GEPHE SUMMARY

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

GepheID
GP00000834

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
Heliothis virescens

Trait State in Taxon B
Heliothis virescens - resistant - allele 2

Ancestral State
Taxon A

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

Taxon A

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

Common Name
tobacco budworm

Synonyms
tobacco budworm; Chloridea virescens; Helicoverpa virescens; Heliothis virescens (Fabricius, 1777)

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Holometabola; Amphiesmenoptera; Lepidoptera; Glossata; Neolepidoptera; Heteroneura; Ditrysia; Obtectomera; Noctuoidea; Noctuidae; Heliothinae; Heliothis

Parent
Heliothis () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7101)

NCBI Taxonomy ID
7102 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7102)

is Taxon A an Infraspecies?
No

Taxon B

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

Common Name
tobacco budworm

Synonyms
tobacco budworm; Chloridea virescens; Helicoverpa virescens; Heliothis virescens (Fabricius, 1777)

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Holometabola; Amphiesmenoptera; Lepidoptera; Glossata; Neolepidoptera; Heteroneura; Ditrysia; Obtectomera; Noctuoidea; Noctuidae; Heliothinae; Heliothis

Parent
Heliothis () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7101)

NCBI Taxonomy ID
7102 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7102)

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

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

GenebankID or UniProtKB
()

(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

V421M (=V410M)

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

Functional and evolutionary consequences of pyrethroid resistance mutations in S6 transmembrane segments of a voltage-gated sodium channel. (2000)
(https://pubmed.ncbi.nlm.nih.gov/11095943)

Authors

Zhao Y; Park Y; Adams ME

Abstract

Pyrethroids are a class of voltage-dependent sodium channel modifiers widely used as insecticides for control of disease vectors and agricultural pests. Many insect populations have developed resistance to pyrethroids linked to nervous system insensitivity and structural mutations in neuronal sodium channels. Pyrethroid resistant strains of the moth Heliothis virescens carry single point mutations leading to amino acid substitutions in either transmembrane segment I-S6 (V421M) or II-S6 (L1029H) of the para-homologous sodium channel. We analyzed the consequences of V421M and L1029H mutations constructed in the Drosophila para sodium channel heterologously expressed in Xenopus oocytes, and found that both mutations confer channel insensitivity to permethrin, with the L1029H mutation having a more pronounced effect. Both mutations also modify the intrinsic voltage-dependent gating properties of the channel, but L1029H less so than V421M. These results suggest that mutation V421M exacts a higher fitness cost than L1029H, providing a plausible explanation for genetic succession observed in field strains, where V421M was replaced by L1029H during the past decade.

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Additional References

Synergistic interaction between two cockroach sodium channel mutations and a tobacco budworm sodium channel mutation in reducing channel sensitivity to a pyrethroid insecticide. (2002)
(https://pubmed.ncbi.nlm.nih.gov/11886774)
A valine421 to methionine mutation in IS6 of the hscp voltage-gated sodium channel associated with pyrethroid resistance in Heliothis virescens F. (1997)
(https://pubmed.ncbi.nlm.nih.gov/9367829)
The V410M mutation associated with pyrethroid resistance in Heliothis virescens reduces the pyrethroid sensitivity of house fly sodium channels expressed in Xenopus oocytes. (2001)
(https://pubmed.ncbi.nlm.nih.gov/11102831)

RELATED GEPHE

Related Genes

2 (ABCC2, cadherin) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^7102^/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=^7102^/or+Gene Gephebase=^para (kdr)^/and+Taxon ID=^7102^#gephebase-summary-title)

EXTERNAL LINKS

COMMENTS