Host Feeding Pattern of Aedes aegypti and Aedes albopictus in Kolkata, India

By
Neelam Tandon** and Sudipta Ray***

**Professor and Head, Department of Medical Entomology, Calcutta School of Tropical Medicine, Chittaranjan Avenue, Kolkata - 700 073
***Research fellow, Department of Medical Entomology, Calcutta School of Tropical Medicine, Chittaranjan Avenue, Kolkata - 700 073

Abstract
Blood meal analysis of Aedes aegypti and Aedes albopictus, collected from cattle sheds and human dwellings in the highly congested residential areas of the city, and from outdoor situations in an urban garden, revealed a high bovine blood index of both the species in the former and a high human blood index in the latter two collection areas. The difference in the various blood indices of each of the two species in the same collection areas is statistically significant (P < 0.05). The blood-feeding pattern of Aedes aegypti and Aedes albopictus pooled from the three collection sites revealed that a majority of members of both the species had fed on one host and a small percentage on more than one host, and, that, both the species were mainly anthropophilic in nature.

Key words: Aedes aegypti, human blood index, Aedes albopictus, Kolkata.

Introduction
Aedes aegypti is the principal vector of dengue and dengue haemorrhagic fever in south-east Asia1. Aedes albopictus has also been recognized as a secondary vector and is important in the maintenance of dengue viruses2,3.

In view of the epidemiological significance3 of the host feeding pattern of vector mosquitoes, and the paucity of information on the subject with respect to Aedes aegypti and Aedes albopictus, coupled with drastic changes in the ecological scenario of the city, which are likely to affect the feeding preferences of vectors, the blood-meal analysis of both the species was undertaken and the results are presented here.

Materials and methods
A description of how the mosquitoes were collected was needed.

#Earlier known as Calcutta
Study area: Fully-fed Aedes aegypti and Aedes albopictus were collected from human dwellings (HDs), cattle sheds (CSs) distributed in various parts of the city, and from outdoor situations in an urban garden. The garden has a mini zoo, which is home to a few rabbits and a variety of birds in addition to a few horses and cows under a large shed. A number of one-roomed houses inhabited by the maintenance staff are situated at the periphery of the garden.

Methods: Fully-engorged adult females of Aedes aegypti and Aedes albopictus, collected in the same number of collections during June 1996 to May 1998 from the above-mentioned collection sites were subjected to Ouchterlony gel immunodiffusion technique\(^4\), using human (Hu), bovine (Bo), avian (Av) and equine (Eq) antisera, and the host feeding pattern of the two species determined. The human-landing periodicity of both the species was also studied.

Statistical analysis: A simple chisquare test (\(x^2\)) was done to show the difference in various blood indices of each of the two species in the same collection site.

Results and discussion

Human blood index: Out of the 636 Aedes aegypti and 186 Aedes albopictus mosquito vectors collected from HDs in the residential areas of the city, 578 (90.88%) and 162 (87.0%), respectively, reacted positively to the test. Of these, 99% of the former and 100% of the latter were positive for human blood, i.e. human blood index (HBI) of Aedes aegypti and Aedes albopictus from HDs was 98.96 and 100 respectively. None of the two species collected from human shelters were found to be positive for bovine blood.

Bovine blood index: The bovine blood index (BBI) of Aedes aegypti and Aedes albopictus collected from cattle sheds (CSs) was 82.35 and 100, respectively, but HBI for both the species was ‘nil’. A small fraction of Aedes aegypti had, however, shown evidence of feeding on more than one host in both types of dwellings (Table 1).

The difference between HBI and bovine blood index (BBI) of each of the two species in the same area statistically is highly significant (\(P < 0.05\) at 5% level). In other words, the difference between HBI in human dwellings and BBI in cattle sheds of the same species is statistically not significant (\(P > 0.05\) at 5% level), indicating opportunistic feeding behaviour of both the species, an observation which has been made earlier also\(^5\).

In the urban garden, a large proportion of Aedes aegypti (75.65%) and Aedes albopictus (80.66%) had fed on human blood and a small fraction of both the species on avian blood. Both the species also showed an inclination for multiple feeding (Table 2).
Table 1. Blood meal analysis of Ae. aegypti and Ae. albopictus collected from human dwellings (HD) and cattle sheds (CS) in Kolkata, India

<table>
<thead>
<tr>
<th>Collection sites</th>
<th>Species</th>
<th>Samples tested</th>
<th>No. +ve</th>
<th>No. and % positive for</th>
<th>Two Host**</th>
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<tr>
<td></td>
<td></td>
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<td>One Host*</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Hu</td>
<td>Bo</td>
</tr>
<tr>
<td>HD</td>
<td>Ae. aegypti</td>
<td>636</td>
<td>578</td>
<td>572</td>
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<tr>
<td></td>
<td>Ae. albopictus</td>
<td>186</td>
<td>162</td>
<td>162</td>
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<tr>
<td>CS</td>
<td>Ae. aegypti</td>
<td>100</td>
<td>85</td>
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<td>70</td>
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<td></td>
<td>Ae. albopictus</td>
<td>45</td>
<td>40</td>
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<td>40</td>
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The variation in different blood indices of both Aedes sp. is significant (P<0.05)

* One host: precipitin band against one antisera
** Two hosts: precipitin band against two antisera.
Hu = Human, Bo = Bovine, Av = Avian, Eq = Equine.

Table 2. Blood meal analysis of Ae. aegypti and Ae. albopictus collected from urban garden (outdoor) in Kolkata, India

<table>
<thead>
<tr>
<th>Species</th>
<th>Samples tested</th>
<th>No. +ve</th>
<th>No. and % positive for</th>
<th>Two Host**</th>
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<td>Hu</td>
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<td>Ae. albopictus</td>
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<td>292</td>
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* One host: precipitin band against one antisera
** Two hosts: precipitin band against two antisera.
Hu = Human, Bo = Bovine, Av = Avian, Eq = Equine.
The variation between different blood indices of the two species in the urban garden is statistically significant (P<0.05 at 5% level), implying that both Aedes aegypti and Aedes albopictus are anthropophilic in nature in the said area, irrespective of the presence of other vertebrate hosts in the vicinity. The host-feeding behaviour of the two species in the garden is unlikely to be affected by the presence of visitors, i.e. between 11 A.M. – 5 P.M., since the man-landing activity of the two species is at its peak after daybreak, in the morning for a few hours, and a little before sunset.(6)

A majority of Aedes aegypti (94.27%) and Aedes albopictus (95.03%) had fed on a single vertebrate host, but a small percentage of each of the two species (Ae. aegypti 5.73%, Ae. albopictus 4.97%) had fed on more than one host during one gonotrophic cycle(7) (Tables 1 & 2) which, while revealing their multiple feeding behaviour(3) is of epidemiological significance.

Of the total Aedes aegypti collected, 82.51% were from indoor (HDs and CSs) habitats, indicating the endophilic nature of the species. On the contrary, Aedes albopictus is exophilic (62.06%) in nature(8,9) (Tables 1 & 2).

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References