

GEPHE SUMMARY

Zygotic hybrid rescue (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^Zygotic hybrid rescue^#gephebase-summary-title)	Gephebase Gene GP00001228	GephelD Main curator
Published	Entry Status Martin	

PHENOTYPIC CHANGE

	Trait Category
Physiology (https://www.gephebase.org/search-criteria?/and+Trait Category=^Physiology^#gephebase-summary-title)	
F1 lethality (female-limited) (https://www.gephebase.org/search-criteria?/and+Trait=F1 lethality (female-limited)^#gephebase-summary-title)	Trait
Drosophila melanogaster	Trait State in Taxon A
Drosophila simulans	Trait State in Taxon B
Data not curated	Ancestral State
Interspecific (https://www.gephebase.org/search-criteria?/and+Taxonomic Status=^Interspecific^#gephebase-summary-title)	Taxonomic Status

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 simulans (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=Drosophila+simulans #gephebase-summary-title)	
fruit fly	Common Name	-	Common Name
Sophophora melanogaster; fruit fly; Drosophila melanogaster Meigen, 1830; Sophophora melanogaster (Meigen, 1830); Drosophila melangaster	Synonyms	-	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; Ephydroidea; 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; Ephydroidea; 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	7240 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7240)	NCBI Taxonomy ID
No	is Taxon A an Infraspecies?	No	is Taxon B an Infraspecies?

GENOTYPIC CHANGE

	Generic Gene Name	UniProtKB
-	0	
-	Synonyms	GenebankID or UniProtKB
-	0	
-	String	
-	Sequence Similarities	
-	GO - Molecular Function	
-	GO - Biological Process	
-	GO - Cellular Component	
-		Presumptive Null

Unknown ([https://www.gephebase.org/search-criteria?/and+Presumptive Null=%5EUnknown%5E#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Presumptive+Null=%5EUnknown%5E#gephebase-summary-title))

Molecular Type

Unknown ([https://www.gephebase.org/search-criteria?/and+Molecular Type=%5EUnknown%5E#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Molecular+Type=%5EUnknown%5E#gephebase-summary-title))

Aberration Type

Unknown ([https://www.gephebase.org/search-criteria?/and+Aberration Type=%5EUnknown%5E#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Aberration+Type=%5EUnknown%5E#gephebase-summary-title))

Molecular Details of the Mutation

Heterochromatin incompatibility

Experimental Evidence

Linkage Mapping ([https://www.gephebase.org/search-criteria?/and+Experimental Evidence=%5ELinkage Mapping%5E#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Experimental+Evidence=%5ELinkage+Mapping%5E#gephebase-summary-title))

Main Reference

Species-specific heterochromatin prevents mitotic chromosome segregation to cause hybrid lethality in Drosophila. (2009) (<https://pubmed.ncbi.nlm.nih.gov/19859525>)

Authors

Ferree PM; Barbash DA

Abstract

Postzygotic reproductive barriers such as sterility and lethality of hybrids are important for establishing and maintaining reproductive isolation between species. Identifying the causal loci and discerning how they interfere with the development of hybrids is essential for understanding how hybrid incompatibilities (HIs) evolve, but little is known about the mechanisms of how HI genes cause hybrid dysfunctions. A previously discovered *Drosophila melanogaster* locus called Zhr causes lethality in F1 daughters from crosses between *Drosophila simulans* females and *D. melanogaster* males. Zhr maps to a heterochromatic region of the *D. melanogaster* X that contains 359-bp satellite repeats, suggesting either that Zhr is a rare protein-coding gene embedded within heterochromatin, or is a locus consisting of the noncoding repetitive DNA that forms heterochromatin. The latter possibility raises the question of how heterochromatic DNA can induce lethality in hybrids. Here we show that hybrid females die because of widespread mitotic defects induced by lagging chromatin at the time during early embryogenesis when heterochromatin is first established. The lagging chromatin is confined solely to the paternally inherited *D. melanogaster* X chromatids, and consists predominantly of DNA from the 359-bp satellite block. We further found that a rearranged X chromosome carrying a deletion of the entire 359-bp satellite block segregated normally, while a translocation of the 359-bp satellite block to the Y chromosome resulted in defective Y segregation in males, strongly suggesting that the 359-bp satellite block specifically and directly inhibits chromatid separation. In hybrids produced from wild-type parents, the 359-bp satellite block was highly stretched and abnormally enriched with Topoisomerase II throughout mitosis. The 359-bp satellite block is not present in *D. simulans*, suggesting that lethality is caused by the absence or divergence of factors in the *D. simulans* maternal cytoplasm that are required for heterochromatin formation of this species-specific satellite block. These findings demonstrate how divergence of noncoding repetitive sequences between species can directly cause reproductive isolation by altering chromosome segregation.

Additional References

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

Zhr maps to a heterochromatic region of the *D. melanogaster* X that contains 359-bp satellite repeats; suggesting either that Zhr is a rare protein-coding gene embedded within heterochromatin; or is a locus consisting of the noncoding repetitive DNA that forms heterochromatin. - <http://flybase.org/reports/FBal0181032>