

GEPHE SUMMARY

	Gephebase Gene	GepheID
para (kdr) (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^para (kdr)^#gephebase-summary-title)	GP00002521	
	Entry Status	Courtier
Published		Main curator

PHENOTYPIC CHANGE

	Trait Category		
Physiology (https://www.gephebase.org/search-criteria?/and+Trait Category=^Physiology^#gephebase-summary-title)			
	Trait		
Xenobiotic resistance (insecticide) (https://www.gephebase.org/search-criteria?/and+Trait=^Xenobiotic resistance (insecticide)^#gephebase-summary-title)			
	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 (https://www.gephebase.org/search-criteria?/and+Taxonomic Status=^Intraspecific^#gephebase-summary-title)			
		Taxon B	
	Latin Name		Latin Name
Anopheles stephensi (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Anopheles stephensi^#gephebase-summary-title)		Anopheles stephensi (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Anopheles stephensi^#gephebase-summary-title)	
	Common Name		Common Name
Asian malaria mosquito		Asian malaria mosquito	
	Synonyms		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		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		Rank
species		species	
	Lineage		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		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		Parent
Neocellia () - (Rank: clade) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 44535)		Neocellia () - (Rank: clade) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 44535)	
	NCBI Taxonomy ID		NCBI Taxonomy ID
30069 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 30069)		30069 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 30069)	
	is Taxon A an Infrasppecies?		is Taxon B an Infrasppecies?
No		No	

GENOTYPIC CHANGE

	Generic Gene Name	UniProtKB Drosophila melanogaster
para	P35500 (http://www.uniprot.org/uniprot/P35500)	
	Synonyms	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	
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
(<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](https://www.gephebase.org/search-criteria?/and+Presumptive Null=))

Molecular Type

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

Aberration Type

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

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](https://www.gephebase.org/search-criteria?/and+Experimental Evidence=))

	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; Ladonni 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 LC50 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

Related Genes

No matches found.

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=))

EXTERNAL LINKS

COMMENTS

@Parallelism