Development of analytical tools for mass spectrometry based molecular mapping and biomolecular characterization

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Goals

- Develop mass spectrometry based methodologies to study the environmental levels and fate of commonly used pesticides and resulting insect lipid homeostasis.
- Analysis of environmental samples from South Florida and the use of *Aedes aegypti* as bio-monitors for pesticide accumulation and organism resistance.

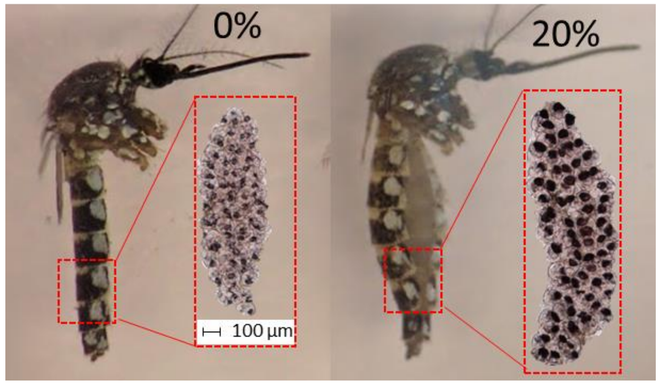
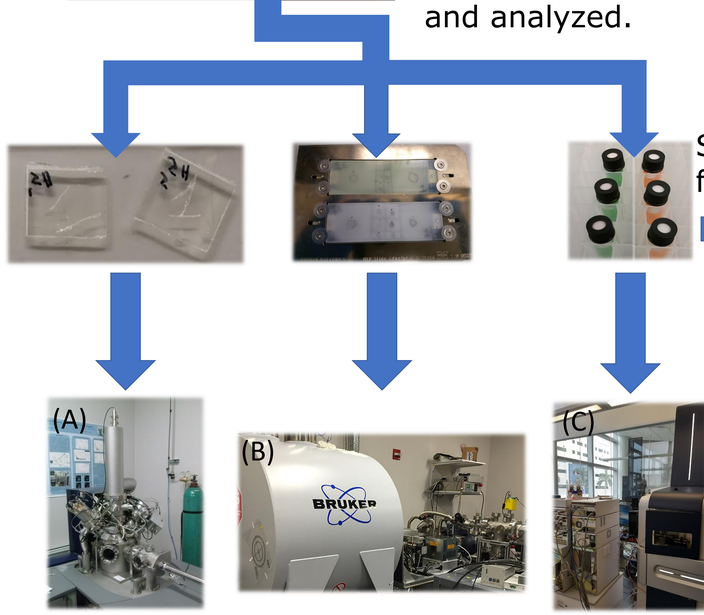


Figure 1. *Aedes agypti* can be used as a model for lipid and pesticide accumulation.
Mosquito ovaries, enlarged above, are a significant site of lipid accumulation in *Aedes aegypti*.

Research Methodology

Develop lab-grown mosquito models in which lipid content can be affected by diet. Positive control specimen will be treated with pesticide. Wild mosquitoes will be collected.

Dissect *Aedes aegypti* to harvest ovary, a site of lipid storage and likely pesticide accumulation. Additionally, water samples at breeding sites will be collected and analyzed.



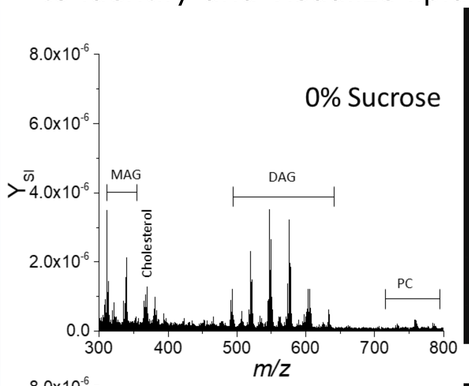
Sample preparation for MS analysis.

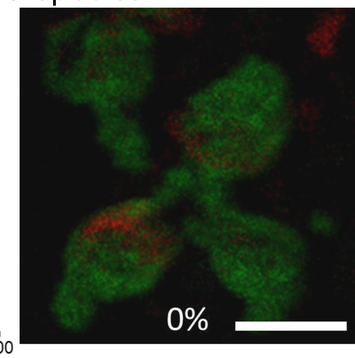
(A)TOF-SIMS,
(B)MALDI FT-ICR
(C)LC-TIMS-MS/MS
(D)LC-MS/MS

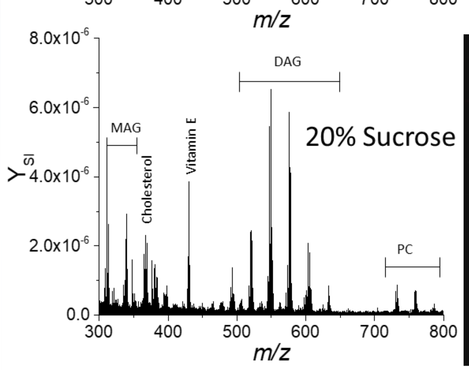
Figure 2. Work-flow for *Aedes aegypti* model. Insects are dissected, ovaries harvested, and prepared for various MS-based imaging and quantitation.

Results

- *Aedes aegypti* is a suitable biological model; its lipid homeostasis can be manipulated via sucrose diet.
- Current MSI instrumentation has the capability to identify and visualize lipid species







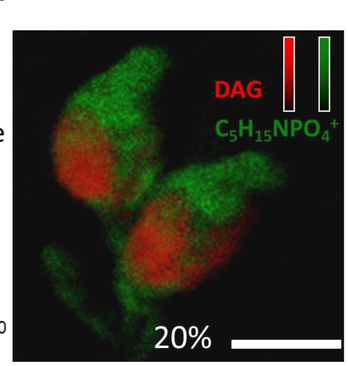
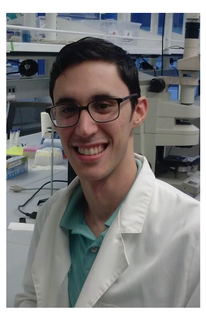


Figure 3. Mass spectrum of mosquito follicles (left) and 2D visualization of selected lipids (right). A variety of endogenous lipid classes are detected. Diacylglyceride (red) and phosphatidylcholine headgroup (green). The scale bar represents 100 µm.



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