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Supplemental information

Antigenic and virological properties of an H3N2

variant that continues to dominate the 2021–22

Northern Hemisphere influenza season

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Supple	mentary Table 1	Etructure
INO	Common Name	Structure
1	Galβ(1-4)-GlcNAcβ-ethyl-NH2	β 4
2		β 4 β 3 β 3 Thr
3		β 4 β 6 3 3
4		
5		$\begin{array}{c} & & \\$
6		β 4 β 6
7	Galβ(1-4)-GlcNAcβ(1-2)-Manα(1-3)-[Galβ(1-4)-GlcNAcβ(1- 2)-Manα(1-6)]-Manβ(1-4)-GlcNAcβ(1-4)-GlcNAcβ-Asn-NH ₂	$\begin{array}{c c} & & & & \\ \hline \\ \hline$
8		$\begin{array}{c c} & & & & \\ \hline & & & & \\ \hline & & & & \\ \hline & & & &$
9		$\begin{array}{c} \hline p & 4 \\ \hline p & 4 \\$
10		$\begin{array}{c} & & \\$
11	NeuAca(2-3)-Galβ(1-4)-6-O-sulfo-GicNAcβ-propyl-NH ₂	0S φ α 3 φ 4
12	NeuAca(2-3)-Galβ(1-4)-[Fuca(1-3)]-6-O-sulfo-GlcNAcβ- propyI-NH2	

13	NeuAcα(2-3)-8-O-sulfo-Galβ(1-4)-GicNAcβ-ethyl-NH2	
14	NeuAca(2-3)-6-O-sulfo-Galβ(1-4)-{Fuca(1-3)}-GlcNAcβ- propyI-NH2	65 α 3 p 4 3 α
15	NeuAcα(2-3)-Galβ(1-3)-6-O-sulfo-GlcNAcβ-propyl-NH2	6S φ _{α 3} β _{β 3}
16	NeuAca(2-3)-Galβ(1-4)-Gicβ-ethyl-NH₂	♦ _{α 3} ● _{β 4} ●
17	NeuAca(2-3)-Galβ(1-4)-GicNAcβ-ethyl-NH ₂	◆ a _ 3 ◯ p _ 4
18	NeuAca(2-3)-Galβ(1-4)-GicNAcβ(1-3)-Galβ(1-4)-GicNAcβ- ethyi-NH ₂	Φ α 3 0 β 4 1 β 3 0 β 4
19	NeuAcα(2-3)-Galβ(1-4)-GicNAcβ(1-3)-Galβ(1-4)- GicNAcβ(1-3)-Galβ(1-4)-GicNAcβ-ethyl-NH2	Фаз <mark>ор4 рзор4 р</mark> зор4
20	NeuAca(2-3)-GalNAcβ(1-4)-GicNAcβ-ethyl-NH ₂	φα3 β4
21	NeuAca(2-3)-Galβ(1-3)-GicNAcβ-ethyl-NH ₂	α 3 β 3
22	NeuAca(2-3)-Galβ(1-3)-GicNAcβ(1-3)-Galβ(1-4)-GicNAcβ- ethyi-NH ₂	◆ α 3 ○ β 3 ○ β 4 ■
23	NeuAca(2-3)-Galβ(1-3)-GicNAcβ(1-3)-Galβ(1-3)-GicNAcβ- ethyi-NH ₂	◆ α 3 ○ ρ 3 ○
24	NeuAca(2-3)-Galβ(1-3)-GalNAcβ(1-3)-Gala(1-4)-Galβ(1-4)- Gicβ-ethyt-NH ₂	φ a 3 β 3 β 3 a 4 β 4
25	NeuAca(2-3)-Galβ(1-3)-GalNAca-Thr-NH ₂	♦ α3 ○ β3 □ α

26	3' NeuAc LN Core 1 (1163)	$ \mathbf{a}_{\alpha} \mathbf{b}_{\beta} \mathbf{a}_{\beta} \mathbf{a}_{\beta} \mathbf{b}_{\beta} $
27	3' NeuAc DiLN Core 1 (1528)	
28	3' NeuAc TriLN Core 1 (1894)	Ф аз Ф ра ц ија Ф ра ц ија Ф ра ц ија Ф ра ц ија Т ил
29	3' NeuAc TetraLN Core 1 (2259)	◆ज़ऀज़ॺॏज़ॖॖॖऀॡॿॕज़ॶॖॡॿऀज़ॷज़ॿऀज़ॷज़ॿॖॖॖॖॖॖॖॖॖॖॖॖॖॖॖॖॖॖॡॿऀज़ॷज़ॿॖॖॖॖॖॖॖॖॖॖॖॖॖॖॖॖॖॖॖॖॖॖॖॖॖॖॖॖॖॖॖॖॖॖ
30	3' NeuAc PentaLN Core 1 (2624)	♦₇₇9₇₇8₇₇9₇₇8₇₇9₇₇8₇₇9₇₇8₇₇9₇₇1
31	NeuAcα(2-3)-Galβ(1-4)-GicNAcβ(1-6)-[Galβ(1-3)]-GalNAca- Thr-NH ₂	
32	NeuAcα(2-3)-Galβ(1-4)-GicNAcβ(1-3)-Galβ(1-4)- GicNAcβ(1-6)-{Galβ(1-3)-GalNAca-Thr-NH ₂	
33	3' NeuAc TriLN Core 2 (1894)	♦ □□□□□□ □ ¹ □ ¹
34	3' NeuAc TetraLN Core 2 (2259)	₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩
35	3' NeuAc PentaLN Core 2 (2624)	∲ᡪᢩᢒᠶᢂᢊᢒᢊᢂᢊᡐᢊᢂᢊᡐᢊᢂᢊᡐᢊᢂᢊᢒᢊᢂ _{ᡗᠧᢂ} ᠐ᡗ
36	3' NeuAc TetraLN TriLN Core 2 (3645)	♦179178179178179178 •179781797817978 •179787797877978779
37	3' NeuAc PentaLN TetraLN Core 2 (4376)	Ŷਜ਼ੑੑੑਗ਼ਸ਼ਗ਼ੑੑੑੑੑਗ਼ਸ਼ਗ਼ੑੑਗ਼ਸ਼ਗ਼ੑਗ਼ਸ਼ਗ਼ੑਗ਼ਸ਼ _{ਲ਼ਗ਼} Ŷਜ਼ੑਗ਼ਸ਼ਗ਼ੑੑਗ਼ਸ਼ਗ਼ੑੑੑੑਗ਼ਸ਼ਗ਼ੑੑਗ਼ਗ਼ਗ਼ਗ਼ਗ਼ਗ਼
38	NeuAcα(2-3)-Galβ(1-4)-GicNAcβ(1-3)-GalNAca-Thr-NH ₂	♦ α3 ○ β4 ■ β3 □ α

39	NeuAcα(2-3)-Galβ(1-4)-GicNAcβ(1-3)-Galβ(1-4)- GicNAcβ(1-3)-GalNAca-Thr-NH ₂	♠ _{α3} ● _{β4} ■ _{β3} ● _{β4} ■ _{β3} □ _α →
40	3' NeuAc TriLN Core 3 (1732)	Фор <mark>уль</mark> ру ра <mark>ру ра</mark> рити
41	3' NeuAc TetraLN Core 3 (2097)	◆ ₹Ţ ○ ₽₹ ₩₽ ₽ ○₽₹₩₽₽○₽₹₩₽₽ ₽₩₽₽₩₽₽₩₽₽₩₽₽₩₽₽₩₽₽₩₽₽₩₽₽₩₽₽₩₽₽₩₽₽₩₽
42	3' NeuAc PentaLN Core 3 (2462)	ᡐᠬᡐᠭ ᢑᡣᡐᡣ᠖ᢧᡐᡎᡀᡊᡐᠭᢛᡵᡐᠧᢛᡨᡛ ᠇ᢇ᠉
43	NeuAca(2-3)-Galβ(1-4)-GlcNAcβ(1-3)-[NeuAca(2-3)- Galβ(1-4)-GlcNAcβ(1-6)]-GalNAca-Thr-NH ₂	$\begin{array}{c} \bullet \alpha_{3} \bullet \beta_{4} \\ \bullet \alpha_{3} \bullet \beta_{4} \\ \bullet \alpha_{3} \bullet \beta_{4} \\ \end{array} \begin{array}{c} \beta_{6} \\ \beta_{3} \\ \beta_{3} \\ \end{array} \begin{array}{c} \alpha_{3} \\ \alpha_{3} \\ \beta_{4} \\ \end{array} \begin{array}{c} \alpha_{3} \\ \beta_{3} \\ \beta_{3} \\ \end{array} \begin{array}{c} \alpha_{3} \\ \alpha_{3} \\ \beta_{4} \\ \end{array} \begin{array}{c} \alpha_{3} \\ \beta_{4} \\ \beta_{3} \\ \end{array} \begin{array}{c} \alpha_{3} \\ \alpha_{3} \\ \beta_{4} \\ \end{array} \begin{array}{c} \alpha_{3} \\ \beta_{4} \\ \beta_{3} \\ \end{array} \begin{array}{c} \alpha_{3} \\ \alpha_{3} \\ \beta_{4} \\ \end{array} \begin{array}{c} \alpha_{3} \\ \beta_{4} \\ \beta_{3} \\ \end{array} \begin{array}{c} \alpha_{3} \\ \alpha_{3} \\ \beta_{4} \\ \beta_{3} \\ \end{array} \begin{array}{c} \alpha_{3} \\ \alpha_{3} \\ \beta_{4} \\ \beta_{5} \\ \beta_{4} \\ \beta_{5} \\ \alpha_{3} \\ \end{array} \right)$
44	NeuAcq(2-3)-Galβ(1-4)-GlcNAcβ(1-3)-Galβ(1-4)- GlcNAcβ(1-3)-[NauAcq(2-3)-Galβ(1-4)-GlcNAcβ(1-3)- Galβ(1-4)-GlcNAcβ(1-6)]-GalNAca-Thr-NH ₂	$ \begin{array}{c} & & & \\ & $
45	3' NeuAc TriLN Core4 (3118)	$ \Phi_{23} \Phi_{14} \Phi_{13} \Phi_{14} \Phi_{23} \Phi_{14} \Phi_{23} \Phi_{14} \Phi_{23} \Phi_{14} \Phi_{23} \Phi_{14} \Phi_{23} \Phi_{14} \Phi_{23} \Phi_{14} \Phi_{14}$
46	3' NeuAc TetraLN Core4 (3848)	
47	3' NeuAc PentaLN Core4 (4579)	᠅ᡊ᠊ᠳᡕᡆ᠊᠋᠋ᡣᡐᡕᡆ᠋ᡎᡐᡕᡆᡎᡐᡕᡆ᠄ᠥᡐᡕᡆ ᠅ᡊ᠊ᢩᠳᡄᡵ᠋ᡊ᠊ᡐᡕᡅᡵ᠊ᡐᡕᡆ᠋ᡎᡐᡕᡆᠶᢙᡵᡅᡗ
48	3' NeuAc TetraLN Core6 (2097)	<mark>∳┰╕Ϙϝ╡<mark>╋</mark>┰╕Ϙ<mark>ϝ╡</mark>╋┱╕Ϙϝ╡<mark>╋┰╕Ϙϝ╡╋┰╡</mark>┲═[╖]и</mark>
49	3' NeuAc PentaLN Core6 (2462)	◆ ₽ ₽₽ ₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽
50	3' NeuAc LecLN I-Antigen(2104)	$ \begin{array}{c} & \alpha \end{array} \xrightarrow{} \beta $
51	NeuAcα(2-3)-Galβ(1-4)-GlcNAcβ(1-2)-Manα(1-3)- [NeuAcα(2-3)-Galβ(1-4)-GlcNAcβ(1-2)-Manα(1-8)]-Manβ(1- 4)-GlcNAcβ(1-4)-GlcNAcβ-Asn-NH ₂	

52	$\label{eq:response} \begin{split} & NeuAcq(2-3)\cdot Gal\beta(1-4)\cdot GicNAc\beta(1-3)\cdot Gal\beta(1-4)\cdot \\ & GicNAc\beta(1-2)\cdot Mana(1-3)\cdot NeuAcq(2-3)\cdot Gal\beta(1-4)\cdot \\ & GicNAc\beta(1-3)\cdot Gal\beta(1-4)\cdot GicNAc\beta(1-2)\cdot Manq(1-6))\cdot Man\beta(1-4)\cdot GicNAc\beta(1-4)\cdot GicN$	$ \begin{array}{c} \bullet_{\overline{\alpha}3} \bullet_{\overline{p}4} \bullet_{\overline{\beta}3} \bullet_{\overline{p}4} \bullet_{\overline{p}2} \bullet_{\overline{\alpha}3} \bullet_{\overline{p}4} \bullet_{\overline{p}4$
53	NeuAca(2-3)Galβ(1-4)-GicNAcβ(1-3)-Galβ(1-4)- GicNAcβ(1-3)-Galβ(1-4)-GicNAcβ(1-2)-Mana(1-3)- [NeuAca(2-3)-Galβ(1-4)-GicNAcβ(1-3)-Galβ(1-4)- GicNAcβ(1-3)-Galβ(1-4)-GicNAcβ(1-2)-Mana(1-6)-Manβ(1- 4)-GicNAcβ(1-4)-GicNAcβ-Asn-NH ₂	Φ ₃₃ Φ _{β4} B ₃₅ Φ _{β4} B ₃ Φ _{β4} B ₄ B
54	3' NeuAc DiLN Bi-(3594)	◆त3 ित्त हत्त्व कर्न्डित कर्न्ड रत्र <mark>कर्न्ड हत्त्व कर्न्ड र</mark> ्न्
55	3' NeuAc TriLN Bi-(4324)	Фа <mark>€на д€на д€на д</mark> € _{лен} Фа€на д€на д€на д€
56	3' NeuAc TetraLN Bi-(4828)	ŶŦŎŗŧŴŗŎŗŧŴŗŧŎŗŧŴŗţŎŗŧŴŗţŎ ^{ŗŧ} ŗŧŴŗŧ
57	3' NeuAc TriLN Bi-CF(4470)	◆21 0 12 0 12 0 12 0 12 0 12 0 12 0 12 0
58	3' NeuAc TetraLN Bi-CF(5200)	Ŷᡊᡐᡣᡆᡊᡐᢊ᠍ᡊᡐᢊ᠍ᡎᡐᡊᡆᢊᡐ _{ᠭᠧ} Ŷᡊᡐᡍᡆᡊᡐᡍ᠍ᡜᡐᡐᡎᠴᡊᠥᡕᡆᡍᡐ ^ᡘ ᠥ᠇ᡆ _ᡍ ᠇
59	3' NeuAc DiLN Tri-(4615)	◆ □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
60	3' NeuAc DiLN Tri-CF(4761)	
61	Gn/3'SLN/3'SLN-TriN	
62	NeuAca(2-3)-[GalNAcβ(1-4)]-Galβ(1-4)-GlcNAcβ-ethyl-NH ₂	
63	NeuAca(2-3)-[GalNAcβ(1-4)]-Galβ(1-4)-Gicβ-ethyl-NH ₂	
64	Galβ(1-3)-GalNAcβ(1-4)-[NeuAca(2-3)]-Galβ(1-4)-Glcβ- ethyl-NH₂	

65	NeuAca(2-3)-Galβ(1-4)-[Fuca(1-3)]-GicNAcβ-propyl-NH ₂	
66	NeuAca(2-3)-Galβ(1-3)-[Fuca(1-4)]-GlcNAcβ(1-3)-Galβ(1- 4)-[Fuca(1-3)]-GlcNAcβ-ethyl-NH ₂	φ α 3 p 3 p 4 3
67	NeuAca(2-3)-Galβ(1-4){Fuca(1-3)}-GlcNAcβ(1-3)-Galβ(1- 4){Fuca(1-3)}-GlcNAcβ-ethyl-NH ₂	$ \begin{array}{c} \bullet \alpha & 3 \\ \bullet \alpha & 3 $
68	NeuAca(2-3)-Galβ(1-4).[Fuca(1-3)]-GlcNAcβ(1-3)-Galβ(1- 4),[Fuca(1-3)]-GlcNAcβ(1-3)-Galβ(1-4),[Fuca(1-3)]- GlcNAcβ-ethyl-NH ₂	• α 3 <u>β</u> 4 3 β 3 3 β 4 3 3 β 4 3 3 8 3 8 3 8 3 8 3 8 3 8 3 8 3 8 3 8
69	3' SLeX TriLN Core 1(2332)	
70	3' SLeX TriLN Core 3(2170)	• • • • • • • • • • • • • • • • • • •
71	3' SLeX TriLN Core 4(3994)	
72		
73	NeuAc(2-6)-Galb(1-4)-(6S)GlcNacb-ethyl-NH2	6S φ α ο φ 4
74	NeuAca(2-6)-Galβ(1-4)-6-O-sulfo-GlcNAcβ-propyl-NH ₂	
75	NeuAca(2-6)-Galβ(1-4)-Gicβ-ethyl-NH ₂	◆ α 6 β 4
76	NeuAca(2-6)-Galβ(1-4)-GlcNAcβ-ethyl-NH ₂	
77	NeuAca(2-6)-Galβ(1-4)-GicNAcβ(1-3)-Galβ(1-4)-GicNAcβ- ethyl-NH ₂	♦ α σ Ο β 4 Π β 3 Ο β 4

78	NeuAca(2-6)-Galβ(1-4)-GicNAcβ(1-3)-Galβ(1-4)- GicNAcβ(1-3)-Galβ(1-4)-GicNAcβ-ethyl-NH ₂	Фαб <mark>ор 4 1 р 3 ор 4 1 р 3 ор 4 1 1 р 3 ор 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 </mark>
79	NeuAca(2-6)-GalNAcβ(1-4)-GlcNAcβ-ethyl-NH ₂	φ _{α.6} _{β.4}
80	6' NeuAc LN Core 1 (1163)	
81	6' NeuAc DiLN Core 1 (1528)	φ α σ p 4 p 3 p 4 p 3 p 3 p 5 p 3 Thr
82	6' NeuAc TriLN Core 1 (1894)	Фас <mark>Ф₂ 1 1 1 7 0 3 1 1 1 3 0 3 1 1 5 7 0 5 7 1 1 - Ти</mark>
83	6' NeuAc TetraLN Core 1 (2259)	◆ ₹₹ ₽ ₹₹
84	6' NeuAc PentaLN Core 1 (2624)	∳ ज़ ॖज़ॏॻज़ज़ॵज़ॖज़ॏॻज़ऀज़ॏॻज़ज़ॵज़ॖज़ॏॻऀॻॱऻॳ
85	NeuAcα(2-6)-Galβ(1-4)-GlcNAcβ(1-6)-[Galβ(1-3)]-GalNAca- Thr-NH₂	$ \begin{array}{c} & \alpha_{6} \\ & \beta_{4} \\ & \beta_{6} \\ & \beta_{3} \\ & \alpha_{5} \end{array} $
86	NeuAcα(2-6)-Galβ(1-4)-GicNAcβ(1-3)-Galβ(1-4)- GicNAcβ(1-6)-{Galβ(1-3)}-GalNAca-Thr-NH ₂	
87	6' NeuAc TriLN Core 2 (1894)	
88	6' NeuAc TetraLN Core 2 (2259)	♠ਜ਼ਫ਼ੑੑੑੑੑਗ਼ਫ਼ਸ਼ਗ਼ਗ਼ਗ਼ਗ਼ਗ਼ਗ਼ਗ਼ਗ਼ਗ਼ਗ਼ਗ਼ਗ਼ ੑੑੑੑੑੑੑੑੑਗ਼ਫ਼ਸ਼ਗ਼ਗ਼ਗ਼ਗ਼ਗ਼ਗ਼ਗ਼ਗ਼ਗ਼ਗ਼
89	6' NeuAc PentaLN Core 2 (2624)	♠ਜ਼ੑੑੑੑੑਗ਼ਗ਼ਗ਼ਗ਼ਗ਼ਗ਼ਗ਼ਗ਼ਗ਼ਗ਼ਗ਼ਗ਼ੑੑੑੑੑੑੑੑੑੑੑੑੑੑੑੑੑੑੑੑ
90	6' NeuAc TetraLN TriLN Core 2 (3645)	◆त•ऀन्त न•्न न•्न न•्न न•्न ◆त•ेन न•्न न•्न न•्न ◆त•ेन न•्न न•्न न•्न न•्न

91	6' NeuAc PentaLN TetraLN Core 2 (4376)	∳┰ᢗᢖ᠋ᡊᢗᡓ᠋ᠴᡐᢩᡘ᠋ᠴᡐᢩᡘ᠋ᠴᡐᡘ᠋ᠴ᠙ᡘ᠋ ᢦ᠇ᢗᠧ᠋ᠴ᠙ᡓ᠋ᠴᡐᡕ᠋ᠴᡐᡘ᠋ᠴᡐᡘᠴᢧᡐᢪ
92	NeuAcα(2-6)-Galβ(1-4)-GlcNAcβ(1-3)-GalNAca-Thr-NH ₂	
93	NeuAca(2-6)-Galβ(1-4)-GicNAcβ(1-3)-Galβ(1-4)- GicNAcβ(1-3)-GalNAca-Thr-NH ₂	♦ α6 9 β4 8 β3 9 α √
94	6' NeuAc TriLN Core 3 (1732)	Ф <u>аб <mark>ра 13 ра 13 ра 1</mark>3 ра Пи</u> Пи
95	6' NeuAc TetraLN Core 3 (2097)	
96	6' NeuAc PentaLN Core 3 (2462)	ŶŦŧŎſĨĬŢĨŎſĬĬŢŎſĬŢŢŎſĬŢĨŎſĬĬŢĨŀĸ
97	NeuAcα(2-6)-Galβ(1-4)-GlcNAcβ(1-3)-[NeuAcα(2-6)- Galβ(1-4)-GlcNAcβ(1-6)]-GalNAca-Thr-NH ₂	$\begin{array}{c} & & & \\ & & & \\ &$
98	NeuAcα(2-6)-Galβ(1-4)-GlcNAcβ(1-3)-Galβ(1-4)- GlcNAcβ(1-3)-[NeuAcα(2-6)-Galβ(1-4)-GlcNAcβ(1-3)- Galβ(1-4)-GlcNAcβ(1-6)]-GalNAca-Thr-NH ₂	$ \begin{array}{c} \bullet \alpha 6 \beta 4 \beta 3 \beta 4 \beta 3 \beta 4 \beta 6 \beta 6 \beta 4 \beta 6 \beta 6 \beta 4 \beta 6 \beta $
99	6' NeuAc TriLN Core4 (3118)	
100	6' NeuAc TetraLN Core4 (3848)	◆ ⋷ ○ ┲ <mark>алота</mark> лота <mark>лота</mark> лота ^{са} лота
101	6' NeuAc PentaLN Core4 (4579)	◆
102	6' NeuAc TetraLN Core6 (2097)	◆ ₹₹ ● ₽₹ ₩ ₽₹ ₩₽ ₹₩₽₹₩₽₹₩₽₽₩₽
103	6' NeuAc PentaLN Core6 (2462)	◆ ₩ ₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽

104	6' NeuAc TriLN I-Antigen (2856)	♦वर ⊖ ₇ र∎ ₇₃ ⊙ ₇ र∎ ₇₃ ⊙ ₇ र∎ ♦वर ⊖ ₇ र∎ ₇₃ ⊙ ₇ र∎
105	6' NeuAc DiLN I-Antigen (2104)	$ \begin{array}{c} & & & \\ & & & \\ & & & \\ & & $
106	Galβ(14)-GlcNAcβ(1-2)-Manα(1-3)-[NeuAcα(2-6)-Galβ(1- 4)-GlcNAcβ(1-2)-Manα(1-6)]-Manβ(1-4)-GlcNAcβ(1-4)- GlcNAcβ-Asn-NH ₂	
107	NeuAcα(2-6)-Galβ(1-4)-GicNAcβ(1-2)-Manα(1-3)-[Galβ(1- 4)-GicNAcβ(1-2)-Manα(1-6)]-Manβ(1-4)-GicNAcβ(1-4)- GicNAcβ-Asn-NH ₂	$\begin{array}{c} & & & \\ & & & \\ \hline p & 4 \\ \hline p & a \\ \hline p & a \\ \hline p & 4 \\ \hline p & 2 \\ \hline p & 4 \\ \hline p & 2 \\ \hline p & 4 \\ \hline p & 2 \\ \hline p & 4 \\ \hline p$
108	GicNAcβ(1-2)-Manα(1-3)-[NeuAcα(2-6)-Galβ(1-4)- GicNAcβ(1-2)-Manα(1-6)]-Manβ(1-4)-GicNAcβ(1-4)- GicNAcβ-Asn-NH ₂	
109	NeuAcα(2-6)-Galβ(1-4)-GlcNAcβ(1-2)-Manα(1-3)- [NeuAcα(2-6)-Galβ(1-4)-GlcNAcβ(1-2)-Manα(1-6)]-Manβ(1- 4)-GlcNAcβ(1-4)-GlcNAcβ-Asn-NH ₂	$ \begin{array}{c} & & & \\ & & & \\ & & & \\ & & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & $
110	NeuAcα(2-6)-Galβ(1-4)-GicNAcβ(1-3)-Galβ(1-4)- GicNAcβ(1-2)-Mana(1-3)-NeuAca(2-6)-Galβ(1-4)- GicNAcβ(1-3)-Galβ(1-4)-GicNAcβ(1-2)-Manβ(1- 4)-GicNAcβ(1-4)-GicNAcβ-Asn-NH ₂	$ \Phi_{\alpha \delta} \Phi_{\beta 4} \Phi_{\beta 3} \Phi_{\beta 4} \Phi_{\beta 2} \Phi_{\alpha \delta} \Phi_{\beta 4} \Phi_{\beta 3} \Phi_{\beta 4} \Phi_{\beta 2} \Phi_{\alpha \delta} \Phi_{\beta 4} \Phi_{\beta 4} \Phi_{\beta 5} \Phi_{\beta 4} \Phi_{\beta 5} \Phi_{$
111	6' NeuAc DiLN Bi-(3594)	♦तर ित्त इउित्त इउ ित्त <mark>उउ</mark> ित्त <mark>उउ</mark> ित्त <mark>उउ</mark>
112	$\label{eq:second} \begin{split} & NeuAca(2-6)-Ga \beta(1-4)-GicNAc\beta(1-3)-Ga \beta(1-4)-\\ & GicNAc\beta(1-3)-Ga \beta(1-4)-GicNAc\beta(1-3)-Mana(1-3)-\\ & [NeuAca(2-6)-Ga \beta(1-4)-GicNAc\beta(1-2)-Mana(1-6)]-Man\beta(1-6)-GicNAc\beta(1-4)-$	$ \Phi_{\overline{e}\overline{e}} \Phi_{\overline{p}\overline{e}} \Phi_{\overline{p}\overline{e}} \Phi_{\overline{p}\overline{s}} \Phi_{\overline{p}\overline{e}} \Phi_{\overline{p}\overline{s}} \Phi_$
113	6' NeuAc TriLN Bi-(4324)	ᡬᠧᡕᠿᠶᡕ᠋᠋ᠴᠶᠿᡕ᠋᠋ᠴᠶᠿᡕ᠋ᠴᠶᠿᡕ᠋ᠴᠶᠥ ᡧᡕᡕᠿᡕᡆᢧᡳᠿᡕ᠋ᠴᠶᠿᡕᡆᠶᠿᡕ᠋ᠴᠶᠥ
114	6' NeuAc TetraLN Bi√4828)	ФлФл∎лФл≣лФл∎лФл∎лФ _л Фл∎лШ ∲лФл∎лФл≣л⊙н∎лФл∎лФ ^л Фл∎лШ
115	6' NeuAc DiLN Bi-CF(3740)	 →
116	6' NeuAc TriLN Bi-CF(4470)	◆ c = O ; c = I ; c O ; c = I ; c O ; c = I ; c O ; c = I ; c O ; c = I ; c O ; c = I ; c O ; c = I ; c O ; c = I ; c O ; c = I ; c O ; c = I ; c O ; c = I ; c O ; c = I ; c O ; c = I ; c =

117	6' NeuAc TetraLN B⊦CF(5200)	◆α●σ= π●σ= π●σ= π●σ= π●σ= π ◆α●σ= π●σ= π●σ= π●σ= π●σ= π ■
118	6' NeuAc DiLN Tri-(4615)	
119	6' NeuAc DILN Tri-CF(4761)	
120	LN/6'SLN/6'SLN-TriN	
121	6'SLN/LeX/LeX-TriN	
122	6'SLNLN/LeX/LeX-TriN	

Supplementary Table 1. List of glycan moieties used in this study. Key for glycan moieties: purple diamond; sialic acid, yellow circle; galactose, green circle; mannose, blue square; N-acetylglucosamine, red triangle; fucose, yellow square; N-acetylgalactosamine.





a Western blot analysis of HA proteins from wild-type 2a1 and 2a2 viruses.

b SDS-PAGE analysis of wild-type and mutant recombinant HA proteins. Mutant 2a1 HA proteins had N159 and I160 substitutions to remove glycosylation motif, and mutant 2a2 HA proteins had Y159 and T160 substitutions to add glycosylation motif.

c,d Infectious virus production following infection with virus at MOI of 0.0001 in MDCK-S (**c**) and hCK (**d**) cells incubated at 37°C. Virus titers in supernatant were measured by focus forming unit assay on MDCK-S cells. Statistical comparison of viruses was completed using a Welch's t-test on \log_{10} -transformed titers at each timepoint post infection (*p≤0.05).





Pre-vaccination (**a**) and post-vaccination (**b**) neutralization titers stratified by previous year (2020-21) vaccination status. Two vaccine recipients from Figure 2 had unknown vaccination status in 2020-21, and so were excluded from this analysis.