

str-217 (<a +str-217+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Gene+Gephebase=">https://www.gephebase.org/search-criteria?/and+Gene+Gephebase="+str-217+"#gephebase-summary-title)	Gephebase Gene	GP00001784	GepheID
Published	Entry Status	Courtier	Main curator

Physiology (https://www.gephebase.org/search-criteria?/and+Trait+Category=^Physiology^#gephebase-summary-title)		Trait Category	
Xenobiotic resistance (insecticide; DEET) (https://www.gephebase.org/search-criteria?/and+Trait=^Xenobiotic resistance (insecticide; DEET)^#gephebase-summary-title)		Trait	
sensitive to DEET		Trait State in Taxon A	
resistant to DEET - note that the phenotype has not been measured in these lines carrying this presumptive null mutation but in another strain carrying another mutation of the str-217 gene		Trait State in Taxon B	
Taxon A		Ancestral State	
Intraspecific (https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=^Intraspecific^#gephebase-summary-title)		Taxonomic Status	
Taxon A		Taxon B	
Caenorhabditis elegans (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Caenorhabditis elegans^#gephebase-summary-title)	Latin Name	Caenorhabditis elegans (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Caenorhabditis elegans^#gephebase-summary-title)	Latin Name
-	Common Name	-	Common Name
roundworm; Rhabditis elegans; Caenorhabditis elegans (Maupas, 1900); Rhabditis elegans Maupas, 1900	Synonyms	roundworm; Rhabditis elegans; Caenorhabditis elegans (Maupas, 1900); Rhabditis elegans Maupas, 1900	Synonyms
species	Rank	species	Rank
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Nematoda; Chromadorea; Rhabditida; Rhabditina; Rhabditomorpha; Rhabditoidea; Rhabditidae; Peloderinae; Caenorhabditis	Lineage	cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Nematoda; Chromadorea; Rhabditida; Rhabditina; Rhabditomorpha; Rhabditoidea; Rhabditidae; Peloderinae; Caenorhabditis	Lineage
Caenorhabditis () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=6237)	Parent	Caenorhabditis () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=6237)	Parent
6239 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=6239)	NCBI Taxonomy ID	6239 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=6239)	NCBI Taxonomy ID
No	is Taxon A an Intraspecies?	Yes	is Taxon B an Intraspecies?
		Taxon B Description	
		JU406, ECA252, NIC2, CX11307, JU2565, JU2853, JY2566, QG536, JU1568, JU2250, JU394, CB4851	

str-217	Generic Gene Name	Q9XX85 (http://www.uniprot.org/uniprot/Q9XX85)	UniProtKB <i>Caenorhabditis elegans</i>
CELE_Y102A5C.28; Y102A5C.28	Synonyms		GenebankID or UniProtKB <i>Caenorhabditis elegans</i>
-	String	Q9XX85 (https://www.ncbi.nlm.nih.gov/nuccore/Q9XX85)	
-	Sequence Similarities		
GO:0038022 : G protein-coupled olfactory receptor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0038022)	GO - Molecular Function		
GO:0007186 : G protein-coupled receptor signaling pathway	GO - Biological Process		

(<https://www.ebi.ac.uk/QuickGO/term/GO:0007186>)
GO:0042048 : olfactory behavior (<https://www.ebi.ac.uk/QuickGO/term/GO:0042048>)
GO - Cellular Component
GO:0005887 : integral component of plasma membrane
(<https://www.ebi.ac.uk/QuickGO/term/GO:0005887>)

Presumptive Null

Yes (<https://www.gephebase.org/search-criteria?/and+Presumptive Null=~Yes~#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

Nonsense

Molecular Details of the Mutation

on chromosome V position 17000292 G>A stop_gained 13C>T - Gln5*

Experimental Evidence

Candidate Gene (<https://www.gephebase.org/search-criteria?/and+Experimental Evidence=~Candidate Gene~#gephebase-summary-title>)

	Taxon A	Taxon B	Position
Codon	-	-	17000292
Amino-acid	Gln	STP	5

Main Reference

A natural variant and engineered mutation in a GPCR promote DEET resistance in *C. elegans*. (2018) (<https://pubmed.ncbi.nlm.nih.gov/30258230>)

Authors

Dennis EJ; Dobosiewicz M; Jin X; Duvall LB; Hartman PS; Bargmann CI; Vosshall LB

Abstract

DEET (N,N-diethyl-meta-toluamide) is a synthetic chemical identified by the US Department of Agriculture in 1946 in a screen for repellents to protect soldiers from mosquito-borne diseases. Since its discovery, DEET has become the world’s most widely used arthropod repellent and is effective against invertebrates separated by millions of years of evolution-including biting flies, honeybees, ticks, and land leeches. In insects, DEET acts on the olfactory system and requires the olfactory receptor co-receptor Orco, but exactly how it works remains controversial. Here we show that the nematode *Caenorhabditis elegans* is sensitive to DEET and use this genetically tractable animal to study the mechanism of action of this chemical. We found that DEET is not a volatile repellent, but instead interferes selectively with chemotaxis to a variety of attractant and repellent molecules. In a forward genetic screen for DEET-resistant worms, we identified a gene that encodes a single GÅ protein-coupled receptor, str-217, which is expressed in a single pair of chemosensory neurons that are responsive to DEET, called ADL neurons. Mis-expression of str-217 in another chemosensory neuron conferred responses to DEET. Engineered str-217 mutants, and a wild isolate of *C. elegans* that carries a str-217 deletion, are resistant to DEET. We found that DEET can interfere with behaviour by inducing an increase in average pause length during locomotion, and show that this increase in pausing requires both str-217 and ADL neurons. Finally, we demonstrated that ADL neurons are activated by DEET and that optogenetic activation of ADL neurons increased average pause length. This is consistent with the ‘confusant’ hypothesis, which proposes that DEET is not a simple repellent but that it instead modulates multiple olfactory pathways to scramble behavioural responses. Our results suggest a consistent motif in the effectiveness of DEET across widely divergent taxa: an effect on multiple chemosensory neurons that disrupts the pairing between odorant stimulus and behavioural response.

Additional References

RELATED GEPHE

Related Genes

3 (acetyl-CoA carboxylase (ACC), beta-tubulin (ben-1), GLC-1) (<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=~str-217~/and+Taxon ID=~6239~/or+Gene Gephebase=~str-217~/and+Taxon ID=~6239~#gephebase-summary-title>)

EXTERNAL LINKS

COMMENTS

Note that DEET resistance has not been measured in the lines carrying this presumptive null mutation. The phenotypic effect has been observed in the natural strain CB which carries a deletion in str-217. Check <https://www.elegansvariation.org/> for molecular details about the various strains.

