GEPHE SUMMARY

Gephebase Gene
CG11699 (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^CG11699^#gephebase-summary-title)

GepheID
GP00001399

Entry Status
Published

Main curator
Prigent

PHENOTYPIC CHANGE

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

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

Trait State in Taxon A
Drosophila melanogaster common wild type

Trait State in Taxon B
Drosophila melanogaster with increased resistance to benzaldehyde and carbofuran insecticide

Ancestral State
Taxon A

Taxonomic Status
Intraspecific (https://www.gephebase.org/search-criteria?/and+Taxonomic Status=^Intraspecific^#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 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 B an Infraspecies?
No

GENOTYPIC CHANGE

Generic Gene Name
Dmel\CG11699

Synonyms
Dmel\CG11699; CG11699; Dmel_CG11699

String
7227.FBpp0073359 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier= 7227.FBpp0073359)

Sequence Similarities
-

GO - Molecular Function
-

GO - Biological Process
-

UniProtKB Drosophila melanogaster
Q9VYX5 (http://www.uniprot.org/uniprot/Q9VYX5)

GenebankID or UniProtKB
32101 (https://www.ncbi.nlm.nih.gov/nuccore/32101)

GO - Cellular Component

GO:0016021 : integral component of membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0016021)

Presumptive Null

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

Molecular Type

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

Aberration Type

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

Insertion Size

100-999 bp

Molecular Details of the Mutation

insertion of a 186bp POGON1 element in the 3'UTR

Experimental Evidence

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

Main Reference

A transposable element insertion confers xenobiotic resistance in Drosophila. (2014) (https://pubmed.ncbi.nlm.nih.gov/25122208)

Authors

Mateo L; Ullastres A; GonzÃ¡lez J

Abstract

The increase in availability of whole genome sequences makes it possible to search for evidence of adaptation at an unprecedented scale. Despite recent progress, our understanding of the adaptive process is still very limited due to the difficulties in linking adaptive mutations to their phenotypic effects. In this study, we integrated different levels of biological information to pinpoint the ecologically relevant fitness effects and the underlying molecular and biochemical mechanisms of a putatively adaptive TE insertion in Drosophila melanogaster: the pogo transposon FBti0019627. We showed that other than being incorporated into Kmn1 transcript, FBti0019627 insertion also affects the polyadenylation signal choice of CG11699 gene. Consequently, only the short 3'UTR transcript of CG11699 gene is produced and the expression level of this gene is higher in flies with the insertion. Our results indicated that increased CG11699 expression leads to xenobiotic stress resistance through increased ALDH-III activity: flies with FBti0019627 insertion showed increased survival rate in response to benzaldehyde, a natural xenobiotic, and to carbofuran, a synthetic insecticide. Although differences in survival rate between flies with and without the insertion were not always significant, when they were, they were consistent with FBti0019627 mediating resistance to xenobiotics. Taken together, our results provide a plausible explanation for the increase in frequency of FBti0019627 in natural populations of D. melanogaster and add to the limited number of examples in which a natural genetic mutation has been linked to its ecologically relevant phenotype. Furthermore, the widespread distribution of TEs across the tree of life and conservation of stress response pathways across organisms make our results relevant not only for Drosophila, but for other organisms as well.

Additional References

RELATED GEPHE

Related Genes

19 (Acetylcholinesterase (Ace-2), alcohol dehydrogenase (Adh), Aldehyde dehydrogenase (Aldh), Cyp12d1, Cyp28d1, Cyp28d1-Cyp28d2, cyp6d2, cyp6g1, glutamate-gated chloride channel (GluCl), GSS (glutathione synthetase), GSTE1-E10 cluster, kin of irre (kire), para (kdr), PHGPx, resistance to dieldrin, RnrS, SOD1, Ugt86Dd, CHKov1) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^7227^/and+Trait=Xenobiotic resistance/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

@TE; the insertion eliminates a large transcript and increases the production of a short transcript. The transmembrane protein interacts and increases ALDH-III activity which metabolizes benzaldehyde and increase resistance to carbofuran. But the resistance is also affected by the genetic background