GEPHE SUMMARY

Gephebase Gene
opsin - (SWS1) (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^opsin - (SWS1)^#gephebase-summary-title)

GepheID
GP00000767

Entry Status
Published

Main curator
Martin

PHENOTYPIC CHANGE

Trait Category
Physiology (https://www.gephebase.org/search-criteria?/and+Trait Category=^Physiology^#gephebase-summary-title)

Trait
Color vision (violet-shift) (https://www.gephebase.org/search-criteria?/and+Trait=^Color vision (violet-shift)^#gephebase-summary-title)

Trait State in Taxon A
Other rodents

Trait State in Taxon B
Cavia porcellus

Ancestral State
Data not curated

Taxonomic Status
Intergeneric or Higher (https://www.gephebase.org/search-criteria?/and+Taxonomic Status=^Intergeneric or Higher^#gephebase-summary-title)

Taxon A

Latin Name
Rodentia (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Rodentia^#gephebase-summary-title)

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) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 314147)

NCBI Taxonomy ID
9989 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 9989)

is Taxon A an Infraspecies?
No

Taxon B

Latin Name
Cavia porcellus (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Cavia porcellus^#gephebase-summary-title)

Common Name
domestic guinea pig

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

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) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 10140)

NCBI Taxonomy ID
10141 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 10141)

is Taxon B an Infraspecies?
No

GENOTYPIC CHANGE

Generic Gene Name
OPN1SW

Synonyms
BCP; BOP; CBT

String
9606.ENSP00000249389 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier=9606.ENSP00000249389)

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

GO - Molecular Function
GO:0038023 : signaling receptor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0038023)
GO:0008020 : G protein-coupled photoreceptor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0008020)

GO - Biological Process
GO:0007165 : signal transduction (https://www.ebi.ac.uk/QuickGO/term/GO:0007165)
GO:0007186 : G protein-coupled receptor signaling pathway

UniProtKB Homo sapiens
P03999 (http://www.uniprot.org/uniprot/P03999)

GenebankID or UniProtKB
ABO39213 (https://www.ncbi.nlm.nih.gov/nuccore/ABO39213)

(https://www.ebi.ac.uk/QuickGO/term/GO:0007186)
GO:0001523 : retinoid metabolic process
(https://www.ebi.ac.uk/QuickGO/term/GO:0001523)
GO:0018298 : protein-chromophore linkage
(https://www.ebi.ac.uk/QuickGO/term/GO:0018298)
GO:0007601 : visual perception (https://www.ebi.ac.uk/QuickGO/term/GO:0007601)
GO:0071482 : cellular response to light stimulus
(https://www.ebi.ac.uk/QuickGO/term/GO:0071482)
GO:0007602 : phototransduction (https://www.ebi.ac.uk/QuickGO/term/GO:0007602)

GO - Cellular Component

GO:0005887 : integral component of plasma membrane
(https://www.ebi.ac.uk/QuickGO/term/GO:0005887)
GO:0001750 : photoreceptor outer segment
(https://www.ebi.ac.uk/QuickGO/term/GO:0001750)
GO:0097381 : photoreceptor disc membrane
(https://www.ebi.ac.uk/QuickGO/term/GO:0097381)

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

F86V

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

A novel amino acid substitution is responsible for spectral tuning in a rodent violet-sensitive visual pigment. (2004) (https://pubmed.ncbi.nlm.nih.gov/15209496)

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 Sciurognathi, 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 (https://www.gephebase.org/search-criteria?/or+Gene Gephebase=^opsin - (SWS1)^/and+Taxon ID=^9989^/or+Gene Gephebase=^opsin - (SWS1)^/and+Taxon ID=^10141^#gephebase-summary-title)

EXTERNAL LINKS

COMMENTS