

GEPHE SUMMARY

	Gephebase Gene	GephelD
para (kdr) (https://www.gephebase.org/search-criteria?/and+Gene Gephebase='para (kdr)'#gephebase-summary-title)	GP00002538	Main curator
Published	Entry Status	Courtier

PHENOTYPIC CHANGE

	Trait Category		
	Trait		
	Trait State in Taxon A		
Anopheles albimanus	Trait State in Taxon B		
Anopheles albimanus - resistant	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
Anopheles albimanus (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms='Anopheles albimanus'#gephebase-summary-title)		Anopheles albimanus (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms='Anopheles albimanus'#gephebase-summary-title)	
-	Common Name	-	Common Name
-	Synonyms	-	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; Anophelinae; Anopheles; Nyssorhynchus; albimanus section; albimanus series	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; Anophelinae; Anopheles; Nyssorhynchus; albimanus section; albimanus series	Lineage
albimanus series () - (Rank: no rank) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 44547)	Parent	albimanus series () - (Rank: no rank) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 44547)	Parent
7167 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7167)	NCBI Taxonomy ID	7167 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7167)	NCBI Taxonomy ID
No	is Taxon A an Infraspecies?	No	is Taxon B an Infraspecies?

GENOTYPIC CHANGE

	Generic Gene Name	UniProtKB Drosophila melanogaster
para	P35500 (http://www.uniprot.org/uniprot/P35500)	GenebankID or UniProtKB
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	0	
7227.FBpp0303597 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier= 7227.FBpp0303597)	String	
Belongs to the sodium channel (TC 1.A.1.10) family. Para subfamily.	Sequence Similarities	
GO:0005509 : calcium ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0005509)	GO - Molecular Function	
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>)

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 in Mexico individuals

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	-	-	-

Main Reference

Molecular evidence for historical presence of knock-down resistance in *Anopheles albimanus*, a key malaria vector in Latin America. (2013) (<https://pubmed.ncbi.nlm.nih.gov/24330978>)

Authors

Lol JC; Castellanos ME; Liebman KA; Lenhart A; Pennington PM; Padilla NR

Abstract

Anopheles albimanus is a key malaria vector in the northern neotropics. Current vector control measures in the region are based on mass distributions of long-lasting insecticidal nets (LLINs) and focal indoor residual spraying (IRS) with pyrethroids. Resistance to pyrethroid insecticides can be mediated by increased esterase and/or multi-function oxidase activity and/or mutations in the voltage-gated sodium channel gene. The aim of this work was to characterize the homologous kdr region of the voltage-gated sodium channel gene in *An. albimanus* and to conduct a preliminary retrospective analysis of field samples collected in the 1990's, coinciding with a time of intense pyrethroid application related to agricultural and public health insect control in the region.

Degenerate primers were designed to amplify the homologous kdr region in a pyrethroid-susceptible laboratory strain (Sanarate) of *An. albimanus*. Subsequently, a more specific primer pair was used to amplify and sequence the region that contains the 1014 codon associated with pyrethroid resistance in other *Anopheles* spp. (L1014F, L1014S or L1014C).

Direct sequencing of the PCR products confirmed the presence of the susceptible kdr allele in the Sanarate strain (L1014) and the presence of homozygous-resistant kdr alleles in field-collected individuals from Mexico (L1014F), Nicaragua (L1014C) and Costa Rica (L1014C).

For the first time, the kdr region in *An. albimanus* is described. Furthermore, molecular evidence suggests the presence of kdr-type resistance in field-collected *An. albimanus* in Mesoamerica in the 1990s. Further research is needed to conclusively determine an association between the genotypes and resistant phenotypes, and to what extent they may compromise current vector control efforts.

Additional References

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

RELATED GEPHE

Related Genes

1 (Acetylcholinesterase (Ace-1)) (<https://www.gephebase.org/search-criteria?/or+Taxon+ID=%7167%/and+Trait=Xenobiotic+resistance/and+groupHaplotypes=true#gephebase-summary-title>)

Related Haplotypes

1 ([https://www.gephebase.org/search-criteria?/or+Gene+Gephebase=%para+\(kdr\)%/and+Taxon+ID=%7167%/or+Gene+Gephebase=%para+\(kdr\)%/and+Taxon+ID=%7167%#gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Gene+Gephebase=%para+(kdr)%/and+Taxon+ID=%7167%/or+Gene+Gephebase=%para+(kdr)%/and+Taxon+ID=%7167%#gephebase-summary-title))

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