GEPHE SUMMARY

Gephebase Gene
resistance to dieldrin (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^resistance to dieldrin^#gephebase-summary-title)

GepheID
GP00001981

Entry Status
Published

Main curator
Courtier

PHENOTYPIC CHANGE

Trait Category
Physiology (https://www.gephebase.org/search-criteria?/and+Trait Category=^Physiology^#gephebase-summary-title)

Trait
Xenobiotic resistance (insecticide) (https://www.gephebase.org/search-criteria?/and+Trait=^Xenobiotic resistance (insecticide)^#gephebase-summary-title)

Trait State in Taxon A
Drosophila simulans

Trait State in Taxon B
Drosophila simulans resistant - allele Eyguieres 42 (E42) - 20â€ƒ000â€fold resistance to the insecticide fipronil

Ancestral State
Taxon A

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

Taxon A

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

Common Name
-

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 Infraspecies?
No

Taxon B

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

Common Name
-

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 B an Infraspecies?
Yes

Taxon B Description
Eyguieres 42 (E42)

GENOTYPIC CHANGE

Generic Gene Name
Rdl

Synonyms
CG10537; CT29555; Dmel\CG10537; DmRdl; DmRDL; gaba; GABA; GABA-R; GABAr; GABA[[A]]; GABA[[A]] receptor; GABA[[A]]-R; GABA[[A]]R; LCCH1; Rd1; rdl; RDL

String
7227.FBpp0305970 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier= 7227.FBpp0305970)

Sequence Similarities
Belongs to the ligand-gated ion channel (TC 1.A.9) family. Gamma-aminobutyric acid receptor (TC 1.A.9.5) subfamily.

GO - Molecular Function

UniProtKB Drosophila melanogaster
P25123 (http://www.uniprot.org/uniprot/P25123)

GenebankID or UniProtKB
AAK00512 (https://www.ncbi.nlm.nih.gov/nuccore/AAK00512)

GO:0004890 : GABA-A receptor activity
(https://www.ebi.ac.uk/QuickGO/term/GO:0004890)
GO:0022851 : GABA-gated chloride ion channel activity
(https://www.ebi.ac.uk/QuickGO/term/GO:0022851)
GO:0030594 : neurotransmitter receptor activity
(https://www.ebi.ac.uk/QuickGO/term/GO:0030594)

GO - Biological Process

GO:0007165 : signal transduction (https://www.ebi.ac.uk/QuickGO/term/GO:0007165)
GO:0007268 : chemical synaptic transmission
(https://www.ebi.ac.uk/QuickGO/term/GO:0007268)
GO:0034220 : ion transmembrane transport
(https://www.ebi.ac.uk/QuickGO/term/GO:0034220)
GO:0042493 : response to drug (https://www.ebi.ac.uk/QuickGO/term/GO:0042493)
GO:0050877 : nervous system process
(https://www.ebi.ac.uk/QuickGO/term/GO:0050877)
GO:0042391 : regulation of membrane potential
(https://www.ebi.ac.uk/QuickGO/term/GO:0042391)
GO:0006811 : ion transport (https://www.ebi.ac.uk/QuickGO/term/GO:0006811)
GO:0042048 : olfactory behavior (https://www.ebi.ac.uk/QuickGO/term/GO:0042048)
GO:0030431 : sleep (https://www.ebi.ac.uk/QuickGO/term/GO:0030431)
GO:0009612 : response to mechanical stimulus
(https://www.ebi.ac.uk/QuickGO/term/GO:0009612)
GO:0002121 : inter-male aggressive behavior
(https://www.ebi.ac.uk/QuickGO/term/GO:0002121)
GO:0050805 : negative regulation of synaptic transmission
(https://www.ebi.ac.uk/QuickGO/term/GO:0050805)
GO:0042749 : regulation of circadian sleep/wake cycle
(https://www.ebi.ac.uk/QuickGO/term/GO:0042749)
GO:0090328 : regulation of olfactory learning
(https://www.ebi.ac.uk/QuickGO/term/GO:0090328)

GO - Cellular Component

GO:0016021 : integral component of membrane
(https://www.ebi.ac.uk/QuickGO/term/GO:0016021)
GO:0005886 : plasma membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0005886)
GO:0005887 : integral component of plasma membrane
(https://www.ebi.ac.uk/QuickGO/term/GO:0005887)
GO:0030054 : cell junction (https://www.ebi.ac.uk/QuickGO/term/GO:0030054)
GO:0030425 : dendrite (https://www.ebi.ac.uk/QuickGO/term/GO:0030425)
GO:0043005 : neuron projection (https://www.ebi.ac.uk/QuickGO/term/GO:0043005)
GO:0030424 : axon (https://www.ebi.ac.uk/QuickGO/term/GO:0030424)
GO:0045211 : postsynaptic membrane
(https://www.ebi.ac.uk/QuickGO/term/GO:0045211)
GO:0045202 : synapse (https://www.ebi.ac.uk/QuickGO/term/GO:0045202)
GO:0034707 : chloride channel complex
(https://www.ebi.ac.uk/QuickGO/term/GO:0034707)
GO:0032589 : neuron projection membrane
(https://www.ebi.ac.uk/QuickGO/term/GO:0032589)
GO:0032809 : neuronal cell body membrane
(https://www.ebi.ac.uk/QuickGO/term/GO:0032809)

Mutation #1

Presumptive Null

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

Molecular Type

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

Aberration Type

SNP (https://www.gephebase.org/search-criteria?/and+Aberration Type=^SNP^#gephebase-summary-title)

SNP Coding Change

Nonsynonymous

Molecular Details of the Mutation

A301G and T350M - both mutations have an effect - In addition to the A301G and T350M mutations the Eyguieres 42 strain also contains the mutation R122G but this mutation is also present in strains that are susceptible to dieldrin and so does not appear to be related to dieldrin resistance.

Experimental Evidence

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

	Taxon A	Taxon B	Position
Codon	GCG	GGG	-
Amino-acid	Ala	Gly	301

Main Reference

Resistance to fipronil in Drosophila simulans: influence of two point mutations in the RDL GABA receptor subunit. (2005) (https://pubmed.ncbi.nlm.nih.gov/15748149)

Authors

Le Goff G; Hamon A; BergÃ© JB; Amichot M

Abstract

The Eyguieres 42 strain of Drosophila simulans, obtained by laboratory selection, displayed approximately 20,000-fold resistance to the insecticide fipronil. Molecular cloning of the

cDNA encoding the RDL GABA receptor subunit of this strain revealed the presence of two mutations: the Rdl mutation (A301G) and an additional mutation in the third transmembrane domain (T350M). In order to assess the individual and combined roles of the two mutations in fipronil resistance, the functional properties of wild-type, A301G, T350M and A301G/T350M homomultimeric RDL receptors were compared by expression in Xenopus oocytes. In wild-type receptors, the inhibition of GABA (EC(30))-induced currents by fipronil and picrotoxin was enhanced by repeated GABA applications. The A301G mutation nearly abolished this effect, decreased the sensitivity to fipronil and picrotoxin and increased the reversibility of inhibition. The T350M mutation also reduced the sensitivity to both antagonists. Of the four receptor variants tested, the double mutant showed the highest resistance to fipronil, following repeated GABA applications. In conclusion, the present study emphasizes new aspects of the pharmacological alterations induced by the Rdl mutation and shows that resistance to GABA receptor-directed insecticides may implicate a mutation distinct from Rdl.

Additional References

Mutation #2

Presumptive Null

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

Molecular Type

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

Aberration Type

SNP (https://www.gephebase.org/search-criteria?/and+Aberration Type=^SNP^#gephebase-summary-title)

SNP Coding Change

Nonsynonymous

Molecular Details of the Mutation

A301G and T350M - both mutations have an effect - In addition to the A301G and T350M mutations the Eyguieres 42 strain also contains the mutation R122G but this mutation is also present in strains that are susceptible to dieldrin and so does not appear to be related to dieldrin resistance.

Experimental Evidence

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

	Taxon A	Taxon B	Position
Codon	ACG	ATG	-
Amino-acid	Thr	Met	350

Main Reference

Resistance to fipronil in Drosophila simulans: influence of two point mutations in the RDL GABA receptor subunit. (2005) (https://pubmed.ncbi.nlm.nih.gov/15748149)

Authors

Le Goff G; Hamon A; BergÃ© JB; Amichot M

Abstract

The Eyguieres 42 strain of Drosophila simulans, obtained by laboratory selection, displayed approximately 20,000-fold resistance to the insecticide fipronil. Molecular cloning of the cDNA encoding the RDL GABA receptor subunit of this strain revealed the presence of two mutations: the Rdl mutation (A301G) and an additional mutation in the third transmembrane domain (T350M). In order to assess the individual and combined roles of the two mutations in fipronil resistance, the functional properties of wild-type, A301G, T350M and A301G/T350M homomultimeric RDL receptors were compared by expression in Xenopus oocytes. In wild-type receptors, the inhibition of GABA (EC(30))-induced currents by fipronil and picrotoxin was enhanced by repeated GABA applications. The A301G mutation nearly abolished this effect, decreased the sensitivity to fipronil and picrotoxin and increased the reversibility of inhibition. The T350M mutation also reduced the sensitivity to both antagonists. Of the four receptor variants tested, the double mutant showed the highest resistance to fipronil, following repeated GABA applications. In conclusion, the present study emphasizes new aspects of the pharmacological alterations induced by the Rdl mutation and shows that resistance to GABA receptor-directed insecticides may implicate a mutation distinct from Rdl.

Additional References

RELATED GEPHE

Related Genes

1 (cyp6g1) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^7240^/and+Trait=Xenobiotic resistance/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

2 (https://www.gephebase.org/search-criteria?/or+Gene Gephebase=^resistance to dieldrin^/and+Taxon ID=^7240^/or+Gene Gephebase=^resistance to dieldrin^/and+Taxon ID=^7240^#gephebase-summary-title)

EXTERNAL LINKS

COMMENTS

@SeveralMutationsWithEffect - http://flybase.org/reports/FBal0029507