

GEPHE SUMMARY

	Gephebase Gene	GephelD
Acetylcholinesterase (Ace) (https://www.gephebase.org/search-criteria?/and+Gene	GP00000042	
Gephebase=^Acetylcholinesterase (Ace)^#gephebase-summary-title)		Main curator
Published	Entry Status	Martin

PHENOTYPIC CHANGE

	Trait Category	
Physiology (https://www.gephebase.org/search-criteria?/and+Trait	Trait	
Category="Physiology" #gephebase-summary-title)		
Xenobiotic resistance (insecticide) (https://www.gephebase.org/search-criteria?/and+Trait	Trait	
Criteria?/and+Trait=Xenobiotic resistance (insecticide)" #gephebase-summary-title)		
	Trait State in Taxon A	
Musca domestica - sensitive	Trait State in Taxon B	
Musca domestica- resistant 77M	Ancestral State	
Taxon A	Taxonomic Status	
Intraspecific (https://www.gephebase.org/search-criteria?/and+Taxonomic		
Status="Intraspecific" #gephebase-summary-title)		
Taxon A	Latin Name	Latin Name
Musca domestica	(https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Musca	
domestica" #gephebase-summary-title)		
house fly	Common Name	Common Name
house fly; Musca domestica Linnaeus, 1758	Synonyms	Synonyms
species	Rank	Rank
	Lineage	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	Parent
Musca () - (Rank: subgenus)	(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 44052)	
7370	NCBI Taxonomy ID	NCBI Taxonomy ID
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7370)		
No	is Taxon A an Infraspecies?	is Taxon B an Infraspecies?
	Yes	Taxon B Description
	Musca domestica- resistant 77M	

GENOTYPIC CHANGE

	Generic Gene Name	UniProtKB Drosophila melanogaster
Ace	Synonyms	GenebankID or UniProtKB
AcChE; ace; ACE; ace-2;ache; AchE; AChE; CG17907; CHE; dAChE; dmAChE; DmAChE; Dmel\CG17907; Dm_ace; FBgn0000024; l(3)26; l(3)87Ed		ACM68725 (https://www.ncbi.nlm.nih.gov/nuccore/ACM68725)
7227.FBpp0289713 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier= 7227.FBpp0289713)	String	
Belongs to the type-B carboxylesterase/lipase family.	Sequence Similarities	
GO:0042803 : protein homodimerization activity (https://www.ebi.ac.uk/QuickGO/term/GO:0042803)	GO - Molecular Function	
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>)
 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 ([#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Presumptive+Null=^No))

Molecular Type

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

Aberration Type

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

SNP Coding Change

Nonsynonymous

Molecular Details of the Mutation

Val180Leu

Experimental Evidence

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

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

Main Reference

Identification and characterization of mutations in housefly (*Musca domestica*) acetylcholinesterase involved in insecticide resistance. (2001) (<https://pubmed.ncbi.nlm.nih.gov/11563981>)

Authors

Walsh SB; Dolden TA; Moores GD; Kristensen M; Lewis T; Devonshire AL; Williamson MS

Abstract

Acetylcholinesterase (AChE) insensitive to organophosphate and carbamate insecticides has been identified as a major resistance mechanism in numerous arthropod species. However, the associated genetic changes have been reported in the AChE genes from only three insect species; their role in conferring insecticide insensitivity has been confirmed, using functional expression, only for those in *Drosophila melanogaster*. The housefly, *Musca domestica*, was one of the first insects shown to have this mechanism; here we report the occurrence of five mutations (Val-180-->Leu, Gly-262-->Ala, Gly-262-->Val, Phe-327-->Tyr and Gly-365-->Ala) in the AChE gene of this species that, either singly or in combination, confer different spectra of insecticide resistance. The baculovirus expression of wild-type and mutated housefly AChE proteins has confirmed that the mutations each confer relatively modest levels of insecticide insensitivity except the novel Gly-262-->Val mutation, which results in much stronger resistance (up to 100-fold) to certain compounds. In all cases the effects of mutation combinations are additive. The mutations introduce amino acid substitutions that are larger than the corresponding wild-type residues and are located within the active site of the enzyme, close to the catalytic triad. The likely influence of these substitutions on the accessibility of the different types of inhibitor and the orientation of key catalytic residues are discussed in the light of the three-dimensional structures of the AChE protein from *Torpedo californica* and *D. melanogaster*.

Additional References

RELATED GEPHE

Related Genes

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

Related Haplotypes

1 ([#gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Gene+Gephebase=^Acetylcholinesterase+(Ace)^/and+Taxon+ID=^7370^/or+Gene+Gephebase=^Acetylcholinesterase+(Ace)^/and+Taxon+ID=^7370^))

EXTERNAL LINKS

COMMENTS

