

GEPHE SUMMARY

|                                                                                                                                         |                |            |              |
|-----------------------------------------------------------------------------------------------------------------------------------------|----------------|------------|--------------|
|                                                                                                                                         | Gephebase Gene |            | GepheID      |
| Cyp28d1-Cyp28d2 ( <a href="https://www.gephebase.org/search-criteria?/and+GeneGephebase=Cyp28d1-Cyp28d2">#gепhebase-summary-title</a> ) |                | GP00002114 |              |
|                                                                                                                                         | Entry Status   | Courtier   | Main curator |
| Published                                                                                                                               |                |            |              |

PHENOTYPIC CHANGE

|                                                                                                                                                                                                                                                                                                                                                                                                                                              |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                              |                             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                              | Trait Category              |                                                                                                                                                                                                                                                                                                                                                                                                                                              |                             |
| Physiology ( <a href="https://www.gephebase.org/search-criteria?/and+TraitCategory=Physiology">#gепhebase-summary-title</a> )                                                                                                                                                                                                                                                                                                                |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                              |                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                              | Trait                       |                                                                                                                                                                                                                                                                                                                                                                                                                                              |                             |
| Xenobiotic resistance (nicotine ; larval stage) ( <a href="https://www.gephebase.org/search-criteria?/and+Trait=Xenobiotic+resistance+(nicotine+;+larval+stage)#gепhebase-summary-title">https://www.gephebase.org/search-criteria?/and+Trait=Xenobiotic resistance (nicotine ; larval stage)#gепhebase-summary-title</a> )                                                                                                                  |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                              |                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                              | Trait State in Taxon A      |                                                                                                                                                                                                                                                                                                                                                                                                                                              |                             |
| Drosophila melanogaster susceptible to nicotine                                                                                                                                                                                                                                                                                                                                                                                              |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                              |                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                              | Trait State in Taxon B      |                                                                                                                                                                                                                                                                                                                                                                                                                                              |                             |
| Drosophila melanogaster resistant to nicotine                                                                                                                                                                                                                                                                                                                                                                                                |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                              |                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                              | Ancestral State             |                                                                                                                                                                                                                                                                                                                                                                                                                                              |                             |
| Taxon A                                                                                                                                                                                                                                                                                                                                                                                                                                      |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                              |                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                              | Taxonomic Status            |                                                                                                                                                                                                                                                                                                                                                                                                                                              |                             |
| Intraspecific ( <a href="https://www.gephebase.org/search-criteria?/and+TaxonomicStatus=Intraspecific">#gепhebase-summary-title</a> )                                                                                                                                                                                                                                                                                                        |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                              |                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                              | Taxon A                     | Taxon B                                                                                                                                                                                                                                                                                                                                                                                                                                      |                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                              | Latin Name                  |                                                                                                                                                                                                                                                                                                                                                                                                                                              | Latin Name                  |
| Drosophila melanogaster ( <a href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=Drosophila+melanogaster">#gепhebase-summary-title</a> )                                                                                                                                                                                                                                                                                 |                             | Drosophila melanogaster ( <a href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=Drosophila+melanogaster">#gепhebase-summary-title</a> )                                                                                                                                                                                                                                                                                 |                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                              | Common Name                 |                                                                                                                                                                                                                                                                                                                                                                                                                                              | Common Name                 |
| fruit fly                                                                                                                                                                                                                                                                                                                                                                                                                                    |                             | fruit fly                                                                                                                                                                                                                                                                                                                                                                                                                                    |                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                              | Synonyms                    |                                                                                                                                                                                                                                                                                                                                                                                                                                              | Synonyms                    |
| Sophophora melanogaster; fruit fly; Drosophila melanogaster Meigen, 1830; Sophophora melanogaster (Meigen, 1830); Drosophila melangaster                                                                                                                                                                                                                                                                                                     |                             | Sophophora melanogaster; fruit fly; Drosophila melanogaster Meigen, 1830; Sophophora melanogaster (Meigen, 1830); Drosophila melangaster                                                                                                                                                                                                                                                                                                     |                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                              | Rank                        |                                                                                                                                                                                                                                                                                                                                                                                                                                              | Rank                        |
| species                                                                                                                                                                                                                                                                                                                                                                                                                                      |                             | species                                                                                                                                                                                                                                                                                                                                                                                                                                      |                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                              | 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; Acalypratae; Ephydroidea; Drosophilidae; Drosophilinae; Drosophilini; Drosophila; Sophophora; melanogaster group; melanogaster subgroup |                             | 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 |                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                              | Parent                      |                                                                                                                                                                                                                                                                                                                                                                                                                                              | 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> )                                                                                                                                                                                                                                   |                             | 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> )                                                                                                                                                                                                                                   |                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                              | NCBI Taxonomy ID            |                                                                                                                                                                                                                                                                                                                                                                                                                                              | 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> )                                                                                                                                                                                                                                                                                    |                             | 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> )                                                                                                                                                                                                                                                                                    |                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                              | is Taxon A an Intraspecies? |                                                                                                                                                                                                                                                                                                                                                                                                                                              | is Taxon B an Intraspecies? |
| Yes                                                                                                                                                                                                                                                                                                                                                                                                                                          |                             | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                          |                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                              | Taxon A Description         |                                                                                                                                                                                                                                                                                                                                                                                                                                              | Taxon B Description         |
| Strain ISO-1                                                                                                                                                                                                                                                                                                                                                                                                                                 |                             | Strain A2                                                                                                                                                                                                                                                                                                                                                                                                                                    |                             |

GENOTYPIC CHANGE

|                                                                                                                                                                                                                   |                         |                                                                                                             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                   | Generic Gene Name       | UniProtKB Drosophila melanogaster                                                                           |
| Cyp28d1                                                                                                                                                                                                           |                         | Q9VMT5 ( <a href="http://www.uniprot.org/uniprot/Q9VMT5">http://www.uniprot.org/uniprot/Q9VMT5</a> )        |
|                                                                                                                                                                                                                   | Synonyms                | GenebankID or UniProtKB                                                                                     |
| 28d1; CG10833; Dmel\CG10833                                                                                                                                                                                       |                         | 33749 ( <a href="https://www.ncbi.nlm.nih.gov/nucore/33749">https://www.ncbi.nlm.nih.gov/nucore/33749</a> ) |
|                                                                                                                                                                                                                   | String                  |                                                                                                             |
| 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> ) |                         |                                                                                                             |
|                                                                                                                                                                                                                   | Sequence Similarities   |                                                                                                             |
| Belongs to the cytochrome P450 family.                                                                                                                                                                            |                         |                                                                                                             |
|                                                                                                                                                                                                                   | GO - Molecular Function |                                                                                                             |
| 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: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

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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>)

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Presumptive Null                  |
| Unknown ( <a href="https://www.gephebase.org/search-criteria?/and+Presumptive Null=~Unknown^#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Presumptive Null=~Unknown^#gephebase-summary-title</a> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Molecular Type                    |
| Gene Amplification ( <a href="https://www.gephebase.org/search-criteria?/and+Molecular Type=~Gene Amplification^#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Molecular Type=~Gene Amplification^#gephebase-summary-title</a> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Aberration Type                   |
| Insertion ( <a href="https://www.gephebase.org/search-criteria?/and+Aberration Type=~Insertion^#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Aberration Type=~Insertion^#gephebase-summary-title</a> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Insertion Size                    |
| 10-100 kb                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Molecular Details of the Mutation |
| duplication of a 15297-bp region; which encompasses 5 genes: Msp300 Cyp28d2 Cyp28d1 CG7742 and CG14034. Associated with increased expression of Cyp28d1 gene expression and increased nicotin resistance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Experimental Evidence             |
| Linkage Mapping ( <a href="https://www.gephebase.org/search-criteria?/and+Experimental Evidence=~Linkage Mapping^#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Experimental Evidence=~Linkage Mapping^#gephebase-summary-title</a> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Main Reference                    |
| Structural variants exhibit widespread allelic heterogeneity and shape variation in complex traits. (2019) ( <a href="https://pubmed.ncbi.nlm.nih.gov/31653862">https://pubmed.ncbi.nlm.nih.gov/31653862</a> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Authors                           |
| Chakraborty M; Emerson JJ; Macdonald SJ; Long AD                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Abstract                          |
| It has been hypothesized that individually-rare hidden structural variants (SVs) could account for a significant fraction of variation in complex traits. Here we identified more than 20,000 euchromatic SVs from 14 Drosophila melanogaster genome assemblies, of which ~40% are invisible to high specificity short-read genotyping approaches. SVs are common, with 31.5% of diploid individuals harboring a SV in genes larger than 5kb, and 24% harboring multiple SVs in genes larger than 10kb. SV minor allele frequencies are rarer than amino acid polymorphisms, suggesting that SVs are more deleterious. We show that a number of functionally important genes harbor previously hidden structural variants likely to affect complex phenotypes. Furthermore, SVs are overrepresented in candidate genes associated with quantitative trait loci mapped using the Drosophila Synthetic Population Resource. We conclude that SVs are ubiquitous, frequently constitute a heterogeneous allelic series, and can act as rare alleles of large effect. |                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Additional References             |

RELATED GEPHE

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Related Genes      |
| 19 (Acetylcholinesterase (Ace-2), alcohol dehydrogenase (Adh), Aldehyde dehydrogenase (Aldh), CG11699, Cyp12d1, Cyp28d1, 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) ( <a href="https://www.gephebase.org/search-criteria?/or+Taxon ID=~7227^/and+Trait=Xenobiotic resistance/and+groupHaplotypes=true#gephebase-summary-title">https://www.gephebase.org/search-criteria?/or+Taxon ID=~7227^/and+Trait=Xenobiotic resistance/and+groupHaplotypes=true#gephebase-summary-title</a> ) |                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Related Haplotypes |
| 1 ( <a href="https://www.gephebase.org/search-criteria?/or+Gene Gephebase=~Cyp28d1-Cyp28d2^/and+Taxon ID=~7227^/or+Gene Gephebase=~Cyp28d1-Cyp28d2^/and+Taxon ID=~7227^#gephebase-summary-title">https://www.gephebase.org/search-criteria?/or+Gene Gephebase=~Cyp28d1-Cyp28d2^/and+Taxon ID=~7227^/or+Gene Gephebase=~Cyp28d1-Cyp28d2^/and+Taxon ID=~7227^#gephebase-summary-title</a> )                                                                                                                                                                                                                                                       |                    |

EXTERNAL LINKS

COMMENTS

@Parrallelism