GEPHE SUMMARY

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

GepheID
GP00000843

Entry Status
Published

Main curator
Martin

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
Musca domestica

Trait State in Taxon B
Musca domestica - resistant super-kdr

Ancestral State
Taxon A

Taxonomic Status
Intraspecific (https://www.gephebase.org/search-criteria?/and+Taxonomic Status=^Intraspecific^#gephebase-summary-title)

Taxon A

Latin Name
Musca domestica (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Musca domestica^#gephebase-summary-title)

Common Name
house fly

Synonyms
house fly; Musca domestica Linnaeus, 1758

Rank
species

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; Calyptratae; Muscoidea; Muscidae; Muscinae; Muscini; Musca; Musca

Parent
Musca () - (Rank: subgenus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 44052)

NCBI Taxonomy ID
7370 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7370)

is Taxon A an Infraspecies?
No

Taxon B

Latin Name
Musca domestica (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Musca domestica^#gephebase-summary-title)

Common Name
house fly

Synonyms
house fly; Musca domestica Linnaeus, 1758

Rank
species

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; Calyptratae; Muscoidea; Muscidae; Muscinae; Muscini; Musca; Musca

Parent
Musca () - (Rank: subgenus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 44052)

NCBI Taxonomy ID
7370 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7370)

is Taxon B an Infraspecies?
No

GENOTYPIC CHANGE

Generic Gene Name
para

Synonyms
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)

UniProtKB Drosophila melanogaster
P35500 (http://www.uniprot.org/uniprot/P35500)

GenebankID or UniProtKB
()

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

M918T

Experimental Evidence

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

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

Main Reference

Cloning and sequencing of the para-type sodium channel gene from susceptible and kdr-resistant German cockroaches (Blattella germanica) and house fly (Musca domestica). (1996) (https://pubmed.ncbi.nlm.nih.gov/8804404)

Authors

Miyazaki M; Ohyama K; Dunlap DY; Matsumura F

Abstract

Using reverse transcription polymerase chain reactions (RT-PCR), the DNA sequence for the main membrane-spanning region (IS3 through IVS6) of the gene encoding the alpha-subunit of the para sodium channel of the German cockroach, Blattella germanica, has been determined. The overall structure of the open reading frame region of this B. germanica gene is very similar to that of the para gene of Drosophila melanogaster, and that of the partially sequenced para gene of Musca domestica. On the other hand, it is distinctly different from that of the DSC gene (Drosophila sodium channel). As a result of a side-by-side comparison of the para gene sequences of the susceptible CSMA strain and the kdr resistant VT strain of B. germanica, one mutation (TTG to TTC) at the approximate center of the IIS6 membrane-spanning segment was found to result in an amino acid change from L to F. While the functional meaning of this mutation for the operation of the para sodium channel remains to be studied, this region is very highly conserved among all sodium channels identified so far, and is one of the most hydrophobic areas of the entire alpha-subunit. For comparison, we have studied the same region of the para sodium channel of both kdr and susceptible SBO strain of the housefly, Musca domestica. We found the homologous type of mutation, CTT to TTT, resulting in the same amino acid alteration (L to F) at this site. However, in the case of houseflies both kdr and susceptible strains contained both L and F versions of the protein. The ratio of TTT to CTT was significantly higher in the kdr strain of M. domestica than in the three susceptible strains examined.

Additional References

Mutations in DIIS5 and the DIIS4-S5 linker of Drosophila melanogaster sodium channel define binding domains for pyrethroids and DDT. (2007) (https://pubmed.ncbi.nlm.nih.gov/17991435)
The molecular interactions of pyrethroid insecticides with insect and mammalian sodium channels. (2001) (https://pubmed.ncbi.nlm.nih.gov/11695180)
The L1014F point mutation in the house fly Vssc1 sodium channel confers knockdown resistance to pyrethroids. (1997) (https://pubmed.ncbi.nlm.nih.gov/9474777)

RELATED GEPHE

Related Genes

5 (Acetylcholinesterase (Ace-2), Acetylcholinesterase (Ace), CYP6D1, esterase isozyme E7 = E3, resistance to dieldrin) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^7370^/and+Trait=Xenobiotic resistance/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

3 (https://www.gephebase.org/search-criteria?/or+Gene Gephebase=^para (kdr)^/and+Taxon ID=^7370^/or+Gene Gephebase=^para (kdr)^/and+Taxon ID=^7370^#gephebase-summary-title)

EXTERNAL LINKS

COMMENTS