

GEPHE SUMMARY

Gephebase Gene		GepheID
opsin - rhodopsin1 (RH1) (https://www.gephebase.org/search-criteria?/and+Gene Gephebase="opsin - rhodopsin1 (RH1)"#gephebase-summary-title)		GP00000788
Entry Status		Main curator
Published		

PHENOTYPIC CHANGE

Trait Category			
Physiology (https://www.gephebase.org/search-criteria?/and+Trait Category="Physiology"#gephebase-summary-title)		Trait	
Color vision (blue-shift) (<a color"="" href="https://www.gephebase.org/search-criteria?/and+Trait=">https://www.gephebase.org/search-criteria?/and+Trait="Color vision (blue-shift)"#gephebase-summary-title)		Trait State in Taxon A	
Mammal ancestor		Trait State in Taxon B	
Loxodonta africana and Elephas maximus		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		Taxon B	
Mammalia		Elephantidae	
(https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms="Mammalia"#gephebase-summary-title)		(https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms="Elephantidae"#gephebase-summary-title)	
Common Name		Common Name	
mammals		elephants	
Synonyms		Synonyms	
mammals		elephants	
Rank		Rank	
class		family	
Lineage		Lineage	
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota		cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Mammalia; Theria; Eutheria; Afrotheria; Proboscidea	
Parent		Parent	
Amniota (amniotes) - (Rank: no rank) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=32524)		Proboscidea (elephants) - (Rank: order) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9779)	
NCBI Taxonomy ID		NCBI Taxonomy ID	
40674 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=40674)		9780 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9780)	
is Taxon A an Intraspecies?		is Taxon B an Intraspecies?	
No		No	

GENOTYPIC CHANGE

Generic Gene Name		UniProtKB Homo sapiens
RHO		P08100 (http://www.uniprot.org/uniprot/P08100)
Synonyms		GenebankID or UniProtKB
RP4; OPN2; CSNBAD1		NP_001267791 (https://www.ncbi.nlm.nih.gov/nuccore/NP_001267791)
String		
9606.ENSPP00000296271 (http://string-db.org/newstring.cgi/show_network_section.pl?identifier=9606.ENSPP00000296271)		
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		

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

Elephants and human color-blind deuteranopes have identical sets of visual pigments. (2005) (<https://pubmed.ncbi.nlm.nih.gov/15781694>)

Authors

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Abstract

Being the largest land mammals, elephants have very few natural enemies and are active during both day and night. Compared with those of diurnal and nocturnal animals, the eyes of elephants and other arrhythmic species, such as many ungulates and large carnivores, must function in both the bright light of day and dim light of night. Despite their fundamental importance, the roles of photosensitive molecules, visual pigments, in arrhythmic vision are not well understood. Here we report that elephants (*Loxodonta africana* and *Elephas maximus*) use RH1, SWS1, and LWS pigments, which are maximally sensitive to 496, 419, and 552 nm, respectively. These light sensitivities are virtually identical to those of certain "color-blind" people who lack MWS pigments, which are maximally sensitive to 530 nm. During the day, therefore, elephants seem to have the dichromatic color vision of deuteranopes. During the night, however, they are likely to use RH1 and SWS1 pigments and detect light at 420-490 nm.

Additional References

RELATED GEPHE

	Related Genes
3	(opsin - (SWS1), opsin - rhodopsin (LWS), opsin - rhodopsin (MWS=duplicate of LWS)) (https://www.gephebase.org/search-criteria?/or+Taxon ID=~40674~/and+Trait=Color vision/or+Taxon ID=~9780~/and+Trait=Color vision/and+groupHaplotypes=true#gephebase-summary-title)
	Related Haplotypes
6	(https://www.gephebase.org/search-criteria?/or+Gene Gephebase=~opsin - rhodopsin1 (RH1)~/and+Taxon ID=~40674~/or+Gene Gephebase=~opsin - rhodopsin1 (RH1)~/and+Taxon ID=~9780~/#gephebase-summary-title)

EXTERNAL LINKS

COMMENTS