

## GEPHE SUMMARY

para (kdr) ( <a href="https://www.gephebase.org/search-criteria?/and+Gene Gephebase='para (kdr)'#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Gene Gephebase='para (kdr)'#gephebase-summary-title</a> )	Gephebase Gene	GephelD
	GP00002521	Main curator
Published	Entry Status	Courtier

## PHENOTYPIC CHANGE

Trait Category		
Physiology ( <a href="https://www.gephebase.org/search-criteria?/and+Trait Category='Physiology'#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Trait Category='Physiology'#gephebase-summary-title</a> )	Trait	
Xenobiotic resistance (insecticide) ( <a href="https://www.gephebase.org/search-criteria?/and+Trait='Xenobiotic resistance (insecticide)'#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Trait='Xenobiotic resistance (insecticide)'#gephebase-summary-title</a> )	Trait State in Taxon A	
Anopheles stephensi - Sensitive to Pyrethroids	Trait State in Taxon B	
Anopheles stephensi - Resistant to Pyrethroids	Ancestral State	
Taxon A	Taxonomic Status	
Intraspecific ( <a href="https://www.gephebase.org/search-criteria?/and+Taxonomic Status='Intraspecific'#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxonomic Status='Intraspecific'#gephebase-summary-title</a> )		
Taxon A	Latin Name	Latin Name
Anopheles stephensi ( <a href="https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms='Anopheles stephensi'#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms='Anopheles stephensi'#gephebase-summary-title</a> )		
	Common Name	
Asian malaria mosquito	Synonyms	
Anopheles mysorensis; Anopheles stephensi mysorensis; Anopheles stephensi var. mysorensis; Neocellia intermedia; Neocellia intermedia Rothwell, 1907; Asian malaria mosquito; Anopheles stephensi Liston, 1901; Anopheles stephensis		
	Rank	
species	Lineage	
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Endopterygota; Diptera; Nematocera; Culicomorpha; Culicoidea; Culicidae; Anophelinae; Anopheles; Cellia; Neocellia		
	Parent	
Neocellia () - (Rank: clade) ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 44535">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 44535</a> )		
30069 ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 30069">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 30069</a> )	NCBI Taxonomy ID	NCBI Taxonomy ID
	is Taxon A an Infraspecies?	is Taxon B an Infraspecies?
No		

## GENOTYPIC CHANGE

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

(<https://www.ebi.ac.uk/QuickGO/term/GO:0005248>)

GO:0005272 : sodium channel activity

(<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

L1014F - one point mutation difference involving a single A-T base change encoding a leucine to phenylalanine amino acid substitution in the pyrethroid-resistant strain.

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	Leu	Phe	1014

Main Reference

Molecular evidence for a kdr-like pyrethroid resistance mechanism in the malaria vector mosquito *Anopheles stephensi*. (2003) (<https://pubmed.ncbi.nlm.nih.gov/12823830>)

Authors

Enayati AA; Vatandoost H; Ladomni H; Townson H; Hemingway J

Abstract

The mosquito *Anopheles stephensi* Liston (Diptera: Culicidae) is the urban vector of malaria in several countries of the Middle East and Indian subcontinent. Extensive use of residual insecticide spraying for malaria vector control has selected *An. stephensi* resistance to DDT, dieldrin, malathion and other organophosphates throughout much of its range and to pyrethroids in the Middle East. Metabolic resistance mechanisms and insensitivity to pyrethroids, so-called knockdown resistance (kdr), have previously been reported in *An. stephensi*. Here we provide molecular data supporting the hypothesis that a kdr-like pyrethroid-resistance mechanism is present in *An. stephensi*. We found that larvae of a pyrethroid-selected strain from Dubai (DUB-R) were 182-fold resistant to permethrin, compared with a standard susceptible strain of *An. stephensi*. Activities of some enzymes likely to confer pyrethroid-resistance (i.e. esterases, monooxygenases and glutathione S-transferases) were significantly higher in the permethrin-resistant than in the susceptible strain, but the use of synergists--piperonyl butoxide (PBO) to inhibit monooxygenases and/or tribufos (DEF) to inhibit esterases--did not fully prevent resistance in larvae (permethrin LC<sub>50</sub> reduced by only 51–68%), indicating the involvement of another mechanism. From both strains of *An. stephensi*, we obtained a 237-bp fragment of genomic DNA encoding segment 6 of domain II of the para type voltage-gated sodium channel, i.e. the putative kdr locus. By sequencing this 237 bp fragment, we identified one point mutation difference involving a single A-T base change encoding a leucine to phenylalanine amino acid substitution in the pyrethroid-resistant strain. This mutation appears to be homologous with those detected in *An. gambiae* and other insects with kdr-like resistance. A diagnostic polymerase chain reaction assay using nested primers was therefore designed to detect this mechanism in *An. stephensi*.

Additional References

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

Status of insecticide resistance and its biochemical and molecular mechanisms in *Anopheles stephensi* (Diptera: Culicidae) from Afghanistan. (2019)

(<https://pubmed.ncbi.nlm.nih.gov/31349836>)

## RELATED GEPHE

No matches found.

Related Genes

Related Haplotypes

1 ([https://www.gephebase.org/search-criteria/?or+Gene+Gephebase=%para+\(kdr\)%/and+Taxon+ID=%30069%/or+Gene+Gephebase=%para+\(kdr\)%/and+Taxon+ID=%30069%#gephebase-summary-title](https://www.gephebase.org/search-criteria/?or+Gene+Gephebase=%para+(kdr)%/and+Taxon+ID=%30069%/or+Gene+Gephebase=%para+(kdr)%/and+Taxon+ID=%30069%#gephebase-summary-title))

## EXTERNAL LINKS

## COMMENTS

@Parallelism