

# ST6Gal I

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## Summary Sentence

ST6Gal I is a sialyltransferase that transfers sialic acid (Sia) from CMP-Sia to C6 position of terminal galactose forming SiaAlpha2,6Galb1,4GlcNAc-sequence common to many Asparagine(N)-linked oligosaccharides

## Abstract

ST6Gal I is an enzyme belonging to the sialyltransferase family [{Tsuij\\_S/Paulson\\_JC.1996.GLYCO}](#) and forms SiaAlpha2,6Gal linkage on the GlcNAc-6S sequence present on N-linked glycoproteins. So far, 16 enzymes have been cloned [{Tsuij\\_S.1996.JBT}](#); [{Lee\\_YC/Tsuij\\_S.1999.JBC}](#); [{Okajima\\_T/Furukawa\\_K.1999.JBC}](#), each of which exhibits unique specificity for its acceptor substrates and forms one of four sialic acid linkages, namely, Neu5Aca2,6Gal, Neu5Aca2,3Gal, Neu5Aca2,6GalNAc, or Neu5Aca2,8Neu5Ac. ST6Gal I forms Neu5Aca2,6Gal linkage. This and other sialyltransferases are localized in the Golgi apparatus [{Taatzes\\_DJ/Shaper\\_JH.1987.EJCB}](#) and are type II membrane proteins with a short cytoplasmic domain, an N-terminal signal anchor, a "stem" region, and a large luminal domain that confers the catalytic activity. Another structural feature of ST6Gal I that is common among other sialyltransferases despite little homology is the presence of two conserved protein domains, termed, L- (Long) and S- (Short) sialylmotif [{Datta\\_AK/Paulson\\_JC.1997.IJBB}](#) \*. Analysis by site-directed mutagenesis showed that these two motifs are linked by an essential disulfide linkage and important for substrate binding [{Datta\\_AK/Paulson\\_JC.1995.JBC}](#); [{Datta\\_AK/Paulson\\_JC.1998.JBC}](#); [{Datta\\_AK/Paulson\\_JC.2001.JBC}](#). In addition, a very small motif of unknown function is found at the C-terminal [{Geremia\\_RA/Delannoy\\_P.1997.GLYCO}](#). No structural information, however, is available from X-ray crystallography or NMR studies. The product of this ST6Gal I, Neu5Aca2,6Galb1,4GlcNAc is shown to be the ligand of [CD22](#), a receptor present on B cells [{Powell\\_LD/Varki\\_A.1994.JBC}](#). In vivo functional study using ST6Gal I deficient mice indicated that this sialoside is essential in promoting B lymphocyte activation and immune function [{Hennot\\_T/Martha\\_JD.1998.PNASU}](#).

## Molecular Families

Families in which hST6gal 1 is a member

- hST6gal 1-->sialyltransferase -->glycosyltransferase

## Names

- SIAT1 [HUGO gene name]
- hST6gal 1 (STgal 1, ST6gal 1) [For nomenclature, {Tsuij\_S/Paulson\_JC.1996.GLYCO}]
- sialyltransferase 1
- beta-galactoside alpha-2,6-sialyltransferase (CMP-N-acetylneuraminic acid beta-galactoside alpha-2,6-sialyltransferase)

## Major Links

- **Locus Link:** <https://www.ncbi.nlm.nih.gov/LocusLink/LocRpt.cgi?l=6480>
- **OMIM Link:** <https://www.ncbi.nlm.nih.gov/entrez/dispmim.cgi?id=109675>
- **PBD Link:**
- **Other Link:** <https://www.ncbi.nlm.nih.gov/htbin-post/Entrez/query?uid=P15907&form=6&db=p&Dopt=g>

## Author's Additional Insights

No information

## Disease relevance/Function in vivo

ST6Gal I deficient mice showed symptoms of immunosuppression [{Hennet\\_T/Marth\\_JD.1998.PNASU}](#).

- The symptoms were marked with reduced serum IgM levels with attenuated antibody production to T-independent and T-dependent antigens.
- The absence of the enzyme product did not effect B cell development, however these mice showed impaired B cell proliferation in response to IgM or [CD40](#) crosslinking.
- The deficiency caused an alteration in phosphotyrosine accumulation following cross-linking of the B lymphocyte antigen receptor

## Cellular Function

- ST6Gal I is localized in trans Golgi and trans Golgi network in which it acts to add sialic acid to the oligosaccharide chains of the newly synthesized protein while in transit through Golgi [{Roth\\_J/Paulson\\_JC.1985.CELL}](#); [{Taatjes\\_DJ/Roth\\_J.1986.EJCB}](#).
- The dimeric form of this enzyme is inactive and may act as galactose-specific lectin [{Ma\\_J/Colley\\_KJ.1996.JBC}](#).
- The enzyme product Sia6LacNAc is a ligand of [CD22](#) , a receptor on B cell and shown to be essential in regulating B lymphocyte activation and immune function [{Hennet\\_T/Marth\\_JD.1998.PNASU}](#).
- NeuAc6LacNAc also plays a role in the expression of the biological activity of prolactin/growth hormone family members during rat pregnancy [{Manzella\\_SM/Baenziger\\_JU.1997.JBC}](#).

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### Protein Location

#### Families in which hST6gal 1 is a member

hST6gal 1 → sialyltransferase → glycosyltransferase

### Cellular Expression

#### Families in which hST6gal 1 is a member

hST6gal 1 → sialyltransferase → glycosyltransferase

## Gene sequence links

### Families in which hST6gal 1 is a member

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## Chromosomal location

### Families in which hST6gal 1 is a member

hST6gal 1 → sialyltransferase → glycosyltransferase

## Gene polymorphism

### Families in which hST6gal 1 is a member

hST6gal 1 → sialyltransferase → glycosyltransferase

## Transcription regulating molecules

Transcription Factor'	Comments	References
Promoter P1	Promoter P1 controls ST6Gal I expression in liver and intestinal epithelium <a href="#">{Wang_X/Lau_JT.1993.JBC}</a> ; <a href="#">{Vertino-Bell_A/Lau_JT.1994.DB}</a> . P1 activity is modulated by liver-enriched transcription factors HNF-1, DBP, and LAP <a href="#">{Svensson_EC/Paulson_JC.1992.JBC}</a> as well as by glucocorticoid <a href="#">{Wang_XC/Lau_JT.1989.JBC}</a> .	asdasdasdsad
Promoter P2	Promoter P2 region containing AP2, NF-kB, and TATA transcriptional start sites controls ST6Gal I expression in mature B cells <a href="#">{Lo_NW/Lau_JT.1996.BBRC}</a> .	<a href="#">{Lo_NW/Lau_JT.1996.BBRC}</a>
Promoter P3	Promoter P3 was shown to control expression of hST6Gal I gene during HL-60 differentiation. The activity is modulated by Sp-1 and Oct-1 <a href="#">{Taniguchi_A/Matsumoto_K.2000.GLYCO}</a> .	<a href="#">{Taniguchi_A/Matsumoto_K.2000.GLYCO}</a>

## Gene Annotation

### Families in which hST6gal 1 is a member

hST6gal 1 → sialyltransferase → glycosyltransferase

## Transcript Sequence Links

### Families in which hST6gal 1 is a member

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## Post-transcriptional Modification

### Families in which hST6gal 1 is a member

hST6gal 1 → sialyltransferase → glycosyltransferase

## Transcript Annotation

### Families in which hST6gal 1 is a member

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## Biochemical Activity

### Families in which hST6gal 1 is a member

hST6gal 1 → sialyltransferase → glycosyltransferase

## Protein Sequence Links

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## Protein Sequence Annotation

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## Protein Polymorphism

### Families in which hST6gal 1 is a member

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## Protein Physical Properties

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## Molecular Pathways

### Families in which hST6gal 1 is a member

hST6gal 1 → sialyltransferase → glycosyltransferase

## Enzymes for which this is a Substrate

### Families in which hST6gal 1 is a member

hST6gal 1 → sialyltransferase → glycosyltransferase

## Substrates

Substrate	Comments	References
Terminal GalBeta1,4GlcNAc containing N-linked glycoproteins	Terminal GalBeta1,4GlcNAc containing N-linked glycoproteins, such as, prolactin	<a href="#">{Manzella_SM/Baenziger_JU.1997.JBC}</a>
lactoferrin	NA	<a href="#">{Coddeville_B/Spik_G.1992.CR}</a>
fat globule membrane CD36	<a href="#">CD36</a>	<a href="#">{Nakata_N/Kobata_A.1993.BIOCH}</a>
HB-6	NA	<a href="#">{Bast_BJ/Tedder_TF.1992.JCB}</a>
CD75s (formerly CDw75 and CDw76)	NA	<a href="#">{Bast_BJ/Tedder_TF.1992.JCB}</a>
Various milk oligosaccharides	NA	<a href="#">{Gyorgy_P/Zilliken_F.1974.EJB}</a>

## Other Ligands and Associated Molecules

### Families in which hST6gal 1 is a member

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