GEPHE SUMMARY

Gephebase Gene

Ir75b (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^Ir75b^#gephebase-summary-title)

GepheID

GP00001702

Entry Status

Published

Main curator

Courtier

PHENOTYPIC CHANGE

Trait #1

Trait Category

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

Trait

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

Trait State in Taxon A

no response to hexanoic acid

Trait State in Taxon B

response to hexanoic acid

Trait #2

Trait Category

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

Trait

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

Trait State in Taxon A

oviposition preference for butyric acid (versus hexanoic acid)

Trait State in Taxon B

oviposition preference for hexanoic acid (versus butyric acid)

Ancestral State

Taxon A

Taxonomic Status

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

Taxon A

Latin Name

Drosophila melanogaster (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Drosophila melanogaster^#gephebase-summary-title)

Common Name

fruit fly

Synonyms

Sophophora melanogaster; fruit fly; Drosophila melanogaster Meigen, 1830; Sophophora melanogaster (Meigen, 1830); Drosophila melangaster

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; Acalyptratae; Ephydroidea; Drosophilidae; Drosophilinae; Drosophilini; Drosophila; Sophophora; melanogaster group; melanogaster subgroup

Parent

melanogaster subgroup () - (Rank: species subgroup) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 32351)

NCBI Taxonomy ID

7227 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7227)

is Taxon A an Infraspecies?

No

Taxon B

Latin Name

Drosophila sechellia (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Drosophila sechellia^#gephebase-summary-title)

Common Name

-

Synonyms

Drosophila sechellia Tsacas and Bachli, 1981

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; Acalyptratae; Ephydroidea; Drosophilidae; Drosophilinae; Drosophilini; Drosophila; Sophophora; melanogaster group; melanogaster subgroup

Parent

melanogaster subgroup () - (Rank: species subgroup) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 32351)

NCBI Taxonomy ID

7238 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7238)

is Taxon B an Infraspecies?

No

GENOTYPIC CHANGE

Generic Gene Name

Ir75b

Synonyms

Ir75abc; IR75abc; CG14586; CG14586-B; CG42643; DmelIR75b; Dmel\CG42643; IR75b; Dmel_CG42643

String

7227.FBpp0291499 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier= 7227.FBpp0291499)

Sequence Similarities

-

GO - Molecular Function

GO:0015276 : ligand-gated ion channel activity (https://www.ebi.ac.uk/QuickGO/term/GO:0015276)
GO:0004970 : ionotropic glutamate receptor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0004970)

GO - Biological Process

GO:0050907 : detection of chemical stimulus involved in sensory perception (https://www.ebi.ac.uk/QuickGO/term/GO:0050907)

GO - Cellular Component

GO:0016021 : integral component of membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0016021)

UniProtKB Drosophila melanogaster

B7Z069 (http://www.uniprot.org/uniprot/B7Z069)

GenebankID or UniProtKB

A0A1S6EMU3 (https://www.ncbi.nlm.nih.gov/nuccore/A0A1S6EMU3)

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

T523S in the LBD domain - caused by C1568G

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

Evolution of Acid-Sensing Olfactory Circuits in Drosophilids. (2017) (https://pubmed.ncbi.nlm.nih.gov/28111079)

Authors

Prieto-Godino LL; Rytz R; Cruchet S; Bargeton B; Abuin L; Silbering AF; Ruta V; Dal Peraro M; Benton R

Abstract

Animals adapt their behaviors to specific ecological niches, but the genetic and cellular basis of nervous system evolution is poorly understood. We have compared the olfactory circuits of the specialist Drosophila sechellia-which feeds exclusively on Morinda citrifolia fruit-with its generalist cousins D.Â melanogaster and D.Â simulans. We show that D.Â sechellia exhibits derived odor-evoked attraction and physiological sensitivity to the abundant Morinda volatile hexanoic acid and characterize how the responsible sensory receptor (the variant ionotropic glutamate receptor IR75b) and attraction-mediating circuit have evolved. A single amino acid change in IR75b is sufficient to recode it as a hexanoic acid detector. Expanded representation of this sensory pathway in the brain relies on additional changes in the IR75b promoter and trans-acting loci. By contrast, higher-order circuit adaptations are not apparent, suggesting conserved central processing. Our work links olfactory ecology to structural and regulatory genetic changes influencing nervous system anatomy and function.

Additional References

Odor-regulated oviposition behavior in an ecological specialist. (2023) (https://pubmed.ncbi.nlm.nih.gov/37236992)
Molecular reconstruction of recurrent evolutionary switching in olfactory receptor specificity. (2021) (https://pubmed.ncbi.nlm.nih.gov/34677122)

RELATED GEPHE

Related Genes

2 (Ir75a, Or22a) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^7227^/and+Trait=Olfaction/or+Taxon ID=^7227^/and+Trait=Oviposition site preference/or+Taxon ID=^7238^/and+Trait=Olfaction/or+Taxon ID=^7238^/and+Trait=Oviposition site preference/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

The difference in hexanoic acid olfaction is associated with the amino acid change T523S. The difference in oviposition site is associated with Ir75b full coding region and the effect of T523S on oviposition preference has not been tested.