

## 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	GP00000829	GepheID
Published	Entry Status	Martin	Main curator

## 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		
Culex pipiens	Trait State in Taxon B		
Culex pipiens - resistant - allele 2	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	Taxon B	Latin Name
Culex pipiens ( <a href="https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms='Culex pipiens'#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms='Culex pipiens'#gephebase-summary-title</a> )		Culex pipiens ( <a href="https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms='Culex pipiens'#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms='Culex pipiens'#gephebase-summary-title</a> )	
northern house mosquito	Common Name	northern house mosquito	Common Name
Culex agilis; Culex autogenicus; Culex azoriensis; Culex bicolor; Culex bifurcatus; Culex calcitrans; Culex calloti; Culex comitatus; Culex consobrinus; Culex dipseticus; Culex disjunctus; Culex doliorum; Culex domesticus; Culex erectus; Culex fasciatus; Culex haematophagus; Culex longefurcatus; Culex luteus; Culex marginalis; Culex melanorhinus; Culex meridionalis; Culex osakaensis; Culex pallipes; Culex phytophagus; Culex quasimodestus; Culex rufinus; Culex rufus; Culex sternopunctatus; Culex thoracicus; Culex torridus; Culex trifurcatus; Culex unistriatus; Culex varioannulatus; northern house mosquito; Culex pipiens Linnaeus, 1758	Synonyms	Culex agilis; Culex autogenicus; Culex azoriensis; Culex bicolor; Culex bifurcatus; Culex calcitrans; Culex calloti; Culex comitatus; Culex consobrinus; Culex dipseticus; Culex disjunctus; Culex doliorum; Culex domesticus; Culex erectus; Culex fasciatus; Culex haematophagus; Culex longefurcatus; Culex luteus; Culex marginalis; Culex melanorhinus; Culex meridionalis; Culex osakaensis; Culex pallipes; Culex phytophagus; Culex quasimodestus; Culex rufinus; Culex rufus; Culex sternopunctatus; Culex thoracicus; Culex torridus; Culex trifurcatus; Culex unistriatus; Culex varioannulatus; northern house mosquito; Culex pipiens Linnaeus, 1758	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; Culicini; Culex; Culex pipiens 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; Culicinae; Culicini; Culex; Culex; Culex pipiens complex	Lineage
Culex pipiens complex () - (Rank: no rank) ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 518105">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 518105</a> )	Parent	Culex pipiens complex () - (Rank: no rank) ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 518105">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 518105</a> )	Parent
7175 ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7175">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7175</a> )	NCBI Taxonomy ID	7175 ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7175">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7175</a> )	NCBI Taxonomy ID
No	is Taxon A an Infraspecies?	No	is Taxon B an Infraspecies?

## GENOTYPIC CHANGE

Generic Gene Name			
para	Synonyms	P35500 ( <a href="http://www.uniprot.org/uniprot/P35500">http://www.uniprot.org/uniprot/P35500</a> )	UniProtKB Drosophila melanogaster
bas; bss; CG9907; Dmel\CG9907; DmNav; DmNav1; DmNa[[v]]; DmNa[[V]]; DmNa[[v]]; I(1)14Da; I(1)ESHS48; lincRNA.S9469; Nav1; Ocd; olfD; par; sbl; sbl-1; Shu; Shudderer	String	AAS89995 ( <a href="https://www.ncbi.nlm.nih.gov/nuccore/AAS89995">https://www.ncbi.nlm.nih.gov/nuccore/AAS89995</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> )	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 ([#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Presumptive+Null=^No))

Molecular Type

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

Aberration Type

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

SNP Coding Change

Nonsynonymous

Molecular Details of the Mutation

L1014S

Experimental Evidence

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

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	-	-	-

## Main Reference

Molecular ecology of pyrethroid knockdown resistance in *Culex pipiens pallens* mosquitoes. (2010) (<https://pubmed.ncbi.nlm.nih.gov/20657783>)

Authors

Chen L; Zhong D; Zhang D; Shi L; Zhou G; Gong M; Zhou H; Sun Y; Ma L; He J; Hong S; Zhou D; Xiong C; Chen C; Zou P; Zhu C; Yan G

Abstract

Pyrethroid insecticides have been extensively used in China and worldwide for public health pest control. Accurate resistance monitoring is essential to guide the rational use of insecticides and resistance management. Here we examined the nucleotide diversity of the para-sodium channel gene, which confers knockdown resistance (*kdr*) in *Culex pipiens pallens* mosquitoes in China. The sequence analysis of the para-sodium channel gene identified L1014F and L1014S mutations. We developed and validated allele-specific PCR and the real-time TaqMan methods for resistance diagnosis. The real-time TaqMan method is more superior to the allele-specific PCR method as evidenced by higher amplification rate and better sensitivity and specificity. Significant positive correlation between *kdr* allele frequency and bioassay-based resistance phenotype demonstrates that the frequency of L1014F and L1014S mutations in the *kdr* gene can be used as a molecular marker for deltamethrin resistance monitoring in natural *Cx. pipiens pallens* populations in the East China region. The laboratory selection experiment found that L1014F mutation frequency, but not L1014S mutation, responded to deltamethrin selection, suggesting that the L1014F mutation is the key mutation conferring resistance to deltamethrin. High L1014F mutation frequency detected in six populations of *Cx. pipiens pallens* suggests high prevalence of pyrethroid resistance in Eastern China, calling for further surveys to map the resistance in China and for investigating alternative mosquito control strategies.

Additional References

## RELATED GEPHE

## Related Genes

5 (Acetylcholinesterase (Ace-1), Cpm1, esterase A8 and B8, esterase B4, esterase B5) (<https://www.gephebase.org/search-criteria?/or+Taxon+ID=^7175#/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=^7175#/or+Gene+Gephebase=^para+\(kdr\)^/and+Taxon+ID=^7175#gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Gene+Gephebase=^para+(kdr)^/and+Taxon+ID=^7175#/or+Gene+Gephebase=^para+(kdr)^/and+Taxon+ID=^7175#gephebase-summary-title))

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