

GEPHE SUMMARY

para (kdr) (https://www.gephebase.org/search-criteria?/and+Gene Gephebase='para (kdr)'#gephebase-summary-title)	Gephebase Gene GP00002545	GephelD
	Entry Status Courtier	Main curator
Published		

PHENOTYPIC CHANGE

Trait Category		Trait	
Physiology (https://www.gephebase.org/search-criteria?/and+Trait Category='Physiology'#gephebase-summary-title)			
Xenobiotic resistance (insecticide) (https://www.gephebase.org/search-criteria?/and+Trait='Xenobiotic resistance (insecticide)'#gephebase-summary-title)		Trait State in Taxon A	
Aedes aegypti		Trait State in Taxon B	
Aedes aegypti - resistant from Malaysia		Ancestral State	
Taxon A		Taxonomic Status	
Intraspecific (https://www.gephebase.org/search-criteria?/and+Taxonomic Status='Intraspecific'#gephebase-summary-title)			
Taxon A	Latin Name	Taxon B	Latin Name
Aedes aegypti (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms='Aedes aegypti'#gephebase-summary-title)		Aedes aegypti (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms='Aedes aegypti'#gephebase-summary-title)	
yellow fever mosquito	Common Name	yellow fever mosquito	Common Name
Stegomyia aegypti; yellow fever mosquito; Aedes aegypti (Linnaeus, 1762)	Synonyms	Stegomyia aegypti; yellow fever mosquito; Aedes aegypti (Linnaeus, 1762)	Synonyms
species	Rank	species	Rank
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Holometabola; Diptera; Nematocera; Culicomorpha; Culicoidea; Culicidae; Culicinae; Aedini; Aedes; Stegomyia	Lineage	cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Holometabola; Diptera; Nematocera; Culicomorpha; Culicoidea; Culicidae; Culicinae; Aedini; Aedes; Stegomyia	Lineage
Stegomyia () - (Rank: subgenus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 53541)	Parent	Stegomyia () - (Rank: subgenus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 53541)	Parent
7159 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7159)	NCBI Taxonomy ID	7159 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7159)	NCBI Taxonomy ID
No	is Taxon A an Infraspecies?	No	is Taxon B an Infraspecies?

GENOTYPIC CHANGE

Generic Gene Name		UniProtKB Drosophila melanogaster
para	Synonyms P35500 (http://www.uniprot.org/uniprot/P35500)	GenebankID or UniProtKB
bas; bss; CG9907; Dmel\CG9907; DmNav; DmNav1; DmNa[[v]]; DmNa[[V]]; DmNa[[v]]1; l(1)14Da; l(1)ESHS48; lincRNA.S9469; Nav1; Ocd; olfD; par; sbl; sbl-1; Shu; Shudderer	String 0	
7227.FBpp0303597 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier= 7227.FBpp0303597)	Sequence Similarities	
Belongs to the sodium channel (TC 1.A.1.10) family. Para subfamily.	GO - Molecular Function GO:0005509 : calcium ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0005509) GO:0005244 : voltage-gated ion channel activity (https://www.ebi.ac.uk/QuickGO/term/GO:0005244) GO:0005248 : voltage-gated sodium channel activity (https://www.ebi.ac.uk/QuickGO/term/GO:0005248) GO:0005272 : sodium channel activity	

GO - Biological Process

GO:0045433 : male courtship behavior, veined wing generated song production
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0045433>)
 GO:0001666 : response to hypoxia (<https://www.ebi.ac.uk/QuickGO/term/GO:0001666>)
 GO:0009612 : response to mechanical stimulus
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0009612>)
 GO:0034765 : regulation of ion transmembrane transport
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0034765>)
 GO:0035725 : sodium ion transmembrane transport
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0035725>)
 GO:0007638 : mechanosensory behavior
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0007638>)
 GO:0060078 : regulation of postsynaptic membrane potential
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0060078>)

GO - Cellular Component

GO:0005887 : integral component of plasma membrane
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0005887>)
 GO:0001518 : voltage-gated sodium channel complex
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0001518>)

Presumptive Null

No (<https://www.gephebase.org/search-criteria?/and+Presumptive+Null=^No^#gephebase-summary-title>)

Molecular Type

Coding (<https://www.gephebase.org/search-criteria?/and+Molecular+Type=^Coding^#gephebase-summary-title>)

Aberration Type

SNP (<https://www.gephebase.org/search-criteria?/and+Aberration+Type=^SNP^#gephebase-summary-title>)

SNP Coding Change

Nonsynonymous

Molecular Details of the Mutation

F1269C = F1534C

Experimental Evidence

Candidate Gene (<https://www.gephebase.org/search-criteria?/and+Experimental+Evidence=^Candidate+Gene^#gephebase-summary-title>)

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	Phe	Cys	1534

Main Reference

Widespread distribution of a newly found point mutation in voltage-gated sodium channel in pyrethroid-resistant *Aedes aegypti* populations in Vietnam. (2009)
 (<https://pubmed.ncbi.nlm.nih.gov/19806205>)

Authors

Kawada H; Higa Y; Komagata O; Kasai S; Tomita T; Thi Yen N; Loan LL; Sánchez RA; Takagi M

Abstract

Resistance of *Aedes aegypti* to photostable pyrethroid insecticides is a major problem for disease-vector control programs. Pyrethroids target the voltage-gated sodium channel on the insects' neurons. Single amino acid substitutions in this channel associated with pyrethroid resistance are one of the main factors that cause knockdown resistance in insects. Although kdr has been observed in several mosquito species, point mutations in the para gene have not been fully characterized in *Ae. aegypti* populations in Vietnam. The aim of this study was to determine the types and frequencies of mutations in the para gene in *Ae. aegypti* collected from used tires in Vietnam.

Several point mutations were examined that cause insensitivity of the voltage-gated sodium channel in the insect nervous system due to the replacement of the amino acids L1014F, the most commonly found point mutation in several mosquitoes; I1011M (or V) and V1016G (or I), which have been reported to be associated to knockdown resistance in *Ae. aegypti* located in segment 6, domain II; and a recently found amino acid replacement in F1269 in *Ae. aegypti*, located in segment 6, domain III. Among 756 larvae from 70 locations, no I1011M or I1011V nor L1014F mutations were found, and only two heterozygous V1016G mosquitoes were detected. However, F1269C mutations on domain III were distributed widely and with high frequency in 269 individuals among 757 larvae (53 collection sites among 70 locations surveyed). F1269C frequencies were low in the middle to north part of Vietnam but were high in the areas neighboring big cities and in the south of Vietnam, with the exception of the southern mountainous areas located at an elevation of 500-1000 m.

The overall percentage of homozygous F1269C seems to remain low (7.4%) in the present situation. However, extensive and uncontrolled frequent use of photostable pyrethroids might be a strong selection pressure for this mutation to cause serious problems in the control of dengue fever in Vietnam.

Additional References

Molecular biology of insect sodium channels and pyrethroid resistance. (2014) (<https://pubmed.ncbi.nlm.nih.gov/24704279>)

RELATED GEPHE

Related Genes

4 (ABCB4, CYP9J26, CYP9M6, resistance to dieldrin) (<https://www.gephebase.org/search-criteria?/or+Taxon+ID=^7159^/and+Trait=Xenobiotic+resistance/and+groupHaplotypes=true#gephebase-summary-title>)

Related Haplotypes

7 ([https://www.gephebase.org/search-criteria?/or+Gene+Gephebase=^para+\(kdr\)^/and+Taxon+ID=^7159^/or+Gene+Gephebase=^para+\(kdr\)^/and+Taxon+ID=^7159^#gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Gene+Gephebase=^para+(kdr)^/and+Taxon+ID=^7159^/or+Gene+Gephebase=^para+(kdr)^/and+Taxon+ID=^7159^#gephebase-summary-title))

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