

GEPHE SUMMARY

Dat (https://www.gephebase.org/search-criteria?/and+Gene Gephebase="Dat" #gephebase-summary-title)	Gephebase Gene	GP00001403	GepheID
Published	Entry Status	Prigent	Main curator

PHENOTYPIC CHANGE

Morphology (https://www.gephebase.org/search-criteria?/and+Trait Category="Morphology" #gephebase-summary-title)	Trait Category		
Coloration (puparium) (https://www.gephebase.org/search-criteria?/and+Trait ="Coloration (puparium)" #gephebase-summary-title)	Trait		
Drosophila americana brown puparium	Trait State in Taxon A		
Drosophila virilis black puparium	Trait State in Taxon B		
Unknown	Ancestral State		
Interspecific (https://www.gephebase.org/search-criteria?/and+Taxonomic Status="Interspecific" #gephebase-summary-title)	Taxonomic Status		

Taxon A	Latin Name	Taxon B	Latin Name
Drosophila americana (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms="Drosophila americana" #gephebase-summary-title)	Drosophila americana	Drosophila virilis (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms="Drosophila virilis" #gephebase-summary-title)	Drosophila virilis
-	Common Name	-	Common Name
-	Synonyms	-	Synonyms
species	Rank	Drosophila virilis Sturtevant, 1916; Drosophila irilis	Rank
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; Acalypratae; Ephydroidea; Drosophilidae; Drosophilinae; Drosophilini; Drosophila; Drosophila; virilis group	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; Acalypratae; Ephydroidea; Drosophilidae; Drosophilinae; Drosophilini; Drosophila; Drosophila; virilis group	Lineage
virilis group () - (Rank: species group) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=32335)	Parent	virilis group () - (Rank: species group) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=32335)	Parent
40366 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=40366)	NCBI Taxonomy ID	7244 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7244)	NCBI Taxonomy ID
No	is Taxon A an Intraspecies?	No	is Taxon B an Intraspecies?

GENOTYPIC CHANGE

AANAT1	Generic Gene Name	Q94521 (http://www.uniprot.org/uniprot/Q94521)	UniProtKB Drosophila melanogaster
AANAT; AA-NAT1; aaNat; aaNAT; aaNAT1; Aanat1; AANATA; AANATB; CG3318; DAT; Dat1; Dmel\CG3318; NAT1; Dat	Synonyms	()	GenebankID or UniProtKB
7227.FBpp0089101 (http://string-db.org/newstring.cgi/show_network_section.pl?identifier=7227.FBpp0089101)	String		
-	Sequence Similarities		
GO:0004059 : aralkylamine N-acetyltransferase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0004059)	GO - Molecular Function		
GO:0004060 : arylamine N-acetyltransferase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0004060)			
GO:0008080 : N-acetyltransferase activity			

(<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

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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 ≈ 11 -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

