

## GEPHE SUMMARY

	Gephebase Gene	GephelD
Acetylcholinesterase (Ace-2) ( <a href="https://www.gephebase.org/search-criteria?/and+Gene">https://www.gephebase.org/search-criteria?/and+Gene</a> Gephebase=^Acetylcholinesterase (Ace-2)^#gephebase-summary-title)	GP00002570	Main curator
	Entry Status	Courtier
Published		

## PHENOTYPIC CHANGE

	Trait Category	
Physiology ( <a href="https://www.gephebase.org/search-criteria?/and+Trait">https://www.gephebase.org/search-criteria?/and+Trait</a> Category=^Physiology^#gephebase-summary-title)	Trait	
Xenobiotic resistance (insecticide) ( <a href="https://www.gephebase.org/search-criteria?/and+Trait=^Xenobiotic+resistance+(insecticide)^#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Trait=^Xenobiotic+resistance+(insecticide)^#gephebase-summary-title</a> )	Trait State in Taxon A	
Drosophila melanogaster - sensitive	Trait State in Taxon B	
Drosophila melanogaster - resistant	Ancestral State	
Taxon A	Taxonomic Status	
Intraspecific ( <a href="https://www.gephebase.org/search-criteria?/and+Taxonomic">https://www.gephebase.org/search-criteria?/and+Taxonomic</a> Status=^Intraspecific^#gephebase-summary-title)		
	Taxon A	Taxon B
	Latin Name	Latin Name
Drosophila melanogaster ( <a href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Drosophila+melanogaster^#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Drosophila+melanogaster^#gephebase-summary-title</a> )	Drosophila melanogaster ( <a href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Drosophila+melanogaster^#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Drosophila+melanogaster^#gephebase-summary-title</a> )	
fruit fly	Common Name	Common Name
Sophophora melanogaster; fruit fly; Drosophila melanogaster Meigen, 1830; Sophophora melanogaster (Meigen, 1830); Drosophila melangaster	Synonyms	Synonyms
	Rank	Rank
species	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; Acalyptratae; Ephydriodea; Drosophilidae; Drosophilinae; Drosophilini; Drosophila; Sophophora; melanogaster group; melanogaster subgroup		
	Parent	Parent
melanogaster subgroup () - (Rank: species subgroup) ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=32351">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=32351</a> )	melanogaster subgroup () - (Rank: species subgroup) ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=32351">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=32351</a> )	
7227 ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7227">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7227</a> )	NCBI Taxonomy ID	NCBI Taxonomy ID
	is Taxon A an Infraspecies?	is Taxon B an Infraspecies?
No	No	

## 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	P07140 ( <a href="http://www.uniprot.org/uniprot/P07140">http://www.uniprot.org/uniprot/P07140</a> )	
	String	
7227.FBpp0289713 ( <a href="http://string-db.org/newstring_cgi/show_network_section.pl?identifier=7227.FBpp0289713">http://string-db.org/newstring_cgi/show_network_section.pl?identifier=7227.FBpp0289713</a> )		
	Sequence Similarities	
Belongs to the type-B carboxylesterase/lipase family.		
	GO - Molecular Function	
GO:0042803 : protein homodimerization activity ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0042803">https://www.ebi.ac.uk/QuickGO/term/GO:0042803</a> )		
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

E81K

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	Glu	Lys	81

Main Reference

Mutations of acetylcholinesterase which confer insecticide resistance in Drosophila melanogaster populations. (2004) (<https://pubmed.ncbi.nlm.nih.gov/15018651>)

Authors

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Abstract

Organophosphate and carbamate insecticides irreversibly inhibit acetylcholinesterase causing death of insects. Resistance-modified acetylcholinesterases(AChEs) have been described in many insect species and sequencing of their genes allowed several point mutations to be described. However, their relative frequency and their cartography had not yet been addressed.

To analyze the most frequent mutations providing insecticide resistance in Drosophila melanogaster acetylcholinesterase, the Ace gene was cloned and sequenced in several strains harvested from different parts of the world. Sequence comparison revealed four widespread mutations, I161V, G265A, F330Y and G368A. We confirm here that mutations are found either isolated or in combination in the same protein and we show that most natural populations are heterogeneous, composed of a mixture of different alleles. In vitro expression of mutated proteins showed that combining mutations in the same protein has two consequences: it increases resistance level and provides a wide spectrum of resistance.

The presence of several alleles in natural populations, offering various resistance to carbamate and organophosphate compounds will complicate the establishment of resistance management programs.

Additional References

## RELATED GEPHE

Related Genes  
 19 (alcohol dehydrogenase (Adh), Aldehyde dehydrogenase (Aldh), CG11699, Cyp12d1, Cyp28d1, Cyp28d1-Cyp28d2, cyp6d2, cyp6g1, glutamate-gated chloride channel (GluCl), GSS (glutathione synthetase), GSTE1-E10 cluster, kin of ire (kire), para (kdr), PHGPx, resistance to dieldrin, RnrS, SOD1, Ugt86Dd, CHKov1) (<https://www.gephebase.org/search-criteria?/or+Taxon+ID=^7227#/gephebase-summary-title>)

Related Haplotypes

4 ([https://www.gephebase.org/search-criteria?/or+Gene+Gephebase=^Acetylcholinesterase+\(Ace-2\)/and+Taxon+ID=^7227#/gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Gene+Gephebase=^Acetylcholinesterase+(Ace-2)/and+Taxon+ID=^7227#/gephebase-summary-title))

## EXTERNAL LINKS

## COMMENTS