

GEPHE SUMMARY

Gephebase Gene
spineless (ss)

Entry Status
Published

GepheID
GP00001987

Main curator
Courtier

PHENOTYPIC CHANGE

Trait Category
Physiology

Trait
Color vision (eye; photoreceptor composition)

Trait State in Taxon A
Drosophila melanogaster

Trait State in Taxon B
Drosophila melanogaster -

Ancestral State
Taxon A

Taxonomic Status
Intraspecific

Taxon A

Latin Name
Drosophila melanogaster

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

Parent
melanogaster subgroup () - (Rank: species subgroup)

NCBI Taxonomy ID
7227

is Taxon A an Intraspecies?
No

Taxon B

Latin Name
Drosophila melanogaster

Common Name
fruit fly

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

Rank
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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; Acalyptera; Ephydroidea; Drosophilidae; Drosophilinae; Drosophilini; Drosophila; Sophophora; melanogaster group; melanogaster subgroup

Parent
melanogaster subgroup () - (Rank: species subgroup)

NCBI Taxonomy ID
7227

is Taxon B an Intraspecies?
No

GENOTYPIC CHANGE

Generic Gene Name
ss

Synonyms
SS; AhR; AHR; CG6993; Dmel\CG6993; Ss; ssa; Dmel_LCG6993

String
7227.FBpp0297168

Sequence Similarities
-

GO - Molecular Function
GO:0046982 : protein heterodimerization activity
GO:0003677 : DNA binding

GO - Biological Process
GO:0045944 : positive regulation of transcription by RNA polymerase II
GO:0000122 : negative regulation of transcription by RNA polymerase II
GO:0048814 : regulation of dendrite morphogenesis
GO:0006805 : xenobiotic metabolic process

UniProtKB Drosophila melanogaster
E1JIM6

GenebankID or UniProtKB

GO:0048800 : antennal morphogenesis
GO:0036011 : imaginal disc-derived leg segmentation
GO:0007469 : antennal development
GO:0010092 : specification of animal organ identity
GO:0008049 : male courtship behavior
GO:0007613 : memory
GO:0009410 : response to xenobiotic stimulus
GO:0045466 : R7 cell differentiation
GO:0045676 : regulation of R7 cell differentiation
GO:0007468 : regulation of rhodopsin gene expression

GO - Cellular Component

GO:0005829 : cytosol
GO:0005634 : nucleus

Presumptive Null

No

Molecular Type

Cis-regulatory

Aberration Type

Insertion

Insertion Size

1-9 bp

Molecular Details of the Mutation

Single base insertion in the ss regulatory region upstream of the ss transcription start site. The insertion affects the stochastic on/off expression of the ss protein seen in the R7 photoreceptors: the presence of the insertion results in a significant decrease in the ratio of ss expressing to non-expressing R7 cells.

Experimental Evidence

Candidate Gene

Main Reference

Natural variation in stochastic photoreceptor specification and color preference in *Drosophila*. (2017)

Authors

Anderson C; Reiss I; Zhou C; Cho A; Siddiqi H; Mormann B; Avelis CM; Deford P; Bergland A; Roberts E; Taylor J; Vasiliauskas D; Johnston RJ

Abstract

Each individual perceives the world in a unique way, but little is known about the genetic basis of variation in sensory perception. In the fly eye, the random mosaic of color-detecting R7 photoreceptor subtypes is determined by stochastic on/off expression of the transcription factor Spineless (Ss). In a genome-wide association study, we identified a naturally occurring insertion in a regulatory DNA element in ss that lowers the ratio of Ss to Ss cells. This change in photoreceptor fates shifts the innate color preference of flies from green to blue. The genetic variant increases the binding affinity for Klumpfuss (Klu), a zinc finger transcriptional repressor that regulates ss expression. Klu is expressed at intermediate levels to determine the normal ratio of Ss to Ss cells. Thus, binding site affinity and transcription factor levels are finely tuned to regulate stochastic expression, setting the ratio of alternative fates and ultimately determining color preference.

Additional References

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

No matches found.

COMMENTS

<http://flybase.org/reports/FBal0337841>