GEPHE SUMMARY

Gephebase Gene
GSS (glutathione synthetase)

GephelD
GP00002115

Entry Status
Published

Main curator
Courtier

PHENOTYPIC CHANGE

Trait Category
Physiology

Trait
Xenobiotic resistance (arsenic)

Trait State in Taxon A
Drosophila melanogaster susceptible to arsenic

Trait State in Taxon B
Drosophila melanogaster resistant to arsenic

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

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

NCBI Taxonomy ID
7227

is Taxon A an Infraspecies?
Yes

Taxon A Description
Strain Oregon R; A2; A6 and B3

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
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)

NCBI Taxonomy ID
7227

is Taxon B an Infraspecies?
Yes

Taxon B Description
Strains ISO-1; A1; B2

GENOTYPIC CHANGE

Generic Gene Name
Gss2

Synonyms
32495; CG32495; Dmel\CG32495; GS; gss; 6835; CG32497; CG33065; Dmel\CG6835; GSS; Gss1; CG6835; Dmel_CG32495; Dmel_CG6835

String
7227.FBpp0290197

Sequence Similarities
Belongs to the eukaryotic GSH synthase family.

GO - Molecular Function
GO:0005524 : ATP binding
GO:0042803 : protein homodimerization activity
GO:0000287 : magnesium ion binding
GO:0043295 : glutathione binding

UniProtKB Drosophila melanogaster
Q86B44

GenebankID or UniProtKB

GO:0004363 : glutathione synthase activity

GO - Biological Process
GO:0071722 : detoxification of arsenic-containing substance

GO - Cellular Component
GO:0005829 : cytosol

Presumptive Null
Unknown

Molecular Type
Gene Amplification

Aberration Type
Insertion

Insertion Size
1-10 kb

Molecular Details of the Mutation
tandem duplication creating the Gss1/Gss2 gene pair. Associated with increased expression of Gss1.

Experimental Evidence
Candidate Gene

Main Reference
Structural variants exhibit widespread allelic heterogeneity and shape variation in complex traits. (2019)

Authors
Chakraborty M; Emerson JJ; Macdonald SJ; Long AD

Abstract
It has been hypothesized that individually-rare hidden structural variants (SVs) could account for a significant fraction of variation in complex traits. Here we identified more than 20,000 euchromatic SVs from 14 Drosophila melanogaster genome assemblies, of which ~40% are invisible to high specificity short-read genotyping approaches. SVs are common, with 31.5% of diploid individuals harboring a SV in genes larger than 5kb, and 24% harboring multiple SVs in genes larger than 10kb. SV minor allele frequencies are rarer than amino acid polymorphisms, suggesting that SVs are more deleterious. We show that a number of functionally important genes harbor previously hidden structural variants likely to affect complex phenotypes. Furthermore, SVs are overrepresented in candidate genes associated with quantitative trait loci mapped using the Drosophila Synthetic Population Resource. We conclude that SVs are ubiquitous, frequently constitute a heterogeneous allelic series, and can act as rare alleles of large effect.

Additional References
Investigating arsenic susceptibility from a genetic perspective in Drosophila reveals a key role for glutathione synthetase. (2009)

RELATED GEPHE

Related Genes
17 (Acetylcholinesterase (Ace-2), alcohol dehydrogenase (Adh), Aldehyde dehydrogenase (Aldh), CG11699, Cyp12d1, Cyp28d1, Cyp28d1-Cyp28d2, cyp6d2, cyp6g1, GSTE1-E10 cluster, kin of irre (kire), PHGPx, resistance to dieldrin, RnrS, SOD1, Ugt86Dd, CHKov1)
Related Haplotypes
No matches found.

EXTERNAL LINKS

COMMENTS

There are also insertions of multiple transposable elements at this locus in various lines. This may contribute to differential expression of Gss1 and different responses to arsenic.