We characterized the susceptibility of an ATM colony established in 1995 to use as a control (ATM95). This reference strain is available to others.

### Methods & Results

#### Larval bioassays
- WHO protocols were followed.
- We compared the insecticidal activity of conventional and newer insecticides on wild ATM populations using our susceptible reference strain (ATM95).
- All the populations tested were fully susceptible to the insecticides used (Table 1).

#### Adults bioassays
- WHO tube tests were used. We compared the mortality of adult wild ATM vs. ATM95 after exposure to insecticides at diagnostic dose.
- All populations tested were susceptible to deltamethrin (Figure 1).
- Two populations from Florida showed resistance to DDT and resistance is suspected in a population from New Jersey (Figure 2).
- Resistance to malathion is suspected in Florida and New Jersey (Figure 3).

#### Biochemical assays
- We compared the global activities of the 3 main detoxification enzyme families (P450, α, and β esterases, and GSTs) between the wild populations and ATM95 in larvae and adults.
- No significant differences were found in P450 or esterase activities in adults (Figure 4 and 5) or esterase activities in larvae, but we found significantly upregulated P450 activities in larvae (Figure 4a).
- Significantly higher GST activities were measured in both larvae and adults from DDT resistant populations in Florida (Figure 4d and 5d).

### Table 1. Insecticidal activity.

<table>
<thead>
<tr>
<th>Population</th>
<th>Beta</th>
<th>Temephos</th>
<th>Propoxur</th>
<th>Spinosad</th>
<th>Methoprene</th>
<th>Pyriproxyfen</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATM95</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LC50 (%)</td>
<td>0.07</td>
<td>0.09</td>
<td>0.03</td>
<td>0.12</td>
<td>0.16</td>
<td>0.02</td>
</tr>
<tr>
<td>LC95 (%)</td>
<td>0.6</td>
<td>0.65</td>
<td>0.2</td>
<td>0.23</td>
<td>0.12</td>
<td>0.16</td>
</tr>
</tbody>
</table>

#### Figures
- Figures. ATM adult mortality rates after exposure to insecticides at diagnostic doses.

### Conclusion
- This study shows that standard larvicides used for mosquito control (temephos, Bit, and methoprene) as well as spinosad and pyriproxyfen, which are increasingly being used for larval control, are still effective against US Aedes albopictus.
- The resistance to DDT we observed in populations from New Jersey and Florida is alarming because of the known cross resistance pattern between DDT and pyrethroids, which are theautilidically of choice for ATM control in many states of the US. GSTs appear to be involved in DDT resistance in Ae. albopictus mosquitoes from Florida.
- This study demonstrates the importance of research on insecticide resistance in Ae. albopictus and the need to develop new tools, new insecticides, and innovative strategies to prevent the development of insecticide resistance in these critical chikungunya vectors.

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