GEPHE SUMMARY

Gephebase Gene
acetyl-CoA carboxylase (ACC) (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^acetyl-CoA carboxylase (ACC)^#gephebase-summary-title)

GepheID
GP00002618

Entry Status
Published

Main curator
Courtier

PHENOTYPIC CHANGE

Trait Category
Physiology (https://www.gephebase.org/search-criteria?/and+Trait Category=^Physiology^#gephebase-summary-title)

Trait
Xenobiotic resistance (insecticide; spirotetramat) (https://www.gephebase.org/search-criteria?/and+Trait=^Xenobiotic resistance (insecticide; spirotetramat)^#gephebase-summary-title)

Trait State in Taxon A
Caenorhabditis elegans - sensitive

Trait State in Taxon B
Caenorhabditis elegans - resistant line after mutagenesis and selection

Ancestral State
Taxon A

Taxonomic Status
Experimental Evolution (https://www.gephebase.org/search-criteria?/and+Taxonomic Status=^Experimental Evolution^#gephebase-summary-title)

Taxon A

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

Common Name
-

Synonyms
roundworm; Rhabditis elegans; Caenorhabditis elegans (Maupas, 1900); Rhabditis elegans Maupas, 1900

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Nematoda; Chromadorea; Rhabditida; Rhabditina; Rhabditomorpha; Rhabditoidea; Rhabditidae; Peloderinae; Caenorhabditis

Parent
Caenorhabditis () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 6237)

NCBI Taxonomy ID
6239 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 6239)

is Taxon A an Infraspecies?
No

Taxon B

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

Common Name
-

Synonyms
roundworm; Rhabditis elegans; Caenorhabditis elegans (Maupas, 1900); Rhabditis elegans Maupas, 1900

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Nematoda; Chromadorea; Rhabditida; Rhabditina; Rhabditomorpha; Rhabditoidea; Rhabditidae; Peloderinae; Caenorhabditis

Parent
Caenorhabditis () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 6237)

NCBI Taxonomy ID
6239 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 6239)

is Taxon B an Infraspecies?
No

GENOTYPIC CHANGE

Generic Gene Name
ACC

Synonyms
A1Z784_DROME; acc; Acc; ACoT; CG11198; CG8723; dACC; DmACC; Dmel\CG11198; FBgn0043811; Dmel_CG11198

String
-

Sequence Similarities
-

GO - Molecular Function
GO:0005524 : ATP binding (https://www.ebi.ac.uk/QuickGO/term/GO:0005524)
GO:0046872 : metal ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0046872)
GO:0003989 : acetyl-CoA carboxylase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0003989)

GO - Biological Process
GO:0006633 : fatty acid biosynthetic process (https://www.ebi.ac.uk/QuickGO/term/GO:0006633)

UniProtKB Drosophila melanogaster
Q7JV23 (http://www.uniprot.org/uniprot/Q7JV23)

GenebankID or UniProtKB
()

GO:0019432 : triglyceride biosynthetic process (https://www.ebi.ac.uk/QuickGO/term/GO:0019432)
GO:0009744 : response to sucrose (https://www.ebi.ac.uk/QuickGO/term/GO:0009744)
GO:0000902 : cell morphogenesis (https://www.ebi.ac.uk/QuickGO/term/GO:0000902)
GO:0005977 : glycogen metabolic process (https://www.ebi.ac.uk/QuickGO/term/GO:0005977)
GO:0071329 : cellular response to sucrose stimulus (https://www.ebi.ac.uk/QuickGO/term/GO:0071329)
GO:2001295 : malonyl-CoA biosynthetic process (https://www.ebi.ac.uk/QuickGO/term/GO:2001295)

GO - Cellular Component

GO:0005737 : cytoplasm (https://www.ebi.ac.uk/QuickGO/term/GO:0005737)
GO:0005739 : mitochondrion (https://www.ebi.ac.uk/QuickGO/term/GO:0005739)

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

A1847V

Experimental Evidence

Linkage Mapping (https://www.gephebase.org/search-criteria?/and+Experimental Evidence=^Linkage Mapping^#gephebase-summary-title)

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

Main Reference

Studies of an insecticidal inhibitor of acetyl-CoA carboxylase in the nematode C. elegans. (2020) (https://pubmed.ncbi.nlm.nih.gov/32828380)

Authors

Guest M; Kriek N; Flemming AJ

Abstract

We have studied the mode of action of the insecticide spirotetramat in the nematode Caenorhabditis elegans. A combination of symptomology, forward genetics and genome editing show that spirotetramat acts on acetyl-CoA carboxylase (ACC) in C. elegans, as it does in insects. We found C. elegans embryos exposed to spirotetramat show a cell division defect which closely resembles the phenotype of loss-of-function mutations in the gene pod-2, which encodes ACC. We then identified two mutations in the carboxyl transferase domain of pod-2 (ACC) which confer resistance and were confirmed using CRISPR/Cas9. One of these mutations substitutes an invertebrate-specific amino acid with one ubiquitous in other taxa; this residue may, therefore, be a determinant of the selectivity of spirotetramat for invertebrates. Such a mutation may also be the target of selection for resistance in the field. Our study is a further demonstration of the utility of C. elegans in studying bioactive chemicals.

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Additional References

RELATED GEPHE

Related Genes

3 (beta-tubulin (ben-1), GLC-1, str-217) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^6239^/and+Trait=Xenobiotic resistance/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

1 (https://www.gephebase.org/search-criteria?/or+Gene Gephebase=^acetyl-CoA carboxylase (ACC)^/and+Taxon ID=^6239^/or+Gene Gephebase=^acetyl-CoA carboxylase (ACC)^/and+Taxon ID=^6239^#gephebase-summary-title)

EXTERNAL LINKS

COMMENTS

A1559V apeared independently in two lines. A1847V also apeared independently in two lines.