

## GEPHE SUMMARY

	Gephebase Gene	GepheID
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</a> )	GP00002544	Main curator
Published	Entry Status	Courtier

## PHENOTYPIC CHANGE

	Trait Category	
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</a> )		
	Trait	
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</a> )		
	Trait State in Taxon A	
Drosophila melanogaster - sensitive to pyrethroids		
	Trait State in Taxon B	
Drosophila melanogaster - resistant to pyrethroids		
	Ancestral State	
Taxon A		
	Taxonomic Status	
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</a> )		
Taxon A		Taxon B
	Latin Name	Latin Name
Drosophila melanogaster ( <a +drosophila+melanogaster+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms="+Drosophila+melanogaster+"#gephebase-summary-title</a> )		Drosophila melanogaster ( <a +drosophila+melanogaster+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms="+Drosophila+melanogaster+"#gephebase-summary-title</a> )
	Common Name	Common Name
fruit fly		fruit fly
	Synonyms	Synonyms
Sophophora melanogaster; fruit fly; Drosophila melanogaster Meigen, 1830; Sophophora melanogaster (Meigen, 1830); Drosophila melangaster		Sophophora melanogaster; fruit fly; Drosophila melanogaster Meigen, 1830; Sophophora melanogaster (Meigen, 1830); Drosophila melangaster
	Rank	Rank
species		species
	Lineage	Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Holometabola; Diptera; Brachycera; Muscomorpha; Eremoneura; Cyclorrhapha; Schizophora; Acalyptratae; Ephydroidea; Drosophilidae; Drosophilinae; Drosophilini; Drosophila; Sophophora; melanogaster group; melanogaster subgroup		cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Holometabola; Diptera; Brachycera; Muscomorpha; Eremoneura; Cyclorrhapha; Schizophora; Acalyptratae; Ephydroidea; Drosophilidae; Drosophilinae; Drosophilini; Drosophila; Sophophora; melanogaster group; melanogaster subgroup
	Parent	Parent
melanogaster subgroup () - (Rank: species subgroup) ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=32351">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=32351</a> )		melanogaster subgroup () - (Rank: species subgroup) ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=32351">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=32351</a> )
	NCBI Taxonomy ID	NCBI Taxonomy ID
7227 ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7227">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7227</a> )		7227 ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7227">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7227</a> )
	is Taxon A an Intraspecies?	is Taxon B an Intraspecies?
No		No

## GENOTYPIC CHANGE

	Generic Gene Name	UniProtKB Drosophila melanogaster
para	P35500 ( <a href="http://www.uniprot.org/uniprot/P35500">http://www.uniprot.org/uniprot/P35500</a> )	GenebankID or UniProtKB
	Synonyms	
bas; bss; CG9907; Dmel\CG9907; 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	()	
	String	
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 ( <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^#gepbase-summary-title)

Molecular Type

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

Aberration Type

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

SNP Coding Change

Nonsynonymous

Molecular Details of the Mutation

A1648V = A1494V

Experimental Evidence

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

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

Main Reference

Point mutations in the Drosophila sodium channel gene para associated with resistance to DDT and pyrethroid insecticides. (1997) (https://pubmed.ncbi.nlm.nih.gov/9435785)

Authors

Pittendrigh B; Reenan R; ffrench-Constant RH; Ganetzky B

Abstract

The gene para in Drosophila melanogaster encodes an alpha subunit of voltage-activated sodium channels, the presumed site of action of DDT and pyrethroid insecticides. We used an existing collection of Drosophila para mutants to examine the molecular basis of targetsite resistance to pyrethroids and DDT. Six out of thirteen mutants tested were associated with a largely dominant, 10- to 30-fold increase in DDT resistance. The amino acid lesions associated with these alleles defined four sites in the sodium channel polypeptide where a mutational change can cause resistance: within the intracellular loop between S4 and S5 in homology domains I and III, within the pore region of homology domain III, and within S6 in homology domain III. Some of these sites are analogous with those defined by knockdown resistance (kdr) and super-kdr resistance-associated mutations in houseflies and other insects, but are located in different homologous units of the channel polypeptide. We find a striking synergism in resistance levels with particular heterozygous combinations of para alleles that appears to mimic the super-kdr double mutant housefly phenotype. Our results indicate that the alleles analyzed from natural populations represent only a subset of mutations that can confer resistance. The implications for the binding site of pyrethroids and mechanisms of target-site insensitivity are discussed.

Additional References

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

RELATED GEPHE

Related Genes

19 (Acetylcholinesterase (Ace-2), alcohol dehydrogenase (Adh), Aldehyde dehydrogenase (Aldh), CG11699, Cyp12d1, Cyp28d1, Cyp28d1-Cyp28d2, cyp6d2, cyp6g1, glutamate-gated chloride channel (GluCl), GSS (glutathione synthetase), GSTE1-E10 cluster, kin of irre (kire), PHGPx, resistance to dieldrin, RnrS, SOD1, Ugt86Dd, CHKov1)  
 (https://www.gephebase.org/search-criteria?/or+Taxon ID=^7227^/and+Trait=Xenobiotic resistance/and+groupHaplotypes=true#gepbase-summary-title)

Related Haplotypes

2 (https://www.gephebase.org/search-criteria?/or+Gene Gephebase=^para (kdr)^/and+Taxon ID=^7227^/or+Gene Gephebase=^para (kdr)^/and+Taxon ID=^7227^#gepbase-summary-title)

EXTERNAL LINKS

