

GEPHE SUMMARY

Gephebase Gene
opsin - (SWS1)

Entry Status
Published

GepheID
GP00000767

Main curator
Martin

PHENOTYPIC CHANGE

Trait Category
Physiology

Trait
Color vision (violet-shift)

Trait State in Taxon A
Other rodents

Trait State in Taxon B
Cavia porcellus

Ancestral State
Data not curated

Taxonomic Status
Intergeneric or Higher

Taxon A

Latin Name
Rodentia

Common Name
rodent

Synonyms
rodent

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; Euarchontoglires; Glires

Parent
Glires (Rodents and rabbits) - (Rank: no rank)

NCBI Taxonomy ID
9989

is Taxon A an Intraspecies?
No

Taxon B

Latin Name
Cavia porcellus

Common Name
domestic guinea pig

Synonyms
Cavia aperea porcellus; Cavia cobaya; domestic guinea pig; guinea pig; Cavia coby

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; Euarchontoglires; Glires; Rodentia; Hystricomorpha; Caviidae; Cavia

Parent
Cavia (guinea pigs) - (Rank: genus)

NCBI Taxonomy ID
10141

is Taxon B an Intraspecies?
No

GENOTYPIC CHANGE

Generic Gene Name
OPN1SW

Synonyms
BCP; BOP; CBT

String
9606.ENSP00000249389

Sequence Similarities
Belongs to the G-protein coupled receptor 1 family. Opsin subfamily.

GO - Molecular Function
GO:0038023 : signaling receptor activity
GO:0008020 : G protein-coupled photoreceptor activity

GO - Biological Process
GO:0007165 : signal transduction
GO:0007186 : G protein-coupled receptor signaling pathway
GO:0001523 : retinoid metabolic process
GO:0018298 : protein-chromophore linkage
GO:0007601 : visual perception
GO:0071482 : cellular response to light stimulus
GO:0007602 : phototransduction

UniProtKB Homo sapiens
P03999

GenebankID or UniProtKB
ABO39213

GO - Cellular Component

GO:0005887 : integral component of plasma membrane

GO:0001750 : photoreceptor outer segment

GO:0097381 : photoreceptor disc membrane

Presumptive Null

No

Molecular Type

Coding

Aberration Type

SNP

SNP Coding Change

Nonsynonymous

Molecular Details of the Mutation

F86V

Experimental Evidence

Candidate Gene

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

Main Reference

A novel amino acid substitution is responsible for spectral tuning in a rodent violet-sensitive visual pigment. (2004)

Authors

Parry JW; Poopalasundaram S; Bowmaker JK; Hunt DM

Abstract

Cone short-wave (SWS1) visual pigments can be divided into two categories that correlate with spectral sensitivity, violet sensitive above 390 nm and ultraviolet sensitive below that wavelength. The evolution and mechanism of spectral tuning of SWS1 opsins are proving more complex than those of other opsin classes. Violet-sensitive pigments probably evolved from an ancestral ultraviolet-sensitive opsin, although in birds ultraviolet sensitivity has re-evolved from violet-sensitive pigments. In certain mammals, a single substitution involving the gain of a polar residue can switch sensitivity from ultraviolet to violet sensitivity, but where such a change is not involved, several substitutions may be required to effect the switch. The guinea pig, *Cavia porcellus*, is a hystricognathous rodent, a distinct suborder from the Sciuromnathi, such as rats and mice. It has been shown by microspectrophotometry to have two cone visual pigments at 530 and 400 nm. We have ascertained the sequence of the short-wave pigment and confirmed its violet sensitivity by expression and reconstitution of the pigment in vitro. Moreover, we have shown by site-directed mutagenesis that a single residue is responsible for wavelength tuning of spectral sensitivity, a Val86Phe causing a 60 nm short-wave shift into the ultraviolet and a Val86Tyr substitution shifting the pigment 8 nm long wave. The convergent evolution of this mammalian VS pigment provides insight into the mechanism of tuning between the violet and UV.

Additional References

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

3

COMMENTS