GEPHE SUMMARY

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

GepheID GP00001403

Entry Status Published

Main curator Prigent

PHENOTYPIC CHANGE

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

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

Trait State in Taxon A Drosophila americana brown puparium

Trait State in Taxon B Drosophila virilis black puparium

Ancestral State Unknown

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

Taxon A

Latin Name Drosophila americana (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Drosophila americana^#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; Drosophila; virilis group

Parent virilis group () - (Rank: species group) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 32335)

NCBI Taxonomy ID 40366 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 40366)

is Taxon A an Infraspecies? No

Taxon B

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

Common Name -

Synonyms Drosophila virilis Sturtevant, 1916; Drosophila irilis

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; Drosophila; virilis group

Parent virilis group () - (Rank: species group) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 32335)

NCBI Taxonomy ID 7244 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7244)

is Taxon B an Infraspecies? No

GENOTYPIC CHANGE

Generic Gene Name AANAT1

Synonyms AANAT; AA-NAT1; aaNat; aaNAT; aaNAT1; Aanat1; AANATA; AANATB; CG3318; DAT; Dat1; Dmel\CG3318; NAT1; Dat

String 7227.FBpp0089101 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier= 7227.FBpp0089101)

Sequence Similarities -

GO - Molecular Function GO:0004059 : aralkylamine N-acetyltransferase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0004059) GO:0004060 : arylamine N-acetyltransferase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0004060) GO:0008080 : N-acetyltransferase activity

UniProtKB Drosophila melanogaster Q94521 (http://www.uniprot.org/uniprot/Q94521)

GenebankID or UniProtKB ()

(https://www.ebi.ac.uk/QuickGO/term/GO:0008080)

GO - Biological Process

GO:0042420 : dopamine catabolic process
(https://www.ebi.ac.uk/QuickGO/term/GO:0042420)
GO:0006584 : catecholamine metabolic process
(https://www.ebi.ac.uk/QuickGO/term/GO:0006584)
GO:0048066 : developmental pigmentation
(https://www.ebi.ac.uk/QuickGO/term/GO:0048066)
GO:0030187 : melatonin biosynthetic process
(https://www.ebi.ac.uk/QuickGO/term/GO:0030187)
GO:0046334 : octopamine catabolic process
(https://www.ebi.ac.uk/QuickGO/term/GO:0046334)
GO:0045187 : regulation of circadian sleep/wake cycle, sleep
(https://www.ebi.ac.uk/QuickGO/term/GO:0045187)
GO:0042429 : serotonin catabolic process
(https://www.ebi.ac.uk/QuickGO/term/GO:0042429)
GO:0030431 : sleep (https://www.ebi.ac.uk/QuickGO/term/GO:0030431)

GO - Cellular Component

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

Presumptive Null

Unknown (https://www.gephebase.org/search-criteria?/and+Presumptive Null=^Unknown^#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

unknown

Experimental Evidence

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

Main Reference

A single gene causes an interspecific difference in pigmentation in Drosophila. (2015) (https://pubmed.ncbi.nlm.nih.gov/25769982)

Authors

Ahmed-Braimah YH; Sweigart AL

Abstract

The genetic basis of species differences remains understudied. Studies in insects have contributed significantly to our understanding of morphological evolution. Pigmentation traits in particular have received a great deal of attention and several genes in the insect pigmentation pathway have been implicated in inter- and intraspecific differences. Nonetheless, much remains unknown about many of the genes in this pathway and their potential role in understudied taxa. Here we genetically analyze the puparium color difference between members of the virilis group of Drosophila. The puparium of Drosophila virilis is black, while those of D. americana, D. novamexicana, and D. lummei are brown. We used a series of backcross hybrid populations between D. americana and D. virilis to map the genomic interval responsible for the difference between this species pair. First, we show that the pupal case color difference is caused by a single Mendelizing factor, which we ultimately map to an âˆ¼11-kb region on chromosome 5. The mapped interval includes only the first exon and regulatory region(s) of the dopamine N-acetyltransferase gene (Dat). This gene encodes an enzyme that is known to play a part in the insect pigmentation pathway. Second, we show that this gene is highly expressed at the onset of pupation in light brown taxa (D. americana and D. novamexicana) relative to D. virilis, but not in the dark brown D. lummei. Finally, we examine the role of Dat in adult pigmentation between D. americana (heavily melanized) and D. novamexicana (lightly melanized) and find no discernible effect of this gene in adults. Our results demonstrate that a single gene is entirely or almost entirely responsible for a morphological difference between species.

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Additional References

RELATED GEPHE

Related Genes

3 (Dopamine N-acetyltransferase (Dat), ebony, tan) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^40366^/and+Trait=Coloration/or+Taxon ID=^7244^/and+Trait=Coloration/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

the candidate region spans 11 Kb and contains numerous changes (substitutions and indels) among which the causal change is not identified