

GEPHE SUMMARY

	Gephebase Gene	GephelD
esterase isozyme E7 = E3 (https://www.gephebase.org/search-criteria?/and+Gene	GP00000299	
Gephebase=^esterase isozyme E7 = E3 "#gephebase-summary-title)		Main curator
	Entry Status	Martin
Published		

PHENOTYPIC CHANGE

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

GENOTYPIC CHANGE

LcaE7	Generic Gene Name	UniProtKB Lucilia cuprina
-	Synonyms	GenebankID or UniProtKB
-	String	
-	Sequence Similarities	
Belongs to the type-B carboxylesterase/lipase family.		
	GO - Molecular Function	
GO:0016787 : hydrolase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0016787)		
	GO - Biological Process	
	GO - Cellular Component	
		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

Gly137Asp

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

The same amino acid substitution in orthologous esterases confers organophosphate resistance on the house fly and a blowfly. (1999) (<https://pubmed.ncbi.nlm.nih.gov/10451921>)

Authors

Claudianos C; Russell RJ; Oakeshott JG

Abstract

Organophosphate (OP) insecticide resistance in certain strains of *Musca domestica* is associated with reduction in the carboxylesterase activity of a particular esterase isozyme. This has been attributed to a 'mutant ali-esterase hypothesis', which invokes a structural mutation to an ali-esterase resulting in the loss of its carboxylesterase activity but acquisition of OP hydrolase activity. It has been shown that the mutation in *Lucilia cuprina* is a Gly137-->Asp substitution in the active site of an esterase encoded by the Lc alpha E7 gene (Newcomb, R.D., Campbell, P.M., Ollis, D.L., Cheah, E., Russell, R.J., Oakeshott, J.G., 1997). A single amino acid substitution converts a carboxylesterase to an organophosphate hydrolase and confers insecticide resistance on a blowfly. Proc. Natl. Acad. Sci. USA 94, 7464-7468). We now report the cloning and characterisation of the orthologous *M. domestica* Md alpha E7 gene, including the sequencing of cDNAs from the OP resistant Rutgers and OP susceptible sb0 and WHO strains. The Md alpha E7 gene has the same intron structure as Lc alpha E7 and encodes a protein with 76% amino acid identity to Lc alpha E7. Comparisons between susceptible and resistance alleles show resistance in *M. domestica* is associated with the same Gly137-->Asp mutation as in *L. cuprina*. Bacterial expression of the Rutgers allele shows its product has OP hydrolase activity. The data indicate identical catalytic mechanisms have evolved in orthologous Md alpha E7 and Lc alpha E7 molecules to endow diazinon-type resistance on the two species of higher Diptera.

Additional References

RELATED GEPHE

Related Genes

5 (Acetylcholinesterase (Ace-2), Acetylcholinesterase (Ace), CYP6D1, 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

No matches found.

EXTERNAL LINKS

COMMENTS