

GEPHE SUMMARY

	Gephebase Gene	GephelD
Acetylcholinesterase (Ace) (https://www.gephebase.org/search-criteria/?and+Gene	GP00000038	
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 State in Taxon A	
Xenobiotic resistance (insecticide)^#gephebase-summary-title)		
Bactrocera oleae- sensitive	Trait State in Taxon B	
Bactrocera oleae - resistant	Ancestral State	
Taxon A	Taxonomic Status	
Intraspecific (https://www.gephebase.org/search-criteria/?and+Taxonomic		
Status="Intraspecific^#gephebase-summary-title)		
Taxon A		Taxon B
	Latin Name	Latin Name
Bactrocera oleae	(https://www.gephebase.org/search-criteria/?and+Taxon+and+Synonyms=Bactrocera+oleae^#gephebase-summary-title)	(https://www.gephebase.org/search-criteria/?and+Taxon+and+Synonyms=Bactrocera+oleae^#gephebase-summary-title)
	Common Name	Common Name
olive fruit fly	Synonyms	Synonyms
Bactrocera (Dacus) oleae; Bactrocera (Dacus) oleae; Dacus oleae; olive fruit fly; olive fly;		
Bactrocera oleae (Rossi, 1790)		
	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; Tephritoidea; Tephritidae; Dacinae; Dacini; Bactrocera; Dacus		
	Parent	Parent
Dacus () - (Rank: subgenus)		
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=69624)		
	NCBI Taxonomy ID	NCBI Taxonomy ID
104688		
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=104688)		
is Taxon A an Infraspecies?		
No		

GENOTYPIC CHANGE

Ace	Generic Gene Name	UniProtKB Drosophila melanogaster
	Synonyms	P07140 (http://www.uniprot.org/uniprot/P07140)
AcChE; ace; ACE; ace-2;ache; AchE; AChE; CG17907; CHE; dAChE; dmAChE; DmAChE; Dmel\CG17907; Dm_ace; FBgn0000024; l(3)26; l(3)87Ed		GenebankID or UniProtKB
7227.FBpp0289713	String	ABF55414 (https://www.ncbi.nlm.nih.gov/nuccore/ABF55414)
(http://string-db.org/newstring_cgi/show_network_section.pl?identifier=7227.FBpp0289713)		
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: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

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

Deletion Size

1-9 bp

Molecular Details of the Mutation

9bp deletion of three glutamine residues at positions 642_644

Experimental Evidence

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

Main Reference

A small deletion in the olive fly acetylcholinesterase gene associated with high levels of organophosphate resistance. (2008) (<https://pubmed.ncbi.nlm.nih.gov/18625401>)

Authors

Kakani EG; Ioannides IM; Margaritopoulos JT; Seraphides NA; Skouras PJ; Tsitsipis JA; Mathiopoulos KD

Abstract

Organophosphate resistance in the olive fly was previously shown to associate with two point mutations in the ace gene. The frequency of these mutations was monitored in *Bactrocera oleae* individuals of increasing resistance. In spite of the difference in resistance among the individuals, there was no correlation between mutation frequencies and resistance level, indicating that other factors may contribute to this variation. The search for additional mutations in the ace gene of highly resistant insects revealed a small deletion at the carboxyl terminal of the protein (termed Delta3Q). Significant correlation was shown between the mutation frequency and resistance level in natural populations. In addition, remaining activity of acetylcholinesterase enzyme (AChE) after dimethoate inhibition was higher in genotypes carrying the mutation. These results strongly suggest a role of Delta3Q in high levels of organophosphate (OP) resistance. Interestingly, the carboxyl terminal of AChE is normally cleaved and substituted by a glycosylphosphatidylinositol (GPI) anchor. We hypothesize that Delta3Q may improve GPI anchoring, thus increasing the amount of AChE that reaches the synaptic cleft. In this way, despite the presence of insecticide, enough enzyme would remain in the cleft for its normal role of acetylcholine hydrolysis, allowing the insect to survive. This provides a previously un-described mechanism of resistance.

Additional References

Altered GPI modification of insect AChE improves tolerance to organophosphate insecticides. (2011) (<https://pubmed.ncbi.nlm.nih.gov/21112395>)

RELATED GEPHE

Related Genes

1 (Acetylcholinesterase (Ace-2)) (<https://www.gephebase.org/search-criteria?/or+Taxon+ID=%104688%/and+Trait=Xenobiotic+resistance/and+groupHaplotypes=true%#gephebase-summary-title>)

Related Haplotypes

1 ([https://www.gephebase.org/search-criteria?/or+Gene+Gephebase=%Acetylcholinesterase+\(Ace\)%/and+Taxon+ID=%104688%/or+Gene+Gephebase=%Acetylcholinesterase+\(Ace\)%/and+Taxon+ID=%104688%#gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Gene+Gephebase=%Acetylcholinesterase+(Ace)%/and+Taxon+ID=%104688%/or+Gene+Gephebase=%Acetylcholinesterase+(Ace)%/and+Taxon+ID=%104688%#gephebase-summary-title))

EXTERNAL LINKS

COMMENTS

