ARE DETOXIFICATION GENE MUTATIONS ASSOCIATED WITH INSECTICIDE RESISTANCE IN *Aedes aegypti* MOSQUITOES?

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**Aedes aegypti**: Vector of Deadly Human Diseases

**Transmits:**

- Dengue
- Zika
- Yellow Fever
- Chikungunya

Ryan et al., 2019 & NPR
Insecticide Resistance Mechanisms

Mutations in \textit{vgsc} \rightarrow knockdown resistance (kdr)

- Domain I
- Domain II
- Domain III
- Domain IV

- V410L
- V1,016I
- F1,534C

Saavedra-Rodriguez et al., 2018

✓ role in resistance clearly characterized

✘ not well understood

Metabolic detoxification enzymes

- Substrate
- Enzyme
- Active site

- decreased pyrethroid binding
2019 High Throughput Sequencing Study

Exome-wide association of deltamethrin resistance in *Aedes aegypti* from Mexico

- 268 detoxification genes
- >100 detoxification SNPs significantly associated with resistance
- Highly resistant Viva Caucel population
OBJECTIVES

1. Validate the accuracy of the HTS method by genotyping knockdown-resistant and susceptible individuals in the Viva Caucel population.

- Selected 6 detoxification SNPs located in 1 esterase (CCE), 1 redox (Aldox), and 4 cytochrome p450 enzymes (CYP)
- Sanger sequencing to verify existence of SNPs
Genotyping Using Allele-Specific PCR Melting Curves
OBJECTIVES

1. Validate the accuracy of the HTS method by genotyping knockdown-resistant and susceptible individuals in the Viva Caucel population.

2. Are these detoxification SNPs associated with resistance in a second resistant A. aegypti population?
Deltamethrin 1.5 µg 1 hour n = 248

Active n = 107

Inactive n = 141

Alive = (Knockdown Resistant) 107

Inactive = Dead (Susceptible) 69

Resistant phenotype allelic frequencies

Susceptible phenotype allelic frequencies

5 de Febrero population
Resistant and susceptible phenotypes have significantly different mutant allele frequencies in **five** detox gene SNPs in Viva Caucel.
Resistant and susceptible phenotypes have significantly different mutant allele frequencies in two detox gene SNPs in 5 de Febrero.
Metabolic resistance is complex.
We need more research!
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