GEPHE SUMMARY

Gephebase Gene
esterase isozyme E7 = E3 (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^esterase isozyme E7 = E3^#gephebase-summary-title)

GepheID
GP00000299

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
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
Musca domestica (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^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
Musca domestica (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^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

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
()

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

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 sbo 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) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^7370^/and+Trait=Xenobiotic resistance/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS