GEPHE SUMMARY

Gephebase Gene
opsin - rhodopsin1 (RH1) (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^opsin - rhodopsin1 (RH1)^#gephebase-summary-title)

GepheID
GP00000781

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

Trait State in Taxon A
Other bats

Trait State in Taxon B
Megaderma lyra

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

Common Name
bats

Synonyms
bats

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; Laurasiatheria

Parent
Laurasiatheria () - (Rank: superorder) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 314145)

NCBI Taxonomy ID
9397 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 9397)

is Taxon A an Infraspecies?
No

Taxon B

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

Common Name
Indian false vampire

Synonyms
Indian false vampire; greater false vampire bat

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; Chiroptera; Microchiroptera; Megadermatidae; Megaderma

Parent
Megaderma () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 9412)

NCBI Taxonomy ID
9413 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 9413)

is Taxon B an Infraspecies?
No

GENOTYPIC CHANGE

Generic Gene Name
RHO

Synonyms
RP4; OPN2; CSNBAD1

String
9606.ENSP00000296271 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier=9606.ENSP00000296271)

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

GO - Molecular Function
GO:0046872 : metal ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0046872)
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

UniProtKB Homo sapiens
P08100 (http://www.uniprot.org/uniprot/P08100)

GenebankID or UniProtKB
()

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

Related Genes

No matches found.

Related Haplotypes

1 (https://www.gephebase.org/search-criteria?/or+Gene Gephebase=^opsin - rhodopsin1 (RH1)^/and+Taxon ID=^9397^/or+Gene Gephebase=^opsin - rhodopsin1 (RH1)^/and+Taxon ID=^9413^#gephebase-summary-title)

EXTERNAL LINKS

COMMENTS