

Supplementary Table S1 The sialyltransferase family

Sialyltransferase	Substrate	Structures formed	References
ST3s			
ST3Gal1	O-GP	Neu5Ac α 2-3Gal β 1-3GalNAc-	(Burchell et al 1999)
ST3Gal2	O-GP	Neu5Ac α 2-3Gal β 1-3GalNAc-	(Margetts et al 2008)
ST3Gal3	O-GP	Neu5Ac α 2-3Gal β 1-3/4GlcNAc-	(Kitagawa and Paulson 1993)
ST3Gal4	O-GP	Neu5Ac α 2-3Gal β 1-4GlcNAc-	(Carvalho et al 2010)
ST3Gal6	O-GP	Neu5Ac α 2-3Gal β 1-4GlcNAc-	(Kawamura et al 2008)
ST6s			
ST6Gal1	N-GP	Neu5Ac α 2-6Gal β 1-4GlcNAc β -	(Grundmann et al 1990)
ST6Gal2	N-GP	Neu5Ac α 2-6Gal(NAc) β 1-4GlcNAc-	(Krzewinski-Recchi et al 2003)
ST6GalNAcs			
ST6GalNAc1	O-GP	Neu5Ac α 2-6-GalNAc-Ser	(Yao et al 2022)
ST6GalNAc2	O-GP	Gal β 1-3-GalNAc-Ser Neu5Ac α 2-6	(Samyn-Petit et al 2000)
ST6GalNAc3	O-GP	Neu5Ac α 2-3Gal β 1-3GalNAc-Ser Neu5Ac α 2-6	(Lee et al 1999)
ST6GalNAc4	O-GP	Neu5Ac α 2-3Gal β 1-3GalNAc-Ser Neu5Ac α 2-6	(Harduin-Lepers et al 2000)
ST8s			
ST8Sia2	GP	Neu5Ac α 2-8)nNeu5Ac α 2-3Gal β 1-4GlcNAc-	(Kojima et al 1995)
ST8Sia3	GP	Neu5Ac α 2-8Neu5Ac α 2-6GalNAc-	(Lee et al 1998)
ST8Sia4	GP	(Neu5Ac α 2-8)nNeu5Ac α 2-3Gal β 1-4GlcNAc-	(Nakayama et al 1995)
ST8Sia6	O-GP	Neu5Ac α 2-8Neu5Ac α 2-3Gal β 1-3GalNAc	(Takashima et al 2002)

References

- Burchell J, Poulson R, Hanby A, Whitehouse C, Cooper L, Clausen H *et al* (1999). An alpha2,3 sialyltransferase (ST3Gal I) is elevated in primary breast carcinomas. *Glycobiology* **9**: 1307-1311.
- Carvalho AS, Harduin-Lepers A, Magalhães A, Machado E, Mendes N, Costa LT *et al* (2010). Differential expression of alpha-2,3-sialyltransferases and alpha-1,3/4-fucosyltransferases regulates the levels of sialyl Lewis a and sialyl Lewis x in gastrointestinal carcinoma cells. *The international journal of biochemistry & cell biology* **42**: 80-89.
- Grundmann U, Nerlich C, Rein T, Zettlmeissl G (1990). Complete cDNA sequence encoding human beta-galactoside alpha-2,6-sialyltransferase. *Nucleic acids research* **18**: 667.
- Harduin-Lepers A, Stokes DC, Steelant WF, Samyn-Petit B, Krzewinski-Recchi MA, Vallejo-Ruiz V *et al* (2000). Cloning, expression and gene organization of a human Neu5Ac alpha 2-3Gal beta 1-3GalNAc alpha 2,6-sialyltransferase: hST6GalNAcIV. *Biochem J* **352 Pt 1**: 37-48.
- Kawamura YI, Toyota M, Kawashima R, Hagiwara T, Suzuki H, Imai K *et al* (2008). DNA hypermethylation contributes to incomplete synthesis of carbohydrate determinants in gastrointestinal cancer. *Gastroenterology* **135**: 142-151.e143.
- Kitagawa H, Paulson JC (1993). Cloning and expression of human Gal beta 1,3(4)GlcNAc alpha 2,3-sialyltransferase. *Biochemical and biophysical research communications* **194**: 375-382.
- Kojima N, Yoshida Y, Tsuji S (1995). A developmentally regulated member of the sialyltransferase family (ST8Sia II, STX) is a polysialic acid synthase. *FEBS letters* **373**: 119-122.
- Krzewinski-Recchi MA, Julien S, Juliant S, Teinturier-Lelièvre M, Samyn-Petit B, Montiel MD *et al* (2003). Identification and functional expression of a second human beta-galactoside alpha2,6-sialyltransferase, ST6Gal II. *European journal of biochemistry* **270**: 950-961.
- Lee YC, Kim YJ, Lee KY, Kim KS, Kim BU, Kim HN *et al* (1998). Cloning and expression of cDNA for a human Sia alpha 2,3Gal beta 1, 4GlcNA:alpha 2,8-sialyltransferase (hST8Sia III). *Archives of biochemistry and biophysics* **360**: 41-46.
- Lee YC, Kaufmann M, Kitazume-Kawaguchi S, Kono M, Takashima S, Kurosawa N *et al* (1999). Molecular cloning and functional expression of two members of mouse NeuAcalpha2,3Galbeta1,3GalNAc GalNAcalpha2,6-sialyltransferase family, ST6GalNAc III and IV. *The Journal of biological chemistry* **274**: 11958-11967.
- Margetts CD, Morris M, Astuti D, Gentle DC, Cascon A, McRonald FE *et al* (2008). Evaluation of a functional epigenetic approach to identify promoter region methylation in pheochromocytoma and neuroblastoma. *Endocrine-related cancer* **15**: 777-786.
- Nakayama J, Fukuda MN, Fredette B, Ranscht B, Fukuda M (1995). Expression cloning of a human polysialyltransferase that forms the polysialylated neural cell adhesion molecule present in embryonic brain. *Proc Natl Acad Sci U S A* **92**: 7031-7035.
- Samyn-Petit B, Krzewinski-Recchi MA, Steelant WF, Delannoy P, Harduin-Lepers A (2000). Molecular cloning and functional expression of human ST6GalNAc II. Molecular expression in various human cultured cells. *Biochim Biophys Acta* **1474**: 201-211.
- Takashima S, Ishida HK, Inazu T, Ando T, Ishida H, Kiso M *et al* (2002). Molecular cloning and expression of a sixth type of alpha 2,8-sialyltransferase (ST8Sia VI) that sialylates O-glycans. *The Journal of biological chemistry* **277**: 24030-24038.
- Yao Y, Kim G, Shafer S, Chen Z, Kubo S, Ji Y *et al* (2022). Mucus sialylation determines intestinal host-commensal homeostasis. *Cell* **185**: 1172-1188.e1128.

