

GEPHE SUMMARY

para (kdr) (https://www.gephebase.org/search-criteria?/and+Gene Gephebase='para (kdr)'#gephebase-summary-title)	Gephebase Gene	GP00002516	GepheID
	Entry Status	Courtier	Main curator
Published			

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		
Boophilus microplus	Trait State in Taxon B		
Boophilus microplus - resistant	Ancestral State		
Taxon A	Taxonomic Status		
Intraspecific (https://www.gephebase.org/search-criteria?/and+Taxonomic Status='Intraspecific'#gephebase-summary-title)			
Taxon A	Latin Name	Taxon B	Latin Name
Rhipicephalus microplus (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms='Rhipicephalus microplus'#gephebase-summary-title)		Rhipicephalus microplus (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms='Rhipicephalus microplus'#gephebase-summary-title)	
southern cattle tick	Common Name	southern cattle tick	Common Name
Boophilus microplus; Rhipicephalus (Boophilus) microplus; southern cattle tick; cattle tick; Rhipicephalus microplus (Canestrini, 1888)	Synonyms	Boophilus microplus; Rhipicephalus (Boophilus) microplus; southern cattle tick; cattle tick; Rhipicephalus microplus (Canestrini, 1888)	Synonyms
species	Rank	species	Rank
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Chelicerata; Arachnida; Acari; Parasitiformes; Ixodoidea; Ixodidae; Rhipicephalinae; Rhipicephalus; Boophilus	Lineage	cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Chelicerata; Arachnida; Acari; Parasitiformes; Ixodoidea; Ixodidae; Rhipicephalinae; Rhipicephalus; Boophilus	Lineage
Boophilus () - (Rank: subgenus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 6940)	Parent	Boophilus () - (Rank: subgenus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 6940)	Parent
6941 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 6941)	NCBI Taxonomy ID	6941 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 6941)	NCBI Taxonomy ID
No	is Taxon A an Infraspecies?	No	is Taxon B an Infraspecies?

GENOTYPIC CHANGE

Generic Gene Name			
para	Synonyms	P35500 (http://www.uniprot.org/uniprot/P35500)	UniProtKB Drosophila melanogaster
bas; bss; CG9907; Dmel\CG9907; DmNav; DmNav1; DmNa[[v]]; DmNa[[V]]; DmNa[[v]]; I(1)14Da; I(1)ESHS48; lincRNA.S9469; Nav1; Ocd; olfD; par; sbl; sbl-1; Shu; Shudderer	String	ACT99714 (https://www.ncbi.nlm.nih.gov/nucleotide/ACT99714)	GenebankID or UniProtKB
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			

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

G72V = G933V - G to T non-synonymous mutation at nucleotide position 214 that results in a glycine to valine substitution (G72V)

Experimental Evidence

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

	Taxon A	Taxon B	Position
Codon	GGN	GTN	-
Amino-acid	Gly	Val	933

Main Reference

Identification of a mutation in the para-sodium channel gene of the cattle tick *Rhipicephalus microplus* associated with resistance to flumethrin but not to cypermethrin. (2010) (<https://pubmed.ncbi.nlm.nih.gov/20708620>)

Authors

Jonsson NN; Cutull C; Corley SW; Seddon JM

Abstract

A mutation in the domain II S4-5 linker region of the para-sodium channel gene has been associated previously with synthetic pyrethroid (SP) resistance in the cattle tick (*Rhipicephalus microplus*) in Australia. This is a C → A mutation at nucleotide position 190, which results in a leucine to isoleucine amino acid substitution (L64I). In a survey of 15 cattle tick populations with known SP resistance status, sourced from Queensland and New South Wales in Australia, there was a strong relationship ($r=0.98$) between the proportion of ticks carrying the L64I homozygous resistant genotype and the survival percentage after exposure to a discriminating concentration of cypermethrin in the bioassay, as expected. However, among populations resistant only to flumethrin, the L64I homozygous genotype was not found. The sequence obtained for a 167 bp region including domain II S4-5 linker in flumethrin-resistant ticks identified a G → T non-synonymous mutation at nucleotide position 214 that results in a glycine to valine substitution (G72V). The frequency of the G72V homozygous genotype in each population was found to be moderately related to the survival percentage at the discriminating concentration of flumethrin in the larval packet test ($r=0.74$). However, a much stronger relationship between genotype and resistance to flumethrin was observed when the heterozygotes of L64I and G72V were added to the G72V homozygotes ($r=0.93$). These results suggest that there is an interaction between the two mutations in the same gene, such that flumethrin resistance might be conferred by either two copies of the G72V mutation or by being a L64I and G72V heterozygote.

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Additional References

Molecular biology of insect sodium channels and pyrethroid resistance. (2014) (<https://pubmed.ncbi.nlm.nih.gov/24704279>)

Mutations in DIIS5 and the DIIS4-S5 linker of *Drosophila melanogaster* sodium channel define binding domains for pyrethroids and DDT. (2007) (<https://pubmed.ncbi.nlm.nih.gov/17991435>)

RELATED GEPHE

2 (resistance to dieldrin, β -adrenergic octopamine receptor gene (AOR)) (<https://www.gephebase.org/search-criteria?/or+Taxon+ID=^6941^/and+Trait=Xenobiotic+resistance/and+groupHaplotypes=true#gephebase-summary-title>)

Related Genes

2 ([https://www.gephebase.org/search-criteria?/or+Gene+Gephebase=^para+\(kdr\)^/and+Taxon+ID=^6941^/or+Gene+Gephebase=^para+\(kdr\)^/and+Taxon+ID=^6941^#gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Gene+Gephebase=^para+(kdr)^/and+Taxon+ID=^6941^/or+Gene+Gephebase=^para+(kdr)^/and+Taxon+ID=^6941^#gephebase-summary-title))

Related Haplotypes

EXTERNAL LINKS

COMMENTS