GEPHE SUMMARY

Gephebase Gene
Acetylcholinesterase (Ace-1) (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^Acetylcholinesterase (Ace-1)^#gephebase-summary-title)

GepheID
GP00000030

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
Culex tritaeniorhynchus Giles - sensitive

Trait State in Taxon B
Culex tritaeniorhynchus Giles -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 tritaeniorhynchus (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Culex tritaeniorhynchus^#gephebase-summary-title)

Common Name
-

Synonyms
Culex tritaeniorhynchus Giles, 1901

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

Parent
Culex () - (Rank: subgenus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 53527)

NCBI Taxonomy ID
7178 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7178)

is Taxon A an Infraspecies?
No

Taxon B

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

Common Name
-

Synonyms
Culex tritaeniorhynchus Giles, 1901

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

Parent
Culex () - (Rank: subgenus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 53527)

NCBI Taxonomy ID
7178 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7178)

is Taxon B an Infraspecies?
No

GENOTYPIC CHANGE

Generic Gene Name
Ace

Synonyms
AcChE; ace; ACE; ace-2; ache; AchE; AChE; CG17907; CHE; dAChE; dmAChE; DmAChE; Dmel\CG17907; Dm_ace; FBgn0000024; l(3)26; l(3)87Ed

String
7227.FBpp0289713 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier= 7227.FBpp0289713)

Sequence Similarities
Belongs to the type-B carboxylesterase/lipase family.

GO - Molecular Function
GO:0042803 : protein homodimerization activity (https://www.ebi.ac.uk/QuickGO/term/GO:0042803)
GO:0003990 : acetylcholinesterase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0003990)
GO:0004104 : cholinesterase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0004104)
GO:0043199 : sulfate binding (https://www.ebi.ac.uk/QuickGO/term/GO:0043199)

UniProtKB Drosophila melanogaster
P07140 (http://www.uniprot.org/uniprot/P07140)

GenebankID or UniProtKB
EDS26232 (https://www.ncbi.nlm.nih.gov/nuccore/EDS26232)

GO - Biological Process

GO:0006581 : acetylcholine catabolic process
(https://www.ebi.ac.uk/QuickGO/term/GO:0006581)
GO:0001507 : acetylcholine catabolic process in synaptic cleft
(https://www.ebi.ac.uk/QuickGO/term/GO:0001507)
GO:0007268 : chemical synaptic transmission
(https://www.ebi.ac.uk/QuickGO/term/GO:0007268)
GO:0042426 : choline catabolic process
(https://www.ebi.ac.uk/QuickGO/term/GO:0042426)
GO:0042331 : phototaxis (https://www.ebi.ac.uk/QuickGO/term/GO:0042331)

GO - Cellular Component

GO:0005886 : plasma membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0005886)
GO:0005737 : cytoplasm (https://www.ebi.ac.uk/QuickGO/term/GO:0005737)
GO:0031225 : anchored component of membrane
(https://www.ebi.ac.uk/QuickGO/term/GO:0031225)
GO:0030054 : cell junction (https://www.ebi.ac.uk/QuickGO/term/GO:0030054)
GO:0043083 : synaptic cleft (https://www.ebi.ac.uk/QuickGO/term/GO:0043083)

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

F331W

Experimental Evidence

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

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

Main Reference

Different amino-acid substitutions confer insecticide resistance through acetylcholinesterase 1 insensitivity in Culex vishnui and Culex tritaeniorhynchus (Diptera: Culicidae) from China. (2007) (https://pubmed.ncbi.nlm.nih.gov/17547232)

Authors

Alout H; Berthomieu A; Cui F; Tan Y; Berticat C; Qiao C; Weill M

Abstract

Insecticide resistance owing to insensitive acetylcholinesterase (AChE)1 has been reported in several mosquito species, and only two mutations in the ace-1 gene have been implicated in resistance: 119S and 331W substitutions. We analyzed the AChE1 resistance status of Culex vishnui (Theobald) and Culex tritaeniorhynchus Giles sampled in various regions of China. These two species displayed distinct mutations leading to AChE1 insensitivity; the 119S substitution in resistant C. vishnui mosquitoes and the 331W substitution in resistant C. tritaeniorhynchus. A biochemical test was validated to detect the 331W mutation in field samples. The comparison of the recombinant G119S and 331W mutant proteins produced in vitro with the AChE1 extracted from resistant mosquitoes indicated that the AChE1 insensitivity observed could be specifically attributed to these substitutions. Comparison of their biochemical characteristics indicated that the resistance conferred by these mutations depends on the insecticide used, regardless of its class. This resistance seemed to be fixed in the Cx. tritaeniorhynchus populations sampled in a 2000-km transect, suggesting a very high level of insecticide application or a low fitness cost associated with this 331W mutation.

Additional References

Genotype to phenotype, the molecular and physiological dimensions of resistance in arthropods. (2015) (https://pubmed.ncbi.nlm.nih.gov/26047113)

RELATED GEPHE

Related Genes

2 (Acetylcholinesterase (Ace-2), esterase B1) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^7178^/and+Trait=Xenobiotic resistance/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS