patient being Case II in the series of observations.
This blood serum was injected in 2 cc doses daily for 14 consecutive days; patient in that time having nine epileptic seizures, all of the nature of grand mal.
As there was no apparent reduction in the number of the attacks the dose of blood serum injected was now increased to 3 cc daily, this quantity injected for seven consecutive days.
The result in this instance was again of a disappointing character as far as the reduction of the epileptic attacks was concerned, the number of these attacks when patient had at this time being eight, giving a total of seventeen epileptic seizures during a period of 21 days as compared with a total
Of fourteen attacks for a corresponding length of time during which no treatment was adopted.

Treatment was now discontinued for seven days during which time patient had four epileptic attacks.

I should add here that the daily calculation of the number of leucocytes made during the time blood serum was injected still showed a constantly present leucytosis, the numbers ranging from 16,000 to 28,000 per cubic millimeter of blood.

The percentage calculation of the different varieties of leucocytes exhibited no striking difference from the figures shown in the preceding table.

The temperature chart pulse rate followed closely the variation seen in the previous chart.

I now injected blood serum derived from the blood of another patient suffering from erysipelas. My Case No. 7 in this series of observations. This blood serum was injected daily in quantities
of 200 for fourteen consecutive days, the
results again were for negative d. e.
The number of epileptic attacks patient
had during this period being eight.
The dose of blood serum was now
increased to amount 300 c.c. of blood
serum derived from the same serum
being injected daily for seven
consecutive days in this time
patient had six attacks, the total
number for the 21 days during
which this treatment was made
being fifteen.
There was no lessening of the severity
of the attacks as the result of the
injections of blood serum.

Serum derived from patients non-
blood was now injected daily for
21 days, the amount injected daily
for the first fourteen days being 200,
for the remainder of the period
300 quantities were given daily.
Then again the results were negative.
The number epileptic attacks recorded
being 20.

The following table shows at a glance the results of these observations:

<table>
<thead>
<tr>
<th>Description</th>
<th>Number of Attacks</th>
</tr>
</thead>
<tbody>
<tr>
<td>No blood serum injected</td>
<td>14</td>
</tr>
<tr>
<td>Serum derived from blood of Case 7</td>
<td>17</td>
</tr>
<tr>
<td>Serum derived from blood of Case 8</td>
<td>15</td>
</tr>
<tr>
<td>Serum derived from blood of Case 9</td>
<td>20</td>
</tr>
</tbody>
</table>

The quantities of blood serum derived from the different sources in the above observations, the amount injected was similar in every instance.

Although the results are disappointing, it is noteworthy that during this time patient whose blood serum seemed to have possessed the greatest inhibitory power on the number of epileptic attacks in the previous cases, viz. A.C. Case 7, was quite free from any evidences of epilepsy himself, at the time blood serum derived from his blood was used as an injection in this case.
This fact I think is worthy of note but I can offer no explanation as to the reason why it should be so. One would have thought if the antitoxic power of the blood showed increased to any extent so as to act as an antidote, as it were, to the factor which produced the epileptic attacks so prevented their occurrence in the patient himself, this property would have been present in the blood or its withdrawal from the body would have rendered it much more protect as an inhibitory agent.

It might be that this property was destroyed in the withdrawal of the blood or on its injection into another individual, as rendering the blood useless as an antitoxin or antitoxin producing agent.

This view however is of a more hypothetical character and may in no way explain the true changes which occurred.

It might likewise be the case that...
the particular patient would have
benefitted by the injections of blood
serum from the blood of A. I even at
the period when the attacks of
epilepsy were most severe.

Patient refused to allow any more
observations to be made: treatment by
means of injections had to be discontinued.

The following are the points which
seem the outstanding ones in this
case, comparing them with the
results obtained in the former cases.

1. The constantly present leucopenia

2. The relative diminution in the
number of lympho-nuclear cells, with
a corresponding increase in the number
of lymphocytes.

3. The absence of any temperature
change of marked character.
Does this mean lowering of reaction force?

6. Glut. faste rate, comparing it with the previous cases.

7. No benefit produced as far as the recent past cases; further case was controlled by injections of:
   - Blood serum from Case ii.
   - Blood serum from Case i.
   - Blood serum from patient own blood.

8. Absence of toxic effects as the result of injection of serum.


10. The strong hereditary tendency to insanity, which existed in this patient.
Comparing the preceding cases the constant factor present in all is a hyperleucocytosis.
Calculating the average number of leucocytes per cubic millimetre of blood I have taken the lowest: highest figures recorded from them calculated the average number of leucocytes per cubic millimetre of blood present in each case.

The following table shows the results obtained.

<table>
<thead>
<tr>
<th>Case</th>
<th>Lower: No. recorded</th>
<th>Higher: No. recorded</th>
<th>Average:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12000</td>
<td>24000</td>
<td>18000</td>
</tr>
<tr>
<td>2</td>
<td>14000</td>
<td>30000</td>
<td>22000</td>
</tr>
<tr>
<td>3</td>
<td>12000</td>
<td>21000</td>
<td>16500</td>
</tr>
<tr>
<td>4</td>
<td>15000</td>
<td>24000</td>
<td>19500</td>
</tr>
<tr>
<td>5</td>
<td>15000</td>
<td>30000</td>
<td>22500</td>
</tr>
</tbody>
</table>

Taking the average number of leucocytes per cubic millimetre of blood as ranging from 6000 to 10000 these figures show a definite increase over this amount.

This hyperleucocytosis was a constant
present factor followed in many instances an increase in the number of epileptic attacks.
It was present likewise irrespective of the presence of epileptic attacks as in the case of A.B. when during a period of 72 days no epileptic seizures were recorded but in the same period a daily count of the number of leukocytes gave a total of from 14,000 to 20,000 per cubic millimeter of blood. Excluding a digestion leukocytopoiesis and also a leukocytopoiesis due to muscular exertion, which is of a transient nature not persisting for any length of time, excluding also by examination of the patients any physical condition which might give rise to a leukocytopoiesis, likewise excluding a post-hematogen leukocytopoiesis as in no case from which blood was withdrawn to furnish meaning, was there any anemia present: I have
adopted the view that the hypodermic toxin found in the preceding cases is due to the chemotactic property preserved by the white blood corpuscle. This chemotaxis being an endeavor on the part of nature to produce a substance or substances antitoxic in character which in virtue of their antitoxic property will counteract the toxin which I believe to be the cause of the disease.

Whether this toxin is of a chemical or of a bacteriologic nature is a question at present unanswerable.

The rise in temperature as the increase in the pulse rate as seen in some of the foregoing charts, particularly the rise in temperature in relation to the epileptic attacks likewise in my opinion points to epilepsy being a disease of a toxic nature.
The results of treatment by means of injections of blood serum were disappointing, in so far as no cure was recorded, but all the cases observed were not perhaps so much deteriorated mentally that a cure was an impossibility.

Of the five cases as treated however the benefit from this form of treatment judging the beneficial effect by the reduction of the number of attacks temporarily was:

Two cases benefit marked
Two cases benefit nil
One case benefit slight.

Three cases in whom benefit was produced relapsed however on the discontinuance of treatment by these means.

The most beneficial blood serum was that obtained from the blood of A.T. (Canis), this being the blood
certain which possessed the most
powerful antitoxic property.
This may be due to the fact that
in certain epileptic patients the blood
is able to form a more powerful
antitoxin in these particular patients
as compared with others suffering from
a similar disease.
Different animals of the same species,
possess this power of producing
antitoxins of varying strength or
potency. I do not see why this
same view may not be held as
regards man.

I do not think that this form of
treatment however will ever be of
practical value in the treatment of
epilepsy.

The withdrawal of blood, the
separation of the serum and the subsequent
injection of the serum being too
cumbersome a method of procedure
for ordinary routine application.
If, however, the toxin-producing agent was discovered an antitoxin might be produced which would either cure the disease or, to prevent any increase in the manifestation of the disease which had become established.

The following are the resulting observations on the endeavour to isolate a organism or organisms from the blood of the suffering from epilepsy.

The methods adopted in carrying out these observations have already been described.

In all four cases were observed only one gave a positive result, the person from whom the blood was withdrawn being at the time in a state of acute epileptic mania. The other three cases showed no
special physical or mental abnormality when observations were made upon them.

The fact that the blood which was withdrawn when the patient was acutely maniacal was the only one which gave positive results is in itself noteworthy. The patient was suffering from that I believe to have been a very acute toxemia due to the particular organism or its products.

The organism isolated was a small diplo-coccus resembling in appearance the diplo-coccus obtained by Dr. Bln from the blood of epidemiac patients. It appeared in Bouillon, which had been incubated at 37°C, in 24 hours.

On nutrient agar incubated at 37°C the organism appeared at the end of 24 hours, in the form of small, white, opaque, circular colonies, each colony of organism being distinct and made from its neighbors.
Unfortunately the organism was of such a delicate nature that I was unable to obtain cultures of the dying even when incubated.

The patient from whom it was obtained having recovered from the attack of mania I did not repeat the observations upon her.
References:


4. Mr. Bex - Revue Neurologique No 10, May 30th 1902

5. Coles - Dreams of the Brain


7. Mr. Bex - Revue Neurologique No 10
   May 30th 1902