GEPHE SUMMARY

Gephebase Gene
CHRNA1

GepheID
GP00000183

Entry Status
Published

Main curator
Courtier

PHENOTYPIC CHANGE

Trait Category
Physiology

Trait
Xenobiotic resistance (snake venom)

Trait State in Taxon A
Other Carnivora

Trait State in Taxon B
Erinaceus spp.

Ancestral State
Taxon A

Taxonomic Status
Intergeneric or Higher

Taxon A

Latin Name
Carnivora

Common Name
carnivores

Synonyms
carnivores

Rank
order

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Mammalia; Theria; Eutheria; Boreoeutheria; Laurasiatheria

Parent
Laurasiatheria () - (Rank: superorder)

NCBI Taxonomy ID
33554

is Taxon A an Infraspecies?
No

Taxon B #1

Latin Name
Erinaceus concolor

Common Name
southern white-breasted hedgehog

Synonyms
southern white-breasted hedgehog; Erinaceus concolor Martin 1838

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Mammalia; Theria; Eutheria; Boreoeutheria; Laurasiatheria; Eulipotyphla; Erinaceidae; Erinaceinae; Erinaceus

Parent
Erinaceus () - (Rank: genus)

NCBI Taxonomy ID
37316

is Taxon B an Infraspecies?
No

Taxon B #2

Latin Name
Erinaceus europaeus

Common Name
western European hedgehog

Synonyms
western European hedgehog; European hedgehog; common hedgehog; Erinaceus europaeus Linnaeus, 1758; Erinaceous europaeus; Erinaceus europeus

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Mammalia; Theria; Eutheria; Boreoeutheria; Laurasiatheria; Insectivora; Erinaceidae; Erinaceinae; Erinaceus

Parent
Erinaceus () - (Rank: genus)

NCBI Taxonomy ID
9365

is Taxon B an Infraspecies?
No

GENOTYPIC CHANGE

Generic Gene Name
CHRNA1

Synonyms
ACHRA; ACHRD; CHRNA; CMS1A; CMS1B; CMS2A; FCCMS; SCCMS; CHNRA

String
9606.ENSP00000261007

Sequence Similarities
Belongs to the ligand-gated ion channel (TC 1.A.9) family. Acetylcholine receptor (TC 1.A.9.1) subfamily. Alpha-1/CHRNA1 sub-subfamily.

GO - Molecular Function
GO:0042166 : acetylcholine binding
GO:0015464 : acetylcholine receptor activity
GO:0022848 : acetylcholine-gated cation-selective channel activity
GO:0005216 : ion channel activity
GO:1904315 : transmitter-gated ion channel activity involved in regulation of postsynaptic membrane potential

GO - Biological Process
GO:0007165 : signal transduction
GO:0007268 : chemical synaptic transmission
GO:0007271 : synaptic transmission, cholinergic
GO:0034220 : ion transmembrane transport
GO:0046716 : muscle cell cellular homeostasis
GO:0050881 : musculoskeletal movement
GO:0050877 : nervous system process
GO:0007528 : neuromuscular junction development
GO:0050905 : neuromuscular process
GO:0007274 : neuromuscular synaptic transmission
GO:0070050 : neuron cellular homeostasis
GO:0019228 : neuronal action potential
GO:0042391 : regulation of membrane potential
GO:0035094 : response to nicotine
GO:0003009 : skeletal muscle contraction
GO:0048630 : skeletal muscle tissue growth

GO - Cellular Component
GO:0005886 : plasma membrane
GO:0005887 : integral component of plasma membrane
GO:0030054 : cell junction
GO:0043005 : neuron projection
GO:0045211 : postsynaptic membrane
GO:0045202 : synapse
GO:0005892 : acetylcholine-gated channel complex
GO:0009986 : cell surface
GO:0099060 : integral component of postsynaptic specialization membrane
GO:0031594 : neuromuscular junction

UniProtKB Homo sapiens
P02708

GenebankID or UniProtKB

Mutation #1
Presumptive Null
No

Molecular Type
Coding

Aberration Type
SNP

SNP Coding Change
Nonsynonymous

Molecular Details of the Mutation
Trp187Arg

Experimental Evidence
Candidate Gene

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	Trp	Arg	187

Main Reference
Why the honey badger don't care: Convergent evolution of venom-targeted nicotinic acetylcholine receptors in mammals that survive venomous snake bites. (2015)

Authors

Drabeck DH; Dean AM; Jansa SA

Abstract

Honey badgers (Mellivora capensis) prey upon and survive bites from venomous snakes (Family: Elapidae), but the molecular basis of their venom resistance is unknown. The muscular nicotinic cholinergic receptor (nAChR), targeted by snake Î±-neurotoxins, has evolved in some venom-resistant mammals to no longer bind these toxins. Through phylogenetic analysis of mammalian nAChR sequences, we show that honey badgers, hedgehogs, and pigs have independently acquired functionally equivalent amino acid replacements in the toxin-binding site of this receptor. These convergent amino acid changes impede toxin binding by introducing a positively charged amino acid in place of an uncharged aromatic residue. In venom-resistant mongooses, different replacements at these same sites are glycosylated, which is thought to disrupt binding through steric effects. Thus, it appears that resistance to snake venom Î±-neurotoxin has evolved at least four times among mammals through two distinct biochemical mechanisms operating at the same sites on the same receptor.

Additional References

Mutation #2
Presumptive Null
No

Molecular Type
Coding

Aberration Type
SNP

SNP Coding Change
Nonsynonymous

Molecular Details of the Mutation
Phe189Ile

Experimental Evidence
Candidate Gene

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	Phe	Ile	189

Main Reference

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Additional References

RELATED GEPHE

Related Genes
No matches found.
Related Haplotypes
4

EXTERNAL LINKS

COMMENTS

Parallel changes in a 3rd lineage thought to be venom resistant (pigs)