

	Gephebase Gene	GepheID
SCN4A (Nav1.4) (https://www.gephebase.org/search-criteria?/and+GeneGephebase=^SCN4A (Nav1.4)^#gephebase-summary-title)	GP00000732	Main curator
Published	Entry Status	Courtier

	Trait Category				
Physiology (#https://www.gephebase.org/search-criteria?/and+TraitCriteria=~Physiology)					
	Trait				
Xenobiotic resistance (TTX) (#https://www.gephebase.org/search-criteria?/and+Trait=~Xenobiotic resistance (TTX))					
	Trait State in Taxon A				
Thamnophis sirtalis - sensitive					
	Trait State in Taxon B				
Thamnophis sirtalis - resistant - Willow creek					
	Ancestral State				
Data not curated					
	Taxonomic Status				
Intraspecific (#https://www.gephebase.org/search-criteria?/and+TaxonomicStatus=~Intraspecific)					
Taxon A			Taxon B		
	Latin Name			Latin Name	
Thamnophis sirtalis (#https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=~Thamnophis sirtalis)			Thamnophis sirtalis (#https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=~Thamnophis sirtalis)		
	Common Name			Common Name	
-			-		
	Synonyms			Synonyms	
FMNH 73660; FMNH:73660			FMNH 73660; FMNH:73660		
	Rank			Rank	
species			species		
	Lineage			Lineage	
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Sauropsida; Sauria; Lepidosauria; Squamata; Bifurcata; Unidentata; Episquamata; Toxicofera; Serpentes; Colubroidea; Colubridae; Natricinae; Thamnophis			cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Sauropsida; Sauria; Lepidosauria; Squamata; Bifurcata; Unidentata; Episquamata; Toxicofera; Serpentes; Colubroidea; Colubridae; Natricinae; Thamnophis		
	Parent			Parent	
Thamnophis () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=34999)			Thamnophis () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=34999)		
	NCBI Taxonomy ID			NCBI Taxonomy ID	
35019 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=35019)			35019 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=35019)		
	is Taxon A an Intraspecies?			is Taxon B an Intraspecies?	
No			No		

SCN4A	Generic Gene Name	P35499 (http://www.uniprot.org/uniprot/P35499)	UniProtKB Homo sapiens
HYPP; SkM1; CMS16; HYKPP; NAC1A; HOKPP2; Nav1.4; Na(V)1.4	Synonyms	DAA64623 (https://www.ncbi.nlm.nih.gov/nucleotide/DAA64623)	GeneBankID or UniProtKB
9606.ENSPP00000396320 (http://string-db.org/newstring.cgi/show_network_section.pl?identifier=9606.ENSPP00000396320)	String		
	Sequence Similarities		
Belongs to the sodium channel (TC 1.A.1.10) family. Nav1.4/SCN4A subfamily.			
	GO - Molecular Function		
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 - Biological Process		
GO:0006814 : sodium ion transport (https://www.ebi.ac.uk/QuickGO/term/GO:0006814)			

GO:0019228 : neuronal action potential
(<https://www.ebi.ac.uk/QuickGO/term/GO:0019228>)
GO:0034765 : regulation of ion transmembrane transport
(<https://www.ebi.ac.uk/QuickGO/term/GO:0034765>)
GO:0086010 : membrane depolarization during action potential
(<https://www.ebi.ac.uk/QuickGO/term/GO:0086010>)
GO:0006936 : muscle contraction (<https://www.ebi.ac.uk/QuickGO/term/GO:0006936>)
GO:0035725 : sodium ion transmembrane transport
(<https://www.ebi.ac.uk/QuickGO/term/GO:0035725>)

GO - Cellular Component

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:0030424 : axon (<https://www.ebi.ac.uk/QuickGO/term/GO:0030424>)
GO:0001518 : voltage-gated sodium channel complex
(<https://www.ebi.ac.uk/QuickGO/term/GO:0001518>)

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

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

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

Nonsynonymous

I1556L and/or D1568N and/or G1569V

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

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

Evolutionary diversification of TTX-resistant sodium channels in a predator-prey interaction. (2005) (<https://pubmed.ncbi.nlm.nih.gov/15815629>)

Geffeney SL; Fujimoto E; Brodie ED; Brodie ED; Ruben PC

Understanding the molecular genetic basis of adaptations provides incomparable insight into the genetic mechanisms by which evolutionary diversification takes place. Whether the evolution of common traits in different lineages proceeds by similar or unique mutations, and the degree to which phenotypic evolution is controlled by changes in gene regulation as opposed to gene function, are fundamental questions in evolutionary biology that require such an understanding of genetic mechanisms. Here we identify novel changes in the molecular structure of a sodium channel expressed in snake skeletal muscle, tsNa(V)1.4, that are responsible for differences in tetrodotoxin (TTX) resistance among garter snake populations coevolving with toxic newts. By the functional expression of tsNa(V)1.4, we show how differences in the amino-acid sequence of the channel affect TTX binding and impart different levels of resistance in four snake populations. These results indicate that the evolution of a physiological trait has occurred through a series of unique functional changes in a gene that is otherwise highly conserved among vertebrates.

Historical Contingency in a Multigene Family Facilitates Adaptive Evolution of Toxin Resistance. (2016) (<https://pubmed.ncbi.nlm.nih.gov/27291053>)

RELATED GEPHE

2 (Nav1.6 sodium channel, Nav1.7 sodium channel) (<https://www.gephebase.org/search-criteria?/or+Taxon ID=~35019~/and+Trait=Xenobiotic resistance/and+groupHaplotypes=true#gephebase-summary-title>)

2 ([https://www.gephebase.org/search-criteria?/or+Gene Gephebase=~SCN4A \(Nav1.4\)~/and+Taxon ID=~35019~/or+Gene Gephebase=~SCN4A \(Nav1.4\)~/and+Taxon ID=~35019~#gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Gene Gephebase=~SCN4A (Nav1.4)~/and+Taxon ID=~35019~/or+Gene Gephebase=~SCN4A (Nav1.4)~/and+Taxon ID=~35019~#gephebase-summary-title))

EXTERNAL LINKS

COMMENTS

Extreme TTX resistance evolved 5 times in Nav1.4 channel; but only in lineages that had previously evolved resistance in paralogous NaV channels

