GEPHE SUMMARY

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

GepheID
GP00001703

Entry Status
Published

Main curator
Courtier

PHENOTYPIC CHANGE

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

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

Trait State in Taxon A
Mammals

Trait State in Taxon B
Tursiops truncatus - blue shift

Ancestral State
Taxon A

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

Taxon A

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

Common Name
mammals

Synonyms
mammals

Rank
class

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

Parent
Amniota (amniotes) - (Rank: no rank) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 32524)

NCBI Taxonomy ID
40674 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 40674)

is Taxon A an Infraspecies?
No

Taxon B

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

Common Name
bottlenose dolphin

Synonyms
bottlenose dolphin; Atlantic bottle-nosed dolphin; bottle-nosed dolphin; Tursiops truncatus Gervais, 1855

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; Cetartiodactyla; Cetacea; Odontoceti; Delphinidae; Tursiops

Parent
Tursiops () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 9738)

NCBI Taxonomy ID
9739 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 9739)

is Taxon B an Infraspecies?
No

GENOTYPIC CHANGE

Generic Gene Name
OPN1LW

Synonyms
RCP

String
9606.ENSP00000358967 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier= 9606.ENSP00000358967)

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

GO - Molecular Function
GO:0008020 : G protein-coupled photoreceptor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0008020)
GO:0009881 : photoreceptor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0009881)

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
P04000 (http://www.uniprot.org/uniprot/P04000)

GenebankID or UniProtKB
()

(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:0032467 : positive regulation of cytokinesis
(https://www.ebi.ac.uk/QuickGO/term/GO:0032467)

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

A292S

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	Ala	Ser	292

Main Reference

Mechanism of spectral tuning in the dolphin visual pigments. (1998) (https://pubmed.ncbi.nlm.nih.gov/9471225)

Authors

Fasick JI; Robsinson PR

Abstract

The absorption maxima of both rod and cone visual pigments of the bottlenose dolphin (Tursiops truncatus) are blue-shifted relative to those of terrestrial mammals. A comparison of the sequence of the dolphin rod photopigment gene with that of the bovine rod suggests that, fo the 28 nonidentical amino acids, three amino acid substitutions at positions 83, 292, and 299 in the dolphin rod pigment are responsible for the 10 nm blue shift in absorption maxima. A similar comparison of the dolphin long-wavelength sensitive (LWS) cone photopigment gene with those of the human LWS cones suggests that a single substitution at position 292 (using the convention of rhodopsin numbering) in the dolphin LWS cone pigment results in a blue shift in absorption maxima. A mutagenesis study reveals that the combination of the three dolphin specific substitutions in the bovine rod pigment (83D to 83N, 292A to 292S, and 299A to 299S) causes a blue shift from the wild-type lambdamax of 499 nm to 389 nm. The single substitution in the dolphin LWS cone pigment (292S to 292A) causes a red shift from the wild-type lambdamax of 524 nm to 552 nm. The interactions of the three amino acids identified in the rod pigment with the chromophore may be a general mechanism for blue shifting in rod visual pigments. Furthermore, the single substitution in the dolphin LWS opsin gene is a novel mechanism of wavelength modulation in mammalian LWS pigments.

Additional References

RELATED GEPHE

Related Genes

3 (opsin - (SWS1), opsin - rhodopsin1 (RH1), opsin - rhodopsin (MWS=duplicate of LWS)) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^40674^/and+Trait=Color vision/or+Taxon ID=^9739^/and+Trait=Color vision/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

5 (https://www.gephebase.org/search-criteria?/or+Gene Gephebase=^opsin - rhodopsin (LWS)^/and+Taxon ID=^40674^/or+Gene Gephebase=^opsin - rhodopsin (LWS)^/and+Taxon ID=^9739^#gephebase-summary-title)

EXTERNAL LINKS

COMMENTS