

GEPHE SUMMARY

	Gephebase Gene		GepheID
para (kdr) (<a +para+(kdr)+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Gene+Gephebase=">https://www.gephebase.org/search-criteria?/and+Gene+Gephebase="+para+(kdr)+"#gephebase-summary-title)		GP00000839	
	Entry Status	Martin	Main curator
Published			

PHENOTYPIC CHANGE

	Trait Category		
Physiology (<a +physiology+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Trait+Category=">https://www.gephebase.org/search-criteria?/and+Trait+Category="+Physiology+"#gephebase-summary-title)			
	Trait		
Xenobiotic resistance (insecticide) (<a +xenobiotic+resistance+(insecticide)+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Trait=">https://www.gephebase.org/search-criteria?/and+Trait="+Xenobiotic+resistance+(insecticide)+"#gephebase-summary-title)			
	Trait State in Taxon A		
Hyalella azteca - sensitive to pyrethroids			
	Trait State in Taxon B		
Hyalella azteca - resistant to pyrethroids - species D			
	Ancestral State		
Taxon A			
	Taxonomic Status		
Intraspecific (<a +intraspecific+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=">https://www.gephebase.org/search-criteria?/and+Taxonomic+Status="+Intraspecific+"#gephebase-summary-title)			
Taxon A		Taxon B	
	Latin Name		Latin Name
Hyalella azteca (<a +hyalella+azteca+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms="+Hyalella+azteca+"#gephebase-summary-title)		Hyalella azteca (<a +hyalella+azteca+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms="+Hyalella+azteca+"#gephebase-summary-title)	
	Common Name		Common Name
-		-	
	Synonyms		Synonyms
Hyalella azteca Saussure, 1858		Hyalella azteca Saussure, 1858	
	Rank		Rank
species		species	
	Lineage		Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Crustacea; Multicrustacea; Malacostraca; Eumalacostraca; Peracarida; Amphipoda; Senticaudata; Talitrida; Talitroidea; Hyalellidae; Hyalella		cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Crustacea; Multicrustacea; Malacostraca; Eumalacostraca; Peracarida; Amphipoda; Senticaudata; Talitrida; Talitroidea; Hyalellidae; Hyalella	
	Parent		Parent
Hyalella () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=199487)		Hyalella () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=199487)	
	NCBI Taxonomy ID		NCBI Taxonomy ID
294128 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=294128)		294128 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=294128)	
	is Taxon A an Intraspecies?		is Taxon B an Intraspecies?
No		No	

GENOTYPIC CHANGE

	Generic Gene Name		UniProtKB Drosophila melanogaster
para		P35500 (http://www.uniprot.org/uniprot/P35500)	
	Synonyms		GenebankID or UniProtKB
bas; bss; CG9907; Dmel\CG9907; DmNav; DmNav1; DmNa[[v]]; DmNa[[V]]; DmNa[[v]]1; l(1)14Da; l(1)ESH548; lincRNA.S9469; Nav1; Occl; olfD; par; sbl; sbl-1; Shu; Shudderer		()	
	String		
7227.FBpp0303597 (http://string-db.org/newstring.cgi/show_network_section.pl?identifier=7227.FBpp0303597)			
	Sequence Similarities		
Belongs to the sodium channel (TC 1.A.1.10) family. Para subfamily.			
	GO - Molecular Function		
GO:0005509 : calcium ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0005509)			
GO:0005244 : voltage-gated ion channel activity (https://www.ebi.ac.uk/QuickGO/term/GO:0005244)			
GO:0005248 : voltage-gated sodium channel activity (https://www.ebi.ac.uk/QuickGO/term/GO:0005248)			
GO:0005272 : sodium channel activity			

(<https://www.ebi.ac.uk/QuickGO/term/GO:0005272>)

GO - Biological Process

GO:0045433 : male courtship behavior, veined wing generated song production

(<https://www.ebi.ac.uk/QuickGO/term/GO:0045433>)

GO:0001666 : response to hypoxia (<https://www.ebi.ac.uk/QuickGO/term/GO:0001666>)

GO:0009612 : response to mechanical stimulus

(<https://www.ebi.ac.uk/QuickGO/term/GO:0009612>)

GO:0034765 : regulation of ion transmembrane transport

(<https://www.ebi.ac.uk/QuickGO/term/GO:0034765>)

GO:0035725 : sodium ion transmembrane transport

(<https://www.ebi.ac.uk/QuickGO/term/GO:0035725>)

GO:0007638 : mechanosensory behavior

(<https://www.ebi.ac.uk/QuickGO/term/GO:0007638>)

GO:0060078 : regulation of postsynaptic membrane potential

(<https://www.ebi.ac.uk/QuickGO/term/GO:0060078>)

GO - Cellular Component

GO:0005887 : integral component of plasma membrane

(<https://www.ebi.ac.uk/QuickGO/term/GO:0005887>)

GO:0001518 : voltage-gated sodium channel complex

(<https://www.ebi.ac.uk/QuickGO/term/GO:0001518>)

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

L925I in species D

Experimental Evidence

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

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

Main Reference

Multiple origins of pyrethroid insecticide resistance across the species complex of a nontarget aquatic crustacean, *Hyalella azteca*. (2013) (<https://pubmed.ncbi.nlm.nih.gov/24065824>)

Authors

Weston DP; Poynton HC; Wellborn GA; Lydy MJ; Blalock BJ; Sepulveda MS; Colbourne JK

Abstract

Use of pesticides can have substantial nonlethal impacts on nontarget species, including driving evolutionary change, often with unknown consequences for species, ecosystems, and society. *Hyalella azteca*, a species complex of North American freshwater amphipods, is widely used for toxicity testing of water and sediment and has frequently shown toxicity due to pyrethroid pesticides. We demonstrate that 10 populations, 3 from laboratory cultures and 7 from California water bodies, differed by at least 550-fold in sensitivity to pyrethroids. The populations sorted into four phylogenetic groups consistent with species-level divergence. By sequencing the primary pyrethroid target site, the voltage-gated sodium channel, we show that point mutations and their spread in natural populations were responsible for differences in pyrethroid sensitivity. At least one population had both mutant and WT alleles, suggesting ongoing evolution of resistance. Although nonresistant *H. azteca* were susceptible to the typical neurotoxic effects of pyrethroids, gene expression analysis suggests the mode of action in resistant *H. azteca* was not neurotoxicity but was oxidative stress sustained only at considerably higher pyrethroid concentrations. The finding that a nontarget aquatic species has acquired resistance to pesticides used only on terrestrial pests is troubling evidence of the impact of chronic pesticide transport from land-based applications into aquatic systems. Our findings have far-reaching implications for continued uncritical use of *H. azteca* as a principal species for monitoring and environmental policy decisions.

Additional References

Unintentional exposure to terrestrial pesticides drives widespread and predictable evolution of resistance in freshwater crustaceans. (2018) (<https://pubmed.ncbi.nlm.nih.gov/29875816>)

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

5 ([https://www.gephebase.org/search-criteria?/or+Gene Gephebase=^para \(kdr\)^/and+Taxon ID=^294128^/or+Gene Gephebase=^para \(kdr\)^/and+Taxon ID=^294128^#gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Gene Gephebase=^para (kdr)^/and+Taxon ID=^294128^/or+Gene Gephebase=^para (kdr)^/and+Taxon ID=^294128^#gephebase-summary-title))

EXTERNAL LINKS

COMMENTS

The L925I resistance allele was identified at high frequencies across three different species of *Hyalomma azteca* (B, C and D).