

GEPHE SUMMARY

	Gephebase Gene		GepheID
resistance to dieldrin (https://www.gephebase.org/search-criteria?/and+Gene+Gephebase=^resistance to dieldrin^#gephebase-summary-title)		GP00000980	
Published	Entry Status	Martin	Main curator

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		
Periplaneta americana			
	Trait State in Taxon B		
Periplaneta americana - resistant			
	Ancestral State		
Taxon A			
	Taxonomic Status		
Intraspecific (https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=^Intraspecific^#gephebase-summary-title)			
Taxon A		Taxon B	
	Latin Name		Latin Name
Periplaneta americana (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Periplaneta americana^#gephebase-summary-title)		Periplaneta americana (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Periplaneta americana^#gephebase-summary-title)	
	Common Name		Common Name
American cockroach		American cockroach	
	Synonyms		Synonyms
Blatta americana; American cockroach; Periplaneta americana (Linnaeus, 1758)		Blatta americana; American cockroach; Periplaneta americana (Linnaeus, 1758)	
	Rank		Rank
species		species	
	Lineage		Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Polyneoptera; Dictyoptera; Blattodea; Blattodea; Blattidae; Blattinae; Periplaneta		cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Polyneoptera; Dictyoptera; Blattodea; Blattodea; Blattidae; Blattinae; Periplaneta	
	Parent		Parent
Periplaneta () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=6977)		Periplaneta () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=6977)	
	NCBI Taxonomy ID		NCBI Taxonomy ID
6978 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=6978)		6978 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=6978)	
	is Taxon A an Intraspecies?		is Taxon B an Intraspecies?
No		No	

GENOTYPIC CHANGE

	Generic Gene Name		UniProtKB Drosophila melanogaster
Rdl		P25123 (http://www.uniprot.org/uniprot/P25123)	
	Synonyms		GenebankID or UniProtKB
CG10537; CT29555; Dmel\CG10537; DmRdl; DmRDL; gaba; GABA; GABA-R; GABA _r ; 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		
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>)

- No (<https://www.gephebase.org/search-criteria?/and+Presumptive Null=~No^#gephebase-summary-title>) Presumptive Null
- Coding (<https://www.gephebase.org/search-criteria?/and+Molecular Type=~Coding^#gephebase-summary-title>) Molecular Type
- SNP (<https://www.gephebase.org/search-criteria?/and+Aberration Type=~SNP^#gephebase-summary-title>) Aberration Type
- Nonsynonymous SNP Coding Change
- Ala302Ser Molecular Details of the Mutation
- Candidate Gene (<https://www.gephebase.org/search-criteria?/and+Experimental Evidence=~Candidate Gene^#gephebase-summary-title>) Experimental Evidence

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	-	-	-

- Conservation of cyclodiene insecticide resistance-associated mutations in insects. (1993) (<https://pubmed.ncbi.nlm.nih.gov/9087552>) Main Reference
- Thompson M; Steichen JC; ffrench-Constant RH Authors

Abstract

Cyclodiene insecticide resistance has accounted for over 60% of reported cases of insecticide resistance. In *Drosophila melanogaster* resistance is associated with a single base pair substitution in the GABA receptor/chloride ion channel gene *Rdl*. This substitution predicts the replacement of an alanine with a serine in the second membrane spanning domain, the region thought to line the chloride ion channel pore. Here we report, via the use of degenerate primers in the polymerase chain reaction, that precisely the same substitution is present in three pests from three different insect orders: the house fly (Diptera), red flour beetle (Coleoptera) and American cockroach (Dictyoptera). This finding suggests that there are a limited number of mutations that can confer resistance to cyclodienes, putative channel blockers, while still maintaining adequate chloride ion channel function. The conservation of the resistance-associated mutation between *Drosophila* and pest insects directly validates the approach of using this insect as a model system for isolating and studying resistance genes. The importance of single base pair substitutions in the evolution of pesticide resistance and in the design of molecular monitoring techniques is discussed.

Additional References

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EXTERNAL LINKS

COMMENTS