

GEPHE SUMMARY

para (kdr) (<a +para+(kdr)^#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Gene+Gephebase=">https://www.gephebase.org/search-criteria?/and+Gene+Gephebase="+para+(kdr)^#gephebase-summary-title)	Gephebase Gene	GP00000819	GepheID
Published	Entry Status	Martin	Main curator

PHENOTYPIC CHANGE

Physiology (<a +physiology^#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Trait+Category=">https://www.gephebase.org/search-criteria?/and+Trait+Category="+Physiology^#gephebase-summary-title)	Trait Category		
Xenobiotic resistance (insecticide) (<a +xenobiotic+resistance+(insecticide)^#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Trait=">https://www.gephebase.org/search-criteria?/and+Trait="+Xenobiotic+resistance+(insecticide)^#gephebase-summary-title)	Trait		
Anopheles gambiae	Trait State in Taxon A		
Anopheles gambiae - resistant - allele 1	Trait State in Taxon B		
Taxon A	Ancestral State		
Intraspecific (<a +intraspecific^#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=">https://www.gephebase.org/search-criteria?/and+Taxonomic+Status="+Intraspecific^#gephebase-summary-title)	Taxonomic Status		
	Taxon A	Taxon B	
Anopheles gambiae (<a +anopheles+gambiae^#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms="+Anopheles+gambiae^#gephebase-summary-title)	Latin Name	Anopheles gambiae (<a +anopheles+gambiae^#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms="+Anopheles+gambiae^#gephebase-summary-title)	Latin Name
African malaria mosquito	Common Name	African malaria mosquito	Common Name
Anopheles gambiae S; African malaria mosquito; Anopheles gambiae Giles, 1902; Anopheles gambia	Synonyms	Anopheles gambiae S; African malaria mosquito; Anopheles gambiae Giles, 1902; Anopheles gambia	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; Cellia; Pyretophorus; gambiae species complex	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; Cellia; Pyretophorus; gambiae species complex	Lineage
gambiae species complex () - (Rank: no rank) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=44542)	Parent	gambiae species complex () - (Rank: no rank) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=44542)	Parent
7165 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7165)	NCBI Taxonomy ID	7165 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7165)	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)	UniProtKB Drosophila melanogaster
bas; bss; CG9907; DmellCG9907; DmNav; DmNav1; DmNa[[v]]; DmNa[[V]]; DmNa[[v]]1; l(1)14Da; l(1)ESH548; lincRNA.S9469; Nav1; Ocd; olfD; par; sbl; sbl-1; Shu; Shudderer	Synonyms	KKI21527 (https://www.ncbi.nlm.nih.gov/nucleotide/KKI21527)	GenebankID or UniProtKB
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

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 characterization of pyrethroid knockdown resistance (kdr) in the major malaria vector *Anopheles gambiae* s.s. (1998) (<https://pubmed.ncbi.nlm.nih.gov/9535162>)

Authors

Martinez-Torres D; Chandre F; Williamson MS; Darriet F; BergÃ© JB; Devonshire AL; Guillet P; Pasteur N; Pauron D

Abstract

Pyrethroid-impregnated bednets are playing an increasing role for combating malaria, especially in stable malaria areas. More than 90% of the current annual malaria incidence (c. 500 million clinical cases with up to 2 million deaths) is in Africa where the major vector is *Anopheles gambiae* s.s. As pyrethroid resistance has been reported in this mosquito, reliable and simple techniques are urgently needed to characterize and monitor this resistance in the field. In insects, an important mechanism of pyrethroid resistance is due to a modification of the voltage-gated sodium channel protein recently shown to be associated with mutations of the para-type sodium channel gene. We demonstrate here that one of these mutations is present in certain strains of pyrethroid resistant *A. gambiae* s.s. and describe a PCR-based diagnostic test allowing its detection in the genome of single mosquitoes. Using this test, we found this mutation in six out of seven field samples from West Africa, its frequency being closely correlated with survival to pyrethroid exposure. This diagnostic test should bring major improvement for field monitoring of pyrethroid resistance, within the framework of malaria control programmes.

Additional References

CRISPR/Cas9 modified *An. gambiae* carrying kdr mutation L1014F functionally validate its contribution in insecticide resistance and combined effect with metabolic enzymes. (2021)

(<https://pubmed.ncbi.nlm.nih.gov/34228718>)

RELATED GEPHE

Related Genes

3 (Acetylcholinesterase (Ace-1), resistance to dieldrin, SAP-2) (<https://www.gephebase.org/search-criteria?/or+Taxon ID=^7165^/and+Trait=Xenobiotic resistance/and+groupHaplotypes=true#gephebase-summary-title>)

Related Haplotypes

2 ([https://www.gephebase.org/search-criteria?/or+Gene Gephebase=^para \(kdr\)^/and+Taxon ID=^7165^/or+Gene Gephebase=^para \(kdr\)^/and+Taxon ID=^7165^#gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Gene Gephebase=^para (kdr)^/and+Taxon ID=^7165^/or+Gene Gephebase=^para (kdr)^/and+Taxon ID=^7165^#gephebase-summary-title))

EXTERNAL LINKS

COMMENTS

@Introgression This allele has also introgressed into *Anopheles coluzzi* (previously named *Anopheles gambiae* M form) (Weill et al 2000 - The kdr mutation occurs in the Mopti form of *Anopheles gambiae*s. through introgression)