GEPHE SUMMARY

Gephebase Gene

Cpm1 (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^Cpm1^#gephebase-summary-title)

GepheID

GP00002552

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; toxin produced by Bacillus sphaericus) (https://www.gephebase.org/search-criteria?/and+Trait=^Xenobiotic resistance (insecticide; toxin produced by Bacillus sphaericus)^#gephebase-summary-title)

Trait State in Taxon A

Culex quinquefasciatus - sensitive

Trait State in Taxon B

Culex quinquefasciatus - 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

Culex quinquefasciatus (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Culex quinquefasciatus^#gephebase-summary-title)

Common Name

southern house mosquito

Synonyms

Culex fatigans; Culex pipiens fatigans; Culex pipiens quinquefasciatus; southern house mosquito; Culex fatigan; Culex pipiens quiquefasciatus; Culex quinquifasciatus; Culex quinquifasiatus; Culex quiquefasciatus

Rank

species

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

Parent

Culex pipiens complex () - (Rank: no rank) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 518105)

NCBI Taxonomy ID

7176 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7176)

is Taxon A an Infraspecies?

No

Taxon B

Latin Name

Culex quinquefasciatus (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Culex quinquefasciatus^#gephebase-summary-title)

Common Name

southern house mosquito

Synonyms

Culex fatigans; Culex pipiens fatigans; Culex pipiens quinquefasciatus; southern house mosquito; Culex fatigan; Culex pipiens quiquefasciatus; Culex quinquifasciatus; Culex quinquifasiatus; Culex quiquefasciatus

Rank

species

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

Parent

Culex pipiens complex () - (Rank: no rank) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 518105)

NCBI Taxonomy ID

7176 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7176)

is Taxon B an Infraspecies?

No

GENOTYPIC CHANGE

Generic Gene Name

-

Synonyms

-

String

-

Sequence Similarities

-

GO - Molecular Function

-

GO - Biological Process

-

GO - Cellular Component

-

UniProtKB

Q95WY5 (http://www.uniprot.org/uniprot/Q95WY5)

GenebankID or UniProtKB

()

Presumptive Null

Yes (https://www.gephebase.org/search-criteria?/and+Presumptive Null=^Yes^#gephebase-summary-title)

Molecular Type

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

Aberration Type

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

Deletion Size

1-9 bp

Molecular Details of the Mutation

one-nucleotide deletion which results in a premature stop codon and leads to production of a truncated protein.

Experimental Evidence

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

Main Reference

Single nucleotide deletion of cqm1 gene results in the development of resistance to Bacillus sphaericus in Culex quinquefasciatus. (2013) (https://pubmed.ncbi.nlm.nih.gov/23871751)

Authors

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Abstract

The entomopathogen Bacillus sphaericus is one of the most effective biolarvicides used to control the Culex species of mosquito. The appearance of resistance in mosquitoes to this bacterium, however, remains a threat to its continuous use in integrated mosquito control programs. Previous work showed that the resistance to B. sphaericus in Culex colonies was associated with the absence of the 60-kDa binary toxin receptor (Cpm1/Cqm1), an alpha-glucosidase present in the larval midgut microvilli. In this work, we studied the molecular basis of the resistance developed by Culex quinquefasciatus to B. sphaericus C3-41. The cqm1 genes were cloned from susceptible (CqSL) and resistant (CqRL/C3-41) colonies, respectively. The sequence of the cDNA and genomic DNA derived from CqRL/C3-41 colony differed from that of CqSL one by a one-nucleotide deletion which resulted in a premature stop codon, leading to production of a truncated protein. Recombinant Cqm1S from the CqSL colony expressed in Escherichia coli specifically bound to the Bin toxin and had Î±-glucosidase activity, whereas the Cqm1R from the CqRL/C3-41 colony, with a deletion of three quarters of the receptor's C-terminal lost its Î±-glucosidase activity and could not bind to the binary toxin. Immunoblotting experiments showed that Cqm1 was undetectable in CqRL/C3-41 larvae, although the gene was correctly transcribed. Thus, the cqm1R represents a new allele in C. quinquefasciatus that confers resistance to B. sphaericus.

Additional References

Loss of the membrane anchor of the target receptor is a mechanism of bioinsecticide resistance. (2002) (https://pubmed.ncbi.nlm.nih.gov/11983886)

RELATED GEPHE

Related Genes

4 (esterase B1 + esterase A, esterase B1 = esterase beta1, para (kdr), resistance to dieldrin) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^7176^/and+Trait=Xenobiotic resistance/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS