GEPHE SUMMARY

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

GepheID
GP00001859

Entry Status
Published

Main curator
Courtier

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
Cimex lectularius

Trait State in Taxon B
Cimex lectularius - resistant

Ancestral State
Taxon A

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

Taxon A

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

Common Name
bed bug

Synonyms
bed bug; Cimex lectularius Linnaeus, 1758; Cimex lectularis

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Paraneoptera; Hemiptera; Prosorrhyncha; Heteroptera; Euheteroptera; Neoheteroptera; Panheteroptera; Cimicomorpha; Cimicoidea; Cimicidae; Cimex

Parent
Cimex () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 30079)

NCBI Taxonomy ID
79782 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 79782)

is Taxon A an Infraspecies?
No

Taxon B

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

Common Name
bed bug

Synonyms
bed bug; Cimex lectularius Linnaeus, 1758; Cimex lectularis

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Paraneoptera; Hemiptera; Prosorrhyncha; Heteroptera; Euheteroptera; Neoheteroptera; Panheteroptera; Cimicomorpha; Cimicoidea; Cimicidae; Cimex

Parent
Cimex () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 30079)

NCBI Taxonomy ID
79782 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 79782)

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)

Mutation #1

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

L925I

Experimental Evidence

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

	Taxon A	Taxon B	Position
Codon	CTT	ATT	-
Amino-acid	Leu	Ile	925

Main Reference

Biochemical and molecular analysis of deltamethrin resistance in the common bed bug (Hemiptera: Cimicidae). (2008) (https://pubmed.ncbi.nlm.nih.gov/19058634)

Authors

Yoon KS; Kwon DH; Strycharz JP; Hollingsworth CS; Lee SH; Clark JM

Abstract

This study establishes deltamethrin resistance in a common bed bug, Cimex lectularius L., population collected from New York City (NY-BB). The NY-BB population was 264-fold more resistant to 1% deltamethrin in contact bioassay compared with an insecticide-susceptible population collected in Florida (FL-BB). General esterase, glutathione S-transferase, and 7-ethoxycoumarin O-deethylase activities of NY-BB were not statistically different from those of FL-BB. cDNA fragments that encoded the open reading frame of voltage-sensitive sodium channel alpha-subunit genes from the FL-BB and NY-BB populations, respectively, were obtained by homology probing polymerase chain reaction (PCR) and sequenced. Sequence alignment of the internal and 5′ and 3′ rapid amplification of cDNA ends (RACE) fragments generated a 6500-bp cDNA sequence contig, which was composed of a 6084-bp open reading frame (ORF) encoding 2027 amino acid residues and 186-bp 5′ and 230-bp 3′ untranslated regions (5′ and 3′ UTRs, respectively). Sequence comparisons of the open reading frames of the alpha-subunit genes identified two point mutations (V419L and L925I) that were presented only in the NY-BB population. L925I, located the intracellular loop between IIS4 and IIS5, has been previously found in a highly pyrethroid-resistant populations of whitefly (Bemisia tabaci). V419L, located in the IS6 transmembrane segment, is a novel mutation. A Val to Met mutation at the corresponding position of the bed bug V419, however, has been identified in the tobacco budworm as a kdr-type mutation. This evidence suggests that the two mutations are likely the major resistance-causing mutations in the deltamethrin-resistant NY-BB through a knockdown-type nerve insensitivity mechanism.

Additional References

Biochemical and molecular analysis of deltamethrin resistance in the common bed bug (Hemiptera: Cimicidae). (2008) (https://pubmed.ncbi.nlm.nih.gov/19058634)
Molecular biology of insect sodium channels and pyrethroid resistance. (2014) (https://pubmed.ncbi.nlm.nih.gov/24704279)
Infestation by pyrethroids resistant bed bugs in the suburb of Paris, France. (2012) (https://pubmed.ncbi.nlm.nih.gov/23193523)

Mutation #2

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

V419M - a Val to Met mutation at the corresponding position of the bed bug V419 has been identified in the tobacco budworm Heliothis virescens (Park et al. 1997) and functionally validated as a kdr-type mutation (Lee and Soderlund 2001)

Experimental Evidence

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

	Taxon A	Taxon B	Position
Codon	GTC	CTC	-
Amino-acid	Val	Met	419

Main Reference

Biochemical and molecular analysis of deltamethrin resistance in the common bed bug (Hemiptera: Cimicidae). (2008) (https://pubmed.ncbi.nlm.nih.gov/19058634)

Authors

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Additional References

Biochemical and molecular analysis of deltamethrin resistance in the common bed bug (Hemiptera: Cimicidae). (2008) (https://pubmed.ncbi.nlm.nih.gov/19058634)
Establishment of quantitative sequencing and filter contact vial bioassay for monitoring pyrethroid resistance in the common bed bug, Cimex lectularius. (2010) (https://pubmed.ncbi.nlm.nih.gov/20695274)
Molecular biology of insect sodium channels and pyrethroid resistance. (2014) (https://pubmed.ncbi.nlm.nih.gov/24704279)
Infestation by pyrethroids resistant bed bugs in the suburb of Paris, France. (2012) (https://pubmed.ncbi.nlm.nih.gov/23193523)

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

@SeveralMutationsWithEffect The other species name used in publications is: Cimex luctularis.