On the Amount of Blood Taken up by a Female Mosquito of Culex pipiens pallens Coquillett

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It became necessary for us to know how much microfilaria of Wuchereria bancrofti should be taken theoretically by a female mosquito in a blood meal, when supposed the microfilaria being distributed homologously in the blood of a patient and the number of microfilaria taken up by a female mosquito being quite proportional to that in the blood of the patient.

By the reason as above, the amount of human blood taken by a female mosquito of Culex pipiens pallens was measured which seems to be the most dangerous filaria carrying mosquito in Japan. This work was carried out under the direction of Prof. N. Omori, to whom the writer wishes to express his sincere appreciation, for his suggestions and reading through the manuscript.

Material and its management

The pupae of Culex pipiens pallens were collected in a pool at Isahaya City on November 9th, 1952. They were put in a room of a constant temperature of about 27°C, for a day to cause the emergence of adults as simultaneous as possible. The adult mosquitoes thus obtained were used to measure their body weight and the length of wing: in Group 1, just after their emergence; in Group 2 and 3, after starvation for two and four days respectively under a laboratory condition; and a part of starved mosquitoes of Group 2 and 3, immediately after their taking a full meal. The taking of a blood meal was allowed, in the 27°C room, on the leg of a man inserted into a cage containing about a hundred starved female mosquitoes, for about an hour.

The measurement was made for twenty individuals in each sex and group, putting ten individuals in a vial, by a chemical balance. The management to which the mosquitoes were subjected before their being measured for each group are;

Group 1.
1. Collection of pupae: on November 9th at 5 p.m.
2. Emergence: within 24 hours, in a room about 27°C.
3. Measurement: just after their being taken out from the room.

Group 2.
1 and 2: the same as above.

After the taking out from the room, for subsequent 2 days, they were starved under a laboratory conditions of a mean temperature of 17.2°C and 68% Relative Humidity.

3. A part of them are measured soon after the above, the other, immediately after their taking up of a full blood meal in the 27°C room.

Group 3.
1 and 2: the same as above.

They were subjected to starvation for 4 days at a mean temperature of 18.3°C and 68% Relative Humidity.

3. the same as "3" in the case of Group 2.

Results of measurement and consideration

Average value of the body weight and the length of wing of C. pipiens pallens subjected to various conditions are tabulated in Table 1.
On the amount of blood taken up by a female mosquito of *Culex pipiens pallens* coquillett

### Table 1. Body weight, length of wing and amount of blood taken by a female of *C. pipiens pallens*

<table>
<thead>
<tr>
<th>Group</th>
<th>Management</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Body weight (mrg.)</td>
<td>Length of wing (mm.)</td>
</tr>
<tr>
<td>1</td>
<td>just after the emergence</td>
<td>3.045</td>
<td>4.11</td>
</tr>
<tr>
<td>2</td>
<td>after 2 days' starvation</td>
<td>2.160</td>
<td>4.13</td>
</tr>
<tr>
<td>3</td>
<td>after 4 days' starvation</td>
<td>3.250</td>
<td>4.78</td>
</tr>
</tbody>
</table>

#### Table 1 continued

<table>
<thead>
<tr>
<th>Group</th>
<th>Original body weight (mrg.)</th>
<th>9 gorged with blood</th>
<th>Amount of blood taken</th>
<th>Original body weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Body weight (mrg.)</td>
<td>Length of wing (mm.)</td>
<td>Amount of blood (mrg.)</td>
</tr>
<tr>
<td>1</td>
<td>4.280</td>
<td>cannot take a blood meal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>3.325</td>
<td>10.400</td>
<td>4.70</td>
<td>7.075</td>
</tr>
<tr>
<td>3</td>
<td>3.250</td>
<td>10.353</td>
<td>4.87</td>
<td>7.103</td>
</tr>
</tbody>
</table>

1. Length of wing.

The length of wing varied from 4.11 to 4.13 mm. in male and 4.70 to 4.94 mm. in female. It seems that the wing length not necessarily decrease with the prolonged starvation.

2. Body weight.

In male, the body weight decreases by 0.885 mrg. or 29.1% after 2 days starvation. In female, the drop in body weight occurs by 0.955 or 22.3% after 2 days' starvation but the drop caused by the further 2 days' starvation is only 0.075 mrg. or 2.36%.

It seems that the newly emerged adults rapidly decrease in their body weight by excretion within about two days or so, while, thereafter the drop in weight occurs very slowly. The above appears to have some relation to the trend that the females starved two days or so after their emergence become very active in taking blood meal.

3. Amount of a blood meal

As seen from the table a female mosquito takes about 7.1 mrg. of human blood at a meal. The amount of blood is equal to 2.1 or 2.2 times their original body weight. There seems to be no significant difference between the amount of blood taken up by the females starved for 2 days and for 4 days.

The amount i.e. 7.1 mrg. of human blood is equivalent to about 6.7 cmm. in volume, if the specific gravity of normal human blood is regarded as 1.06. The number of microfilaria is usually counted within a volume of 20 cmm. of blood taken by a capillary pipette from a ear of a patient. Then, we can see that, if the assumption mentioned above could be allowed, a female mosquito can take one-third of the number of microfilaria contained within 20 cmm. of the blood of a patient.