

GEPHE SUMMARY

	Gephebase Gene	GephelD
metallothionein (MtnA) (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^metallothionein (MtnA)^#gephebase-summary-title)	GP00002018	Main curator
Published	Entry Status	Courtier

PHENOTYPIC CHANGE

		Trait Category	
Physiology (https://www.gephebase.org/search-criteria?/and+Trait Category=^Physiology^#gephebase-summary-title)		Trait	
Oxidative stress resistance (https://www.gephebase.org/search-criteria?/and+Trait=^Oxidative+stress+resistance^#gephebase-summary-title)		Trait State in Taxon A	
Drosophila melanogaster		Trait State in Taxon B	
Drosophila melanogaster		Ancestral State	
Taxon A		Taxonomic Status	
Intraspecific (https://www.gephebase.org/search-criteria?/and+Taxonomic Status=^Intraspecific^#gephebase-summary-title)			
Taxon A	Latin Name	Taxon B	Latin Name
Drosophila melanogaster (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Drosophila+melanogaster^#gephebase-summary-title)		Drosophila melanogaster (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Drosophila+melanogaster^#gephebase-summary-title)	
fruit fly	Common Name	fruit fly	Common Name
Sophophora melanogaster; fruit fly; Drosophila melanogaster Meigen, 1830; Sophophora melanogaster (Meigen, 1830); Drosophila melanogaster	Synonyms	Sophophora melanogaster; fruit fly; Drosophila melanogaster Meigen, 1830; Sophophora melanogaster (Meigen, 1830); Drosophila melanogaster	Synonyms
species	Rank	species	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; Acalyptratae; Ephdroidea; Drosophilidae; Drosophilinae; Drosophilini; Drosophila; Sophophora; melanogaster group; melanogaster subgroup	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; Ephdroidea; Drosophilidae; Drosophilinae; Drosophilini; Drosophila; Sophophora; melanogaster group; melanogaster subgroup	Lineage
melanogaster subgroup () - (Rank: species subgroup) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=32351)	Parent	melanogaster subgroup () - (Rank: species subgroup) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=32351)	Parent
7227 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7227)	NCBI Taxonomy ID	7227 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7227)	NCBI Taxonomy ID
No	is Taxon A an Infraspecies?	No	is Taxon B an Infraspecies?

GENOTYPIC CHANGE

MtnA	Generic Gene Name	UniProtKB Drosophila melanogaster
	Synonyms	GenebankID or UniProtKB
anon-WO0153538.42; anon-WO0153538.44; anon-WO0153538.49; BcDNA:GH18460; CG9470; Dmel\CG9470; DrosMtn; Mtn; MTN; mtnA		
7227.FBpp0081636 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier=7227.FBpp0081636)	String	
Belongs to the metallothionein superfamily. Type 5 family.	Sequence Similarities	
	GO - Molecular Function	
GO:0046872 : metal ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0046872)		
	GO - Biological Process	
GO:0010038 : response to metal ion (https://www.ebi.ac.uk/QuickGO/term/GO:0010038)		

GO:0055065 : metal ion homeostasis

(<https://www.ebi.ac.uk/QuickGO/term/GO:0055065>)

GO - Cellular Component

-	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
Deletion (https://www.gephebase.org/search-criteria/?and+Aberration+Type=%Deletion%#gephebase-summary-title)	Deletion Size
10-99 bp	Molecular Details of the Mutation
49bp deletion in the MtnA 3'UTR	Experimental Evidence
Association Mapping (https://www.gephebase.org/search-criteria/?and+Experimental+Evidence=%Association+Mapping%#gephebase-summary-title)	Main Reference
An Indel Polymorphism in the MtnA 3' Untranslated Region Is Associated with Gene Expression Variation and Local Adaptation in <i>Drosophila melanogaster</i> . (2016) (https://pubmed.ncbi.nlm.nih.gov/27120580)	Authors
CatalÁin A; Glaser-Schmitt A; Argyridou E; Duchen P; Parsch J	Abstract
Insertions and deletions (indels) are a major source of genetic variation within species and may result in functional changes to coding or regulatory sequences. In this study we report that an indel polymorphism in the 3' untranslated region (UTR) of the metallothionein gene MtnA is associated with gene expression variation in natural populations of <i>Drosophila melanogaster</i> . A derived allele of MtnA with a 49-bp deletion in the 3' UTR segregates at high frequency in populations outside of sub-Saharan Africa. The frequency of the deletion increases with latitude across multiple continents and approaches 100% in northern Europe. Flies with the deletion have more than 4-fold higher MtnA expression than flies with the ancestral sequence. Using reporter gene constructs in transgenic flies, we show that the 3' UTR deletion significantly contributes to the observed expression difference. Population genetic analyses uncovered signatures of a selective sweep in the MtnA region within populations from northern Europe. We also find that the 3' UTR deletion is associated with increased oxidative stress tolerance. These results suggest that the 3' UTR deletion has been a target of selection for its ability to confer increased levels of MtnA expression in northern European populations, likely due to a local adaptive advantage of increased oxidative stress tolerance.	Additional References

RELATED GEPHE

1 (Jheh1-Jheh2-Jheh3 complex) (https://www.gephebase.org/search-criteria/?or+Taxon+ID=%7227%and+Trait=Oxidative+stress+resistanceand+groupHaplotypes=true#gephebase-summary-title)	Related Genes
No matches found.	Related Haplotypes

EXTERNAL LINKS

COMMENTS

signatures of a @SelectiveSweep in the MtnA region within populations from northern Europe. The 3' UTR deletion is associated with increased oxidative stress tolerance. These results suggest that the 3' UTR deletion has been a target of selection for its ability to confer increased levels of MtnA expression in northern European populations; likely due to a local adaptive advantage of increased oxidative stress tolerance. - <http://flybase.org/reports/FBal0338143>