GEPHE SUMMARY

Gephebase Gene
esterase isozyme E3 (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^esterase isozyme E3^#gephebase-summary-title)

GepheID
GP00000294

Entry Status
Published

Main curator
Martin

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

Latin Name
Lucilia cuprina (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Lucilia cuprina^#gephebase-summary-title)

Common Name
Australian sheep blowfly

Synonyms
Australian sheep blowfly; greenbottle fly; Lucilia cuprina (Wiedemann, 1830)

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; Oestroidea; Calliphoridae; Luciliinae; Lucilia

Parent
Lucilia () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7374)

NCBI Taxonomy ID
7375 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7375)

is Taxon A an Infraspecies?
No

Taxon B

Latin Name
Lucilia cuprina (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Lucilia cuprina^#gephebase-summary-title)

Common Name
Australian sheep blowfly

Synonyms
Australian sheep blowfly; greenbottle fly; Lucilia cuprina (Wiedemann, 1830)

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; Oestroidea; Calliphoridae; Luciliinae; Lucilia

Parent
Lucilia () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7374)

NCBI Taxonomy ID
7375 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7375)

is Taxon B an Infraspecies?
No

GENOTYPIC CHANGE

Generic Gene Name
LcaE7

Synonyms
-

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
-

UniProtKB Lucilia cuprina
Q25252 (http://www.uniprot.org/uniprot/Q25252)

GenebankID or UniProtKB
U56636 (https://www.ncbi.nlm.nih.gov/nuccore/U56636)

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

Gly137Asp

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	-	-	-

Main Reference

A single amino acid substitution converts a carboxylesterase to an organophosphorus hydrolase and confers insecticide resistance on a blowfly. (1997) (https://pubmed.ncbi.nlm.nih.gov/9207114)

Authors

Newcomb RD; Campbell PM; Ollis DL; Cheah E; Russell RJ; Oakeshott JG

Abstract

Resistance to organophosphorus (OP) insecticides is associated with decreased carboxylesterase activity in several insect species. It has been proposed that the resistance may be the result of a mutation in a carboxylesterase that simultaneously reduces its carboxylesterase activity and confers an OP hydrolase activity (the "mutant ali-esterase hypothesis"). In the sheep blowfly, Lucilia cuprina, the association is due to a change in a specific esterase isozyme, E3, which, in resistant flies, has a null phenotype on gels stained using standard carboxylesterase substrates. Here we show that an OP-resistant allele of the gene that encodes E3 differs at five amino acid replacement sites from a previously described OP-susceptible allele. Knowledge of the structure of a related enzyme (acetylcholinesterase) suggests that one of these substitutions (Gly137 --> Asp) lies within the active site of the enzyme. The occurrence of this substitution is completely correlated with resistance across 15 isogenic strains. In vitro expression of two natural and two synthetic chimeric alleles shows that the Asp137 substitution alone is responsible for both the loss of E3's carboxylesterase activity and the acquisition of a novel OP hydrolase activity. Modeling of Asp137 in the homologous position in acetylcholinesterase suggests that Asp137 may act as a base to orientate a water molecule in the appropriate position for hydrolysis of the phosphorylated enzyme intermediate.

Additional References

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

1 (https://www.gephebase.org/search-criteria?/or+Gene Gephebase=^esterase isozyme E3^/and+Taxon ID=^7375^/or+Gene Gephebase=^esterase isozyme E3^/and+Taxon ID=^7375^#gephebase-summary-title)

EXTERNAL LINKS

COMMENTS