

GEPHE SUMMARY

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

PHENOTYPIC CHANGE

Trait #1	Trait Category	
Physiology (https://www.gephebase.org/search-criteria?/and+Trait Category=^Physiology^#gephebase-summary-title)	Trait	
Fertility (https://www.gephebase.org/search-criteria?/and+Trait=^Fertility^#gephebase-summary-title)	Trait State in Taxon A	
other <i>Drosophila simulans</i>	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 (https://www.gephebase.org/search-criteria?/and+Trait Category=^Physiology^#gephebase-summary-title)	Trait	
Lifespan (https://www.gephebase.org/search-criteria?/and+Trait=^Lifespan^#gephebase-summary-title)	Trait State in Taxon A	
<i>Drosophila simulans</i>	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 (https://www.gephebase.org/search-criteria?/and+Trait Category=^Physiology^#gephebase-summary-title)	Trait	
Locomotor activity (https://www.gephebase.org/search-criteria?/and+Trait=^Locomotor+activity^#gephebase-summary-title)	Trait State in Taxon A	
<i>Drosophila simulans</i>	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		

Taxon A	Ancestral State	
	Taxonomic Status	
Intraspecific (https://www.gephebase.org/search-criteria?/and+Taxonomic Status=^Intraspecific^#gephebase-summary-title)		

Taxon A	Latin Name	Taxon B	Latin Name
Common Name	Synonyms	Common Name	Synonyms
<i>Drosophila simulans</i> (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Drosophila+simulans^#gephebase-summary-title)		<i>Drosophila simulans</i> (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Drosophila+simulans^#gephebase-summary-title)	
-	-	-	-

species	Rank	species	Rank
	Lineage		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	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
	Parent		Parent
melanogaster subgroup () - (Rank: species subgroup) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=32351)		melanogaster subgroup () - (Rank: species subgroup) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=32351)	
7240 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7240)	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

COX7A	Generic Gene Name	UniProtKB Drosophila melanogaster
CG9603; Cox7a; COXJ; COXK; Dmel\CG9603; VIIa	Synonyms	GenebankID or UniProtKB
7227.FBpp0296960 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier=7227.FBpp0296960)	String	0
Belongs to the cytochrome c oxidase VIIa family.	Sequence Similarities	
GO:0004129 : cytochrome-c oxidase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0004129)	GO - Molecular Function	
GO:0006123 : mitochondrial electron transport, cytochrome c to oxygen (https://www.ebi.ac.uk/QuickGO/term/GO:0006123)	GO - Biological Process	
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:0005739 : mitochondrion (https://www.ebi.ac.uk/QuickGO/term/GO:0005739)	GO - Cellular Component	Presumptive Null
GO:0005751 : mitochondrial respiratory chain complex IV (https://www.ebi.ac.uk/QuickGO/term/GO:0005751)		Molecular Type
No (https://www.gephbase.org/search-criteria/?and+Presumptive Null=%No%#gephbase-summary-title)		
Coding (https://www.gephbase.org/search-criteria/?and+Molecular Type=%Coding%#gephbase-summary-title)		Aberration Type
Deletion (https://www.gephbase.org/search-criteria/?and+Aberration Type=%Deletion%#gephbase-summary-title)		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 complexIV (cytochrome c oxidase) of the electron transport chain.		Experimental Evidence
Candidate Gene (https://www.gephbase.org/search-criteria/?and+Experimental Evidence=%Candidate Gene%#gephbase-summary-title)		Main Reference
A candidate complex approach to study functional mitochondrial DNA changes: sequence variation and quaternary structure modeling of <i>Drosophila simulans</i> 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 <i>Drosophila simulans</i> 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 <i>D. simulans</i> COX. Third, we predicted that six of nine amino acid changes in <i>D. simulans</i> 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 <i>Drosophila simulans</i> . (2011) (https://pubmed.ncbi.nlm.nih.gov/21143473)		

RELATED GEPHE

1 (InR) ([https://www.gephebase.org/search-criteria?/or+Taxon ID=%7240%20/and+Trait=Fertility/or+Taxon ID=%7240%20/and+Trait=Lifespan/or+Taxon ID=%7240%20/and+Trait=Locomotoractivity/and+groupHaplotypes=true#gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Taxon%20ID=%7240%20/and+Trait=Fertility/or+Taxon%20ID=%7240%20/and+Trait=Lifespan/or+Taxon%20ID=%7240%20/and+Trait=Locomotoractivity/and+groupHaplotypes=true#gephebase-summary-title))

Related Genes

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

<http://flybase.org/reports/FBal0277773>