

GEPHE SUMMARY

Gephebase Gene
hsp70Ba

Entry Status
Published

GepheID
GP00002006

Main curator
Courtier

PHENOTYPIC CHANGE

Trait Category
Physiology

Trait
Temperature tolerance

Trait State in Taxon A
Drosophila melanogaster - wild-type tolerance

Trait State in Taxon B
Drosophila melanogaster - lower tolerance - Arv/Zim allele

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
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 B an Intraspecies?
Yes

Taxon B Description

The Arv/Zim populations were founded from crosses of parents from California and Zimbabwe and were cultured at 188C for 5 years before experimentation.

GENOTYPIC CHANGE

Generic Gene Name
Hsp70Ba

Synonyms
CG51449; dhsp70; dHsp70; Dm-hsp70; Dmel\CG51449; Hsp 70; hsp-70; Hsp-70; hsp70; Hsp70; HSP70; hsp70 87C; hsp70 Ba; Hsp70(87C); hsp70b; hsp70B; Hsp70B; hsp70ba; hsp70Ba

String
7227.FBpp0082107

Sequence Similarities
Belongs to the heat shock protein 70 family.

GO - Molecular Function
GO:0005524 : ATP binding
GO:0031072 : heat shock protein binding

UniProtKB Drosophila melanogaster
Q8IN18

GenebankID or UniProtKB

GO:0051082 : unfolded protein binding
GO:0016887 : ATPase activity
GO:0042623 : ATPase activity, coupled
GO:0051787 : misfolded protein binding
GO:0044183 : protein folding chaperone

GO - Biological Process

GO:0001666 : response to hypoxia
GO:0034605 : cellular response to heat
GO:0009408 : response to heat
GO:0034620 : cellular response to unfolded protein
GO:0051085 : chaperone cofactor-dependent protein refolding
GO:0035080 : heat shock-mediated polytene chromosome puffing
GO:0042026 : protein refolding
GO:0006986 : response to unfolded protein

GO - Cellular Component

GO:0005737 : cytoplasm
GO:0005829 : cytosol

Presumptive Null

No

Molecular Type

Cis-regulatory

Aberration Type

Insertion

Insertion Size

1-10 kb

Molecular Details of the Mutation

A non-autonomous 1383bp P-element is inserted 97bp upstream of the Hsp70Ba transcription start site. The P-element intervenes between the second and third heat shock response elements (HSEs).

Experimental Evidence

Candidate Gene

Main Reference

Modification of heat-shock gene expression in *Drosophila melanogaster* populations via transposable elements. (2003)

Authors

Lerman DN; Michalak P; Helin AB; Bettencourt BR; Feder ME

Abstract

We report multiple cases in which disruption of hsp70 regulatory regions by transposable element (TE) insertions underlies natural variation in expression of the stress-inducible molecular chaperone Hsp70 in *Drosophila melanogaster*. Three *D. melanogaster* populations from different continents are polymorphic for jockey or P element insertions in the promoter of the hsp70Ba gene. All three TE insertions are within the same 87-bp region of hsp70Ba promoter, and we suggest that the distinctive promoter architecture of hsp genes may make them vulnerable to TE insertions. Each of the TE insertions reduces Hsp70 levels, and RNase protection assays demonstrate that such insertions can reduce transcription of the hsp70Ba gene. In addition, the TEs alter two measures of organismal fitness, inducible thermotolerance and female reproductive success. Thus, transposition can create quantitative genetic variation in gene expression within populations, on which natural selection can act.

Additional References

RELATED GEPHE

Related Genes

1 (lncRNA:Hsr omega)

Related Haplotypes

2

COMMENTS

@TE - <http://flybase.org/reports/FBa0147841.html>