

GEPHE SUMMARY

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

Gephebase Gene GP00002625

Entry Status Courtier

Published

GepheID Main curator

PHENOTYPIC CHANGE

Physiology ([https://www.gephebase.org/search-criteria?/and+Trait Category="+Physiology^#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Trait+Category=))

Trait Category

Xenobiotic resistance (insecticide) ([https://www.gephebase.org/search-criteria?/and+Trait="+Xenobiotic resistance \(insecticide\)^#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Trait=))

Trait

Aedes aegypti

Trait State in Taxon A

Aedes aegypti - resistant from India

Trait State in Taxon B

Taxon A

Ancestral State

Intraspecific ([https://www.gephebase.org/search-criteria?/and+Taxonomic Status="+Intraspecific^#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=))

Taxonomic Status

Taxon A	Latin Name	Taxon B	Latin Name
Aedes aegypti ( <a +aedes+aegypti^#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=">https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms="+Aedes aegypti^#gephebase-summary-title</a> )	Aedes aegypti	Aedes aegypti ( <a +aedes+aegypti^#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=">https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms="+Aedes aegypti^#gephebase-summary-title</a> )	Aedes aegypti
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) ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=53541">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=53541</a> )	Parent	Stegomyia () - (Rank: subgenus) ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=53541">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=53541</a> )	Parent
7159 ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7159">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7159</a> )	NCBI Taxonomy ID	7159 ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7159">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7159</a> )	NCBI Taxonomy ID
No	is Taxon A an Intraspecies?	No	is Taxon B an Intraspecies?

GENOTYPIC CHANGE

para

Generic Gene Name P35500 (<http://www.uniprot.org/uniprot/P35500>)

Synonyms ()

bas; bss; CG9907; Dmel\CG9907; DmNav; DmNav1; DmNa[[v]]; DmNa[[V]]; DmNa[[v]]1; l(1)14Da; l(1)ESH548; lincRNA.S9469; Nav1; Occl; olfD; par; sbl; sbl-1; Shu; Shudderer

String 7227.FBpp0303597 ([http://string-db.org/newstring.cgi/show\\_network\\_section.pl?identifier=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

UniProtKB Drosophila melanogaster

GenebankID or UniProtKB

(<https://www.ebi.ac.uk/QuickGO/term/GO:0005272>)

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

F1534L - Phe (TTC) → Leu (CTC)

Experimental Evidence

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

	Taxon A	Taxon B	Position
Codon	TTC	CTC	-
Amino-acid	Phe	Leu	1534

Main Reference

A new knockdown resistance (kdr) mutation, F1534L, in the voltage-gated sodium channel of *Aedes aegypti*, co-occurring with F1534C, S989P and V1016G. (2020)

(<https://pubmed.ncbi.nlm.nih.gov/32600469>)

Authors

Kushwah RBS; Kaur T; Dykes CL; Ravi Kumar H; Kapoor N; Singh OP

Abstract

*Aedes aegypti* is a primary vector of dengue, chikungunya and Zika infections in India. In the absence of specific drugs or safe and effective vaccines for these infections, their control relies mainly on vector control measures. The emergence of insecticide resistance in vectors, especially against pyrethroids, is a serious threat to the insecticide-based vector control programme. This study reports the presence of multiple knockdown resistance (kdr) mutations present in an *Ae. aegypti* population from Bengaluru (India), including a new mutation F1534L.

*Aedes aegypti* collected from Bengaluru were subjected to insecticide susceptibility tests with DDT, deltamethrin and permethrin. The DNA sequencing of partial domain II, III and IV of the voltage-gated sodium channel (VGSC) was performed to screen kdr mutations present in the population and PCR-based assays were developed for their detection. Genotyping of kdr mutations was done using PCR-based assays, allelic frequencies were determined, and tests of genetic association of kdr mutations with the insecticide resistance phenotype were performed.

The *Ae. aegypti* population was resistant to DDT, deltamethrin and permethrin. The DNA sequencing of the VGSC revealed the presence of four kdr mutations, i.e. S989P and V1016G in domain II and two alternative kdr mutations F1534C and F1534L in domain III. Allele-specific PCR assays (ASPCR) were developed for the detection of kdr mutations S989P and V1016G and an existing PCR-RFLP based strategy was modified for the genotyping of all three known kdr mutations in domain III (F1534L, F1534C and T1520I). Genotyping of *Ae. aegypti* samples revealed a moderate frequency of S989P/V1016G (18.27%) and F1534L (17.48%), a relatively high frequency of F1534C (50.61%) and absence of T1520I in the population. Mutations S989P and V1016G were in complete linkage disequilibrium in this population while they were in linkage equilibrium with kdr mutations F1534C and F1534L. The alleles F1534C and F1534L are genetically associated with permethrin resistance.

A new kdr mutation, F1534L, was found in an *Ae. aegypti* population from Bengaluru (India), co-occurring with the other three mutations S989P, V1016G and F1534C. The findings of a new mutation have implications for insecticide resistance management.

Additional References

RELATED GEPHE

Related Genes

4 (ABC B4, 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))

EXTERNAL LINKS

COMMENTS