

GEPHE SUMMARY

	Gephebase Gene	GephelD
esterase isozyme E3 (https://www.gephebase.org/search-criteria/?and+Gene Gephebase=^esterase isozyme E3^#gephebase-summary-title)	GP00000295	Main curator
	Entry Status	Martin
Published		

PHENOTYPIC CHANGE

	Trait Category	
Physiology (https://www.gephebase.org/search-criteria/?and+Trait Category=^Physiology^#gephebase-summary-title)	Trait	
Xenobiotic resistance (insecticide) (https://www.gephebase.org/search-criteria/?and+Trait=^Xenobiotic+resistance+(insecticide)^#gephebase-summary-title)	Trait State in Taxon A	
Lucilia cuprina	Trait State in Taxon B	
Lucilia cuprina	Ancestral State	
Data not curated	Taxonomic Status	
Intraspecific (https://www.gephebase.org/search-criteria/?and+Taxonomic Status=^Intraspecific^#gephebase-summary-title)		
Taxon A		Taxon B
	Latin Name	Latin Name
Lucilia cuprina (https://www.gephebase.org/search-criteria/?and+Taxon+and+Synonyms=^Lucilia+cuprina^#gephebase-summary-title)		Lucilia cuprina (https://www.gephebase.org/search-criteria/?and+Taxon+and+Synonyms=^Lucilia+cuprina^#gephebase-summary-title)
Australian sheep blowfly	Common Name	Common Name
Australian sheep blowfly; greenbottle fly; Lucilia cuprina (Wiedemann, 1830)	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; Oestroidea; Calliphoridae; Luciliinae; Lucilia		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; Oestroidea; Calliphoridae; Luciliinae; Lucilia
Lucilia () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7374)	Parent	Parent
7375 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7375)	NCBI Taxonomy ID	NCBI Taxonomy ID
No	is Taxon A an Infraspecies?	is Taxon B an Infraspecies?

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 (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=%5ECoding%5E#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Molecular%20Type=%5ECoding%5E#gephebase-summary-title))

Aberration Type

SNP ([https://www.gephebase.org/search-criteria?/and+Aberration Type=%5ESNP%5E#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Aberration%20Type=%5ESNP%5E#gephebase-summary-title))

SNP Coding Change

Nonsynonymous

Molecular Details of the Mutation

Trp251Leu

Experimental Evidence

Candidate Gene ([https://www.gephebase.org/search-criteria?/and+Experimental Evidence=%5ECandidate Gene%5E#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Experimental%20Evidence=%5ECandidate%20Gene%5E#gephebase-summary-title))

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

Structure and function of an insect $\hat{\pm}$ -carboxylesterase ($\hat{\pm}$ Esterase) associated with insecticide resistance. (2013) (<https://pubmed.ncbi.nlm.nih.gov/23733941>)

Main Reference

Jackson CJ; Liu JW; Carr PD; Younus F; Coppin C; Meirelles T; Lethier M; Pandey G; Ollis DL; Russell RJ; Weik M; Oakeshott JG

Authors

Insect carboxylesterases from the $\hat{\pm}$ Esterase gene cluster, such as $\hat{\pm}$ E7 (also known as E3) from the Australian sheep blowfly *Lucilia cuprina* (Lc $\hat{\pm}$ E7), play an important physiological role in lipid metabolism and are implicated in the detoxification of organophosphate (OP) insecticides. Despite the importance of OPs to agriculture and the spread of insect-borne diseases, the molecular basis for the ability of $\hat{\pm}$ -carboxylesterases to confer OP resistance to insects is poorly understood. In this work, we used laboratory evolution to increase the thermal stability of Lc $\hat{\pm}$ E7, allowing its overexpression in *Escherichia coli* and structure determination. The crystal structure reveals a canonical $\hat{\pm}$ / β -hydrolase fold that is very similar to the primary target of OPs (acetylcholinesterase) and a unique N-terminal $\hat{\pm}$ -helix that serves as a membrane anchor. Soaking of Lc $\hat{\pm}$ E7 crystals in OPs led to the capture of a crystallographic snapshot of Lc $\hat{\pm}$ E7 in its phosphorylated state, which allowed comparison with acetylcholinesterase and rationalization of its ability to protect insects against the effects of OPs. Finally, inspection of the active site of Lc $\hat{\pm}$ E7 reveals an asymmetric and hydrophobic substrate binding cavity that is well-suited to fatty acid methyl esters, which are hydrolyzed by the enzyme with specificity constants (\approx 410(6) M(-1) s(-1)) indicative of a natural substrate.

Abstract

Additional References

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

1 ([https://www.gephebase.org/search-criteria?/or+Gene Gephebase=%5Eesterase isozyme E3%5E/and+Taxon ID=%5E7375%5E/or+Gene Gephebase=%5Eesterase isozyme E3%5E/and+Taxon ID=%5E7375%5E#gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Gene%20Gephebase=%5Eesterase%20isozyme%20E3%5E/and+Taxon%20ID=%5E7375%5E/or+Gene%20Gephebase=%5Eesterase%20isozyme%20E3%5E/and+Taxon%20ID=%5E7375%5E#gephebase-summary-title))

EXTERNAL LINKS

COMMENTS