GLA galactosidase alpha [*Homo sapiens* (human)]

Download Datasets

Gene ID: 2717, updated on 12-Sep-2024

Summary

Official Symbol	GLA provided by HGNC
Official Full Name	galactosidase alpha provided by HGNC
Primary source	HGNC:HGNC:4296
See related	Ensembl:ENSG00000102393 MIM:300644; AllianceGenome:HGNC:4296
Gene type	protein coding
RefSeq status	REVIEWED
Organism	Homo sapiens
Lineage	Eukaryota; Metazoa; Chordata; Craniata; Vertebrata; Euteleostomi; Mammalia; Eutheria; Euarchontoglires; Primates; Haplorrhini; Catarrhini; Hominidae; Homo
Also known as	GALA
Summary	This gene encodes a homodimeric glycoprotein that hydrolyses the terminal alpha-galactosyl moieties from glycolipids and glycoproteins. This enzyme predominantly hydrolyzes ceramide trihexoside, and it can catalyze the hydrolysis of melibiose into galactose and glucose. A variety of mutations in this gene affect the synthesis, processing, and stability of this enzyme, which causes Fabry disease, a rare lysosomal storage disorder that results from a failure to catabolize alpha-D-galactosyl glycolipid moieties. [provided by RefSeq, Jul 2008]
Expression	Ubiquitous expression in bone marrow (RPKM 16.8), placenta (RPKM 14.4) and 25 other tissues See more
Orthologs	mouse all

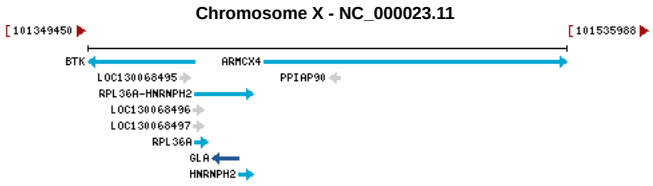
NEW **Try the new Gene table**
Try the new Transcript table

Genomic context

Location: Xq22.1

Exon count: 10

Annotation release	Status	Assembly	Chr	Location
RS_2024_08	current	GRCh38.p14 (GCF_000001405.40)	X	NC_000023.11 (101397803..101407925, complement)
RS_2024_08	current	T2T-CHM13v2.0 (GCF_009914755.1)	X	NC_060947.1 (99841918..99852040, complement)
RS_2024_09	previous assembly	GRCh37.p13 (GCF_000001405.25)	X	NC_000023.10 (100652791..100662913, complement)

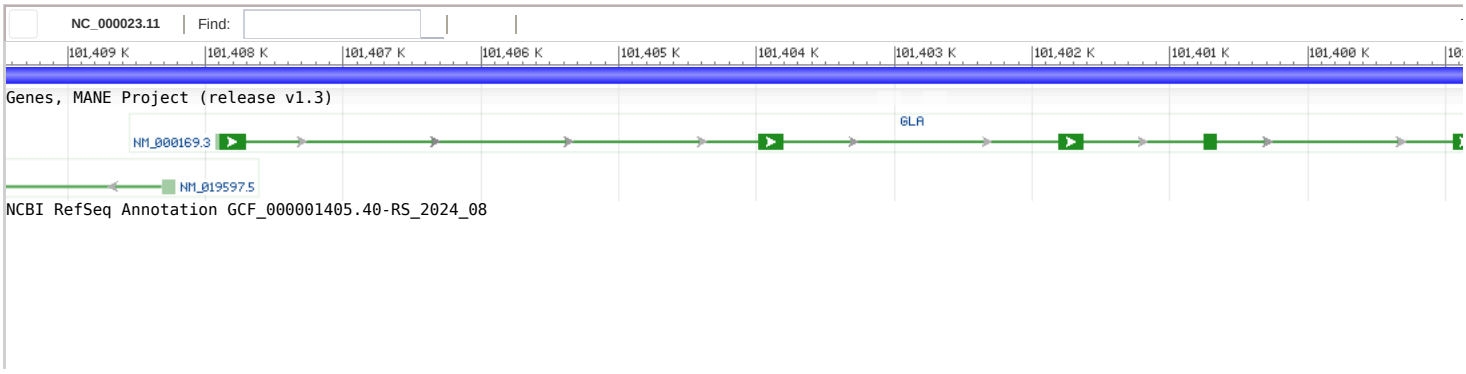


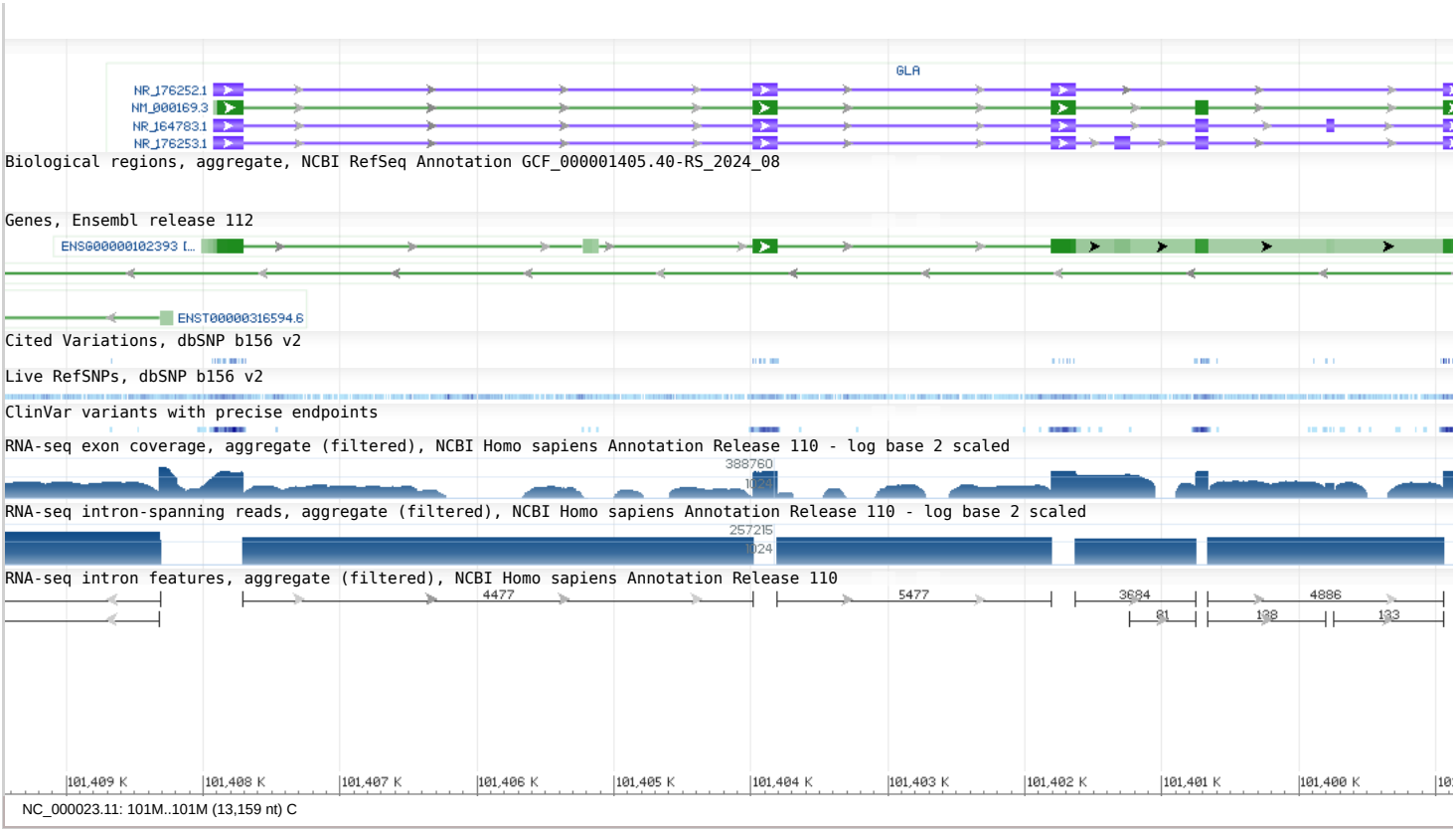
Genomic regions, transcripts, and products

Go to reference sequence details

Genomic Sequence: NC_000023.11 Chromosome X Reference GRCh38.p14 Primary Assembly

Go to nucleotide: Graphics FASTA GenBank



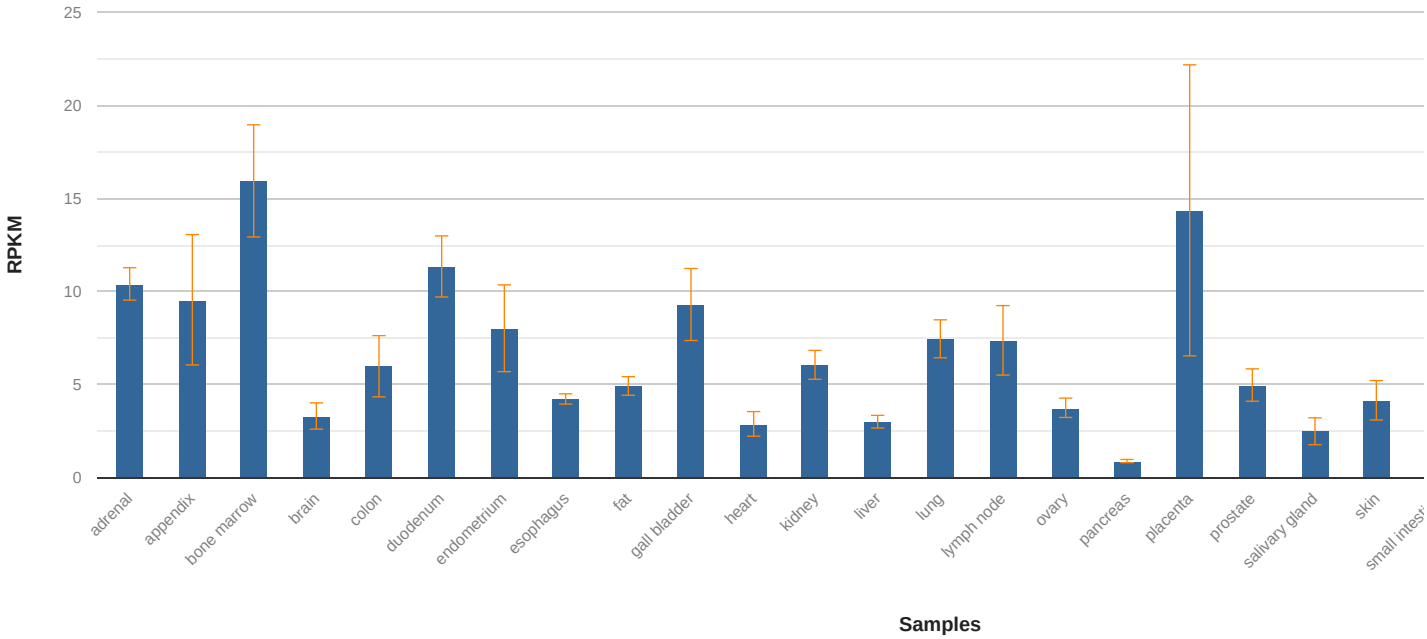


Expression

See details

HPA RNA-seq normal tissues

- Project title: HPA RNA-seq normal tissues HPA RNA-seq normal tissues
- Description: RNA-seq was performed of tissue samples from 95 human individuals representing 27 different tissues in order to determine tissue-specificity of all protein-coding genes
- BioProject: PRJEB4337
- Publication: PMID 24309898
- Analysis date: Wed Apr 4 07:08:55 2018



Bibliography

Related articles in PubMed

1. Late-onset and classic phenotypes of Fabry disease in males with the GLA-Thr410Ala mutation.
   Valtola K, *et al*. Open Heart, 2023 Mar. PMID 36927868, **Free PMC Article**

2. D313Y Variant in Fabry Disease: A Systematic Review and Meta-analysis.
   Palaiodimou L, *et al*. Neurology, 2022 Nov 8. PMID 36344272
3. A theoretical study on binding and stabilization of galactose and novel galactose analogues to the human α-galactosidase A variant causing Fabry disease.
   Klaewkla M, *et al*. Biophys Chem, 2023 Jan. PMID 36334502
4. Aseptic meningitis in Fabry disease due to a novel GLA variant: an expanded phenotype?
   Nóbrega PR, *et al*. Neurol Sci, 2023 Jan. PMID 36094773
5. p.R220L Is a Likely Pathogenic Novel GLA Gene Mutation Responsible for Fabry Disease.
   Barman HA, *et al*. Anatol J Cardiol, 2022 May. PMID 35552179, **Free PMC Article**

See all (275) citations in PubMed

GeneRIFs: Gene References Into Functions

What's a GeneRIF?

1. D313Y variant in two related end-stage renal disease patients - Pathogenic or not yet?
2. GLA Mutations Suppress Autophagy and Stimulate Lysosome Generation in Fabry Disease.
3. Prevalence of Fabry disease and GLA variants in young patients with acute stroke: The challenge to widen the screening. The Fabry-Stroke Italian Registry.
4. Impact of GLA Variant Classification on the Estimated Prevalence of Fabry Disease: A Systematic Review and Meta-Analysis of Screening Studies.
5. c.376A>G, (p.Ser126Gly) Alpha-Galactosidase A mutation induces ER stress, unfolded protein response and reduced enzyme trafficking to lysosome: Possible relevance in the pathogenesis of late-onset forms of Fabry Disease.
6. Asn215Ser, Ala143Thr, and Arg112Cys variants in alpha-galactosidase A protein confer stability loss in Fabry's disease.
7. Enzymatic properties and clinical associations of serum alpha-galactosidase A in Parkinson's disease.
8. Late-onset fabry disease due to the p.Phe113Leu variant: the first italian cluster of five families.
9. All reported non-canonical splice site variants in GLA cause aberrant splicing.
10. Late-onset and classic phenotypes of Fabry disease in males with the GLA-Thr410Ala mutation.

Submit: New GeneRIF Correction See all GeneRIFs (175)

Phenotypes

BioGRID CRISPR Screen Phenotypes (11 hits/898 screens)

Find tests for this gene in the NIH Genetic Testing Registry (GTR)

Review eQTL and phenotype association data in this region using PheGenI

Professional guidelines

Description
Professional guideline ACMG 2013 The ACMG recommends that laboratories performing clinical sequencing seek and report mutations in GLA that are pathogenic or expected to be pathogenic. Guideline, PubMed

Associated conditions

Description	Tests
Fabry disease MedGen: C0002986, OMIM: 301500, GeneReviews: Fabry Disease	Compare labs

Copy number response

Description
Copy number response Triplosensitivity No evidence available (Last evaluated 2021-03-24) ClinGen Genome Curation Page
Haploinsufficency Sufficient evidence for dosage pathogenicity (Last evaluated 2021-03-24) ClinGen Genome Curation Page, PubMed

Variation

See variants in ClinVar

See studies and variants in dbVar

See Variation Viewer (GRCh37.p13)

See Variation Viewer (GRCh38)

Pathways from PubChem

14 items Download

Metabolism
Data Source: Reactome External ID: R-HSA-1430728
Taxonomy Name: Homo sapiens (human)

Metabolism of lipids
Data Source: Reactome External ID: R-HSA-556833
Taxonomy Name: Homo sapiens (human)

Sphingolipid metabolism
Data Source: Reactome External ID: R-HSA-428157
Taxonomy Name: Homo sapiens (human)

Glycosphingolipid metabolism
Data Source: Reactome External ID: R-HSA-1660662
Taxonomy Name: Homo sapiens (human)

Ciliary landscape
Data Source: WikiPathways External ID: WP4352
Taxonomy Name: Homo sapiens (human)

Galactose Metabolism
Data Source: PathBank External ID: SMP0000043
Taxonomy Name: Homo sapiens (human)

Sphingolipid Metabolism
Data Source: PathBank External ID: SMP0000034
Taxonomy Name: Homo sapiens (human)

Galactosemia
Data Source: PathBank External ID: SMP0000182
Taxonomy Name: Homo sapiens (human)

Gaucher Disease
Data Source: PathBank External ID: SMP0000349
Taxonomy Name: Homo sapiens (human)

Globoid Cell Leukodystrophy
Data Source: PathBank External ID: SMP0000348
Taxonomy Name: Homo sapiens (human)

Metachromatic Leukodystrophy (MLD)
Data Source: PathBank External ID: SMP0000347
Taxonomy Name: Homo sapiens (human)

Fabry Disease
Data Source: PathBank External ID: SMP0000525
Taxonomy Name: Homo sapiens (human)

Krabbe Disease
Data Source: PathBank External ID: SMP0000526
Taxonomy Name: Homo sapiens (human)

Glycosphingolipid catabolism
Data Source: Reactome External ID: R-HSA-9840310
Taxonomy Name: Homo sapiens (human)

PubChem

Interactions

Items 1 - 25 of 65 << First < Prev Page 1 of 3 Next > Last >>

Products	Interactant	Other Gene	Complex	Source	Pubs	Description
P06280	P06280	GLA	-	HPRD	PubMed	
BioGRID:108981	BioGRID:106990	ALDH7A1	-	BioGRID	PubMed	Co-fractionation
BioGRID:108981	BioGRID:136328	ALG11	-	BioGRID	PubMed	Affinity Capture-MS

Products	Interactant	Other Gene	Complex	Source	Pubs	Description
BioGRID:108981	BioGRID:123663	ARHGAP24		BioGRID	PubMed	Affinity Capture-MS
BioGRID:108981	BioGRID:107271	CANX		BioGRID	PubMed	Affinity Capture-MS
BioGRID:108981	BioGRID:107273	CAPN1		BioGRID	PubMed	Co-fractionation
BioGRID:108981	BioGRID:116875	CLEC16A		BioGRID	PubMed	Affinity Capture-MS
BioGRID:108981	BioGRID:120866	CNDP2		BioGRID	PubMed	Co-fractionation
BioGRID:108981	BioGRID:120724	CNOT11		BioGRID	PubMed	Affinity Capture-MS
BioGRID:108981	BioGRID:110910	CNOT2		BioGRID	PubMed	Affinity Capture-MS
BioGRID:108981	BioGRID:121542	CNOT6		BioGRID	PubMed	Affinity Capture-MS
BioGRID:108981	BioGRID:114030	CUL3		BioGRID	PubMed	Affinity Capture-MS
BioGRID:108981	BioGRID:115776	DDX17		BioGRID	PubMed	Co-fractionation
BioGRID:108981	BioGRID:115034	DEPDC5		BioGRID	PubMed	Affinity Capture-MS
BioGRID:108981	BioGRID:108137	DPP4		BioGRID	PubMed	Affinity Capture-MS
BioGRID:108981	BioGRID:125185	EGLN3		BioGRID	PubMed	Affinity Capture-MS
BioGRID:108981	BioGRID:113297	EIF4H		BioGRID	PubMed	Co-fractionation
BioGRID:108981	BioGRID:108298	EIF5		BioGRID	PubMed	Co-fractionation
BioGRID:108981	BioGRID:121294	FAM20C		BioGRID	PubMed	Affinity Capture-MS
BioGRID:108981	BioGRID:117654	FBXO6		BioGRID	PubMed	Affinity Capture-MS
BioGRID:108981	BioGRID:115237	G3BP2		BioGRID	PubMed	Affinity Capture-MS
BioGRID:108981	BioGRID:108814	G6PD		BioGRID	PubMed	Co-fractionation
BioGRID:108981	BioGRID:108904	GBP2		BioGRID	PubMed	Co-fractionation
BioGRID:108981	BioGRID:109061	GNS		BioGRID	PubMed	Co-fractionation
BioGRID:108981	BioGRID:109367	HLA-DRA		BioGRID	PubMed	Affinity Capture-MS

Items 1 - 25 of 65 << First < Prev Page 1 of 3 Next > Last >>

General gene information

Markers

Homology

NCBI Orthologs
Orthologs from OrthoDB

Gene Ontology Provided by GOA

Function	Evidence Code	Pubs
enables alpha-galactosidase activity	IBA	
enables alpha-galactosidase activity	IDA	PubMed
enables alpha-galactosidase activity	IMP	PubMed
enables catalytic activity	IDA	PubMed
enables galactoside binding	IEA	
enables hydrolase activity	TAS	PubMed
enables protein binding	IPI	PubMed
enables protein homodimerization activity	IDA	PubMed
enables signaling receptor binding	IDA	PubMed

Process	Evidence Code	Pubs
involved_in glycoside catabolic process	IBA	
involved_in glycosphingolipid catabolic process	IDA	PubMed
involved_in glycosphingolipid catabolic process	IMP	PubMed
involved_in glycosphingolipid catabolic process	TAS	PubMed
involved_in glycosylceramide catabolic process	ISS	
involved_in negative regulation of nitric oxide biosynthetic process	ISS	
involved_in negative regulation of nitric-oxide synthase activity	ISS	
involved_in oligosaccharide metabolic process	IBA	
involved_in oligosaccharide metabolic process	IDA	PubMed

Component	Evidence Code	Pubs
located_in Golgi apparatus	IMP	PubMed
located_in azurophil granule lumen	TAS	
is_active_in cytoplasm	IBA	
located_in cytoplasm	IMP	PubMed
located_in extracellular exosome	HDA	PubMed
located_in extracellular region	IDA	PubMed
located_in extracellular region	IMP	PubMed
located_in extracellular region	TAS	
located_in lysosomal lumen	TAS	
located_in lysosome	IMP	PubMed
located_in lysosome	TAS	PubMed

General protein information

Preferred Names
alpha-galactosidase A

Names
agalsidase alfa
alpha-D-galactosidase A
alpha-D-galactoside galactohydrolase 1
alpha-gal A
galactosylgalactosylglucosylceramidase GLA
melibiase

NP_000160.1

EC 3.2.1.22

NP_001393676.1

EC 3.2.1.22

NP_001393677.1

EC 3.2.1.22

NP_001393678.1

EC 3.2.1.22

XP_047297946.1

EC 3.2.1.22

XP_054182808.1

EC 3.2.1.22

NCBI Reference Sequences (RefSeq)

NEW **Try the new Transcript table**

RefSeqs maintained independently of Annotated Genomes

These reference sequences exist independently of genome builds. Explain

Genomic

1. **NG_007119.1 RefSeqGene**

Range	4951..15173
Download	GenBank, FASTA, Sequence Viewer (Graphics), LRG_672

mRNA and Protein(s)

1. **NM_000169.3** → **NP_000160.1** **alpha-galactosidase A isoform b precursor**

See identical proteins and their annotated locations for NP_000160.1

Status: REVIEWED

Source sequence(s)	AL035422, BC002689, DB370480
Consensus CDS	CCDS14484.1
UniProtKB/Swiss-Prot	P06280, Q6LER7
UniProtKB/TrEMBL	Q53HF3, Q53Y83
Related	ENSP00000218516.4, ENST00000218516.4

Conserved Domains (1) summary

		Melibiase_2; Alpha galactosidase A

	pfam16499 Location:39 → 411

2. **NM_001406747.1 → NP_001393676.1 alpha-galactosidase A isoform a precursor**

   Status: REVIEWED

Source sequence(s)	AL035422
UniProtKB/TrEMBL	A0A3B3IUC4, A0AA34QW02
Related	ENSP00000498186.1, ENST00000649178.1

3. **NM_001406748.1 → NP_001393677.1 alpha-galactosidase A isoform c precursor**

   Status: REVIEWED

Source sequence(s)	AL035422
UniProtKB/TrEMBL	A0A6Q8PHD1
Related	ENSP00000502629.2, ENST00000674634.2

4. **NM_001406749.1 → NP_001393678.1 alpha-galactosidase A isoform d precursor**

   Status: REVIEWED

Source sequence(s)	AL035422
UniProtKB/TrEMBL	B4DLT5

RNA

1. **NR_164783.1 RNA Sequence**

   Status: REVIEWED

Source sequence(s)	AL035422
Related	ENST00000493905.6

2. **NR_176252.1 RNA Sequence**

   Status: REVIEWED

Source sequence(s)	AL035422
Related	ENST00000480513.6

3. **NR_176253.1 RNA Sequence**

   Status: REVIEWED

Source sequence(s)	AL035422
Related	ENST00000486121.7

RefSeqs of Annotated Genomes: GCF_000001405.40-RS_2024_08

The following sections contain reference sequences that belong to a specific genome build. Explain

Reference GRCh38.p14 Primary Assembly

Genomic

1. **NC_000023.11 Reference GRCh38.p14 Primary Assembly**

Range	101397803..101407925 complement
Download	GenBank, FASTA, Sequence Viewer (Graphics)

mRNA and Protein(s)

1. **XM_047441990.1 → XP_047297946.1 alpha-galactosidase A isoform X1**

Alternate T2T-CHM13v2.0

Genomic

1. **NC_060947.1 Alternate T2T-CHM13v2.0**

Range	99841918..99852040 complement
Download	GenBank, FASTA, Sequence Viewer (Graphics)

mRNA and Protein(s)

1. **XM_054326833.1 → XP_054182808.1 alpha-galactosidase A isoform X1**

Related sequences

Nucleotide		Protein
Heading	Accession and Version	
genomic	AL035422.12 (79567..89789)	None
genomic	CH471115.1	EAX02862.1
		EAX02863.1
genomic	CP068255.2 (99841918..99852040)	None
genomic	KU508439.1 (69..359)	None
genomic	LC061278.1	BAT62474.1
genomic	LT599481.1	None
genomic	M13571.1	AAA51676.1
genomic	M18242.1	AAA52514.1
genomic	M20317.1	AAA52559.1
genomic	U78027.1	AAB64203.1
genomic	X14448.1	CAA32617.1
mRNA	AK222627.1	BAD96347.1
mRNA	AK291095.1	BAF83784.1
mRNA	AK297148.1	BAG59647.1
mRNA	BC002689.2	AAH02689.1
mRNA	BT006864.1	AAP35510.1
mRNA	D00039.1	BAA34059.1
mRNA	DB370480.1	None
mRNA	X05790.1	CAA29232.1
mRNA	X16889.1	None

Protein Accession	Links	
	GenPept Link	UniProtKB Link
P06280.1	GenPept	UniProtKB/Swiss-Prot:P06280

Additional links

Locus-specific Databases

- CCHMC - Human Genetics Mutation Database
- GLA @ LOVD

Gene LinkOut