

GEPHE SUMMARY

	Gephebase Gene		GepheID
cytochrome c oxidase (COX7A) ( <a href="https://www.gephebase.org/search-criteria?/and+Gene">https://www.gephebase.org/search-criteria?/and+Gene</a> )		GP00001980	
Gephebase= <sup>^</sup> cytochrome c oxidase (COX7A) <sup>^</sup> #gephebase-summary-title)			Main curator
	Entry Status	Courtier	
Published			

PHENOTYPIC CHANGE

Trait #1	Trait Category
Physiology ( <a href="https://www.gephebase.org/search-criteria?/and+Trait">https://www.gephebase.org/search-criteria?/and+Trait</a> )	
Category= <sup>^</sup> Physiology <sup>^</sup> #gephebase-summary-title)	Trait
Fertility ( <a href="https://www.gephebase.org/search-criteria?/and+Trait=&lt;sup&gt;^&lt;/sup&gt;Fertility&lt;sup&gt;^&lt;/sup&gt;#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Trait=<sup>^</sup>Fertility<sup>^</sup>#gephebase-summary-title</a> )	
	Trait State in Taxon A
other Drosophila simulans	
	Trait State in Taxon B
Drosophila simulans homozygous for the deletion - reduction in cox activity - compensated by an increase in mtDNA copy number and ADP:O ratio that is correlated with higher early fertility - reduced physical activity in homozygotes on day 18 and reduced mean survival	

Trait #2	Trait Category
Physiology ( <a href="https://www.gephebase.org/search-criteria?/and+Trait">https://www.gephebase.org/search-criteria?/and+Trait</a> )	
Category= <sup>^</sup> Physiology <sup>^</sup> #gephebase-summary-title)	Trait
Lifespan ( <a href="https://www.gephebase.org/search-criteria?/and+Trait=&lt;sup&gt;^&lt;/sup&gt;Lifespan&lt;sup&gt;^&lt;/sup&gt;#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Trait=<sup>^</sup>Lifespan<sup>^</sup>#gephebase-summary-title</a> )	
	Trait State in Taxon A
Drosophila simulans	
	Trait State in Taxon B
Drosophila simulans - reduction in cox activity - compensated by an increase in mtDNA copy number and ADP:O ratio that is correlated with higher early fertility - reduced physical activity in homozygotes on day 18 and reduced mean survival	

Trait #3	Trait Category
Physiology ( <a href="https://www.gephebase.org/search-criteria?/and+Trait">https://www.gephebase.org/search-criteria?/and+Trait</a> )	
Category= <sup>^</sup> Physiology <sup>^</sup> #gephebase-summary-title)	Trait
Locomotor activity ( <a href="https://www.gephebase.org/search-criteria?/and+Trait=&lt;sup&gt;^&lt;/sup&gt;Locomotor activity&lt;sup&gt;^&lt;/sup&gt;#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Trait=<sup>^</sup>Locomotor activity<sup>^</sup>#gephebase-summary-title</a> )	
	Trait State in Taxon A
Drosophila simulans	
	Trait State in Taxon B
Drosophila simulans - reduction in cox activity - compensated by an increase in mtDNA copy number and ADP:O ratio that is correlated with higher early fertility - reduced physical activity in homozygotes on day 18 and reduced mean survival	

	Ancestral State		
Taxon A		Taxonomic Status	
Intraspecific ( <a href="https://www.gephebase.org/search-criteria?/and+Taxonomic">https://www.gephebase.org/search-criteria?/and+Taxonomic</a> )			
Status= <sup>^</sup> Intraspecific <sup>^</sup> #gephebase-summary-title)			
	Taxon A	Taxon B	
	Latin Name		Latin Name
Drosophila simulans		Drosophila simulans	
( <a href="https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=&lt;sup&gt;^&lt;/sup&gt;Drosophila simulans&lt;sup&gt;^&lt;/sup&gt;#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=<sup>^</sup>Drosophila simulans<sup>^</sup>#gephebase-summary-title</a> )		( <a href="https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=&lt;sup&gt;^&lt;/sup&gt;Drosophila simulans&lt;sup&gt;^&lt;/sup&gt;#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=<sup>^</sup>Drosophila simulans<sup>^</sup>#gephebase-summary-title</a> )	
	Common Name		Common Name
-		-	
	Synonyms		Synonyms
-		-	

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  
7240  
(<https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7240>)  
is Taxon A an Infrappecies?  
No

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  
7240  
(<https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7240>)  
is Taxon B an Infrappecies?  
No

## GENOTYPIC CHANGE

Generic Gene Name  
COX7A

UniProtKB Drosophila melanogaster  
Q9VHS2 (<http://www.uniprot.org/uniprot/Q9VHS2>)

Synonyms  
CG9603; Cox7a; COXJ; COXK; Dmel\CG9603; VIIa

GenebankID or UniProtKB  
()

String  
7227.FBpp0296960  
([http://string-db.org/newstring.cgi/show\\_network\\_section.pl?identifier=7227.FBpp0296960](http://string-db.org/newstring.cgi/show_network_section.pl?identifier=7227.FBpp0296960))

Sequence Similarities  
Belongs to the cytochrome c oxidase VIIa family.

GO - Molecular Function  
GO:0004129 : cytochrome-c oxidase activity  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0004129>)

GO - Biological Process  
GO:0006123 : mitochondrial electron transport, cytochrome c to oxygen  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0006123>)  
GO:0097250 : mitochondrial respirasome assembly  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0097250>)  
GO:0002082 : regulation of oxidative phosphorylation  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0002082>)

GO - Cellular Component  
GO:0005739 : mitochondrion (<https://www.ebi.ac.uk/QuickGO/term/GO:0005739>)  
GO:0005751 : mitochondrial respiratory chain complex IV  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0005751>)

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

Molecular Type  
Coding ([https://www.gephebase.org/search-criteria?/and+Molecular Type="Coding"#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Molecular Type=))

Aberration Type  
Deletion ([https://www.gephebase.org/search-criteria?/and+Aberration Type="Deletion"#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Aberration Type=))

Deletion Size  
1-9 bp

Molecular Details of the Mutation  
Deletion of two amino acids (Trp85 and Val86). The deletion occurs in subunit 7A of the mitochondrial electron trans- port chain protein cytochrome c oxidase (cox7A). The nuclear encoded cox7A gene produces a protein that is imported into the mitochondrion and forms a subunit of complex IV (cytochrome c oxidase) of the electron transport chain.

Experimental Evidence  
Candidate Gene ([https://www.gephebase.org/search-criteria?/and+Experimental Evidence="Candidate Gene"#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Experimental Evidence=))

Main Reference  
A candidate complex approach to study functional mitochondrial DNA changes: sequence variation and quaternary structure modeling of Drosophila simulans cytochrome c oxidase. (2008)  
(<https://pubmed.ncbi.nlm.nih.gov/18320260>)

Authors  
Melvin RG; Katewa SD; Ballard JW

Abstract  
A problem with studying evolutionary dynamics of mitochondrial (mt) DNA is that classical population genetic techniques cannot identify selected substitutions because of genetic hitchhiking. We circumvented this problem by employing a candidate complex approach to study sequence variation in cytochrome c oxidase (COX) genes within and among three distinct Drosophila simulans mtDNA haplogroups. First, we determined sequence variation in complete coding regions for all COX mtDNA and nuclear loci and their isoforms. Second, we constructed a quaternary structure model of D. simulans COX. Third, we predicted that six of nine amino acid changes in D. simulans mtDNA are likely to be functionally important. Of these seven, genetic crosses can experimentally determine the functional significance of three. Fourth, we identified two single amino acid changes and a deletion of two consecutive amino acids in nuclear encoded COX loci that are likely to influence cytochrome c oxidase activity. These data show that linking population genetics and quaternary structure modeling can lead to functional predictions of specific mtDNA amino acid mutations and validate the candidate complex approach.

Additional References  
Early life benefits and later life costs of a two amino acid deletion in Drosophila simulans. (2011) (<https://pubmed.ncbi.nlm.nih.gov/21143473>)

## RELATED GEPHE

Related Genes

1 (lnR) (<https://www.gephebase.org/search-criteria?/or+Taxon+ID=^7240^/and+Trait=Fertility/or+Taxon+ID=^7240^/and+Trait=Lifespan/or+Taxon+ID=^7240^/and+Trait=Locomotor+activity/and+groupHaplotypes=true#gephebase-summary-title>)

Related Haplotypes

No matches found.

## EXTERNAL LINKS

## COMMENTS

<http://flybase.org/reports/FBal027773>