

## GEPHE SUMMARY

|                                                                                                                                                                                                                                                         | Gephebase Gene | GepheID      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------|
| GLUD2 retrogene ( <a href="https://www.gephebase.org/search-criteria?/and+Gene+Gephebase%3DGLUD2+retrogene%3D#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Gene+Gephebase%3DGLUD2+retrogene%3D#gephebase-summary-title</a> ) | GP00000405     |              |
|                                                                                                                                                                                                                                                         | Entry Status   | Main curator |
| Published                                                                                                                                                                                                                                               |                |              |

## PHENOTYPIC CHANGE

|                                                                                                                                                                                                                                                                                                                                                                                                         |  |                                                                                                                                                                                                                                                                                                                                                      |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Physiology ( <a href="https://www.gephebase.org/search-criteria?/and+Trait+Category=^Physiology^#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Trait+Trait Category=^Physiology^#gephebase-summary-title</a> )                                                                                                                                                                |  | Trait Category                                                                                                                                                                                                                                                                                                                                       |  |
| Gene expression change (novel expression domain in testicles and brain) ( <a href="https://www.gephebase.org/search-criteria?/and+Trait=^Gene expression change (novel expression domain in testicles and brain)^#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Trait=^Gene expression change (novel expression domain in testicles and brain)^#gephebase-summary-title</a> ) |  | Trait                                                                                                                                                                                                                                                                                                                                                |  |
| Hominoids                                                                                                                                                                                                                                                                                                                                                                                               |  | Trait State in Taxon A                                                                                                                                                                                                                                                                                                                               |  |
| other mammals                                                                                                                                                                                                                                                                                                                                                                                           |  | Trait State in Taxon B                                                                                                                                                                                                                                                                                                                               |  |
| Taxon A                                                                                                                                                                                                                                                                                                                                                                                                 |  | Ancestral State                                                                                                                                                                                                                                                                                                                                      |  |
| Intergeneric or Higher ( <a href="https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=^Intergeneric or Higher^#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxonomic Status=^Intergeneric or Higher^#gephebase-summary-title</a> )                                                                                                                              |  | Taxonomic Status                                                                                                                                                                                                                                                                                                                                     |  |
| Taxon A                                                                                                                                                                                                                                                                                                                                                                                                 |  | Taxon B                                                                                                                                                                                                                                                                                                                                              |  |
| Mammalia                                                                                                                                                                                                                                                                                                                                                                                                |  | Hominidae                                                                                                                                                                                                                                                                                                                                            |  |
| ( <a href="https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Mammalia^#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Mammalia^#gephebase-summary-title</a> )                                                                                                                                                                             |  | ( <a href="https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Hominidae^#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Hominidae^#gephebase-summary-title</a> )                                                                                                                        |  |
| Common Name                                                                                                                                                                                                                                                                                                                                                                                             |  | Common Name                                                                                                                                                                                                                                                                                                                                          |  |
| mammals                                                                                                                                                                                                                                                                                                                                                                                                 |  | great apes                                                                                                                                                                                                                                                                                                                                           |  |
| Synonyms                                                                                                                                                                                                                                                                                                                                                                                                |  | Synonyms                                                                                                                                                                                                                                                                                                                                             |  |
| mammals                                                                                                                                                                                                                                                                                                                                                                                                 |  | Pongidae; great apes; Hominidae Gray, 1825                                                                                                                                                                                                                                                                                                           |  |
| 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; Boreoeutheria; Euarchontoglires; Primates; Haplorrhini; Simiiformes; Catarrhini; Hominoidea |  |
| Parent                                                                                                                                                                                                                                                                                                                                                                                                  |  | Parent                                                                                                                                                                                                                                                                                                                                               |  |
| Amniota (amniotes) - (Rank: no rank) ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 32524">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 32524</a> )                                                                                                                                                                                                            |  | Hominoidea (apes) - (Rank: superfamily) ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 314295">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 314295</a> )                                                                                                                                                    |  |
| NCBI Taxonomy ID                                                                                                                                                                                                                                                                                                                                                                                        |  | NCBI Taxonomy ID                                                                                                                                                                                                                                                                                                                                     |  |
| 40674                                                                                                                                                                                                                                                                                                                                                                                                   |  | 9604                                                                                                                                                                                                                                                                                                                                                 |  |
| ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 40674">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 40674</a> )                                                                                                                                                                                                                                                 |  | ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 9604">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 9604</a> )                                                                                                                                                                                                |  |
| is Taxon A an Intraspecies?                                                                                                                                                                                                                                                                                                                                                                             |  | is Taxon B an Intraspecies?                                                                                                                                                                                                                                                                                                                          |  |
| No                                                                                                                                                                                                                                                                                                                                                                                                      |  | No                                                                                                                                                                                                                                                                                                                                                   |  |

## GENOTYPIC CHANGE

|                                                                                                                                                                                                                                 |                         |                                                                                                                        |                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|------------------------------------------------------------------------------------------------------------------------|-------------------------|
| GLUD2                                                                                                                                                                                                                           | Generic Gene Name       | P49448 ( <a href="http://www.uniprot.org/uniprot/P49448">http://www.uniprot.org/uniprot/P49448</a> )                   | UniProtKB Homo sapiens  |
| GDH2; GLUDP1                                                                                                                                                                                                                    | Synonyms                | AAH05111 ( <a href="https://www.ncbi.nlm.nih.gov/nuccore/AAH05111">https://www.ncbi.nlm.nih.gov/nuccore/AAH05111</a> ) | GenebankID or UniProtKB |
| 9606.ENSPO0000327589<br>( <a href="http://string-db.org/newstring.cgi/show_network_section.pl?identifier=9606.ENSPO0000327589">http://string-db.org/newstring.cgi/show_network_section.pl?identifier=9606.ENSPO0000327589</a> ) | String                  |                                                                                                                        |                         |
|                                                                                                                                                                                                                                 | Sequence Similarities   |                                                                                                                        |                         |
| Belongs to the Glu/Leu/Phe/Val dehydrogenases family.                                                                                                                                                                           |                         |                                                                                                                        |                         |
|                                                                                                                                                                                                                                 | GO - Molecular Function |                                                                                                                        |                         |
| GO:0043531 : ADP binding ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0043531">https://www.ebi.ac.uk/QuickGO/term/GO:0043531</a> )                                                                                          |                         |                                                                                                                        |                         |
| GO:0005525 : GTP binding ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0005525">https://www.ebi.ac.uk/QuickGO/term/GO:0005525</a> )                                                                                          |                         |                                                                                                                        |                         |
| GO:0004352 : glutamate dehydrogenase (NAD+) activity<br>( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0004352">https://www.ebi.ac.uk/QuickGO/term/GO:0004352</a> )                                                           |                         |                                                                                                                        |                         |
| GO:0004353 : glutamate dehydrogenase [NAD(P)+] activity<br>( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0004353">https://www.ebi.ac.uk/QuickGO/term/GO:0004353</a> )                                                        |                         |                                                                                                                        |                         |

GO:0070728 : leucine binding (<https://www.ebi.ac.uk/QuickGO/term/GO:0070728>)  
GO - Biological Process

GO:0055114 : oxidation-reduction process  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0055114>)  
GO:0006537 : glutamate biosynthetic process  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0006537>)  
GO:0006538 : glutamate catabolic process  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0006538>)  
GO:0006536 : glutamate metabolic process  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0006536>)

GO - Cellular Component

GO:0005739 : mitochondrion (<https://www.ebi.ac.uk/QuickGO/term/GO:0005739>)

Presumptive Null

No (<https://www.gephebase.org/search-criteria?/and+Presumptive Null=~No~#gephebase-summary-title>)

Molecular Type

Gene Amplification (<https://www.gephebase.org/search-criteria?/and+Molecular Type=~Gene Amplification~#gephebase-summary-title>)

Aberration Type

Complex Change (<https://www.gephebase.org/search-criteria?/and+Aberration Type=~Complex Change~#gephebase-summary-title>)

Molecular Details of the Mutation

Retroduplication; + E7K enhancing mitochondrial targeting

Experimental Evidence

Candidate Gene (<https://www.gephebase.org/search-criteria?/and+Experimental Evidence=~Candidate Gene~#gephebase-summary-title>)

Main Reference

Birth and adaptive evolution of a hominoid gene that supports high neurotransmitter flux. (2004) (<https://pubmed.ncbi.nlm.nih.gov/15378063>)

Authors

Burki F; Kaessmann H

Abstract

The enzyme glutamate dehydrogenase (GDH) is important for recycling the chief excitatory neurotransmitter, glutamate, during neurotransmission. Human GDH exists in housekeeping and brain-specific isotypes encoded by the genes GLUD1 and GLUD2, respectively. Here we show that GLUD2 originated by retroposition from GLUD1 in the hominoid ancestor less than 23 million years ago. The amino acid changes responsible for the unique brain-specific properties of the enzyme derived from GLUD2 occurred during a period of positive selection after the duplication event.

Additional References

Mitochondrial targeting adaptation of the hominoid-specific glutamate dehydrogenase driven by positive Darwinian selection. (2008) (<https://pubmed.ncbi.nlm.nih.gov/18688271>)

RELATED GEPHE

Related Genes

2 (FoxP2, Prolactin (deciduous Prolactin; dPRL)) (<https://www.gephebase.org/search-criteria?/or+Taxon ID=~40674~/and+Trait=Gene expression change/or+Taxon ID=~9604~/and+Trait=Gene expression change/and+groupHaplotypes=true#gephebase-summary-title>)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS