GEPHE SUMMARY

Gephebase Gene
opsin - rhodopsin1 (RH1)

GephelD
GP00000783

Entry Status
Published

Main curator
Martin

PHENOTYPIC CHANGE

Trait Category
Physiology

Trait
Color vision (blue shift)

Trait State in Taxon A
Other Vespertilionoidea bats

Trait State in Taxon B
four Vespertilionoidea bats

Ancestral State
Data not curated

Taxonomic Status
Intergeneric or Higher

Taxon A

Latin Name
Vespertilionidae

Common Name
common bats

Synonyms
common bats; vespertilionid bats

Rank
family

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

Parent
Microchiroptera () - (Rank: suborder)

NCBI Taxonomy ID
9431

is Taxon A an Infraspecies?
No

Taxon B

Latin Name
Flaveria trinervia

Common Name
-

Synonyms
Flaveria australasica; Flaveria australasica Hook.; Flaveria trinervia (Spreng.) C.Mohr

Rank
species

Lineage
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetalae; asterids; campanulids; Asterales; Asteraceae; Asteroideae; Heliantheae alliance; Tageteae; Flaveria

Parent
Flaveria () - (Rank: genus)

NCBI Taxonomy ID
4227

is Taxon B an Infraspecies?
No

GENOTYPIC CHANGE

Generic Gene Name
RHO

Synonyms
RP4; OPN2; CSNBAD1

String
9606.ENSP00000296271

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

GO - Molecular Function
GO:0046872 : metal ion binding
GO:0004930 : G protein-coupled receptor activity
GO:0008020 : G protein-coupled photoreceptor activity
GO:0005502 : 11-cis retinal binding

GO - Biological Process
GO:0007186 : G protein-coupled receptor signaling pathway
GO:0001523 : retinoid metabolic process
GO:0006468 : protein phosphorylation
GO:0018298 : protein-chromophore linkage
GO:0007601 : visual perception

UniProtKB Homo sapiens
P08100

GenebankID or UniProtKB

GO:0071482 : cellular response to light stimulus
GO:0007602 : phototransduction
GO:0016038 : absorption of visible light
GO:0045494 : photoreceptor cell maintenance
GO:0007603 : phototransduction, visible light
GO:0022400 : regulation of rhodopsin mediated signaling pathway
GO:0060041 : retina development in camera-type eye
GO:0016056 : rhodopsin mediated signaling pathway

GO - Cellular Component
GO:0016021 : integral component of membrane
GO:0005886 : plasma membrane
GO:0000139 : Golgi membrane
GO:0005887 : integral component of plasma membrane
GO:0005794 : Golgi apparatus
GO:0005911 : cell-cell junction
GO:0001750 : photoreceptor outer segment
GO:0097381 : photoreceptor disc membrane
GO:0060170 : ciliary membrane
GO:0030660 : Golgi-associated vesicle membrane
GO:0001917 : photoreceptor inner segment
GO:0060342 : photoreceptor inner segment membrane
GO:0042622 : photoreceptor outer segment membrane

Presumptive Null
No

Molecular Type
Coding

Aberration Type
SNP

SNP Coding Change
Nonsynonymous

Molecular Details of the Mutation
D83N

Experimental Evidence
Candidate Gene

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

Main Reference
Vertebrate rhodopsin adaptation to dim light via rapid meta-II intermediate formation. (2010)

Authors
Sugawara T; Imai H; Nikaido M; Imamoto Y; Okada N

Abstract
Rhodopsin is a photoreceptive protein present in vertebrate rod photoreceptor cells, which are responsible for scotopic vision. Recent molecular studies have shown that several aquatic vertebrate species have independently acquired rhodopsin containing Asp83Asn, Glu122Gln, and Ala292Ser substitutions, causing a blue shift in the rhodopsin absorption spectra for adaptation to the blue-green photic environment in deep water. Here, we provide new evidence for the evolutionary and functional relevance of the Asp83Asn substitution. Spectroscopic and kinetic analyses of rhodopsins in six cichlid fishes from the East African Great Lakes using charge-coupled device spectrophotometer revealed that the Asp83Asn substitution accelerated the formation of meta-II, a rhodopsin intermediate crucial for activation of the G-protein transducin. Because rapid formation of meta-II likely results in effective transduction of photic signals, it is reasonable to assume that deep-water cichlid species have acquired rhodopsin containing Asn83 to adapt to dim lighting. Remarkably, rhodopsin containing Asn83 has been identified in terrestrial vertebrates such as bats, and these rhodopsin variants also exhibit accelerated meta-II formation. Our results indicated that the Asp83Asn substitution observed in a variety of animal species was acquired independently in many different lineages during vertebrate evolution for adaptation to dimly lit environments.

Additional References

RELATED GEPHE

Related Genes
No matches found.
Related Haplotypes
No matches found.

COMMENTS