PNEUMONIA PROPHYLAXIS IN NATIVES OF EAST AFRICA.

BY

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The following is a report showing the effect of inoculation against pneumonia in native troops in East Africa.

The camp was situated on the Athi plains a few miles from Nairobi in Kenya, height above sea-level six thousand feet. Africans were here trained in the use of motor transport, and taught how to drive. There were seven thousand five hundred native troops and the average age was 20 years. They came from the native quarters of Kenya, Uganda and Tanganyika. The experiment took place between September, 1942, and January, 1943.

The incidence of pneumonia was high. It was noted that during the months of July and August, 1942, the average number of cases weekly was 70-5, and it was decided that special measures should be adopted.

A few special factors were considered as the cause for this high incidence.

There are marked temperature variations in this area particularly noticed as a rise in temperature two or three hours after sunrise, and also a rapid fall at sundown. A large number of the troops were enlisted from lower and coastal regions and they were affected by the cold nights.

The East African male is generally used to a lazy way of life, this was of course altered. In a training camp, discipline is strict and hours are long.

Sleeping quarters were checked so that the regulation floor space was allotted per head and all troops were ordered to sleep head to foot alternately. Nevertheless during demonstrations, lectures, sick parades, as well as in the evenings after duty hours, large numbers herded together. This must have been an important factor in the spreading of the pneumococcus by droplets.

Some general measures were first adopted with regard to clothing and diet. Each recruit was issued with two blankets G.S. (General Service) or one blanket G.S. and two cotton. A greatcoat was a general issue as well as a long sleeve jersey.

Ghi forms a part of the African’s daily ration. (It is the main fat ration and is a palm extract.) Whenever possible a synthetic ghi substitute was used instead of ghi, on account of its higher vitamin “A” (protective) content.

It was considered that conditions were satisfactory to attempt an experiment to assess the effect of preventive inoculation. This could be performed on a large scale and then the incidence of pneumonia among the protected and unprotected personnel compared.

The Anti-Pneumonia Vaccine was prepared by “The Medical Research Laboratory, Kenya.” This was made up containing 1,000 million organisms each of types I, II, III, V, VII, VIII, XIV, and XV, in each c.c. These eight types were chosen as the commonest to affect the African.
Altogether 2,330 recruits were inoculated. The first batch was of 330; they received 1·0 c.c. of vaccine and a further 1·0 c.c. after seven days. After perusal of the results it was considered that this dosage was too large.

The second batch was of 1,000 recruits and the dosage was 0·4 c.c. and then 0·6 c.c. after seven days. The third batch was of 1,000 recruits with the same dosage and time interval.

The average daily strength of Africans in camp was 7,540. A control was established by a comparison of the incidence amongst the inoculated and the remainder.

Special discs were stamped, similar to ordinary Service identity discs. The marking was "Anti-Pneum Vac" and dated. These were worn around the neck with the identity disc. They proved to be a great help in the rapid check on subsequent cases of pneumonia to differentiate between inoculated and controls. Loss of the disc subjected the man concerned to a charge. Punishment was severe and usually to the extent of seven days’ stoppage of pay. This meant a heavy fine to a recruit who is paid 28 shillings a month.

A careful watch had to be made on each batch as inoculated. Most Africans have great faith in an injection. I had observed during previous routine inoculations that a number of men immediately after inoculation would join on the end of the line of those still waiting, so as presumably to obtain a little extra of the desired medicine.

The figures accepted were all frank cases of pneumonia, with pyrexia, blood-stained sputum and positive clinical signs. Other facilities for proving the diagnosis were not available.

Evidence could only be obtained during the periods as shown, as batches of recruits were posted away after about two and a half months of training, and these men were sent to active theatres of war where further observations would have been difficult.

Tables.

First Batch
330 recruits
1 c.c. vaccine 10.9.42
1 c.c. vaccine 17.9.42

Average daily ration strength 7,540. This leaves 7,210 unprotected.

Second Batch
1,000 recruits
0·4 c.c. vaccine 10.11.42
0·6 c.c. vaccine 17.11.42

Average daily ration strength as before 7,540. This leaves 6,210 unprotected, but after December 5 the first batch was posted away.

Third Batch
Same as second
0·4 c.c. vaccine 10.12.42
0·6 c.c. vaccine 17.12.42

From this date there were 2,000 protected and 5,540 unprotected. Cases occurring amongst different batches were determined by noting the dates on the stamped discs worn around their necks.
The number of cases of pneumonia occurring weekly per 1,000 were worked out for each batch of protected and unprotected.

### FIRST BATCH

<table>
<thead>
<tr>
<th>Week ending 1942</th>
<th>No. of cases per 1,000 protected</th>
<th>No. of cases per 1,000 unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sept. 19</td>
<td>15·2</td>
<td>4·9</td>
</tr>
<tr>
<td>Sept. 26</td>
<td>6·1</td>
<td>6·8</td>
</tr>
<tr>
<td>Oct. 3</td>
<td>15·2</td>
<td>5·5</td>
</tr>
<tr>
<td>Oct. 10</td>
<td>6·1</td>
<td>5·8</td>
</tr>
<tr>
<td>Oct. 17</td>
<td>Nil</td>
<td>5·9</td>
</tr>
<tr>
<td>Oct. 24</td>
<td>6·1</td>
<td>6·0</td>
</tr>
<tr>
<td>Oct. 31</td>
<td>3·0</td>
<td>7·8</td>
</tr>
<tr>
<td>Nov. 7</td>
<td>3·0</td>
<td>5·7</td>
</tr>
<tr>
<td>Nov. 14</td>
<td>3·0</td>
<td>9·0</td>
</tr>
<tr>
<td>Nov. 21</td>
<td>Nil</td>
<td>2·9</td>
</tr>
<tr>
<td>Nov. 28</td>
<td>Nil</td>
<td>6·0</td>
</tr>
<tr>
<td>Dec. 5</td>
<td>Nil</td>
<td>2·4</td>
</tr>
</tbody>
</table>

### SECOND BATCH

<table>
<thead>
<tr>
<th>Week ending 1942-3</th>
<th>No. of cases per 1,000 protected</th>
<th>No. of cases per 1,000 unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov. 14</td>
<td>3·0</td>
<td>9·0</td>
</tr>
<tr>
<td>Nov. 21</td>
<td>3·0</td>
<td>2·9</td>
</tr>
<tr>
<td>Nov. 28</td>
<td>1·0</td>
<td>6·0</td>
</tr>
<tr>
<td>Dec. 5</td>
<td>4·0</td>
<td>2·4</td>
</tr>
<tr>
<td>Dec. 12</td>
<td>3·0</td>
<td>2·7</td>
</tr>
<tr>
<td>Dec. 19</td>
<td>1·0</td>
<td>2·7</td>
</tr>
<tr>
<td>Dec. 26</td>
<td>Nil</td>
<td>2·7</td>
</tr>
<tr>
<td>Jan. 2</td>
<td>1·0</td>
<td>4·7</td>
</tr>
</tbody>
</table>

### THIRD BATCH

<table>
<thead>
<tr>
<th>Week ending 1942-3</th>
<th>No. of cases per 1,000 protected</th>
<th>No. of cases per 1,000 unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dec. 14</td>
<td>3·0</td>
<td>2·7</td>
</tr>
<tr>
<td>Dec. 26</td>
<td>4·0</td>
<td>2·7</td>
</tr>
<tr>
<td>Jan. 2</td>
<td>5·0</td>
<td>4·7</td>
</tr>
</tbody>
</table>

Third is inconclusive

#### Observations and Discussion.

(a) The recruits carried on with their duties as usual after inoculation. Reactions were very few and very mild. Less than one per cent. reported sick. A mild pyrexia, headache and malaise being the common type of reaction.

(b) In the first batch during the four weeks following the two inoculations there was an average increase in the incidence of pneumonia among those protected. The average number of cases per thousand was 10·55 for protected and 5·75 for the unprotected, during this four-week period.

The number of cases was markedly reduced after this period amongst the inoculated. During the tenth, eleventh and twelfth weeks after inoculation no cases occurred amongst this batch. The first batch was the most valuable
for observing the effect over any appreciable period. A period of twelve weeks was noted. The inoculated were shown to be more prone to infection during the period of four weeks following the injections. This was considered as due to a negative phase during which immunity is being developed and resistance to the infection is appreciably reduced.

The dosage was reduced to prevent a too marked negative phase. The second and third batches were given 0.4 and 0.6 c.c. with the same interval of seven days between the injections.

With batch two, there was again a slightly higher incidence noticed after
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the second, third and fifth weeks, and thereafter a pronounced fall. Unfortunately the second batch was posted away eight weeks after the injections, and no further results could be kept.

The third batch was not continued long enough for definite conclusions to be formed.

(c) It is particularly regretted that greater detail could not be obtained, such as the titre of antibody in the circulation, and sputum tests in each case. Facilities in the camp were very poor and the staff were very few. Our hands were full with many problems at the same time.

SUMMARY AND CONCLUSIONS.

Pneumonia had been observed to be very prevalent amongst black troops in a training camp in East Africa. During a bad period over seventy cases occurred weekly. A large number were inoculated with a mixed anti-pneumonia vaccine. The experiment was carried out under difficult conditions in the East African Command. The vaccine was made up from the eight commonest types of pneumococci known to affect the native of East Africa. Each 1 c.c. contained 1,000 million organisms each of types I, II, III, V, VII, VIII, XIV, and XV. A comparison was kept of the incidence of pneumonia between protected and unprotected and a table and histogram showing the results are shown. There appeared to be a pronounced negative phase especially in the first batch, where three hundred and thirty recruits were each protected with 2.0 c.c. of the vaccine divided into two equal doses with seven days' interval. The next batch was of one thousand protected with 0.4 and 0.6 c.c. respectively with seven days' interval between.

After this negative phase there was a marked fall in the incidence of pneumonia among the inoculated. This was particularly observed with the first batch and also with the second batch of one thousand. Owing to the exigencies of the Service the observations were not continued. The first batch was observed up to twelve weeks after inoculation and the second up to eight weeks.

A third batch similar to the second was observed only for three weeks. This period was insufficient for any satisfactory conclusions to be formed.
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