

## GEPHE SUMMARY

Cyp28d1 ( <a href="https://www.gephebase.org/search-criteria?/and+Gene+Gephebase=Cyp28d1#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Gene+Gephebase=Cyp28d1#gephebase-summary-title</a> )	Gephebase Gene	GP00001407	GepheID
Published	Entry Status	Prigent	Main curator

## PHENOTYPIC CHANGE

Physiology ( <a href="https://www.gephebase.org/search-criteria?/and+Trait+Category=Physiology#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Trait+Category=Physiology#gephebase-summary-title</a> )	Trait Category		
Xenobiotic resistance (nicotine ; larval stage) ( <a href="https://www.gephebase.org/search-criteria?/and+Trait=Xenobiotic+resistance+(nicotine+;+larval+stage)#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Trait=Xenobiotic+resistance+(nicotine+;+larval+stage)#gephebase-summary-title</a> )	Trait		
Drosophila melanogaster susceptible to nicotine	Trait State in Taxon A		
Drosophila melanogaster resistant to nicotine	Trait State in Taxon B		
Taxon A	Ancestral State		
Intraspecific ( <a href="https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=Intraspecific#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=Intraspecific#gephebase-summary-title</a> )	Taxonomic Status		
	Taxon A	Taxon B	
Drosophila melanogaster ( <a href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=Drosophila+melanogaster#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=Drosophila+melanogaster#gephebase-summary-title</a> )	Latin Name	Drosophila melanogaster ( <a href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=Drosophila+melanogaster#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=Drosophila+melanogaster#gephebase-summary-title</a> )	Latin Name
fruit fly	Common Name	fruit fly	Common Name
Sophophora melanogaster; fruit fly; Drosophila melanogaster Meigen, 1830; Sophophora melanogaster (Meigen, 1830); Drosophila melangaster	Synonyms	Sophophora melanogaster; fruit fly; Drosophila melanogaster Meigen, 1830; Sophophora melanogaster (Meigen, 1830); Drosophila melangaster	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; Acalypratae; 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; Acalypratae; Ephydroidea; Drosophilidae; Drosophilinae; Drosophilini; Drosophila; Sophophora; melanogaster group; melanogaster subgroup	Lineage
melanogaster subgroup () - (Rank: species subgroup) ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=32351">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=32351</a> )	Parent	melanogaster subgroup () - (Rank: species subgroup) ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=32351">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=32351</a> )	Parent
7227 ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7227">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7227</a> )	NCBI Taxonomy ID	7227 ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7227">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7227</a> )	NCBI Taxonomy ID
Yes	is Taxon A an Intraspecies?	Yes	is Taxon B an Intraspecies?
Strain ISO-1	Taxon A Description	Strain A4	Taxon B Description

## GENOTYPIC CHANGE

Cyp28d1	Generic Gene Name	Q9VMT5 ( <a href="http://www.uniprot.org/uniprot/Q9VMT5">http://www.uniprot.org/uniprot/Q9VMT5</a> )	UniProtKB Drosophila melanogaster
28d1; CG10833; Dmel\CG10833	Synonyms	33749 ( <a href="https://www.ncbi.nlm.nih.gov/nucleotide/33749">https://www.ncbi.nlm.nih.gov/nucleotide/33749</a> )	GenebankID or UniProtKB
7227.FBpp0078698 ( <a href="http://string-db.org/newstring.cgi/show_network_section.pl?identifier=7227.FBpp0078698">http://string-db.org/newstring.cgi/show_network_section.pl?identifier=7227.FBpp0078698</a> )	String		
Belongs to the cytochrome P450 family.	Sequence Similarities		
GO:0020037 : heme binding ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0020037">https://www.ebi.ac.uk/QuickGO/term/GO:0020037</a> )	GO - Molecular Function		

GO:0005506 : iron ion binding (<https://www.ebi.ac.uk/QuickGO/term/GO:0005506>)  
GO:0004497 : monooxygenase activity  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0004497>)  
GO:0016705 : oxidoreductase activity, acting on paired donors, with incorporation or  
reduction of molecular oxygen (<https://www.ebi.ac.uk/QuickGO/term/GO:0016705>)  
GO - Biological Process

GO - Cellular Component

GO:0005789 : endoplasmic reticulum membrane  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0005789>)  
GO:0031090 : organelle membrane (<https://www.ebi.ac.uk/QuickGO/term/GO:0031090>)

Unknown (<https://www.gephebase.org/search-criteria?/and+Presumptive Null=^Unknown^#gephebase-summary-title>) Presumptive Null  
Gene Amplification (<https://www.gephebase.org/search-criteria?/and+Molecular Type=^Gene Amplification^#gephebase-summary-title>) Molecular Type  
Insertion (<https://www.gephebase.org/search-criteria?/and+Aberration Type=^Insertion^#gephebase-summary-title>) Aberration Type  
1-10 kb Insertion Size  
insertion of a partial 1.5kb Accord transposable element and a Cyp28d1 gene tandem duplication (CNV - 3754 bp) that may play complementary role in resistance levels Molecular Details of the Mutation  
Linkage Mapping (<https://www.gephebase.org/search-criteria?/and+Experimental Evidence=^Linkage Mapping^#gephebase-summary-title>) Experimental Evidence  
Hidden genetic variation shapes the structure of functional elements in *Drosophila*. (2018) (<https://pubmed.ncbi.nlm.nih.gov/29255259>) Main Reference  
Chakraborty M; VanKuren NW; Zhao R; Zhang X; Kalsow S; Emerson JJ Authors  
Mutations that add, subtract, rearrange, or otherwise refashion genome structure often affect phenotypes, although the fragmented nature of most contemporary assemblies obscures them. To discover such mutations, we assembled the first new reference-quality genome of *Drosophila melanogaster* since its initial sequencing. By comparing this new genome to the existing *D. melanogaster* assembly, we created a structural variant map of unprecedented resolution and identified extensive genetic variation that has remained hidden until now. Many of these variants constitute candidates underlying phenotypic variation, including tandem duplications and a transposable element insertion that amplifies the expression of detoxification-related genes associated with nicotine resistance. The abundance of important genetic variation that still evades discovery highlights how crucial high-quality reference genomes are to deciphering phenotypes. Abstract  
Fine-mapping nicotine resistance loci in *Drosophila* using a multiparent advanced generation inter-cross population. (2014) (<https://pubmed.ncbi.nlm.nih.gov/25236448>) Additional References  
Structural variants exhibit widespread allelic heterogeneity and shape variation in complex traits. (2019) (<https://pubmed.ncbi.nlm.nih.gov/31653862>)

## RELATED GEPHE

19 (Acetylcholinesterase (Ace-2), alcohol dehydrogenase (Adh), Aldehyde dehydrogenase (Aldh), CG11699, Cyp12d1, Cyp28d1-Cyp28d2, cyp6d2, cyp6g1, glutamate-gated chloride channel (GluCl), GSS (glutathione synthetase), GSTE1-E10 cluster, kin of irre (kire), para (kdr), PHGPx, resistance to dieldrin, RnrS, SOD1, Ugt86Dd, CHKov1) (<https://www.gephebase.org/search-criteria?/or+Taxon ID=^7227^/and+Trait=Xenobiotic resistance/and+groupHaplotypes=true#gephebase-summary-title>) Related Genes  
1 (<https://www.gephebase.org/search-criteria?/or+Gene Gephebase=^Cyp28d1^/and+Taxon ID=^7227^/or+Gene Gephebase=^Cyp28d1^/and+Taxon ID=^7227^#gephebase-summary-title>) Related Haplotypes

## EXTERNAL LINKS

## COMMENTS

The QTL harbors a pair of cytochrome P450 genes. According to gene expression Cyp28d1 is the best candidate but Cyp28d2 is also possible. @TE described with nicotine-dependent effect on gene expression in the follow-up article by Chakraborty et al.: Intergenic element between a gene copy is the 5â€™ end of Accord, a long terminal repeat (LTR) retrotransposon.; Insertion of Accord upstream of another gene called Cyp6g1 has been linked to upregulation of the encoded cytochrome P450 enzyme suggesting that the retrotransposon may be responsible for the upregulated expression of the Cyp28d gene