INTRODUCTION

How does urban microclimate in the larval stage affect adult mosquito vector competence?

METHODS

- Rural, suburban, and urban sites were chosen based on their percentage of impervious surface
- Placed four rearing trays in a 30 x 30 m area at each site
- Conducted in the summer of 2016
- Collected fine-scale adult and larval temperature and relative humidity data of each tray’s microclimate

Rural Suburban Urban

At each 30 x 30 m site:
100 1st instar Ae. albopictus larvae

Offered dengue infectious blood meal to Ae. albopictus aged 4-6 days old

Tested mosquitoes for dengue infection and infectiousness 14 and 21 days post infection (dpi) & measured wing length

RESULTS

MEAN AMBIENT TEMPERATURE BY LAND CLASS

Urban sites were significantly hotter than other land classes

Evidence of an urban heat island effect

FEMALE EMERGENCE CURVES

Mosquitoes emerged earlier and at a faster rate in urban land classes

Fewer larvae emerged in urban land classes than in rural or suburban

ADULT INFECTION

ADULT INFECTIOUSNESS

Urban sites have the lowest infection rates, but there is no difference across sites in infectiousness

PREDICTED DISEASE TRANSMISSION

Predicted disease transmission can be calculated by parameterizing the Ross-McDonald equation for vectorial capacity:

\[ VC = \frac{ma^2bp^n}{-\ln(p)} \]

Parameter Source
m mosquito density field-derived
a vector rate field-derived
b vector competence field-derived
p adult mosquito survival field-derived
n extrinsic incubation period field-derived

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Evidence of an urban heat island effect

Although there is no difference in vector competence across land class, overall predicted disease transmission varies significantly.

Incorporating the effect of microclimate leads to more accurate predictions of disease transmission.

CONCLUSIONS