

GEPHE SUMMARY

opsin - rhodopsin1 (RH1) (https://www.gephebase.org/search-criteria?/and+Gene)		Gephebase Gene	GP00000783	GepheID
Gephebase="opsin - rhodopsin1 (RH1)"#gephebase-summary-title)				Main curator
Published	Entry Status		Martin	

PHENOTYPIC CHANGE

Physiology (https://www.gephebase.org/search-criteria?/and+Trait)		Trait Category		
Category="Physiology"#gephebase-summary-title)				
Color vision (blue shift) (<a color"="" href="https://www.gephebase.org/search-criteria?/and+Trait=">https://www.gephebase.org/search-criteria?/and+Trait="Color)		Trait		
vision (blue shift)"#gephebase-summary-title)				
Other Vespertilionoidea bats	Trait State in Taxon A			
four Vespertilionoidea bats	Trait State in Taxon B			
Data not curated	Ancestral State			
Intergenic or Higher (https://www.gephebase.org/search-criteria?/and+Taxonomic)		Taxonomic Status		
Status="Intergenic or Higher"#gephebase-summary-title)				

Taxon A		Taxon B	
	Latin Name		Latin Name
Vespertilionidae		Flaveria trinervia	
(https://www.gephebase.org/search-criteria?/and+Taxon and		(https://www.gephebase.org/search-criteria?/and+Taxon and	Synonyms="Flaveria
Synonyms="Vespertilionidae"#gephebase-summary-title)		trinervia"#gephebase-summary-title)	
common bats	Common Name	-	Common Name
common bats; vespertilionid bats	Synonyms	Flaveria australasica; Flaveria australasica Hook.; Flaveria trinervia (Spreng.) C.Mohr	Synonyms
family	Rank	species	Rank
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia;	Lineage	cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta;	Lineage
Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii;		Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae;	
Dipnotetrapodomorpha; Tetrapoda; Amniota; Mammalia; Theria; Eutheria; Boreoeutheria;		eudicotyledons; Gunneridae; Pentapetalae; asterids; campanulids; Asterales; Asteraceae;	
Laurasiatheria; Chiroptera; Microchiroptera		Asterioideae; Heliantheae alliance; Tageteae; Flaveria	
Microchiroptera () - (Rank: suborder)	Parent	Flaveria () - (Rank: genus)	Parent
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=30560)		(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=4223)	
9431	NCBI Taxonomy ID	4227	NCBI Taxonomy ID
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9431)		(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=4227)	
No	is Taxon A an Intraspecies?	No	is Taxon B an Intraspecies?

GENOTYPIC CHANGE

RHO	Generic Gene Name	P08100 (http://www.uniprot.org/uniprot/P08100)	UniProtKB Homo sapiens
RP4; OPN2; CSNBAD1	Synonyms	()	GenebankID or UniProtKB
9606.ENSPP00000296271	String		
(http://string-db.org/newstring_.../show_network_section.pl?identifier=9606.ENSPP00000296271)			
Belongs to the G-protein coupled receptor 1 family. Opsin subfamily.	Sequence Similarities		
GO:0046872 : metal ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0046872)	GO - Molecular Function		
GO:0004930 : G protein-coupled receptor activity			
(https://www.ebi.ac.uk/QuickGO/term/GO:0004930)			
GO:0008020 : G protein-coupled photoreceptor activity			
(https://www.ebi.ac.uk/QuickGO/term/GO:0008020)			
GO:0005502 : 11-cis retinal binding (https://www.ebi.ac.uk/QuickGO/term/GO:0005502)	GO - Biological Process		

GO:0007186 : G protein-coupled receptor signaling pathway
 (https://www.ebi.ac.uk/QuickGO/term/GO:0007186)
 GO:0001523 : retinoid metabolic process
 (https://www.ebi.ac.uk/QuickGO/term/GO:0001523)
 GO:0006468 : protein phosphorylation
 (https://www.ebi.ac.uk/QuickGO/term/GO:0006468)
 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:0016038 : absorption of visible light
 (https://www.ebi.ac.uk/QuickGO/term/GO:0016038)
 GO:0045494 : photoreceptor cell maintenance
 (https://www.ebi.ac.uk/QuickGO/term/GO:0045494)
 GO:0007603 : phototransduction, visible light
 (https://www.ebi.ac.uk/QuickGO/term/GO:0007603)
 GO:0022400 : regulation of rhodopsin mediated signaling pathway
 (https://www.ebi.ac.uk/QuickGO/term/GO:0022400)
 GO:0060041 : retina development in camera-type eye
 (https://www.ebi.ac.uk/QuickGO/term/GO:0060041)
 GO:0016056 : rhodopsin mediated signaling pathway
 (https://www.ebi.ac.uk/QuickGO/term/GO:0016056)

GO - Cellular Component

GO:0016021 : integral component of membrane
 (https://www.ebi.ac.uk/QuickGO/term/GO:0016021)
 GO:0005886 : plasma membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0005886)
 GO:0000139 : Golgi membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0000139)
 GO:0005887 : integral component of plasma membrane
 (https://www.ebi.ac.uk/QuickGO/term/GO:0005887)
 GO:0005794 : Golgi apparatus (https://www.ebi.ac.uk/QuickGO/term/GO:0005794)
 GO:0005911 : cell-cell junction (https://www.ebi.ac.uk/QuickGO/term/GO:0005911)
 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)
 GO:0060170 : ciliary membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0060170)
 GO:0030660 : Golgi-associated vesicle membrane
 (https://www.ebi.ac.uk/QuickGO/term/GO:0030660)
 GO:0001917 : photoreceptor inner segment
 (https://www.ebi.ac.uk/QuickGO/term/GO:0001917)
 GO:0060342 : photoreceptor inner segment membrane
 (https://www.ebi.ac.uk/QuickGO/term/GO:0060342)
 GO:0042622 : photoreceptor outer segment membrane
 (https://www.ebi.ac.uk/QuickGO/term/GO:0042622)

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

D83N

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

Vertebrate rhodopsin adaptation to dim light via rapid meta-II intermediate formation. (2010) (https://pubmed.ncbi.nlm.nih.gov/19858068)

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

No matches found.

No matches found.

[Related Genes](#)

[Related Haplotypes](#)

EXTERNAL LINKS

COMMENTS