

ARE DETOXIFICATION  
GENE MUTATIONS  
ASSOCIATED WITH  
INSECTICIDE  
RESISTANCE IN *AEDEES  
AEGYPTI*  
MOSQUITOES?

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India Hilty

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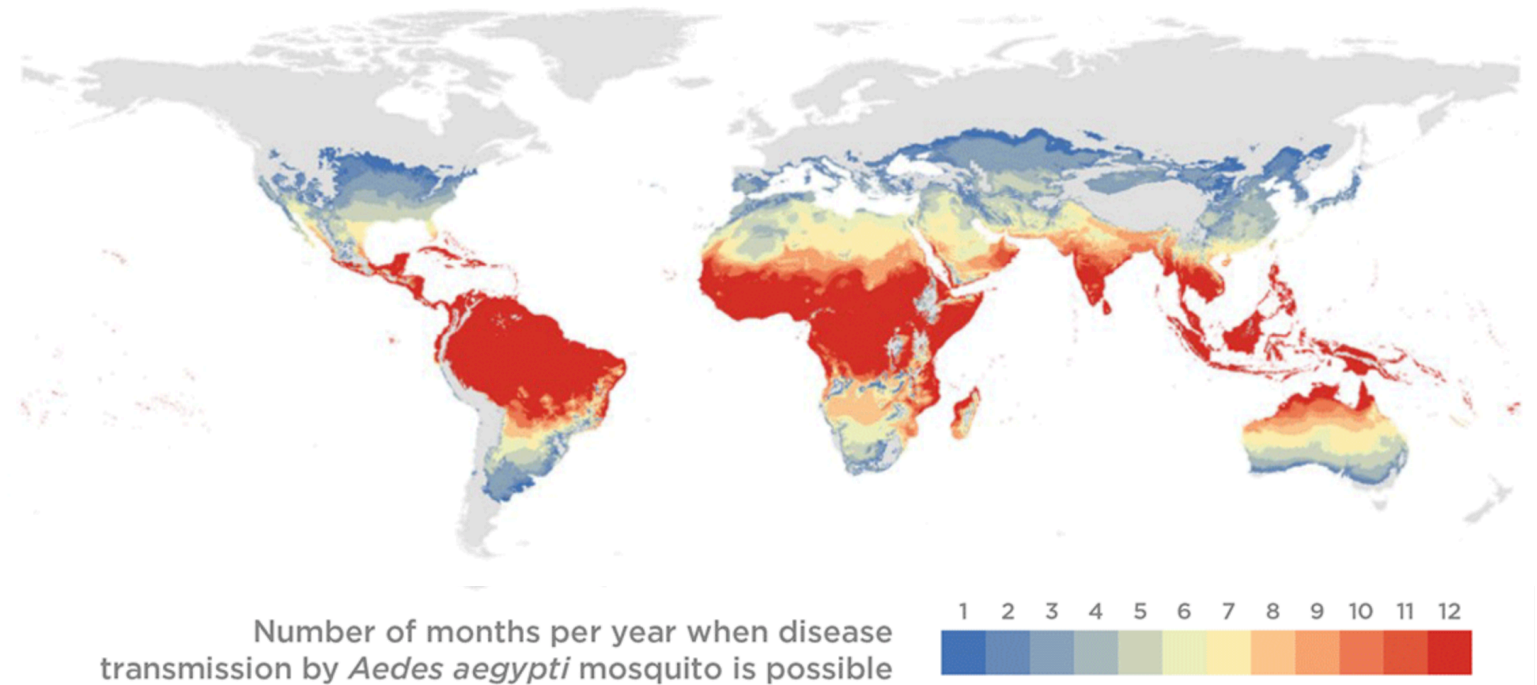
OBE Day, Spring 2020



# *Aedes aegypti*: Vector of Deadly Human Diseases

## Transmits:

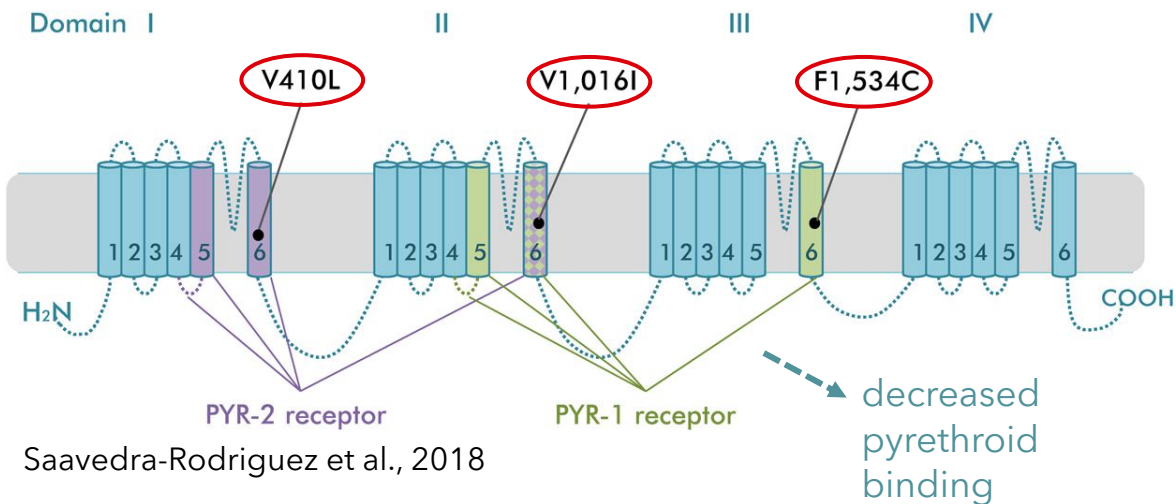
- Dengue
- Zika
- Yellow Fever
- Chikungunya



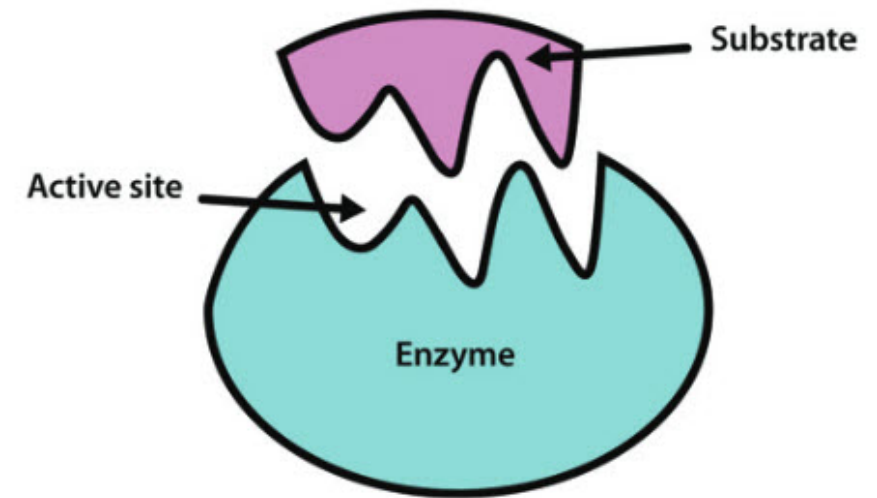
Ryan et al., 2019 & NPR

# Insecticide Resistance Mechanisms

## Mutations in *vgsc* → knockdown resistance (kdr)



## Metabolic detoxification enzymes



✓ role in resistance clearly characterized

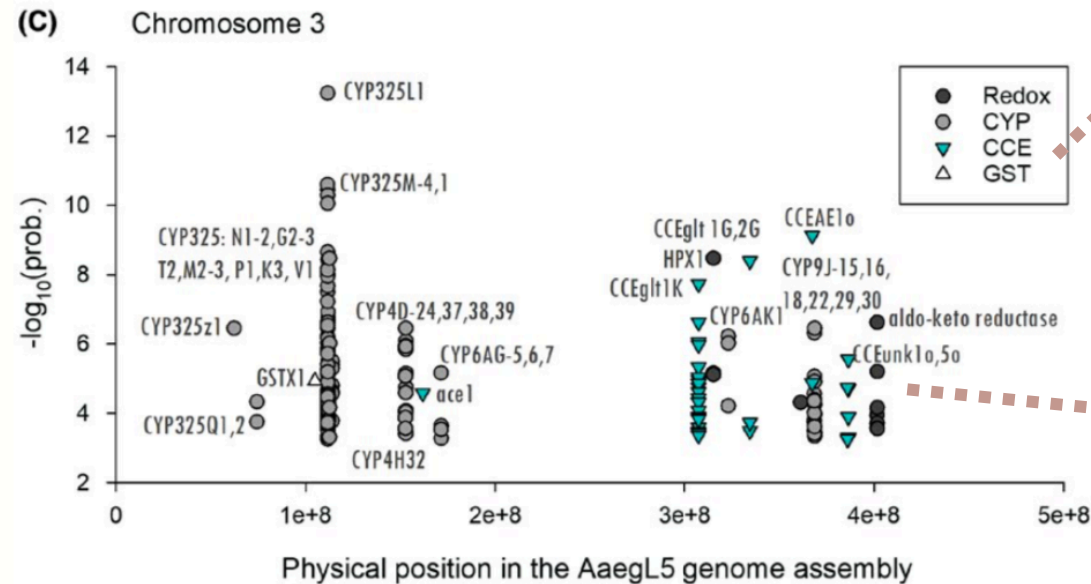
✗ not well understood

# 2019 High Throughput Sequencing Study



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

Highly resistant Viva Cauceal population



268  
detoxification  
genes

>100  
detoxification  
SNPs  
significantly  
associated with  
resistance

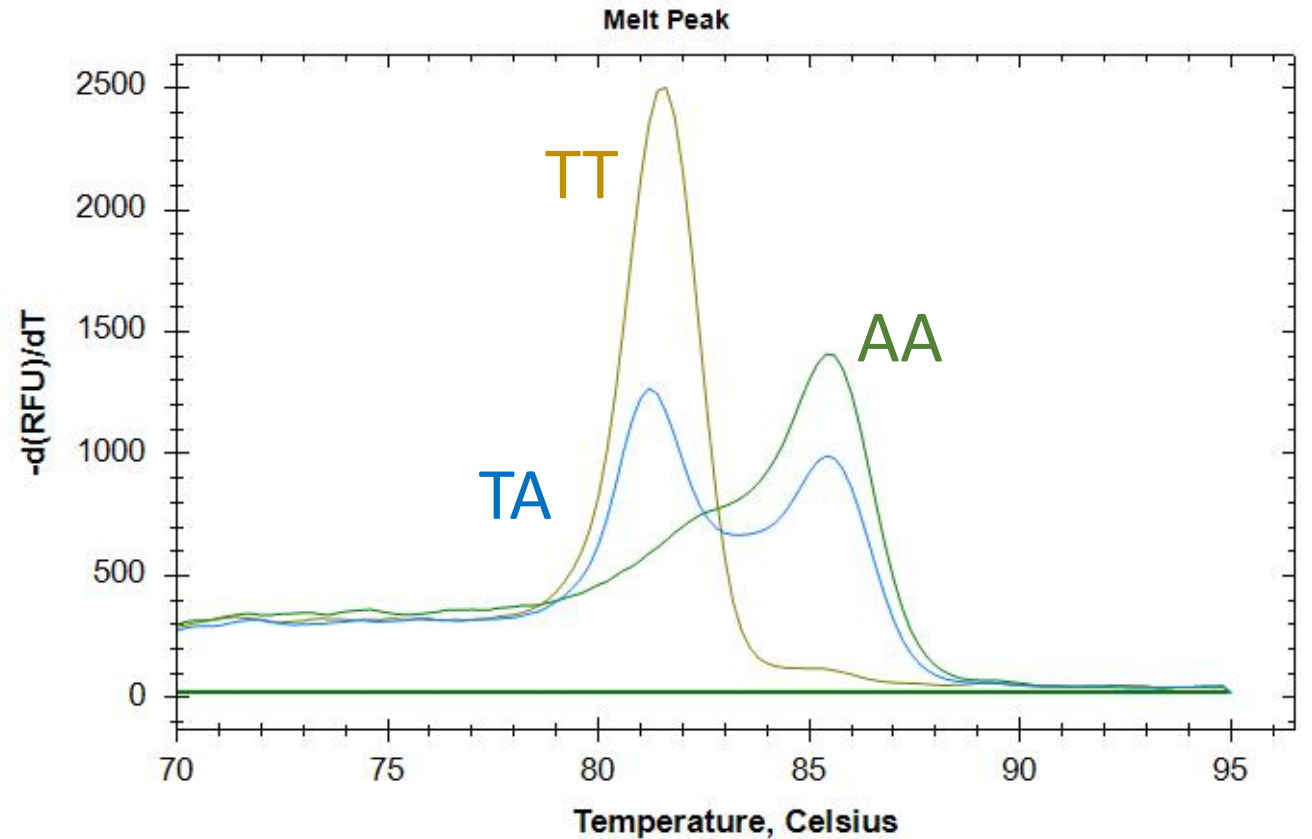
# OBJECTIVES

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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



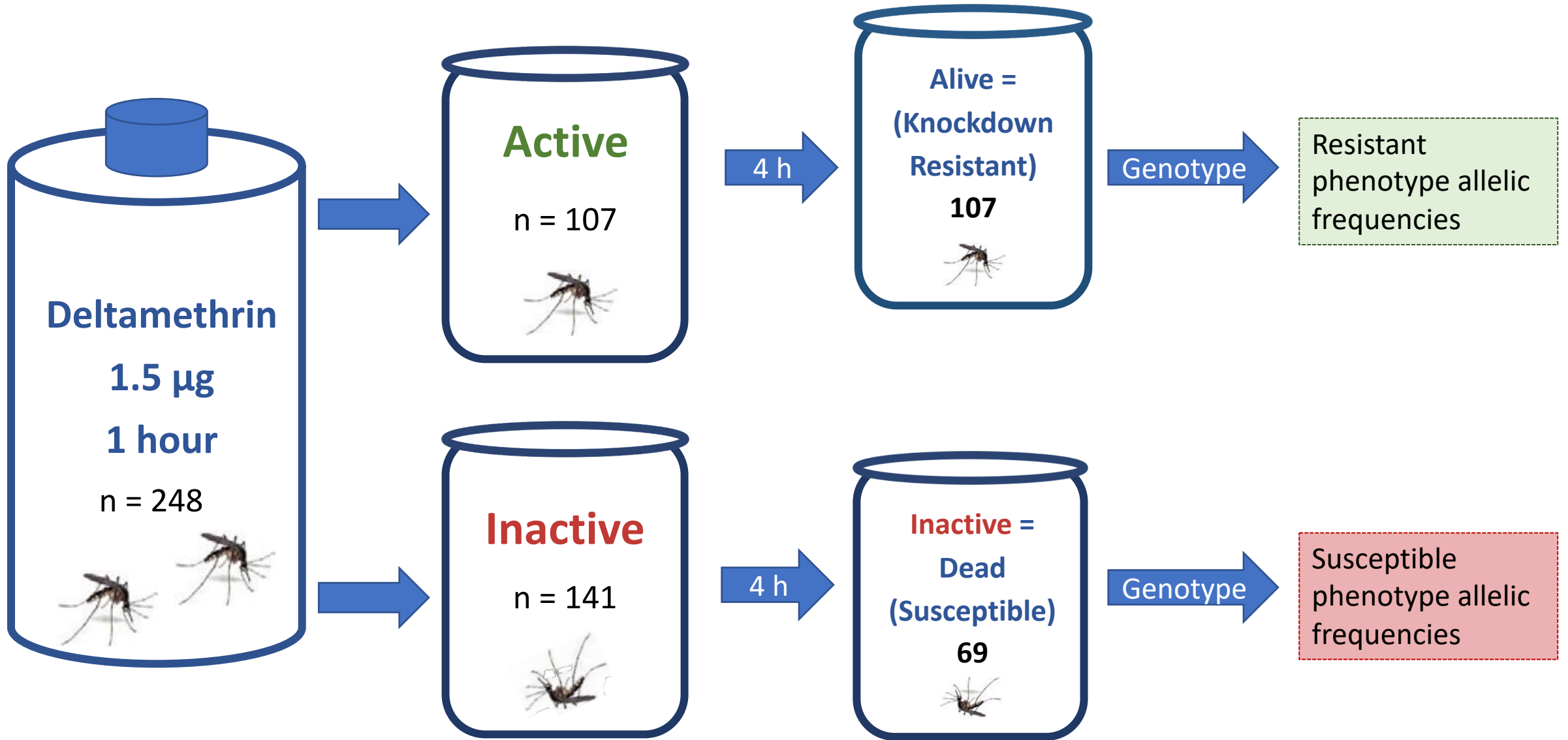
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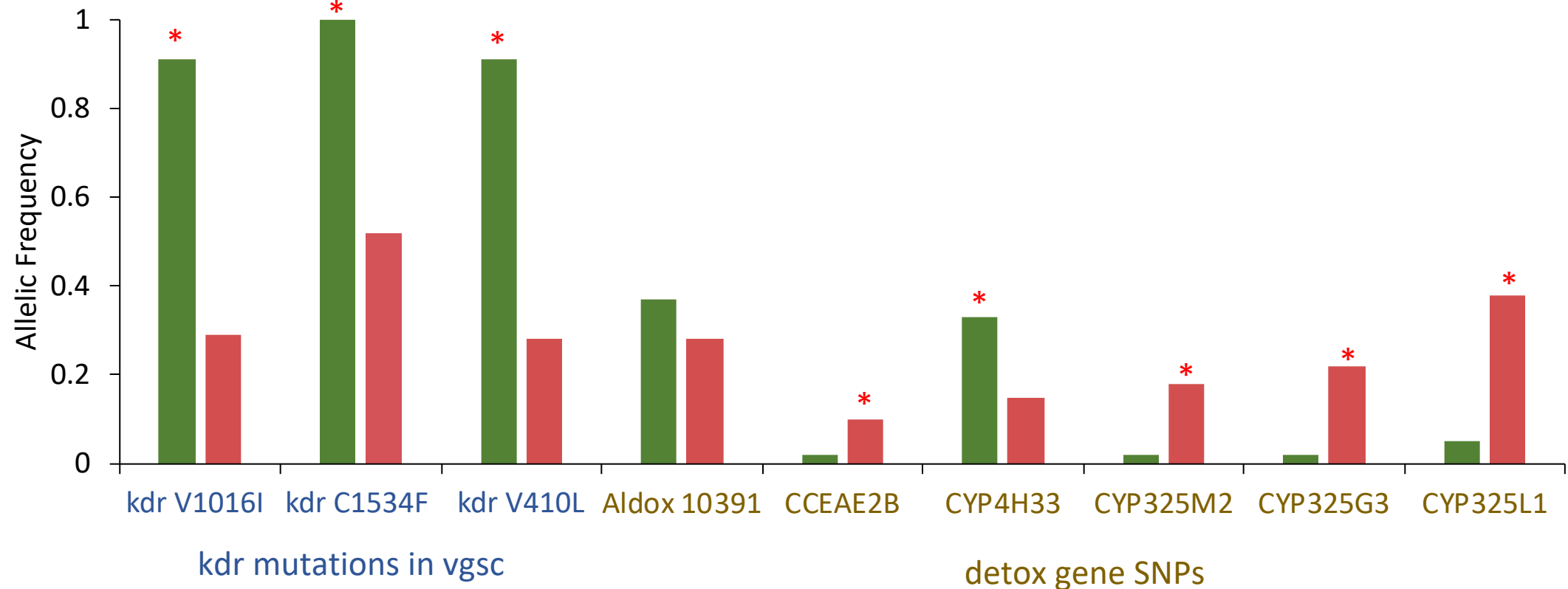
2. Are these detoxification SNPs associated with resistance in a second resistant *A. aegypti* population?



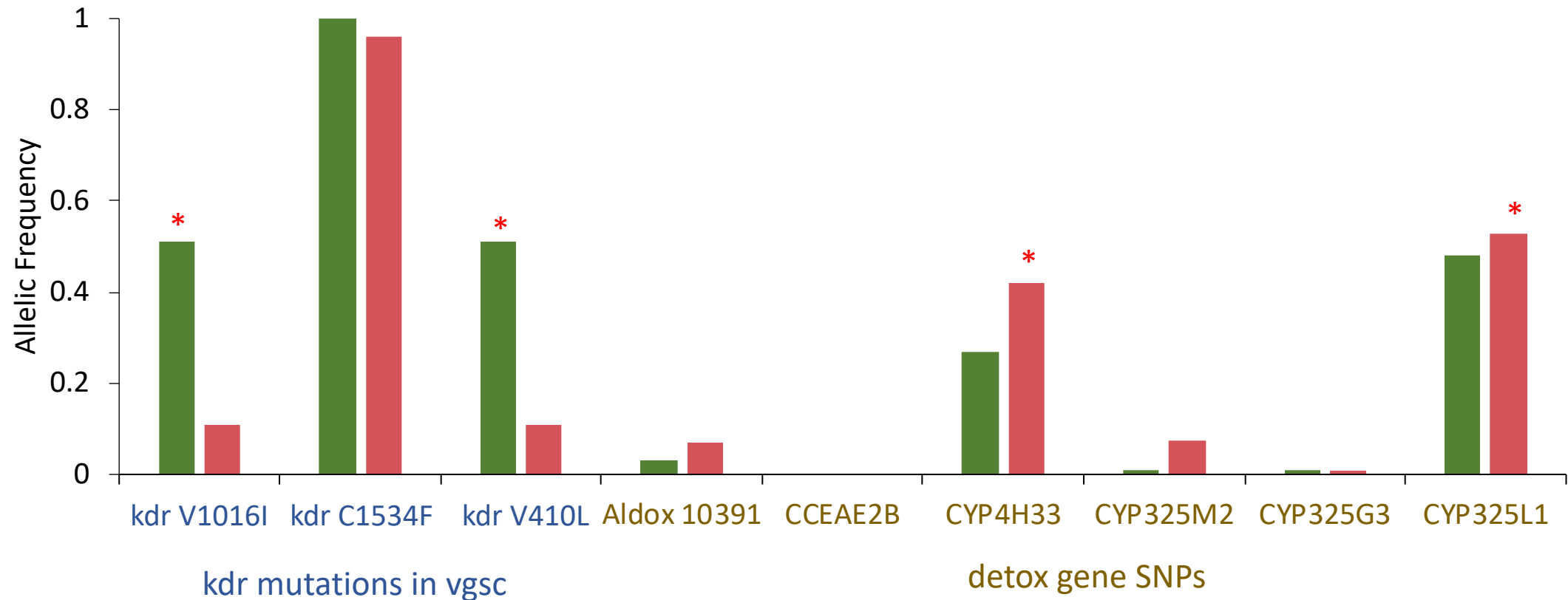
5 de Febrero population



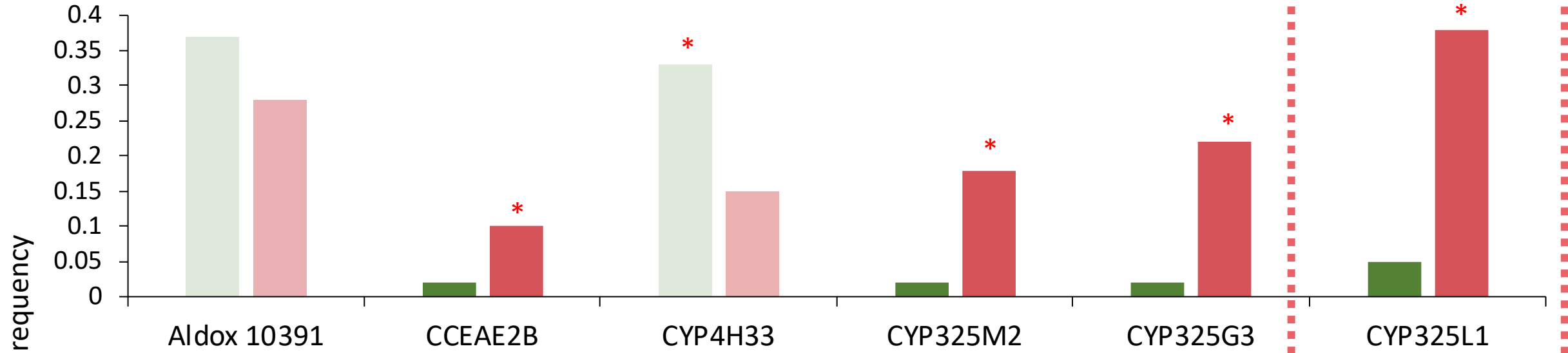
# Resistant and susceptible phenotypes have significantly different mutant allele frequencies in **five** detox gene SNPs in Viva Caucel



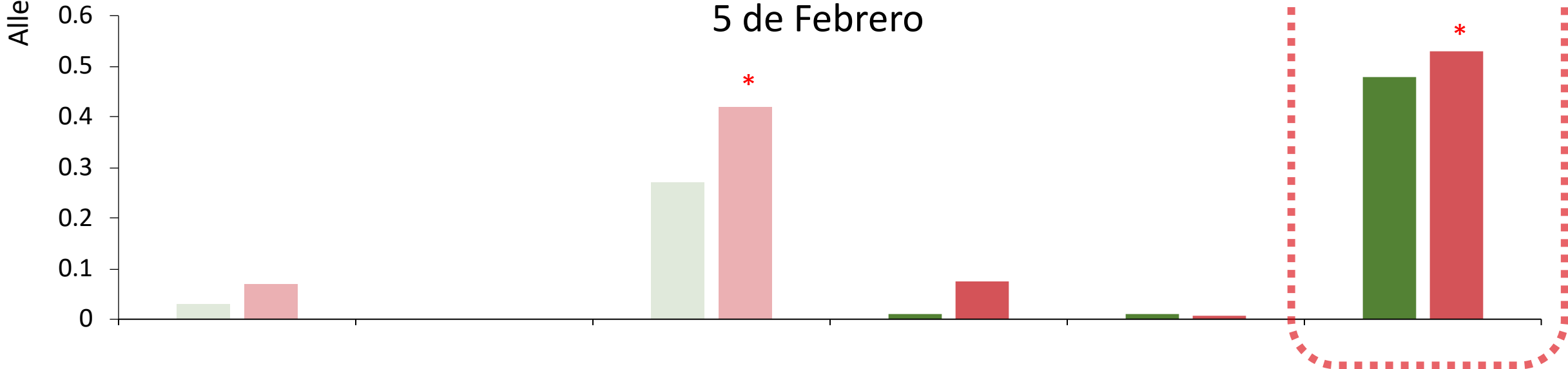
Resistant and susceptible phenotypes have significantly different mutant allele frequencies in **two** detox gene SNPs in 5 de Febrero



## Viva Caucel



## 5 de Febrero



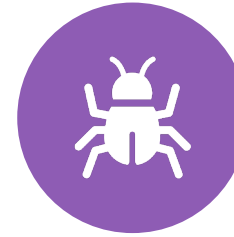


**Metabolic resistance is complex.  
We need more research!**

# Acknowledgments



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