GEPHE SUMMARY

Gephebase Gene
Fas2 (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^Fas2^#gephebase-summary-title)

GepheID
GP00002345

Entry Status
Published

Main curator
Courtier

PHENOTYPIC CHANGE

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

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

Trait State in Taxon A
pupates further from the food

Trait State in Taxon B
pupates closer to the food

Ancestral State
Unknown

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

Common Name
-

Synonyms
-

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
7240 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7240)

is Taxon B an Infraspecies?
No

GENOTYPIC CHANGE

Generic Gene Name
Fas2

Synonyms
1D4; Ab 1D4; anon-EST:Liang-1.60; CG3665; clone 1.60; CT12301; Dmel\CG3665; EG:EG0007.3; Fas; FAS 11; Fas 2; fas II; Fas II; FAS II; fas-II; Fas-II; fas2; FAS2; Fasc II; fasciclin II; FascII; fasII; Fasii; FasII; FASII; l(1)G0032; l(1)G0048; l(1)G0081; l(1)G0293; l(1)G0336; mAb 1D4; mAb1D4; mAB1D4; MAB1D4

String
7227.FBpp0070633 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier= 7227.FBpp0070633)

Sequence Similarities
-

GO - Molecular Function
GO:0098632 : cell-cell adhesion mediator activity

UniProtKB Drosophila melanogaster
P34082 (http://www.uniprot.org/uniprot/P34082)

GenebankID or UniProtKB
P34082 (https://www.ncbi.nlm.nih.gov/nuccore/P34082)

(https://www.ebi.ac.uk/QuickGO/term/GO:0098632)

GO - Biological Process

GO:0048149 : behavioral response to ethanol
(https://www.ebi.ac.uk/QuickGO/term/GO:0048149)
GO:0007156 : homophilic cell adhesion via plasma membrane adhesion molecules
(https://www.ebi.ac.uk/QuickGO/term/GO:0007156)
GO:0007614 : short-term memory (https://www.ebi.ac.uk/QuickGO/term/GO:0007614)
GO:0007528 : neuromuscular junction development
(https://www.ebi.ac.uk/QuickGO/term/GO:0007528)
GO:0016319 : mushroom body development
(https://www.ebi.ac.uk/QuickGO/term/GO:0016319)
GO:0008355 : olfactory learning (https://www.ebi.ac.uk/QuickGO/term/GO:0008355)
GO:0007411 : axon guidance (https://www.ebi.ac.uk/QuickGO/term/GO:0007411)
GO:0007413 : axonal fasciculation (https://www.ebi.ac.uk/QuickGO/term/GO:0007413)
GO:0008045 : motor neuron axon guidance
(https://www.ebi.ac.uk/QuickGO/term/GO:0008045)
GO:0007611 : learning or memory (https://www.ebi.ac.uk/QuickGO/term/GO:0007611)
GO:1904059 : regulation of locomotor rhythm
(https://www.ebi.ac.uk/QuickGO/term/GO:1904059)
GO:0048167 : regulation of synaptic plasticity
(https://www.ebi.ac.uk/QuickGO/term/GO:0048167)
GO:0008582 : regulation of synaptic growth at neuromuscular junction
(https://www.ebi.ac.uk/QuickGO/term/GO:0008582)
GO:0050808 : synapse organization (https://www.ebi.ac.uk/QuickGO/term/GO:0050808)
GO:0042059 : negative regulation of epidermal growth factor receptor signaling pathway
(https://www.ebi.ac.uk/QuickGO/term/GO:0042059)
GO:0048667 : cell morphogenesis involved in neuron differentiation
(https://www.ebi.ac.uk/QuickGO/term/GO:0048667)
GO:0050803 : regulation of synapse structure or activity
(https://www.ebi.ac.uk/QuickGO/term/GO:0050803)
GO:0001746 : Bolwig's organ morphogenesis
(https://www.ebi.ac.uk/QuickGO/term/GO:0001746)
GO:0070593 : dendrite self-avoidance
(https://www.ebi.ac.uk/QuickGO/term/GO:0070593)
GO:0048803 : imaginal disc-derived male genitalia morphogenesis
(https://www.ebi.ac.uk/QuickGO/term/GO:0048803)
GO:1904800 : negative regulation of neuron remodeling
(https://www.ebi.ac.uk/QuickGO/term/GO:1904800)
GO:0008038 : neuron recognition (https://www.ebi.ac.uk/QuickGO/term/GO:0008038)
GO:0072499 : photoreceptor cell axon guidance
(https://www.ebi.ac.uk/QuickGO/term/GO:0072499)
GO:0035158 : regulation of tube diameter, open tracheal system
(https://www.ebi.ac.uk/QuickGO/term/GO:0035158)
GO:0035159 : regulation of tube length, open tracheal system
(https://www.ebi.ac.uk/QuickGO/term/GO:0035159)
GO:0072553 : terminal button organization
(https://www.ebi.ac.uk/QuickGO/term/GO:0072553)

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:0016324 : apical plasma membrane
(https://www.ebi.ac.uk/QuickGO/term/GO:0016324)
GO:0005737 : cytoplasm (https://www.ebi.ac.uk/QuickGO/term/GO:0005737)
GO:0031225 : anchored component of membrane
(https://www.ebi.ac.uk/QuickGO/term/GO:0031225)
GO:0043005 : neuron projection (https://www.ebi.ac.uk/QuickGO/term/GO:0043005)
GO:0030424 : axon (https://www.ebi.ac.uk/QuickGO/term/GO:0030424)
GO:0045211 : postsynaptic membrane
(https://www.ebi.ac.uk/QuickGO/term/GO:0045211)
GO:0031594 : neuromuscular junction
(https://www.ebi.ac.uk/QuickGO/term/GO:0031594)
GO:0030426 : growth cone (https://www.ebi.ac.uk/QuickGO/term/GO:0030426)
GO:0042995 : cell projection (https://www.ebi.ac.uk/QuickGO/term/GO:0042995)
GO:0031256 : leading edge membrane
(https://www.ebi.ac.uk/QuickGO/term/GO:0031256)
GO:0097482 : muscle cell postsynaptic specialization
(https://www.ebi.ac.uk/QuickGO/term/GO:0097482)
GO:0048786 : presynaptic active zone
(https://www.ebi.ac.uk/QuickGO/term/GO:0048786)
GO:0042734 : presynaptic membrane
(https://www.ebi.ac.uk/QuickGO/term/GO:0042734)
GO:0036062 : presynaptic periactive zone
(https://www.ebi.ac.uk/QuickGO/term/GO:0036062)
GO:0061174 : type I terminal bouton (https://www.ebi.ac.uk/QuickGO/term/GO:0061174)

Presumptive Null

No (https://www.gephebase.org/search-criteria?/and+Presumptive Null=^No^#gephebase-summary-title)

Molecular Type

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

Aberration Type

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

Molecular Details of the Mutation

Gene identified via deficiency mapping. RNAi in D. melanogaster leads to pupae pupating closer to the food.

Experimental Evidence

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

Main Reference

The Loci of Behavioral Evolution: Evidence That Fas2 and tilB Underlie Differences in Pupation Site Choice Behavior between Drosophila melanogaster and D.Â simulans. (2020) (https://pubmed.ncbi.nlm.nih.gov/31774527)

Authors

Pischedda A; Shahandeh MP; Turner TL

Abstract

The behaviors of closely related species can be remarkably different, and these differences have important ecological and evolutionary consequences. Although the recent boom in genotype-phenotype studies has led to a greater understanding of the genetic architecture and evolution of a variety of traits, studies identifying the genetic basis of behaviors are, comparatively, still lacking. This is likely because they are complex and environmentally sensitive phenotypes, making them difficult to measure reliably for association studies. The Drosophila species complex holds promise for addressing these challenges, as the behaviors of closely related species can be readily assayed in a common environment. Here, we investigate the genetic basis of an evolved behavioral difference, pupation site choice, between Drosophila melanogaster and D.Â simulans. In this study, we demonstrate a significant contribution of the X chromosome to the difference in pupation site choice behavior between these species. Using a panel of X-chromosome deficiencies, we screened the majority of the X chromosome for causal loci and identified two regions associated with this X-effect. We then collect gene disruption and RNAi data supporting a single gene that affects pupation behavior within each region: Fas2 and tilB. Finally, we show that differences in tilB expression correlate with the differences in pupation site choice behavior between species. This evidence associating two genes with differences in a complex, environmentally sensitive behavior represents the first step toward a functional and evolutionary understanding of this behavioral divergence.

Additional References

RELATED GEPHE

Related Genes

1 (touch insensitive larva B (tilB)) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^7227^/and+Trait=Pupation site choice/or+Taxon ID=^7240^/and+Trait=Pupation site choice/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS