

GEPHE SUMMARY

TAS2R16 ( <a href="https://www.gephebase.org/search-criteria?/and+Gene+Gephebase=TAS2R16#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Gene+Gephebase=TAS2R16#gephebase-summary-title</a> )	Gephebase Gene	GP00001956	GepheID
Published	Entry Status	Courtier	Main curator

PHENOTYPIC CHANGE

Trait Category  
 Behavior, Physiology (<https://www.gephebase.org/search-criteria?/and+Trait+Category=Behavior/and+Trait+Category=Physiology#gephebase-summary-title>)

Trait  
 Taste sensitivity (bitter) ([https://www.gephebase.org/search-criteria?/and+Trait=Taste+sensitivity+\(bitter\)#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Trait=Taste+sensitivity+(bitter)#gephebase-summary-title))

Trait State in Taxon A  
 TAS2R16 recognizes arbutin as an inverse agonist and possibly exhibits constitutive activity

Trait State in Taxon B  
 TAS2R16 regained the ability to recognize arbutin as an agonist

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 #1	Taxon B
<p>Latin Name  <i>Varecia variegata</i>  <a href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=Varecia+variegata#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=Varecia+variegata#gephebase-summary-title</a></p> <p>Common Name            ruffed lemur</p> <p>Synonyms  <i>Lemur variegatus</i>; ruffed lemur; variegated lemur</p> <p>Rank            species</p> <p>Lineage            cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Mammalia; Theria; Eutheria; Boreoeutheria; Euarchontoglires; Primates; Strepsirrhini; Lemuriformes; Lemuridae; Varecia</p> <p>Parent  <i>Varecia</i> () - (Rank: genus)  <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9454">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9454</a></p> <p>NCBI Taxonomy ID            9455  <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9455">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9455</a></p> <p>is Taxon A an Intraspecies?            No</p>	<p>Latin Name  <i>Lemur catta</i>  <a href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=Lemur+catta#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=Lemur+catta#gephebase-summary-title</a></p> <p>Common Name            Ring-tailed lemur</p> <p>Synonyms            Ring-tailed lemur</p> <p>Rank            species</p> <p>Lineage            cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Mammalia; Theria; Eutheria; Boreoeutheria; Euarchontoglires; Primates; Strepsirrhini; Lemuriformes; Lemuridae; Lemur</p> <p>Parent  <i>Lemur</i> () - (Rank: genus)  <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9446">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9446</a></p> <p>NCBI Taxonomy ID            9447  <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9447">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9447</a></p> <p>is Taxon B an Intraspecies?            No</p>

Taxon A #2
<p>Latin Name  <i>Eulemur macaco</i>  <a href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=Eulemur+macaco#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=Eulemur+macaco#gephebase-summary-title</a></p> <p>Common Name            black lemur</p> <p>Synonyms  <i>Lemur macaco</i>; <i>Petterus macaco</i>; black lemur; <i>Eulemur macaco</i> (Linnaeus, 1766)</p> <p>Rank            species</p> <p>Lineage            cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Mammalia; Theria; Eutheria; Boreoeutheria; Euarchontoglires; Primates; Strepsirrhini; Lemuriformes; Lemuridae; Eulemur</p> <p>Parent  <i>Eulemur</i> () - (Rank: genus)  <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=13513">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=13513</a></p>

NCBI Taxonomy ID

30602

(<https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=30602>)

is Taxon A an Intraspecies?

No

Taxon A #3

Latin Name

*Eulemur flavifrons*

([#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=Eulemur+flavifrons))

Common Name

Sclater's lemur

Synonyms

*Eulemur macaco flavifrons*; Sclater's lemur; *Eulemur flavifrons* Gray, 1867

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; Euarchontoglires; Primates; Strepsirrhini; Lemuriformes; Lemuridae; *Eulemur*

Parent

*Eulemur* () - (Rank: genus)

(<https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=13513>)

NCBI Taxonomy ID

87288

(<https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=87288>)

is Taxon A an Intraspecies?

No

Taxon A #4

Latin Name

*Eulemur fulvus*

([#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=Eulemur+fulvus))

Common Name

brown lemur

Synonyms

*Lemur fulvus*; *Petterus fulvus*; brown lemur

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; Euarchontoglires; Primates; Strepsirrhini; Lemuriformes; Lemuridae; *Eulemur*

Parent

*Eulemur* () - (Rank: genus)

(<https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=13513>)

NCBI Taxonomy ID

13515

(<https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=13515>)

is Taxon A an Intraspecies?

No

GENOTYPIC CHANGE

-	Generic Gene Name	0	UniProtKB
-	Synonyms	0	GenebankID or UniProtKB
-	String		
-	Sequence Similarities		
-	GO - Molecular Function		

GO - Biological Process

GO - Cellular Component

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=))

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=))

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 Coding Change

Nonsynonymous

Molecular Details of the Mutation

Ser282Leu TCG>TTG

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=))

	Taxon A	Taxon B	Position
Codon	TCG	TTG	-
Amino-acid	Ser	Leu	-

Main Reference

A natural point mutation in the bitter taste receptor TAS2R16 causes inverse agonism of arbutin in lemur gustation. (2019) (<https://pubmed.ncbi.nlm.nih.gov/31161904>)

Authors

Itoigawa A; Hayakawa T; Suzuki-Hashido N; Imai H

Abstract

Bitter taste enables the detection of potentially harmful substances and is mediated by bitter taste receptors, TAS2Rs, in vertebrates. Few antagonists and inverse agonists of TAS2Rs have been identified, especially natural compounds. TAS2R16s in humans, apes and Old World monkeys (Catarrhini, Anthroidea) recognize  $\beta$ -glucoside analogues as specific agonists. Here, we investigated responses of TAS2R16 to  $\beta$ -glucosides in non-anthropoid primates, namely lemurs (Lemuriformes, Strepsirrhini). Salicin acted as an agonist on lemur TAS2R16. Arbutin acted as an agonist in the ring-tailed lemur (*Lemur catta*) but as an inverse agonist in black lemur (*Eulemur macaco*) and black-and-white ruffed lemur (*Varecia variegata*). We identified a strepsirrhine-specific amino acid substitution responsible for the inverse agonism of arbutin. In a food preference test, salicin bitterness was inhibited by arbutin in the black lemur. Structural modelling revealed this locus was important for a rearrangement of the intracellular end of transmembrane helix 7 (TM7). Accordingly, arbutin is the first known natural inverse agonist of TAS2Rs, contributing to our understanding of receptor-ligand interactions and the molecular basis of the unique feeding habit diversification in lemurs. Furthermore, the identification of a causal point mutation suggests that TAS2R can acquire functional changes according to feeding habits and environmental conditions.

Additional References

## RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

1 ([https://www.gephebase.org/search-criteria?/or+Gene Gephebase="+TAS2R16^/and+Taxon ID="+9455^/or+Gene Gephebase="+TAS2R16^/and+Taxon ID="+30602^/or+Gene Gephebase="+TAS2R16^/and+Taxon ID="+87288^/or+Gene Gephebase="+TAS2R16^/and+Taxon ID="+13515^/or+Gene Gephebase="+TAS2R16^/and+Taxon ID="+9447^"#gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Gene+Gephebase=))

## EXTERNAL LINKS

## COMMENTS