GEPHE SUMMARY

Gephebase Gene
Ir75a (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^Ir75a^#gephebase-summary-title)

GepheID
GP00001701

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

Trait State in Taxon A
response to acetic acid

Trait State in Taxon B
no response to acetic 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
Ir75a

Synonyms
CG14585; DmelIR75a; Dmel\CG14585; IR75a; Ir75abc; IR75abc

String
7227.FBpp0271900 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier= 7227.FBpp0271900)

Sequence Similarities
Belongs to the glutamate-gated ion channel (TC 1.A.10.1) family.

GO - Molecular Function
GO:0015276 : ligand-gated ion channel activity (https://www.ebi.ac.uk/QuickGO/term/GO:0015276)
GO:0004984 : olfactory receptor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0004984)

UniProtKB Drosophila melanogaster
Q9VVL1 (http://www.uniprot.org/uniprot/Q9VVL1)

GenebankID or UniProtKB
()

GO:0004971 : AMPA glutamate receptor activity
(https://www.ebi.ac.uk/QuickGO/term/GO:0004971)

GO - Biological Process

GO:0007605 : sensory perception of sound
(https://www.ebi.ac.uk/QuickGO/term/GO:0007605)
GO:0050907 : detection of chemical stimulus involved in sensory perception
(https://www.ebi.ac.uk/QuickGO/term/GO:0050907)
GO:0050911 : detection of chemical stimulus involved in sensory perception of smell
(https://www.ebi.ac.uk/QuickGO/term/GO:0050911)

GO - Cellular Component

GO:0016021 : integral component of membrane
(https://www.ebi.ac.uk/QuickGO/term/GO:0016021)
GO:0005886 : plasma membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0005886)
GO:0005887 : integral component of plasma membrane
(https://www.ebi.ac.uk/QuickGO/term/GO:0005887)
GO:0030425 : dendrite (https://www.ebi.ac.uk/QuickGO/term/GO:0030425)
GO:0044297 : cell body (https://www.ebi.ac.uk/QuickGO/term/GO:0044297)
GO:0032281 : AMPA glutamate receptor complex
(https://www.ebi.ac.uk/QuickGO/term/GO:0032281)
GO:0071683 : sensory dendrite (https://www.ebi.ac.uk/QuickGO/term/GO:0071683)

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

T289S and/or Q536K and/or F538L - introduction of these three amino acid changes in the D. melanogaster protein is sufficient to confer response indistinguishable from the one of D. sechellia

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

Olfactory receptor pseudo-pseudogenes. (2016) (https://pubmed.ncbi.nlm.nih.gov/27776356)

Authors

Prieto-Godino LL; Rytz R; Bargeton B; Abuin L; Arguello JR; Peraro MD; Benton R

Abstract

Pseudogenes are generally considered to be non-functional DNA sequences that arise through nonsense or frame-shift mutations of protein-coding genes. Although certain pseudogene-derived RNAs have regulatory roles, and some pseudogene fragments are translated, no clear functions for pseudogene-derived proteins are known. Olfactory receptor families contain many pseudogenes, which reflect low selection pressures on loci no longer relevant to the fitness of a species. Here we report the characterization of a pseudogene in the chemosensory variant ionotropic glutamate receptor repertoire of Drosophila sechellia, an insect endemic to the Seychelles that feeds almost exclusively on the ripe fruit of Morinda citrifolia. This locus, D. sechellia Ir75a, bears a premature termination codon (PTC) that appears to be fixed in the population. However, D. sechellia Ir75a encodes a functional receptor, owing to efficient translational read-through of the PTC. Read-through is detected only in neurons and is independent of the type of termination codon, but depends on the sequence downstream of the PTC. Furthermore, although the intact Drosophila melanogaster Ir75a orthologue detects acetic acid-a chemical cue important for locating fermenting food found only at trace levels in Morinda fruit-D. sechellia Ir75a has evolved distinct odour-tuning properties through amino-acid changes in its ligand-binding domain. We identify functional PTC-containing loci within different olfactory receptor repertoires and species, suggesting that such 'pseudo-pseudogenes' could represent a widespread phenomenon.

Additional References

RELATED GEPHE

Related Genes

2 (Or22a, Ir75b) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^7227^/and+Trait=Olfaction/or+Taxon ID=^7238^/and+Trait=Olfaction/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

The D. sechellia Ir75a gene contains a premature stop codon but is nevertheless transcribed into a full protein in neurons