

Supplementary Table 1.

Epitopic and structural preference of antibody binding to individual carbohydrate structures carried out by unsupervised agglomerative hierarchical clustering using Ward's method (53) with 1-correlation distance on the medTSI including both the 203 glycans and the 8 biotin controls. Cluster identification number (ID).

ID	Carbohydrate structures	Correlation (min- max)
1	Fuca1-4(Fuca1-2Galβ1-3)GlcNAcβ1-3Galβ1-4Glcβ-sp4	0.78 - 0.98
	Fuca1-2Galβ1-3GlcNAcβ1-3Galβ1-4Glcβ-sp4	
	Fuca1-2Galβ1-3GlcNAcβ1-3Galβ1-4Glcβ-sp4	
	Fuca1-3(Fuca1-2Galβ1-4)GlcNAcβ1-3Galβ1-4Glcβ-sp4	
	Galβ1-3GlcNAcβ1-3Galβ1-4Glcβ-sp4	
	Galβ1-4GlcNAcβ1-3Galβ1-4Glcβ-sp4	
2	technical control (8x)	0.82 - 0.97
3	Manα-sp	0.67-0.95
	aminoglucitol	
	GlcN(Gc)β-sp4	
	GlcNAcβ1-3Galβ-sp2	
4	Manα1-3(Manα1-6)Manβ-sp4	0.23 - 0.80
	Manα1-3(Manα1-6)Manα1-6(Manα1-3)Manβ-sp4	
	Fuca1-3(Fuca1-2Galβ1-4)GlcNAcβ-sp	
	(G-GN-M)2-3,6-M-GN-GNβ-sp4	

	(GN-M)2-3,6-M-GN-GN β -sp4	
	Man α 1-3(Man α 1-6)Man β 1-4GlcNAc β 1-4GlcNAc β - sp4Gal β 1-4GlcNAc β 1-3(Gal β 1-4GlcNAc β 1-6)Gal β 1- 4GlcNAc-sp2	
5	Fuc α 1-2Gal β 1-4GlcNAc β -sp Fuc α 1-3(NeuAc α 2-3Gal β 1-4)6-O-Su-GlcNAc β -sp	0.36
6	Gal β 1-2Gal β -sp Neu5Gc α 2-6Gal β 1-4GlcNAc β -sp NeuAc α 2-6Gal β 1-4GlcNAc β -sp	0.44 - 0.89
7	Neu5Ac α 2-6(Gal β 1-3)GlcNAc β 1-3Gal β 1-4Glc β -sp4 (Glc α 1-4)3 β -sp4 (Glc α 1-4)4 β -sp	0.56 - 0.67
8	Neu5Ac α 2-8Neu5Ac α 2-sp GlcNAc β 1-4(GlcNAc β 1-6)GalNAc α -sp Man α 1-6Man β -sp4 Neu5Ac α 2-8Neu5Ac α -OCH ₂ C ₆ H ₄ -p-sp4 GlcNAc β 1-3(GlcNAc β 1-6)Gal β 1-4GlcNAc β -sp2	0.21 - 0.59
9	Gal β 1-4GlcNAc β -sp Gal β 1-4(6-O-Su)GlcNAc β -sp Gal β 1-4GlcNAc β 1-3Gal β 1-4GlcNAc β -sp Gal β 1-4GlcNAc β 1-3Gal β 1-4GlcNAc β 1-3Gal β 1- 4GlcNAc β -sp2 GlcNAc β 1-3Gal β 1-4GlcNAc β -sp 3-O-Su-Gal β 1-4GlcNAc β 1-3Gal β 1-4GlcNAc-sp	0.48 - 0.96

	GlcNAc β 1-3Gal β 1-4GlcNAc β -sp2	
	Gal β 1-4GlcNAc β 1-3Gal β 1-4GlcNAc β -sp2	
	GlcNAc β 1-4GlcNAc β 1-4GlcNAc β -sp4	
10	(GlcNAc β 1-4)5 β -sp4	0.91 - 0.96
	(GlcNAc β 1-4)6 β -sp4	
	GlcNAc β 1-4GlcNAc β -sp4	
11	GlcNAc β 1-4GlcNAc β -Asn	0.78
	Fuc α 1-2Gal β 1-3GalNAc α -sp	
	Fuc α 1-4(Fuc α 1-2Gal β 1-3)GlcNAc β -sp	
12	GlcA β -sp	0.40 - 0.71
	Fuc α -sp	
	GlcNAc β 1-3(Gal β 1-4GlcNAc β 1-6)Gal β 1-4GlcNAc β -sp2	
	6-H ₂ PO ₃ Glc β -sp4	
	GalNAc β 1-4Gal β 1-4Glc β -sp	
13	Gal α 1-3Gal β 1-4(Fuc α 1-3)GlcNAc β -sp	0.26 - 0.55
	Fuc α 1-3(NeuAc α 2-3Gal β 1-4)GlcNAc β -sp	
	3-O-Su-Gal β -sp	
14	3',4'-O-Su ₂ -Gal β 1-4GlcNAc β -spGal α 1-3Gal β -sp	0.24 - 0.49
	Fuc α 1-4(Gal β 1-3)GlcNAc β -sp	
	3'-O-Su-Gal β 1-4Glc β -sp ₂	
15	3'-O-Su-Gal β 1-4GlcNAc β -sp	0.69 - 0.84
	3'-O-Su-Gal β 1-4GlcNAc β -sp ₂	

	3',6-O-Su2-Galβ1-4GlcNAcβ-sp	
	3',6-O-Su2-Galβ1-4Glcβ-sp2	
16	GlcNAcβ1-3Galβ1-4Glcβ-sp2	0.15 - 0.62
	Galβ1-4Glcβ-sp	
	6-O-Su-Galβ1-4Glcβ-sp2	
	6'-O-Su-Galβ1-4GlcNAcβ-sp	
17	6'-O-Su-Galβ1-4GlcNAcβ-sp2	0.43 - 0.81
	3',6,6'-O-Su3-Galβ1-4GlcNAcβ-sp2	
	3',6'-O-Su2-Galβ1-4GlcNAcβ-sp2	
	Fucα1-3(Neu5Acα2-3Galβ1-4)GlcNAcβ1-3Galβ-sp	
18	Fucα1-3(3-O-Su-Galβ1-4)GlcNAcβ-sp	0.43 - 0.70
	GlcNAcβ1-6(Galβ1-4GlcNAcβ1-3)Galβ1-4GlcNAc-sp2	
	Neu5Acα2-3GalNAcα-sp	
19	NeuAcα2-3Galβ1-3-(6-Su)GalNAcα-sp	0.20 - 0.43
	GlcAα-sp	
	Fucα1-2Galβ1-4Glcβ-sp4	
	GlcNAcβ-O-C6H4-NH2	
20	Neu5Acα2-3Galβ-sp	0.19 - 0.68
	6-H2PO3Manα-sp	
	Galβ1-3GalNAcα-p-OC6H4NH2	
	(SA2-6G-GN-M)2-3,6-M-GN-GNβ-sp4	
21	GalNAcβ1-3Galβ-sp	0.29 - 0.98
	Fucα1-2(GalNAcβ1-3)Galβ-sp	
	Fucα1-2(GalNAcβ1-3)Galβ-sp	

	Neu5Ac α 2-8Neu5Ac β -OCH ₂ C ₆ H ₄ -p-sp ₄	
22	(NeuAc α 2-8) ₃ -sp-beta	0.37 - 0.73
	Neu5Ac β -OCH ₂ C ₆ H ₄ -p-sp ₄	
	Fuc α 1-2(Gal β 1-4GalNAc β 1-3)Gal β 1-4GlcNAc β -sp	
	3'-O-Su-Gal β 1-3GalNAc α -sp	
23	NeuAc α 2-3Gal β 1-3GalNAc α -sp	0.36 - 0.71
	Man β -sp	
	NeuAc α 2-3Gal β 1-4Glc β -sp	
	GlcNAc α 1-3Gal β 1-4GlcNAc β -sp	
24	GlcNAc α 1-3Gal β 1-4GlcNAc β -sp ₂	0.43 - 0.95
	Gal β 1-3Gal β 1-4GlcNAc β -sp ₄	
	Gal β 1-3GalNAc β 1-4Gal β 1-4Glc β -sp	
	GlcNAc β 1-2Gal β 1-3GalNAc α -sp	
	NeuAc α 2-6Gal β 1-4Glc β -sp ₄	
	Fuc α 1-4GlcNAc β -sp	
25	NeuAc α 2-3Gal β 1-4Glc β -sp ₄	0.34 - 0.76
	NeuAc α 2-8NeuAc α 2-3Gal β 1-4Glc β -sp ₄	
	Gal α 1-2Gal β -sp	
	Fuc α 1-2(Gal β 1-4GalNAc α 1-3)Gal β 1-4GlcNAc β -sp	
	4',6'-O-Su ₂ -Gal β 1-4GlcNAc β -sp ₂	
26	4',6'-O-Su ₂ -Gal β 1-4GlcNAc β -sp	0.78 - 0.98
	4'-O-Su-Gal β 1-4GlcNAc β -sp	
	4'-O-Su-Gal β 1-4GlcNAc β -sp ₂	

	GalNAc α 1-3GalNAc β -sp	
	GalNAc α 1-3Gal β -sp	
27	Gal α 1-3GalNAc β -sp	0.14 - 0.70
	Man β 1-4GlcNAc β -sp4	
	Gal α 1-6Glc β -sp	
	Gal α 1-4Gal β 1-4Glc β -sp4	
28	Glc α 1-6Glc α 1-6Glc β -sp4	0.94
	isomaltotetraose-sp	
	Gal α 1-3GalNAc α -p-OC ₆ H ₄ NH ₂	
29	Glc α 1-4Glc β -sp	0.15 - 0.42
	Gal α 1-3GalNAc α -sp	
	Gal α 1-3(Fuc α 1-2)Gal β 1-4GlcNAc β -sp	
30	Fuc α 1-2(Gal α 1-3)Gal β -sp	0.87 - 0.97
	Fuc α 1-2(Gal α 1-3)Gal β -spy	
	GalNAc α 1-3(Fuc α 1-2)Gal β 1-4GlcNAc β -sp	
31	Fuc α 1-2(GalNAc α 1-3)Gal β -sp	0.59 - 0.92
	Fuc α 1-2(GalNAc α 1-3)Gal β -spy	
32	Neu5Gc β 2-6Gal β 1-4GlcNAc β -sp	0.87
	Neu5Ac β 2-6Gal β 1-4GlcNAc β -sp	
	Gal β 1-3(Neu5Ac α 2-6)GalNAc α -sp	
33	Gal β 1-3GalNAc α -sp	0.66 - 0.86
	GlcNAc β 1-6(Gal β 1-3)GalNAc α -sp	
	Gal β 1-3(Gal β 1-4GlcNAc β 1-6)GalNAc α -sp	

	Fuca1-4(NeuAca2-3Galβ1-3)GlcNAcβ-sp	
	Fucβ1-3GlcNAcβ-sp	
	Galβ1-3GlcNAcβ-sp	
34	3'-O-Su-Galβ1-3GlcNAcβ-sp	0.44 - 0.90
	NeuAca2-3Galβ1-3GlcNAcβ-sp	
	Fuca1-3GlcNAcβ-sp	
	GlcNAcβ-sp	
	GlcAβ1-3GlcNAcβ-sp	
35	Neu5Acβ2-6GalNAca-sp	0.67
	Galβ1-3(Neu5Acβ2-6)GalNAca-sp	
36	Galα1-4Galβ1-4GlcNAcβ-sp	0.64
	Galα1-4(Fuca1-2)Galβ1-4GlcNAcβ-sp	
37	Galβ1-4GlcNAcβ1-3GalNAca-sp	0.82
	Galβ1-4GlcNAcβ1-3(Galβ1-4GlcNAcβ1-6)GalNAca-sp	
38	6,6'-O-Su2-Galβ1-4GlcNAcβ-sp2	
	NeuAca2-6Galβ1-4-(6-Su)GlcNAcβ-sp	0.25 - 0.63
	Galα1-3Galβ1-4GlcNAcβ-sp	
	Galα1-3(Galα1-4)Galβ1-4GlcNAcβ-sp	
39	Galβ1-3Galβ-sp	0.71
	Galβ1-3Galβ-sp	
40	Fuca1-2Galβ1-3GlcNAcβ-sp	
	Fuca1-4(3-O-Su-Galβ1-3)GlcNAcβ-sp	0.46 - 0.64
	(NeuAca2-3Galβ1)2-3,4-GlcNAc-sp	

	NeuAca2-3Galβ1-3(NeuAca2-6)GalNAca-sp	
41	Glcα-sp	0.08 - 0.42
	Fuca1-3(Galβ1-4)GlcNAcβ-sp	
42	NeuAca2-3Galβ1-4GlcNAcβ-sp	0.70
	NeuAca2-3Galβ1-4-(6-Su)GlcNAcβ-sp	
	GlcNAcβ1-4Mur-L-Ala-D-i-Gln-Lys	
	Fuca1-3(NeuAca2-3(6-O-Su)Galβ1-4)GlcNAcβ-sp	
43	GlcNAcβ1-4-[HOOC(CH ₃)CH]-3-O-GlcNAcβ-sp ⁴	0.13 - 0.54
	(NeuAca2-8) ₃ α-sp	
	Fuca1-4(NeuAca2-3Galβ1-3)GlcNAcβ-sp ⁴	
44	GalNAca1-4(Fuca1-2)Galβ1-4GlcNAcβ-sp	0.96
	(GlcNAcβ1) _{3-3,4,6} -GalNAca-sp	
	9-NAc-Neu5Aca-sp	
	(9-NAc-NeuAca2-6)Galβ1-4GlcNAcβ-sp	
45	GalNAca-sp	0.32 - 0.93
	Neu5Aca2-6GalNAca-sp	
	Neu5Gca2-6GalNAca-sp	
	Neu5Aca-sp	
	GlcNAcβ1-3(GlcNAcβ1-4)Galβ1-4GlcNAcβ-sp	
46	Neu5Aca-OCH ₂ C ₆ H ₄ -p-sp ⁴	0.26 - 0.83
	Galα1-4GlcNAcβ-sp	
	Galα1-4GlcNAcβ1-3Galβ1-4GlcNAcβ-sp	
47	GlcNAcβ1-6Galβ1-4GlcNAcβ-sp ²	0.69
	Galβ1-4GlcNAcβ1-6Galβ1-4GlcNAcβ-sp ²	

	Gal β 1-3GalNAc β -sp	
48	Neu5Gc α -sp	0.41 - 0.62
	GlcNAc β 1-3Gal β 1-3GalNAc α -sp	
	6-O-Su-GlcNAc β -sp	
49	GlcNAc β 1-3GalNAc α -sp	0.34 - 0.77
	GlcNAc β 1-3(GlcNAc β 1-6)GalNAc α -sp	
	6,6'-O-Su ₂ -Gal β 1-4Glc β -sp ₂	
	6'-O-Su-Gal β 1-4Glc β -sp ₂	
50	Glc β -sp	0.32 - 0.67
	GlcNAc β 1-6GalNAc α -sp	
	Gal β 1-4GlcNAc β 1-6GalNAc α -sp	
	Gal β -sp	
	GalNAc β -sp	
	Fuc α 1-2Gal β -sp	
51	Neu5Ac α 2-6Gal β -sp	0.29 - 0.63
	GlcA β 1-6Gal β -sp	
	GlcA β 1-3Gal β -sp	
	Gal α -sp	
	GalNAc α 1-Oser	
	Gal β 1-4GlcNAc α 1-6Gal β 1-4GlcNAc β -sp ₂	
52	GlcNAc β 1-3Man β -sp ₄	0.37 - 0.50
	GalNAc β 1-4GlcNAc β -sp	
	Glc β 1-4Glc β -sp ₄	

	Rha α -sp	
53	Glc β 1-6Glc β -sp4	0.40 - 0.61
	GlcNAc β 1-4Gal β 1-4GlcNAc β -sp2	
	GlcNAc α 1-6Gal β 1-4GlcNAc β -sp2	

legend:

sp $-(\text{CH}_2)_3\text{-NH}_2$

sp2 $-(\text{CH}_2)_2\text{-NH}_2$

sp4 $-\text{NH-CO-CH}_2\text{-NH}_2$

spX $-\text{CH}_2\text{-(CHOH)}_3\text{-CHNHAc-CHOH-CH}_2\text{-CH(NH}_2\text{)-}$

COOH

spY $\text{O-(CH}_2\text{)}_3\text{-NH-CO(CH}_2\text{)}_5\text{-NH}_2$

Oser O-Serin