

## GEPHE SUMMARY

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

## 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= <sup>^</sup> Physiology <sup>^</sup> #gephebase-summary-title	Trait		
Xenobiotic resistance (insecticide) ( <a href="https://www.gephebase.org/search-criteria?/and+Trait">https://www.gephebase.org/search-criteria?/and+Trait</a> )			
criteria= <sup>^</sup> Xenobiotic resistance (insecticide) <sup>^</sup> #gephebase-summary-title	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= <sup>^</sup> Intraspecific <sup>^</sup> #gephebase-summary-title			
	Taxon A	Taxon B	
	Latin Name		Latin Name
Drosophila melanogaster		Drosophila melanogaster	
( <a href="https://www.gephebase.org/search-criteria?/and+Taxon">https://www.gephebase.org/search-criteria?/and+Taxon</a> )		( <a href="https://www.gephebase.org/search-criteria?/and+Taxon">https://www.gephebase.org/search-criteria?/and+Taxon</a> )	
and Synonyms= <sup>^</sup> Drosophila melanogaster <sup>^</sup> #gephebase-summary-title	Common Name	and Synonyms= <sup>^</sup> Drosophila melanogaster <sup>^</sup> #gephebase-summary-title	Common Name
fruit fly		fruit fly	
	Synonyms		Synonyms
Sophophora melanogaster; fruit fly; Drosophila melanogaster Meigen, 1830; Sophophora melanogaster (Meigen, 1830); Drosophila melangaster		Sophophora melanogaster; fruit fly; Drosophila melanogaster Meigen, 1830; Sophophora melanogaster (Meigen, 1830); Drosophila melangaster	
	Rank		Rank
species		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; Ephydroidea; Drosophilidae; Drosophilinae; Drosophilini; Drosophila; Sophophora; melanogaster group; melanogaster subgroup		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; Ephydroidea; Drosophilidae; Drosophilinae; Drosophilini; Drosophila; Sophophora; melanogaster group; melanogaster subgroup	
	Parent		Parent
melanogaster subgroup () - (Rank: species subgroup)		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> )	NCBI Taxonomy ID	( <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> )	NCBI Taxonomy ID
7227		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> )		( <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> )	
	is Taxon A an Intraspecies?		is Taxon B an Intraspecies?
No		No	

## GENOTYPIC CHANGE

	Generic Gene Name	UniProtKB Drosophila melanogaster
Ace		P07140 ( <a href="http://www.uniprot.org/uniprot/P07140">http://www.uniprot.org/uniprot/P07140</a> )
	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		()
	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 (<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

E81K

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	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 irre (kire), para (kdr), PHGPx, resistance to dieldrin, RnrS, SOD1, Ugt86Dd, CHKov1) (<https://www.gephebase.org/search-criteria?/or+Taxon ID=^7227^/and+Trait=Xenobiotic resistance/and+groupHaplotypes=true#gephebase-summary-title>)

Related Haplotypes

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

## EXTERNAL LINKS

