

GEPHE SUMMARY

Gephebase Gene
 opsin - (SWS1) ([https://www.gephebase.org/search-criteria?/and+Gene+Gephebase=^opsin-\(SWS1\)^#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Gene+Gephebase=^opsin-(SWS1)^#gephebase-summary-title))
 GP00000766
 Entry Status
 Martin
 Published
 GepheID
 Main curator

PHENOTYPIC CHANGE

Trait Category
 Physiology (<https://www.gephebase.org/search-criteria?/and+Trait+Category=^Physiology^#gephebase-summary-title>)
 Trait
 Color vision (violet-shift) ([https://www.gephebase.org/search-criteria?/and+Trait=^Color+vision+\(violet-shift\)^#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Trait=^Color+vision+(violet-shift)^#gephebase-summary-title))
 Trait State in Taxon A
 Other marsupials
 Trait State in Taxon B
 Macropodidae (wallaby; quenda; quokka)
 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	Latin Name	Taxon B	Latin Name
Metatheria (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Metatheria^#gephebase-summary-title)	Macropodidae (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Macropodidae^#gephebase-summary-title)		
Common Name marsupials	Common Name -	Common Name -	Common Name -
Synonyms Marsupialia; marsupials	Synonyms -	Synonyms -	Synonyms -
Rank no rank	Rank family	Rank -	Rank -
Lineage cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Mammalia; Theria	Lineage cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Mammalia; Theria; Metatheria;	Lineage cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Mammalia; Theria; Metatheria;	Lineage cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Mammalia; Theria; Metatheria;
Parent Theria () - (Rank: no rank) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=32525)	Parent Diprotodontia () - (Rank: order) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=38609)	Parent -	Parent -
NCBI Taxonomy ID 9263 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9263)	NCBI Taxonomy ID 9307 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9307)	NCBI Taxonomy ID -	NCBI Taxonomy ID -
is Taxon A an Intraspecies? No	is Taxon A an Intraspecies? No	is Taxon B an Intraspecies? -	is Taxon B an Intraspecies? -

GENOTYPIC CHANGE

Generic Gene Name
 OPN1SW
 P03999 (<http://www.uniprot.org/uniprot/P03999>)
 Synonyms
 BCP; BOP; CBT
 ()
 String
 9606.ENSP00000249389
 (http://string-db.org/newstring.cgi/show_network_section.pl?identifier=9606.ENSP00000249389)
 Sequence Similarities
 Belongs to the G-protein coupled receptor 1 family. Opsin subfamily.
 GO - Molecular Function
 GO:0038023 : signaling receptor activity
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0038023>)
 GO:0008020 : G protein-coupled photoreceptor activity
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0008020>)
 GO - Biological Process
 GO:0007165 : signal transduction (<https://www.ebi.ac.uk/QuickGO/term/GO:0007165>)
 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: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 - 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](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](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](https://www.gephebase.org/search-criteria?/and+Aberration+Type+SNP^#gephebase-summary-title))

SNP Coding Change

Nonsynonymous

Molecular Details of the Mutation

F86Y

Experimental Evidence

Candidate Gene ([https://www.gephebase.org/search-criteria?/and+Experimental Evidence+Candidate Gene^#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Experimental+Evidence+Candidate+Gene^#gephebase-summary-title))

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

Main Reference

The cone visual pigments of an Australian marsupial, the tammar wallaby (*Macropus eugenii*): sequence, spectral tuning, and evolution. (2003) (<https://pubmed.ncbi.nlm.nih.gov/12885969>)

Authors

Deeb SS; Wakefield MJ; Tada T; Marotte L; Yokoyama S; Marshall Graves JA

Abstract

Studies on marsupial color vision have been limited to very few species. There is evidence from behavioral, electroretinographic (ERG), and microspectrophotometric (MSP) measurements for the existence of both dichromatic and trichromatic color vision. No studies have yet investigated the molecular mechanisms of spectral tuning in the visual pigments of marsupials. Our study is the first to determine the mRNA sequence, infer the amino acid sequence, and determine, by in vitro expression, the spectra of the cone opsins of a marsupial, the tammar wallaby (*Macropus eugenii*). This yielded some information on mechanisms and evolution of spectral tuning of these pigments. The tammar wallaby retina contains only short-wavelength sensitive (SWS) and middle-wavelength sensitive (MWS) pigment mRNAs. This predicts dichromatic color vision, which is consistent with conclusions from previous behavioral studies (Hemmi 1999). We found that the wallaby has a SWS1 class pigment of 346 amino acids. Sequence comparison with eutherian SWS pigments predicts that this SWS1 pigment absorbs maximally (lambda_{damax}) at 424 nm and, therefore, is a blue rather than a UV pigment. This (lambda_{damax}) is close to that of the in vitro-expressed wallaby SWS pigment (lambda_{damax} of 420 +/- 2 nm) and to that determined behaviorally (420 nm). The difference from the mouse UV pigment (lambda_{damax} of 359 nm) is largely accounted for by the F86Y substitution, in agreement with in vitro results comparing a variety of other SWS pigments. This suggests that spectral tuning employing F86Y substitution most likely arose independently in the marsupials and ungulates as a result of convergent evolution. An apparently different mechanism of spectral tuning of the SWS1 pigments, involving five amino acid positions, evolved in primates. The wallaby MWS pigment has 363 amino acids. Species comparisons at positions critical to spectral tuning predict a lambda_{damax} near 530 nm, which is close to that of the in vitro-expressed pigment (529 +/- 1 nm), but quite different from the value of 539 nm determined by microspectrophotometry. Introns interrupt the coding sequences of the wallaby, mouse, and human MWS pigment sequences at the same corresponding nucleotide positions. However, the length of introns varies widely among these species.

Additional References

Cone topography and spectral sensitivity in two potentially trichromatic marsupials, the quokka (*Setonix brachyurus*) and quenda (*Issoodon obesulus*). (2005)

(<https://pubmed.ncbi.nlm.nih.gov/15888411>)

RELATED GEPHE

No matches found.

Related Genes

No matches found.

Related Haplotypes

EXTERNAL LINKS

COMMENTS

