Preferential recognition of avian-like receptors in human influenza A H7N9 viruses

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Supporting Online Material

Materials and Methods

Expression and purification of H7 HA in a baculovirus system

H7 HA cDNAs of H7N9 A/Shanghai/1/13 (Sh1) [Global Initiative on Sharing All Influenza Data (GISAID) isolate ID: EPI_ISL_138737] and H7N9 A/Shanghai/2/13 (Sh2) (GISAID isolate ID: EPI_ISL_138738) were synthesized by Genscript (USA) without codon optimization. H7 HA ectodomains were expressed using a baculovirus expression system as described previously (*21*). The constructs contain an N-terminal signal sequence for secretion, the H7 HA ectodomain, a thrombin cleavage site, a trimerization foldon sequence, and a His₆-tag for purification. Expressed HA was purified through a His-tag affinity purification step and subsequent column chromatography steps.

Crystallization and structural determination of H7 HA

The purified H7 HA was digested with thrombin to remove the expression tag, foldon and His tag. The product was purified by gel filtration in 20 mM Tris pH 8.0, 50 mM NaCl, and concentrated to 10 mg/mL for crystallization. H7 HA crystals were grown at 22.5°C in sitting drops by vapor diffusion against a reservoir containing 17-20% PEG3350, 0.2 M ammonium acetate. The crystals were cryoprotected by adding ethylene glycol to the mother liquor to a final concentration of 20%, and then flash cooling the crystals in liquid nitrogen. HA-ligand complexes were obtained by soaking HA crystals in cryo-solutions containing glycan ligands. Final ligand concentrations and soaking times are included in tables S1 and S2. Diffraction data were collected on synchrotron radiation sources specified in the data processing and refinement statistics in tables S1 and S2. Data were processed with HKL2000 (40). Initial phases were determined by molecular replacement using Phaser (41). Refinement was carried out in Phenix (42), and alternated with manual rebuilding and adjustment in COOT (43). Two HA protomers are present per asymmetric unit, one of which is much better defined in the electron density maps with lower B-values (fig. S4, tables S1-2). Final refinement statistics are summarized in tables

S1-2.

Expression and purification of H7 HA in a mammalian expression system

Codon-optimized H7 and H1 HA-encoding cDNAs (Genscript, USA) of A/Shanghai/2/13 (H7N9) and A/Kentucky/UR06-0258/2007 (H1N1) (GenBank accession number: CY028163) were cloned into the pCD5 expression plasmid as described previously (44). The pCD5 expression vector is adapted, such that the HA-encoding cDNAs are cloned in frame with DNA sequences coding for signal sequence, а GCN4 trimerization a motif (RMKQIEDKIEEIESKQKKIENEIARIKK) (45), and a Strep-tag II (WSHPQFEK; IBA, Germany).

The HA proteins were expressed in HEK293S GnTI⁻ cells and purified from the cell culture supernatants as described previously (*46*). pCD5 expression vectors were transfected into HEK293S GnTI⁻ cells using polyethyleneimine I (PEI). At 6 h post transfection, the transfection mixture was replaced by 293 SFM II expression medium (Gibco), supplemented with sodium bicarbonate (3.7 g/liter), glucose (2.0 g/liter), Primatone RL-UF (3.0 g/liter), penicillin (100 units/ml), Streptomycin (100 μ g/ml), glutaMAX (Gibco), and 1.5% DMSO. Tissue culture supernatants were harvested 5–6 days post transfection. HA proteins were purified using Strep-Tactin Sepharose beads according to the manufacturer's instructions (IBA, Germany).

Plate-based glycan binding of HA from mammalian expression

96-well nunc maxisorp plates were coated with 1 μ g/ml SLNLN that contained either α 2-3 or α 2-6 linked sialic acids. Purified, soluble trimeric HA was pre-complexed with horseradish peroxidase (HRP)-linked anti-Strep-tag mouse antibody and with HRP-linked anti-mouse IgG (4:2:1 molar ratio) prior to incubation for 15 minutes on ice. The pre-formed HA complexes were incubated for 90 minutes on the SLNLN-coated plates and washed three times with PBST, and HA binding was detected using the TMB substrate kit (Thermo Scientific), similar to our previously published protocols (44).

Glycan microarray binding of mammalian-expressed HA

HA samples were eluted from the strep tag beads with 100mM Tris, 150mM NaCl, 1mM EDTA, 2.5mM D-Biotin, pH 7.2. Purified soluble trimeric HA was used at 50µg/ml precomplexed with horseradish peroxidase (HRP)-linked anti-Strep-tag mouse antibody and with Alexa488-linked anti-mouse IgG (4:2:1 molar ratio) prior to incubation for 15 min on ice in 100 µl PBS-T, and incubated on the array surface in a humidified chamber for 90 minutes. Slides were subsequently washed by successive rinses with PBS-T, PBS, and deionized H2O. Washed arrays were dried by centrifugation and immediately scanned for FITC signal on a Perkin-Elmer ProScanArray Express confocal microarray scanner. Fluorescent signal intensity was measured using Imagene (Biodiscovery) and mean intensity minus mean background was calculated and graphed using MS Excel. For each glycan, the mean signal intensity is calculated from 6 replicates. The highest and lowest signals of the 6 replicates were removed and the remaining 4 replicates were used to calculate the mean signal, standard deviation (SD), and standard error measurement (SEM). Bar graphs represent the averaged mean signal minus background for each glycan sample and error bars are the SD value. A list of glycans on the microarray is included in table S3.

Glycan microarray binding using baculovirus-expressed HAs

HA samples were dialyzed against 20 mM Tris-HCl, 50 mM NaCl, pH 8.0 overnight at 4°C after His-tag affinity purification. Proteins were concentrated to 1 mg/ml before binding assay. Procedures for the HA glycan microarray binding assay were similar to those described above with small alterations. Briefly, 15 μ g/ml HA was pre-complexed with an Alexa488-linked anti-penta-His mouse antibody and with Alexa488-linked anti-mouse IgG (4:2:1 molar ratio) and applied directly to the array for 1 hour.

Glycan binding of baculovirus-expressed HAs by bio-layer interferometry

Recombinant HA expression from the baculovirus expression system was bufferexchanged into PBS buffer. Association of HA was measured on an Octet Red (ForteBio) against immobilized glycans on the sensors. 3'-SLNLN and 6'-SLNLN are biotinylated glycans and were immobilized using Super Streptavidin Biosensors (ForteBio). Association was measured for 300 seconds at 30°C by exposing the sensors to protein solution in 1x kinetic buffer (1x PBS, pH 7.4, 0.01% BSA, and 0.002% Tween 20) after which the sensors were exposed to 1x kinetic buffer for dissociation for 300 seconds at 30°C.



Fig. S1. Glycan binding specificity of the HAs was analyzed by Bio-Layer Interferometry (BLI) on an Octet Red system (ForteBio) using recombinant HAs expressed in a baculovirus system. HA binding at 0.7 mg/ml was measured against immobilized biotinylated glycans 6'-SLNLN (**A**), and 3'-SLNLN (**B**). (**C**) The binding curve for 3'-SLNLN was best fitted using the 2:1 heterogeneous ligand binding model, with apparent K_D values of 0.24 and 0.88 μ M. Avian H7N7 HA (A/Netherlands/219/2003, Neth219) shows specific recognition for 3'-SLNLN, but not 6'-SLNLN. Sh1 and Sh2 HAs from the recent H7N9 human outbreak also display detectable binding but to 3'-SLNLN only, albeit less efficiently than Neth219 HA. The L226I mutation on the Sh2 background has little impact on receptor binding specificity or avidity. The L226Q mutant, however, shows much more efficient association with glycan 3'-SLNLN (apparent K_D values of 0.024 and 0.3 μ M).



Fig. S2. Binding results on the glycan microarray using recombinant HA proteins from baculovirus expression. The mean signal and standard error were calculated from six independent replicates on the array. α 2-3 sialosides are shown in white bars (glycans #3-35), α 2-6 in black bars (glycans #36-56, very little signal), and stripped bars denoted mixed bi-antennary glycans (glycans #57-58) that contain both α 2-3 and α 2-6 linked sialylated glycans. List of glycans imprinted on the array is included in table S3.



Fig. S3. Electron density maps (2Fo-Fc) of glycan ligands in the Sh2 H7 HA crystal structures. (A) LSTa, with 10 min soak (B) LSTc with 10 min soak (C) LSTa with 2 hour soak, (D) glycan #3, (E) glycan #21, (F) glycan #23. D-F are also 2 hour ligand soaks. The maps are contoured at a 1 σ level (colored in grey) in panels B, D E and F. In (A) and (C), maps are shown at the 0.8 σ level. Only density for the glycan receptors is shown for clarity.



Fig. S4. Analysis of B-value distribution in the Sh2 H7 HA crystal structure. The two HA protomers within the asymmetric unit are colored by B-value. The warmest colors (*i.e.*, red and orange) indicate high B-values, while cool colors (*i.e.*, blue) indicate low B-values. The two protomers are shown in similar orientations for clarity. One protomer (**A**) has low B-values and clear and unambiguous electron density, while the other protomer (**B**) is less well-defined and has much higher B-values.

		10	20	30	40 50
Consensus	MNTQILVFALIAIIPTN	ADKICLGHH	IAVSNGTKVNT	LTERGVEVVN	ATETVERTNIPRIC
A /Shanghai /2 /2012	-				
A/Anhui/1/2012					
A/Shanghai/1/2013					
A/Hangzhou/1/2013					
A/Zheijang/DTID-ZIU01/2013					
A/Hangzhou/2/2013					
A/Hangzhou/3/2013					
A/Shanghai/3/2013					
A/Shanghai/4/2013					
A/Zhejiang/01/2013					
A/Zhejiang/1/2013					
A/Zhejiang/2/2013					
A/Taiwan/1/2013					
A/Fujian/1/2013					
A/Shanghai/4664T/2013	•••••A				
A/Shanghai/Patient3/2013					
A/Taiwan/S02076/2013					
A/Taiwan/T02081/2013					
A/Zhejiang/HZ1/2013					
A/Nanjing/1/2013					
A/Nanchang/1/2013					
A/Huzhou/10/2013					
A/Huzhou/3/2013					
A/Huzhou/4/2013					
A/Huzhou/5/2013					
A/Huzhou/6/2013					
A/Wuxi/1/2013					
A/Wuxi/2/2013					
A/environment/Wuxi/1/2013					
A/liangsu/1/2013					
	60	70	80	90	100 110
Consensus	5KGKRTVDLGQCGLLG	70 FİTGPPQCDÇ	PLEFSADLII	90 ERREGSDVCY	100 110 PGKFVNEEALRQIL
Consensus A/Shanghai/2/2013	⁶⁰ SKGKRTVDLGQCGLLG	⁷⁰ TİTGPPQCDÇ	PLEFSADLII	90 ERREGSDVCY	100 PGKFVNEEALRQIL
Consensus A/Shanghai/2/2013 A/Anhui/1/2013	SKGKRTVDLGQCGLLG	⁷⁰ TİTGPPQCDÇ	PFLEFSADLII	90 ERREGSDVCY	100 110 PGK FVN E EALR QI L
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013	SKGKRTVDLGQCGLLG	⁷⁰ TITGPPQCDÇ	PFLEFSADLII	90 E E R E G S D V C Y	100 110 PGK FVN E EALR QI L
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013	SKGKRTVDLGQCGLLG	⁷⁰ FİTGPPQCDÇ	⁸⁰ PFLEFSADLII	90 ERREGSDVCY	100 110 PGKFVNEEALRQIL
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Zhejiang/DTID-ZJU01/2013	SKGKRTVDLGQCGLLG	⁷⁰ TİTGPPQCDÇ	80 OFLEFSADLII	90 ERREGSDVCY	110 110 PGK FVN EEA LR QI L
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Zhejiang/DTID-ZJU01/2013 A/Hangzhou/2/2013	SKGKRTVDLGQCGLLG	⁷⁰ TİTGPPQCDÇ	80 PFLEFSADLII	90 ERREGSDVCY	110 PGK FVN E EALR QIL
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Zhejiang/DTID-2JU01/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013	SKGKRTVDLGQCGLLG	70 FİTGPPQCDÇ	⁸⁰ FLEFSADLII	90 ERREGSDVCY	100 110 PGK FVN E EALR QIL
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013	SKGKRTVDLGQCGLLG	⁷⁰ TİTGPPQCDÇ	PFLEFSADLII	90 ERREGSDVCY	100 110 PGKFVNEEALRQIL
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/3/2013 A/Shanghai/4/2013	SKGKRTVDLGQCGLLG	70 FITGPPQCDC	2FLEFSADLII	90 ERREGSDVCY	1100 110 PGK FVN EEALR QIL
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Shanghai/3/2013 A/Shanghai/4/2013 A/Shanghai/4/2013 A/Shanghai/4/2013	SKGKRTVDLGQCGLLG	70 FITGPPQCDC	⁸⁰ PFLEFSADLII	90 ERREGSDVCY	110 PGKFVNEEALRQIL
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/3/2013 A/Shanghai/4/2013 A/Zhejiang/01/2013 A/Zhejiang/01/2013 A/Zhejiang/02/2013	SKGKRTVDLGQCGLLG	70 FITGPPQCDC	PFLEFSADLII	90 ERREGSDVCY	110 PGK FVN E EALR QIL
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Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/3/2013 A/Shanghai/4/2013 A/Shanghai/1/2013 A/Zhejiang/1/2013 A/Zhejiang/2/2013 A/Taiwan/1/2013 A/Changhai/46Cff/2012	SKGKRTVDLGQCGLLG	70 FITGPPQCDC	2FLEFSADLII	90 ERREGSDVCY	110 PGKFVNEEALRQIL
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Jhanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Hanghai/3/2013 A/Shanghai/3/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Fujian/1/2013 A/Shanghai/4664T/2013 A/Shanghai/4664T/2013 A/Shanghai/4664T/2013 A/Shanghai/4664T/2013	SKGKRTVDLGQCGLLG	70 TITGPPQCDC	⁸⁰ PFLEFSADLII	90 ERREGSDVCY	100 110 PGKFVNEEALRQIL
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/4/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Fujian/1/2013 A/Fujian/1/2013 A/Fujian/1/2013 A/Fujian/1/2013 A/Fujian	SKGKRTVDLGQCGLLG	70 FİTGPPQCDÇ	2FLEFSADLII	90 ERREGSDVCY	100 110 PGKFVNEEALRQIL
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Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/4/2013 A/Shanghai/4/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Taiwan/S02076/2013 A/Taiwan/S02076/2013 A/Taiwan/S02076/2013 A/Taiwan/S02076/2013 A/Taiwan/S02076/2013 A/Taiwan/S02076/2013 A/Taiwan/S02076/2013 A/Taiwan/S02076/2013 A/Lapiang/1/2013 A/Lapiang/1/2013 A/Lapiang/1/2013 A/Huzhou/1/2013 A/Huzhou/3/2013 A/Huzhou/5/2013 A/Huzhou/5/2013 A/Huzhou/5/2013 A/Huzhou/5/2013 A/Huzhou/5/2013 A/Huzhou/5/2013	SKGKRTVDLGQCGLLG	70 FITGPPQCDC	2FLEFSADLII	90 ERREGSDVCY	110 PGK FVN EEALR QIL
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/4/2013 A/Shanghai/4/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Fujian/1/2013 A/Shanghai/4664T/2013 A/Shanghai/4664T/2013 A/Taiwan/S02076/2013 A/Taiwan/S02076/2013 A/Taiwan/S02076/2013 A/Taiwan/S02076/2013 A/Lapiang/1/2013 A/Nanjing/1/2013 A/Huzhou/1/2013 A/Huzhou/1/2013 A/Huzhou/1/2013 A/Huzhou/2/2013 A/Huzhou	SKGKRTVDLGQCGLLG	70 FITGPPQCDC	2FLEFSADLII	90 ERREGSDVCY	110 PGK FVN EEALR QIL
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Jhanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/3/2013 A/Shanghai/3/2013 A/Zhejiang/01/2013 A/Zhejiang/01/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Fujian/1/2013 A/Fujian/1/2013 A/Fujiang/HZ1/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/1/2013 A/Lapijang/HZ1/2013 A/Nanchang/1/2013 A/Huzhou/1/2013 A/Huzhou/1/2013 A/Huzhou/2013 A/Huzhou/2013 A/Huzhou/2013 A/Huzhou/2013 A/Huzhou/2013 A/Huzhou/2013 A/Waxi/1/2013 A/Wuxi/2/2013 A/Wuxi/2/2013	SKGKRTVDLGQCGLLG	70 FITGPPQCDC	2FLEFSADLII	90 ERREGSDVCY	100 110 PGKFVNEEALRQIL
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/4/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Huzhou/1/2013 A/Huzhou/1/2013 A/Huzhou	SKGKR TV DLG QCG LLG	70 FİTGPPQCDÇ	2FLEFSADLII	90 ERREGSDVCY	100 110 PGK FVN EEALR QIL

	120	130	140	150	160 170
Consensus	RESGGIDKEAMGFT	YSGİRTNGATS	ACRRSGSSFY	AĖMKWLLSNTDI	NAAFPOMTKSYKNT
A /Shanghai /2 /2012					_
A/Anhui/1/2012					
A/Shanghai/1/2013			c		
A/Hangzhou/1/2013			5		
A/Theijang/DTID=7IU01/2013					
A/Hangzhou/2/2013					T
A/Hangzhou/3/2013					
A/Shanghai/3/2013					
A/Shanghai/4/2013					
A/Zheijang/01/2013					
A/Zhejiang/1/2013					
A/Zhejiang/2/2013					
A/Taiwan/1/2013					
A/Fujian/1/2013					
A/Shanghai/4664T/2013					
A/Shanghai/Patient3/2013					S
A/Taiwan/S02076/2013					
A/Taiwan/T02081/2013					
A/Zhejiang/HZ1/2013					
A/Nanjing/1/2013					
A/Nanchang/1/2013					
A/Huzhou/1/2013		· · · · · · · · · · · ·			
A/Huzhou/10/2013		••••G			
A/Huzhou/3/2013					
A/Huzhou/4/2013				• • • • • • • • • • • •	
A/Huzhou/S/2013				• • • • • • • • • • • •	
A/Huzhou/6/2013					
A/Wuxi/1/2013		••••••			
A/wuxi/2/2013					
A/liangsu/1/2013					
A/Jiangsu/1/2015					
	180	190	200	210	220 230
Consensus	PKSPALTVWCTHHS		200 SCNKLVTVCS	210 SNYOOSEVPSP	220 230 CAR POUNCI SCRTD
Consensus	RKSPALIVWGIHHS	¹⁹⁰ VSTAEQTKLYG	SGNKLVTVGS	SNYQQSFVPSP	220 230 GARPQVNGLSGRID
Consensus A/Shanghai/2/2013	RKSPALIVWGIHHS	¹⁹⁰ VSTAEQTKLYG	SGNKLVTVGS	210 SNYQQSFVPSPO	220 230 230 230 230 230 230 230 230 230
Consensus A/Shanghai/2/2013 A/Anhui/1/2013	RKSPALIVWGIHHS	¹⁹⁰ VSTAEQTKLYG	SGNKLVTVGS	210 SNYQQSFVPSP0	ZZO ZZO ZZO ZZO ZZO ZZO ZZO ZZO ZZO ZZO
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013	RKSPALIVWGIHHS	¹⁹⁰ VSTAEQTKLYG G	200 SGNKLVTVGS	210 SNYQQSFVPSP0	220 230 GARPQVNGLSGRID
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Taoiirea (JZID, 2014)/2013	180 RKSPALIVWGIHHS	190 VSTAĖQTKLYG G	200 SGNKLVTVGS	210 SNYQQSFVPSP0	220 230 240 250 250 250 250 250 250 250 250 250 25
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Zhejiang/DTID-ZJU01/2013 A/Hangzhou/2/2013	180 RKSPALIVWGIHHS	190 VSTAEQTKLYG G	200 SGNKLVTVGS	210 SNYQQSFVPSP	220 230 240 250 250 250 250 250 250 250 250 250 25
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Zhejiang/DTID-ZJU01/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013	180 RKSPALIVWGIHHS	190 VSTAEQTKLYG G	200 SGNKLVTVGS	²¹⁰ SNYQQSFVPSP	220 230 GAR P Q V N G L S G R I D
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Anagzhou/1/2013 A/Zhejiang/DTID-2JU01/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/3/2013	180 RKSPALIVWGIHHS	190 VSTAEQTKLYG G	200 SGNKLVTVGS	210 SNYQQSFVPSP	220 230 GAR P Q V N G L S G R I D TQ
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/3/2013	180 RKSPALIVWGIHHS	190 VSTAEQTKLYG G	200 SGNKLVTVGS	²¹⁰ SNYQQSFVPSP	220 230 240 250 250 250 250 250 250 250 250 250 25
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Zhangzhou/1/2013 A/Zhejiang/DTID-ZJU01/2013 A/Hangzhou/3/2013 A/Shanghai/3/2013 A/Shanghai/4/2013 A/Zhejiang/01/2013	180 RKSPALIVWGIHHS	190 VSTAEQTKLYG G	200 SGNKLVTVGS	²¹⁰ SNYQQSFVPSP	220 230 240 250 250 250 250 250 250 250 250 250 25
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/4/2013 A/Shanghai/4/2013 A/Zhejiang/01/2013	180 RKSPALIVWGIHHS	190 VSTAEQTKLYG G	200 SGNKLVTVGS	²¹⁰ SNYQQSFVPSP	220 230 3AR PQVNGLSGRID
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Anaghai/1/2013 A/Hangzhou/1/2013 A/Zhejiang/DTID-2JU01/2013 A/Hangzhou/3/2013 A/Shanghai/4/2013 A/Shanghai/4/2013 A/Zhejiang/01/2013 A/Zhejiang/1/2013 A/Zhejiang/2/2013	180 RKSPALIVWGIHHS	190 VSTAEQTKLYG G	200 SGNKLVTVGS	²¹⁰ SNYQQSFVPSP	220 230 3AR PQVNGLSGRID
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Anagzhou/1/2013 A/Hangzhou/1/2013 A/Zhejiang/DTID-ZJU01/2013 A/Hangzhou/3/2013 A/Shanghai/4/2013 A/Shanghai/4/2013 A/Zhejiang/1/2013 A/Zhejiang/2/2013 A/Taiwan/1/2013	180 RKSPALIVWGIHHS	190 VSTAEQTKLYG G	200 SGNKLVTVGS	²¹⁰ SNYQQSFVPSP	220 230 3AR PQVNGLSGRID
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/3/2013 A/Shanghai/4/2013 A/Zhejiang/01/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Fujian/1/2013	180 RKSPALIVWGIHHS	190 VSTAEQTKLYG	200 SGNKLVTVGS	²¹⁰ SNYQQSFVPSP	220 230 3AR PQVNG LSGR I D
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Langzhou/1/2013 A/Langzhou/1/2013 A/Langzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/4/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Fujian/1/2013 A/Fujian/1/2013 A/Fujian/1/2013 A/Fujian/1/2013	180 RKSPALIVWGIHHS	190 VSTAEQTKLYG G	200 SGNKLVTVGS	²¹⁰ SNYQQSFVPSP	220 230 3AR PQVNGLSGRID TQ I I P
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Anaghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Shanghai/4/2013 A/Shanghai/4/2013 A/Zhejiang/01/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Zhaigang/2/2013 A/Taiwan/1/2013 A/Shanghai/4664T/2013 A/Shanghai/Patient3/2013	IN RKSPALIVWGIHHS	190 VSTAEQTKLYG	200 SGNKLVTVGS	²¹⁰ SNYQQSFVPSP	220 CARPQVNGLSGRID
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Anaghai/1/2013 A/Hangzhou/1/2013 A/Zhejiang/DTID-ZJU01/2013 A/Hangzhou/3/2013 A/Hangzhou/3/2013 A/Shanghai/4/2013 A/Shanghai/4/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Fujian/1/2013 A/Shanghai/4664T/2013 A/Shanghai/464T/2013 A/Shanghai/A664T/2013 A/Shanghai/A664T/2013 A/Shanghai/A664T/2013 A/Shanghai/A664T/2013 A/Shanghai/A664T/2013	IN IN IN IN IN IN IN IN IN IN IN IN IN I	190 VSTAEQTKLYG	200 SGNKLVTVGS	²¹⁰ SNYQQSFVPSP	220 230 CARPQVNGLSGRID
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Zhajiang/DTID-ZJU01/2013 A/Zhejiang/DTID-ZJU01/2013 A/Hangzhou/3/2013 A/Shanghai/3/2013 A/Shanghai/4/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Shanghai/464T/2013 A/Shanghai/464T/2013 A/Shanghai/42013 A/Shanghai/Patient3/2013 A/Taiwan/T02081/2013	180 RKSPALIVWGIHHS	190 VSTAEQTKLYG	200 SGNKLVTVGS	²¹⁰ SNYQQSFVPSP	220 230 3AR PQVNG LSGR I D T.Q I I P
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Langzhou/1/2013 A/Langzhou/2/2013 A/Langzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/4/2013 A/Zhejiang/01/2013 A/Zhejiang/01/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Fujan/1/2013 A/Fujan/1/2013 A/Fujan/2013 A/Fujan/2013 A/Fujan/2013 A/Fujan/2013 A/Fujan/2013 A/Fujan/2013 A/Fujan/2013 A/Fujan/2013 A/Fujan/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013	180 RKSPALIVWGIHHS	190 VSTAEQTKLYG G	200 SGNKLVTVGS	²¹⁰ SNYQQSFVPSP	220 230 3AR PQVNGLSGRID T.Q I.I. P
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Anhai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Shanghai/3/2013 A/Shanghai/4/2013 A/Shanghai/4/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Shanghai/4664T/2013 A/Shanghai/464T/2013 A/Shanghai/Patient3/2013 A/Taiwan/S02076/2013 A/Taiwan/S02076/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Shanghai/Patient3/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Nanjing/1/2013	IN RKSPALIVWGIHHS	190 VSTAEQTKLYG	200 SGNKLVTVGS	²¹⁰ SNYQQSFVPSP	220 CAR PQVNG LSGR I D T Q I I P P
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Anhai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hanghou/3/2013 A/Shanghai/4/2013 A/Shanghai/4/2013 A/Zhejiang/01/2013 A/Zhejiang/01/2013 A/Zhejiang/1/2013 A/Zhaiwan/1/2013 A/Shanghai/4664T/2013 A/Shanghai/4664T/2013 A/Shanghai/4664T/2013 A/Shanghai/Patient3/2013 A/Taiwan/T02081/2013 A/Nanign/1/2013 A/Nanign/1/2013 A/Nanign/1/2013 A/Nanign/1/2013 A/Nanign/1/2013	180 RKSPALIVWGIHHS	190 VSTAEQTKLYG	200 SGNKLVTVGS	210 SNYQQSFVPSP	220 230 3AR PQVNGLSGRID
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Anhui/1/2013 A/Hangzhou/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Hanghai/4/2013 A/Shanghai/4/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Taiwan/102081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T2013 A/Nanjing/1/2013 A/Nanjing/1/2013 A/Nanchang/1/2013 A/Nanchang/1/2013 A/Nanchang/1/2013 A/Huzhou/1/2013	180 RKSPALIVWGIHHS	190 VSTAEQTKLYG	200 SGNKLVTVGS	210 SNYQQSFVPSP	220 230 GAR PQVNG LSGR I D T.Q I
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Zhajiang/DTID-ZJU01/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/3/2013 A/Shanghai/4/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Taiwan/102081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Nanchang/1/2013 A/Nanchang/1/2013 A/Nanchang/1/2013 A/Huzhou/1/2013 A/Huzhou/1/2013	180 RKSPALIVWGIHHS	190 VSTAEQTKLYG	200 SGNKLVTVGS	210 SNYQQSFVPSP	220 230 GAR PQVNG LSGR I D T.Q I P P G
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Anhai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Hanghai/3/2013 A/Shanghai/3/2013 A/Shanghai/4/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Shanghai/4664T/2013 A/Shanghai/4664T/2013 A/Shanghai/4664T/2013 A/Shanghai/42013 A/Taiwan/T020876/2013 A/Taiwan/T02081/2013 A/Taiwan/12013 A/Taiwan/12013 A/Taiwan/12013 A/Taiwan/12013 A/Taiwan/12013 A/Laiwan/12013 A/Laiwan/12013 A/Nanjing/12013 A/Nanchang/1/2013 A/Huzhou/12013 A/Huzhou/12013 A/Huzhou/12013	180 RKSPALIVWGIHHS	190 VSTAEQTKLYG G	200 SGNKLVTVGS	210 SNYQQSFVPSP	220 230 GAR PQVNG LSGR I D TQ I I P
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Anhui/1/2013 A/Hangzhou/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hanghou/3/2013 A/Shanghai/4/2013 A/Shanghai/4/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Laiwan/1/2013 A/Shanghai/4664T/2013 A/Shanghai/4664T/2013 A/Shanghai/Patient3/2013 A/Taiwan/T02081/2013 A/Laiwan/T02081/2013 A/Laiwan/1/2013 A/Naning/1/2013 A/Nanchang/1/2013 A/Nanchang/1/2013 A/Huzhou/1/2013 A/Huzhou/1/2013 A/Huzhou/1/2013 A/Huzhou/1/2013 A/Huzhou/1/2013 A/Huzhou/2/2013 A/Huzhou/2/2013 A/Huzhou/2/2013	180 RKSPALIVWGIHHS	190 VSTAEQTKLYG	200 SGNKLVTVGS	210 SNYQQSFVPSP	220 230 GAR PQVNGLSGRID
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Anhui/1/2013 A/Hangzhou/1/2013 A/Hangzhou/1/2013 A/Hangzhou/3/2013 A/Hangzhou/3/2013 A/Janghai/4/2013 A/Shanghai/4/2013 A/Shanghai/4/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Taiwan/102081/2013 A/Taiwan/12013 A/Taiwan/12013 A/Taiwan/12013 A/Taiwan/12013 A/Taiwan/12013 A/Taiwan/12013 A/Nanging/HZ1/2013 A/Nanchang/1/2013 A/Nanchang/1/2013 A/Huzhou/1/2013 A/Huzhou/3/2013 A/Huzhou/3/2013 A/Huzhou/2013 A/Huzhou/2/2013 A/Huzhou/2/2013 A/Huzhou/6/2013 A/Huzhou/6/2013	180 RKSPALIVWGIHHS	190 VSTAEQTKLYG	200 SGNKLVTVGS	210 SNYQQSFVPSP	220 230 GAR PQVNG LSGR I D T.QI I P
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Anaghai/1/2013 A/Hangzhou/1/2013 A/Langzhou/2/2013 A/Langzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/3/2013 A/Shanghai/4/2013 A/Zhejiang/01/2013 A/Zhejiang/1/2013 A/Zhejiang/2/2013 A/Taiwan/1/2013 A/Faijang/1/2013 A/Shanghai/4664T/2013 A/Shanghai/4664T/2013 A/Shanghai/4664T/2013 A/Taiwan/S02076/2013 A/Taiwan/S02076/2013 A/Taiwan/S02076/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Lapiang/1/2013 A/Huzhou/1/2013 A/Huzhou/1/2013 A/Huzhou/1/2013 A/Huzhou/2/2013 A/Huzho	180 RKSPALIVWGIHHS	190 VSTAEQTKLYG	200 SGNKLVTVGS	210 SNYQQSFVPSP	220 230 GAR PQVNG LSGR I D
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Anhai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Hanghai/3/2013 A/Shanghai/3/2013 A/Shanghai/4/2013 A/Shanghai/1/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Zhaiyan/1/2013 A/Taiwan/1/2013 A/Shanghai/4664T/2013 A/Shanghai/4664T/2013 A/Shanghai/4664T/2013 A/Shanghai/42013 A/Taiwan/502076/2013 A/Taiwan/502076/2013 A/Taiwan/102081/2013 A/Laiwan/12013 A/Laiwan/12013 A/Laiwan/12013 A/Laiwan/12013 A/Laiwan/12013 A/Laiwan/12013 A/Laiwan/12013 A/Huzhou/12013 A/Huzhou/1/2013 A/	180 RKSPALIVWGIHHS	190 VSTAEQTKLYG G	200 SGNKLVTVGS	210 SNYQQSFVPSP	220 230 GAR PQVNG LSGR I D
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Anhui/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hanghou/3/2013 A/Shanghai/4/2013 A/Shanghai/4/2013 A/Zhejiang/01/2013 A/Zhejiang/01/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Faiwan/1/2013 A/Shanghai/4664T/2013 A/Shanghai/Ateint3/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Laiwan/1/2013 A/Laiwan/1/2013 A/Laiwan/1/2013 A/Laiwan/1/2013 A/Laiwan/1/2013 A/Huzhou/1/2013 A/Huzhou/1/2013 A/Huzhou/5/2013 A/Huzhou/2/2/2013 A/Huzhou/2/2/2013 A/Huzhou/2/2/2013 A/Huzhou/2/2/2013 A/Huzhou/2/2/2013 A/Huzhou/2/2/2013 A/Huzhou/2/2/2013 A/Huzhou/2/2/2013 A/Huzhou/2/2/2013 A/Huzhou/2/2/2013 A/Huzhou/2/2/2013 A/Huzhou/2/2/2013 A/Huzh	180 RKSPALIVWGIHHS	190 VSTAEQTKLYG	200 SGNKLVTVGS	210 SNYQQSFVPSP	220 230 3AR PQVNGLSGRID
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Anapai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Hanghou/3/2013 A/Shanghai/4/2013 A/Shanghai/4/2013 A/Zhejiang/01/2013 A/Zhejiang/01/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Fujian/1/2013 A/Shanghai/4664T/2013 A/Shanghai/4664T/2013 A/Shanghai/Patient3/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Naning/1/2013 A/Nanchang/1/2013 A/Nanchang/1/2013 A/Huzhou/1/2013 A/Huzhou/3/2013 A/Huzhou/3/2013 A/Huzhou/2/2013 A/Huzhou/2/2013 A/Huzhou/2/2013 A/Huzhou/2/2013 A/Huzhou/2/2013 A/Huzhou/2/2013 A/Huzhou/1/2013 A/Huzhou/2/2013 A/Huzhou/2/2013 A/Huzhou/1/2013 A/Huzhou/1/2013 A/Huzhou/2/2013 A/Huzhou/1/2013 A/Huzhou/2/2013 A/Huzhou/1/2013 A/Hu	180 RKSPALIVWGIHHS	190 VSTAEQTKLYG	200 SGNKLVTVGS	210 SNYQQSFVPSP	220 230 3AR PQVNGLSGRID T.Q I P

	240	250	260	270	280 290
Consensus	FHWLMLNPNDTVTFSF	IGAFIAPDRAS	SFLRGKSMGI	QSGVQVDANCE	GDCYHSGGTIISN
A/Shanghai/2/2013					
A/Anhui/1/2013		. 			
A/Shanghai/1/2013				D	Y
A/Hangzhou/1/2013					
A/Zheijang/DTID-ZIU01/2013					
A/Hangzhou/2/2013					
A/Hangzhou/3/2013					
A/Shanghai/3/2013					H
A/Shanghai/4/2013					
A/Zhejiang/01/2013					
A/Zhejiang/1/2013					
A/Zhejiang/2/2013					
A/Taiwan/1/2013					••••N•
A/Fujian/1/2013					
A/Shanghai/4664T/2013		· · <u>·</u> · · · · · · · ·			H
A/Shanghai/Patient3/2013		T			M
A/Taiwan/S02076/2013					
A/Taiwan/102081/2013					
A/Znejlang/HZ1/2013					
A/Nanjing/1/2013					
A/Huzbou/1/2013					
A/Huzhou/10/2013					
A/Huzhou/3/2013					
A/Huzhou/4/2013					
A/Huzhou/5/2013					
A/Huzhou/6/2013					
A/Wuxi/1/2013					
A/Wuxi/2/2013					
A/environment/Wuxi/1/2013					
A/Jiangsu/1/2013					
	300	310	320	1	10 20
Consensus	300 LPFQNIDSRAVGKCPR	³¹⁰ YVKQRSLLLAJ	³²⁰ FGMKNVPEIP	KGRGLFGAIAG	¹⁰ FIENGWEGLIDGW
Consensus A/Shanghai/2/2013	300 LPFQNIDSRAVGKCPR	³¹⁰ YVKQRSLLLA1	320 FGMKNVPEIP	KGRGLFGAIAG	¹⁰ FIENGWEGLIDĠW
Consensus A/Shanghai/2/2013 A/Anhui/1/2013	300 LPFQNIDSRAVGKCPR	³¹⁰ YVKQRSLLLAT	320 FGMKNVPEIP	KGRGLFGAIAG	¹⁰ FIENGWEGLIDGW
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013	300 LPFQNIDSRAVGKCPR	³¹⁰ YVKQRSLLLAT	³²⁰ FGMKNVPEIP	KGRGLFGAIAG	FIENGWEGLIDGW
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013	300 LPFQNIDSRAVGKCPR	³¹⁰ YVKQRSLLLAT	³²⁰ FGMKNVPEIP	KGRGLFGAIAG	FIENGWEGLIDGW
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Zhejiang/DTID-ZJU01/2013	300 LPFQNIDSRAVGKCPR	³¹⁰ VVKQRSLLLAT	³²⁰ FGMKNVPEIP	KGRGLFGAIAC	10 20 FIENGWEGLIDGW
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Zhejiang/DTID-ZJU01/2013 A/Hangzhou/2/2013	300 LPFQNIDSRAVGKCPR	³¹⁰ YVKQRSLLLAT	320 FGMKNVPEIP	KGRGLFGAIAC	10 20 FIENGWEGLIDGW
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Hangzhou/3/2013	300 LPFQNIDSRAVGKCPR	³¹⁰ YVKQRSLLLAT	320 FGMKNVPEIP	KGRGLFGAIAC	10 20 FIENGWEGLIDĠW
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/3/2013 A/Shanghai/2/2013	300 LPFQNIDSRAVGKCPR	³¹⁰ YVKQRSLLLAT	320 FGMKNVPEIP	KGRGLFGAIAC	10 20 FIENGWEGLIDĠW
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/3/2013 A/Shanghai/4/2013 A/Zheijan (01/2013	300 LPFQNIDSRAVGKCPR	³ jo YVK QR S LLLA 1	320 PGMKNVPEIP	KGRĞLFGAIAC	10 20 FIENGWEGLIDGW
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Hangzhou/3/2013 A/Shanghai/3/2013 A/Shanghai/4/2013 A/Zheijang/01/2013 A/Zheijang/1/2013	300 LPFQNIDSRAVGKCPR	³ 10 YVK QR S LLLA 1	320 FGMKNVPEIP	KGRGLFGAIAC	10 20 FIENGWEGLIDGW
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Hangzhou/3/2013 A/Shanghai/3/2013 A/Shanghai/4/2013 A/Zhejiang/01/2013 A/Zhejiang/2/2013	300 LPFQNIDSRAVGKCPR	³¹⁰ YVKQRSLLLAT	320 FGMKNVPEIP	KGRGLFGAIAG	10 20 FIENGWEGLIDGW
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Jhanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Shanghai/3/2013 A/Shanghai/4/2013 A/Zhejiang/01/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013	300 LPFQNIDSRAVGKCPR	³¹⁰ YVKQRSLLLAT	320 FGMKNVPEIP	KGRGLFGAIAC	10 20 FIENGWEGLIDĠW
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/4/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Fujian/1/2013	300 LPFQNIDSRAVGKCPR	³ jo YVK QR S LLLA 1	320 PGMKNVPEIP	KGRGLFGAIAC	10 20 FIENGWEGLIDGW
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/4/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Zhejiang/2/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Fujian/1/2013 A/Shanghai/4664T/2013	300 LPFQNIDSRAVGKCPR	³ 10 YVKQRSLLLAT	320 FGMKNVPEIP	KGRĞLFGAIAC	10 20 FIENGWEGLIDGW
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Hangzhou/3/2013 A/Shanghai/3/2013 A/Shanghai/4/2013 A/Zhejiang/1/2013 A/Zhejiang/2/2013 A/Zhaijang/1/2013 A/Zhaijan/1/2013 A/Shanghai/4664T/2013 A/Shanghai/Patient3/2013	300 LPFQNIDSRAVGKCPR	310 YVKQRSLLLAT	320 PGMKNVPEIP	KGRĞLFGAIAC	10 20 FIENGWEGLIDGW
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Jhanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Hangzhou/3/2013 A/Shanghai/3/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Shanghai/4664T/2013 A/Shanghai/4664T/2013 A/Taiwan/502076/2013	300 LPFQNIDSRAVGKCPR	310 YVKQRSLLLAT	320 PGMKNVPEIP	KGRGLFGAIAG	10 20 FIENGWEGLIDGW
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/3/2013 A/Shanghai/3/2013 A/Zhejiang/01/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Fujian/1/2013 A/Fujian/1/2013 A/Fujian/1/2013 A/Fujian/1/2013 A/Fujian/2013 A/Fujian/2013 A/Fujian/2013 A/Fujian/2013 A/Fujian/2013 A/Fujian/2013 A/Fujian/2013 A/Fujian/2013 A/Taiwan/T02081/2013	300 LPFQNIDSRAVGKCPR	^{3j0} XVK QR S LLLA 1	320 PGMKNVPEIP	KGRGLFGAIAC	10 20 FIENGWEGLIDGW
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/4/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Taiwan/12013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013	300 LPFQNIDSRAVGKCPR	310 YVKQRSLLLAT	320 PGMKNVPEIP	KGRĞLFGAIAC	10 20 FIENGWEGLIDGW
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/4/2013 A/Zhejiang/01/2013 A/Zhejiang/2/2013 A/Zhejiang/2/2013 A/Zhejiang/1/2013 A/Equinan/1/2013 A/Fujian/1/2013 A/Shanghai/4664T/2013 A/Shanghai/4664T/2013 A/Shanghai/Patient3/2013 A/Taiwan/T02081/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013	300 LPFQNIDSRAVGKCPR	310 YVKQRSLLLAT	320 FGMKNVPEIP	KGRĞLFGAIAC	10 20 FIENGWEGLIDGW
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/3/2013 A/Shanghai/4/2013 A/Zhejiang/1/2013 A/Zhejiang/2/2013 A/Zhaijan/2/2013 A/Taiwan/1/2013 A/Shanghai/4664T/2013 A/Shanghai/4664T/2013 A/Shanghai/Patient3/2013 A/Taiwan/T02081/2013 A/Zhejiang/L2/2013 A/Zhaijang/L2/2013 A/Laiwan/T2013 A/Laiwan/T2013 A/Laiwan/T2013 A/Laiwan/T2013 A/Laiwan/T2013 A/Laiwan/T2013 A/Laiwan/T2013 A/Laiwan/T2013 A/Laiwan/T2013 A/Laiwan/T2013 A/Nanjing/1/2013 A/Nanchang/1/2013	300 LPFQNIDSRAVGKCPR	310 YVKQRSLLLAT	320 PGMKNVPEIP	KGRĞLFGAIAC	10 20 FIENGWEGLIDGW
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Jhanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Hangzhou/3/2013 A/Shanghai/3/2013 A/Zhejiang/01/2013 A/Zhejiang/01/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Nanjing/1/2013 A/Nanjing/1/2013 A/Nanjing/1/2013 A/Nanjing/1/2013 A/Nanjing/1/2013 A/Nanjing/1/2013 A/Nanjing/1/2013 A/Nanjing/1/2013 A/Nanjing/1/2013 A/Nanjing/1/2013 A/Nanjing/1/2013 A/Nanjing/1/2013 A/Huzhou/1/2013	300 LPFQNIDSRAVGKCPR	310 YVKQRSLLLAT	320 PGMKNVPEIP	KGRGLFGAIAG	10 20 FIENGWEGLIDĠW
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/4/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Nanchang/1/2013 A/Nanchang/1/2013 A/Huzhou/1/2013 A/Huzhou/1/2013 A/Huzhou/1/2013	300 LPFQNIDSRAVGKCPR	310 YVKQRSLLLAT	320 PGMKNVPEIP	KGRĠLFGAIAC	10 20 FIENGWEGLIDGW
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/4/2013 A/Shanghai/4/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Fujian/1/2013 A/Fujian/1/2013 A/Fujian/1/2013 A/Fujiang/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Nanihag/1/2013 A/Nanchang/1/2013 A/Huzhou/1	300 LPFQNIDSRAVGKCPR	310 YVKQRSLLLAT	320 PGMKNVPEIP	KGRĞLFGAIAC	10 20 FIENGWEGLIDGW
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/4/2013 A/Zhejiang/01/2013 A/Zhejiang/1/2013 A/Zhejiang/2/2013 A/Zhejiang/2/2013 A/Zhejiang/1/2013 A/Laiwan/1/2013 A/Fujian/1/2013 A/Shanghai/4664T/2013 A/Shanghai/4664T/2013 A/Taiwan/S02076/2013 A/Taiwan/S02076/2013 A/Laiwan/T02081/2013 A/Laiwan/T02081/2013 A/Nanjing/1/2013 A/Nanchang/1/2013 A/Huzhou/1/2013 A/Hu	300 LPFQNIDSRAVGKCPR	310 YVKQRSLLLAT	320 PGMKNVPEIP	KGRĞLFGAIAC	10 20 FIENGWEGLIDGW
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Jhanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Shanghai/3/2013 A/Zhejiang/01/2013 A/Zhejiang/01/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/1/2013 A/Lapiang/HZ1/2013 A/Nanjing/1/2013 A/Nanjing/1/2013 A/Huzhou/1/2013 A/Huzhou/1/2013 A/Huzhou/3/2013 A/Huzhou/3/2013 A/Huzhou/3/2013 A/Huzhou/5/2013 A/Huzhou/6/2013 A/Huzhou/6/2013	300 LPFQNIDSRAVGKCPR	310 YVKQRSLLLAT G.G.	320 PGMKNVPEIP	KGRĞLFGAIAG	10 20 FIENGWEGLIDGW
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/3/2013 A/Shanghai/3/2013 A/Zhejiang/01/2013 A/Zhejiang/01/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Taiwan/102081/2013 A/Taiwan/02081/2013 A/Taiwan/102081/2013 A/Taiwan/102081/2013 A/Taiwan/12013 A/Taiwan/12013 A/Lapiang/1/2013 A/Lapiang/1/2013 A/Huzhou/1/2013 A/Huzhou/1/2013 A/Huzhou/4/2013 A/Huzhou/4/2013 A/Huzhou/6/2013 A/Huzhou/6/2013 A/Waxi1/2013	300 LPFQNIDSRAVGKCPR	310 YVKQRSLLLAT G.G.	320 PGMKNVPEIP	KGRGLFGAIAC	10 20 FIENGWEGLIDĠW
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/4/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02013 A/Huzhou/1/2013 A/Huzhou/1/2013 A/Huzhou/1/2013 A/Huzhou/1/2013 A/Huzhou/1/2013 A/Huzhou/1/2013 A/Huzhou/1/2013 A/Huzhou/1/2013 A/Huzhou/1/2013 A/Huzhou/1/2013 A/Huzhou/2/2013 A/Huzhou/2/2013 A/Huzhou/2/2013 A/Huzhou/2/2013 A/Huzhou/2/2013 A/Huzhou/2/2013 A/Huzhou/2/2013 A/Huzhou/2/2013 A/Wuxi/2/2013	300 LPFQNIDSRAVGKCPR	310 YVKQRSLLLAT	320 PGMKNVPEIP	KGRĞLFGAIAC	10 20 FIENGWEGLIDGW
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/4/2013 A/Shanghai/4/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Fujian/1/2013 A/Fujian/1/2013 A/Fujian/1/2013 A/Fujiang/2/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Huzhou/1/2013 A/Huzhou/1/2013 A/Huzhou/1/2013 A/Huzhou/2/2013 A/Huzhou/5/2013 A/Huzhou/5/2013 A/Huzhou/2/2013 A/Huzhou/2/2013 A/Huzhou/1/2013 A/Huzhou/2/2013 A/Huzhou/2/2013 A/Huzhou/1/2013 A/Huzhou/1/2013 A/Huzhou/2/2013 A/Huzhou/1/2013 A/Huzhou/1/2013 A/Huzhou/1/2013 A/Huzhou/2/2013 A/Huzhou/1/2013 A/Huzhou/2/2013 A/Huzhou/1/2013 A/Huzhou/2/2013 A/Huzhou/	300 LPFQNIDSRAVGKCPR	310 YVKQRSLLLAT G.G.	320 PGMKNVPEIP	KGRĞLFGAIAC	10 20 FIENGWEGLIDGW

	30	40	50	60	70 80
Consensus	YGFRHQNAQGEGTAADY	KSTQSAIDQI	TĠKLNRLIEF	KTNQQFELIDN	EFNEVEKQIGNVI
A/Shanghai/2/2013					
A/Anhui/1/2013					
A/Shanghai/1/2013					т
A/Hangzhou/1/2013					
A/Zheijang/DTID-ZIU01/2013					
A/Hangzhou/2/2013					
A/Hangzhou/3/2013					
A/Shanghai/3/2013					
A/Shanghai/4/2013					
A/Zhejiang/01/2013					
A/Zhejiang/1/2013					
A/Zhejiang/2/2013					
A/Taiwan/1/2013					
A/Fujian/1/2013					
A/Shanghai/4664T/2013			· · · <u>·</u> · · · · · ·		
A/Shanghai/Patient3/2013			F	н	
A/Taiwan/S02076/2013					
A/Taiwan/T02081/2013		• • • • • • • • • • •			
A/Znejlang/HZ1/2013					
A/Nanjing/1/2013					
A/Huzbou/1/2013					
A/Huzhou/10/2013					
A/Huzhou/3/2013					
A/Huzhou/4/2013					
A/Huzhou/5/2013					
A/Huzhou/6/2013					
A/Wuxi/1/2013					
A/Wuxi/2/2013					
A/environment/Wuxi/1/2013					
A/Jiangsu/1/2013					
	90	100	110	120	130 140
Consensus	90 NWTRDSITEVWSYNAEL	100 LVAMENQHTI	110 DLADSEMDKI	120 LYERVKRQLRE	130 NAEEDGTGCFEIF
Consensus A/Shanghai/2/2013	90 NWTRDSITEVWSYNAEL	100 LVAMENQHTI	DLADSEMDKI	120 LYERVKRQLRE	130 NAEEDGTGCFEIF
Consensus A/Shanghai/2/2013 A/Anhui/1/2013	90 NWTRDSITEVWSYNAEL	LVAMENQHTI	110 DLADSEMDKI	¹²⁰ LYERVKRQLRE	130 140 NAEEDGTGCFEIF
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013	90 NWTR DSITEVWSYNAEL	LVAMENQHTI	DLADSEMDKI	120 LYERVKRQLRE	130 140 NAEEDGTGCFEIF
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013	90 NWTR DS I TEVWS YNA EL	LVAMENQHTI	DLADSEMDKI	120 LYERVKRQLRE	130 140 NAEEDGTGCFEIF
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Zhejiang/DTID-ZJU01/2013	90 NWTR DS I TEVWS YNAEL	100 LVAMENQHTI	DLADSEMDKI	120 LYERVKRQLRE	130 140 NAEEDGTGCFEIF
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013	90 NWTR DS I TEVWS YNA EL	100 LVAMENQHTI	110 DLADSEMDKI	120 LYERVKRQLRE	130 140 ENAEEDGTGCFEIF
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Hangzhou/1/2013 A/Zhejiang/DTID-ZJU01/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013	90 NWTR DS I TEVWS YNA EL	100 LVAMENQHTI	DLADSEMDKI	120 LYERVKRQLRE	130 140 NAEEDGTGCFEIF
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Hangzhou/3/2013	90 NWTR DS I TEVWS YNA E L	100 LVAMENQHTI	110 DLADSEMDKI	120 LYERVKRQLRE	130 140 NAEEDGTGCFEIF
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/3/2013 A/Shanghai/4/2013	90 NWTR DS I TEVWS YNA EL	100 LVAMENQHTI	110 DLADSEMDKI	120 LYERVKRQLRE	130 140 NAEEDGTGCFEIF
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/3/2013 A/Shanghai/4/2013 A/Shanghai/1/2013 A/Zhejiang/01/2013	90 NWTR DS I TEVWS YNA EL	100 LVAMENQHTI	110 DLADSEMDKI	120 LYERVKRQLRE	130 140 NAEEDGTGCFEIF
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Shanghai/4/2013 A/Shanghai/4/2013 A/Zhejiang/1/2013 A/Zhejiang/2/2013	90 NWTR DS I TEVWS YNA EL	100 LVAMENQHTI	110 DLADSEMDKI	120 LYERVKRQLRE	130 INAEEDGTGCFEIF
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/3/2013 A/Shanghai/4/2013 A/Zhejiang/01/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013	90 NWTR DS I TEVWS YNA E L	100 LVAMENQHTI	DLADSEMDKI	120 LYERVKRQLRE	130 140 INAEEDGTGCFEIF
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/4/2013 A/Shanghai/4/2013 A/Zhejiang/1/2013 A/Zhejiang/2/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Entijan/1/2013	90 NWTR DS I TEVWS YNA EL	100 LVAMENQHTI		120 LYERVKRQLRE	130 140 NAEEDGTGCFEIF
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/3/2013 A/Shanghai/4/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Shanghai/4664T/2013	90 NWTR DS I TEVWS YNA EL	100 LVAMENQHTI		120 LYERVKRQLRE	130 140 NAEEDGTGCFEIF
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/3/2013 A/Shanghai/4/2013 A/Zhejiang/01/2013 A/Zhejiang/2/2013 A/Zhejiang/1/2013 A/Zhagiang/2/2013 A/Taiwan/1/2013 A/Fujian/1/2013 A/Shanghai/4664T/2013 A/Shanghai/Patient3/2013	90 NWTR DS I TEVWS YNA EL	100 LVAMENQHTI	DLADSEMDKI	120 LYERVKRQLRE	130 INAEEDGTGCFEIF
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Jhanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Shanghai/4/2013 A/Zhejiang/01/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Shanghai/4664T/2013 A/Shanghai/464T/2013 A/Shanghai/42013 A/Taiwan/S02076/2013	90 NWTRDSITEVWSYNAEL	100 LVAMENQHTI		120 LYERVKRQLRE	130 INAEEDGTGCFEIF
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Hangzhou/3/2013 A/Shanghai/4/2013 A/Zhejiang/1/2013 A/Zhejiang/2/2013 A/Taiwan/1/2013 A/Fuijan1/2013 A/Fuijan1/2013 A/Fuijan2/2013 A/Fuijan2/2013 A/Fuijan2/2013 A/Faiwan/20206/2013 A/Taiwan/T02081/2013	90 NWTR DS I TEVWS YNA E L	100 LVAMENQHTI		120 LYERVKRQLRE	130 140 NAEEDGTGCFEIF
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/4/2013 A/Zhejiang/01/2013 A/Zhejiang/1/2013 A/Zhejiang/2/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Shanghai/4664T/2013 A/Shanghai/4664T/2013 A/Shanghai/Actient3/2013 A/Taiwan/S02076/2013 A/Zhejiang/HZ1/2013	90 NWTR DS I TEVWS YNA EL	100 LVAMENQHTI		120 LYERVKRQLRE	130 140 NAEEDGTGCFEIF
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Shanghai/3/2013 A/Shanghai/4/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Shanghai/4664T/2013 A/Shanghai/464T/2013 A/Shanghai/Patient3/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Zhejiang/L21/2013 A/Nanjing/1/2013	90 NWTR DS I TEVWS YNA EL	100 LVAMENQHTI		120 LYERVKRQLRE	130 140 NAEEDGTGCFEIF
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Langzhou/1/2013 A/Zhejiang/DTID-ZJU01/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Shanghai/4/2013 A/Zhejiang/01/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Taiwan/S02076/2013 A/Taiwan/S02076/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Nanjing/1/2013 A/Nanjing/1/2013	90 NWTRDSITEVWSYNAEL	100 LVAMENQHTI		120 LYERVKRQLRE	130 140 NAEEDGTGCFEIF
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Hangzhou/3/2013 A/Shanghai/4/2013 A/Zhejiang/01/2013 A/Zhejiang/01/2013 A/Zhejiang/2/2013 A/Taiwan/1/2013 A/Fuian/1/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Nanchang/1/2013 A/Nanchang/1/2013 A/Nanchang/1/2013 A/Huzhou/1/2013	90 NWTR DS I TEVWS YNA E L	100 LVAMENQHTI		120 LYERVKRQLRE	130 140 NAEEDGTGCFEIF
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Hangzhou/3/2013 A/Shanghai/4/2013 A/Zhejiang/1/2013 A/Zhejiang/2/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Fujian/1/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/1/2013 A/Nanchang/1/2013 A/Huzhou/1/2013 A/Huzhou/1/2013	90 NWTR DS I TEVWS YNA EL	100 LVAMENQHTI		120 LYERVKRQLRE	130 140 NAEEDGTGCFEIF
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/4/2013 A/Shanghai/4/2013 A/Zhejiang/1/2013 A/Zhejiang/2/2013 A/Zhejiang/2/2013 A/Zhejiang/2/2013 A/Taiwan/1/2013 A/Fujian/1/2013 A/Faiwan/502076/2013 A/Taiwan/502076/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Nanjing/1/2013 A/Huzhou/1/2013 A/Hu	90 NWTR DS I TEVWS YNA EL	100 LVAMENQHTI		120 LYERVKRQLRE	130 140 NAEEDGTGCFEIF
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Langzhou/1/2013 A/Langzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Shanghai/4/2013 A/Zhejiang/01/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Taiwan/102081/2013 A/Taiwan/T02081/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Lapiang/1/2013 A/Naning/1/2013 A/Naning/1/2013 A/Huzhou/1/2013 A/Huzhou/3/2013 A/Huzhou/3/2013 A/Huzhou/3/2013 A/Huzhou/3/2013 A/Huzhou/4/Huzhou/4/2013 A/Huzhou/4/2013 A/Huzho	90 NWTRDSITEVWSYNAEL	100 LVAMENQHTI		120 LYERVKRQLRE	130 140 NAEEDGTGCFEIF
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/3/2013 A/Shanghai/3/2013 A/Zhejiang/01/2013 A/Zhejiang/01/2013 A/Zhejiang/1/2013 A/Zhejiang/2/2013 A/Taiwan/1/2013 A/Fujian/1/2013 A/Faiman/S02076/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Nanchang/1/2013 A/Nanchang/1/2013 A/Nanchang/1/2013 A/Huzhou/1/2013 A/Huzhou/1/2013 A/Huzhou	90 NWTRDSITEVWSYNAEL	100 LVAMENQHTI		120 LYERVKRQLRE	130 140 NAEEDGTGCFEIF
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Hangzhou/3/2013 A/Shanghai/4/2013 A/Zhejiang/1/2013 A/Zhejiang/2/2013 A/Zhejiang/2/2013 A/Taiwan/1/2013 A/Fujian/1/2013 A/Fujian/1/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Lapiang/1/2013 A/Huzhou/1/2013 A/Huzhou/1/2013 A/Huzhou/2/2013 A/Hu	90 NWTR DS I TEVWS YNA EL	100 LVAMENQHTI		120 LYERVKRQLRE	130 140 NAEEDGTGCFEIF
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Shanghai/4/2013 A/Shanghai/4/2013 A/Zhejiang/1/2013 A/Zhejiang/2/2013 A/Zhejiang/2/2013 A/Zhejiang/1/2013 A/Fujian/1/2013 A/Fujian/1/2013 A/Fujiang/2013 A/Faiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Lapiang/1/2013 A/Huzhou/1/2013 A/Huzhou/1/2013 A/Huzhou/5/2013 A/Huzhou/5/2013 A/Huzhou/5/2013 A/Huzhou/5/2013 A/Huzhou/5/2013 A/Huzhou/5/2013 A/Huzhou/5/2013 A/Huzhou/2/2013 A/Huzhou/1/2013 A/Huzhou/5/20	90 NWTR DS I TEVWS YNA EL	100 LVAMENQHTI		120 LYERVKRQLRE	130 140 NAEEDGTGCFEIF
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Shanghai/1/2013 A/Jhangbai/1/2013 A/Zhejiang/DTID-ZJU01/2013 A/Hangzhou/2/2013 A/Hangzhou/2/2013 A/Jhanghai/3/2013 A/Zhejiang/01/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Taiwan/S02076/2013 A/Taiwan/S02076/2013 A/Taiwan/T02081/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Taiwan/1/2013 A/Lapiang/1/2013 A/Naning/1/2013 A/Huzhou/1/2013 A/Huzhou/3/2013 A/Huzhou/6/2013 A/Huzhou/6/2013 A/Wuxi/1/2013 A/Wuxi/1/2013 A/Wuxi/1/2013 A/Wuxi/2/2013 A/Wuxi/1/2013 A/Wuxi/1/2013 A/Wuxi/2/2013 A/Wuxi/1/2013 A/Wuxi/2/2013 A/Wuxi/1/2013 A/Wuxi/2/2013 A/Wuxi/2/2013 A/Wuxi/1/2013 A/Wuxi/2	90 NWTRDSITEVWSYNAEL	100 LVAMENQHTI		120 LYERVKRQLRE	130 140 NAEEDGTGCFEIF
Consensus A/Shanghai/2/2013 A/Anhui/1/2013 A/Jhanghai/1/2013 A/Jhanghai/1/2013 A/Hangzhou/1/2013 A/Hangzhou/2/2013 A/Hangzhou/3/2013 A/Hangzhou/3/2013 A/Jangiang/01/2013 A/Zhejiang/01/2013 A/Zhejiang/01/2013 A/Zhejiang/1/2013 A/Zhejiang/1/2013 A/Taiwan/1/2013 A/Taiwan/T02081/2013 A/Taiwan/T02081/2013 A/Taiwan/1/2013 A/Lapiang/HZ1/2013 A/Lapiang/1/2013 A/Nanchang/1/2013 A/Huzhou/1/2013 A/Huzhou/2/2013 A/Huzhou/2/2013 A/Huzhou/2/2013 A/Huzhou/2/2013 A/Huzhou/2/2013 A/Waxi/1/2013 A/Waxi	90 NWTRDSITEVWSYNAEL	100 LVAMENQHTI		120 LYERVKRQLRE	130 140 NAEEDGTGCFEIF

	150	160	170	180	190 200
Consensus	HKCDDDCMASIRNNTYD	HŚKYREEAMO	NRIQIDPVK	LSSGYKDVILW	FSFGASCFILLAI
A/Shanghai/2/2013					
A/Anhui/1/2013					
A/Shanghai/1/2013					
A/Hangzhou/1/2013					
A/Theijang/DTID-7IU01/2013					
A/Hangzhou/2/2013					
A/Hangzhou/3/2013					
A/Shanghai/3/2013					
A/Shanghai/4/2013					
A/Zhejiang/01/2013					
A/Zhejiang/1/2013					
A/Zhejiang/2/2013					
A/Taiwan/1/2013					
A/Fujian/1/2013					
A/Shanghai/4664T/2013					
A/Shanghai/Patient3/2013		S			
A/Taiwan/S02076/2013					
A/Taiwan/T02081/2013					
A/Zhejiang/HZ1/2013					
A/Nanjing/1/2013	• • • • • • • • • • • • • • • • • • • •				
A/Nanchang/1/2013					
A/Huzhou/1/2013					
A/Huzhou/10/2013		· · · · · · · · · · · · ·			
A/Huzhou/4/2013		п			
A/Huzhou/5/2013					
A/Huzhou/6/2013					
A/Wuxi/1/2013					
A/Wuxi/2/2013					
A/environment/Wuxi/1/2013					
A/Jiangsu/1/2013					
	210	220			
Consensus	VMGLVFICVKNGNMRCT	ıċı			
A/Shanghai/2/2012					
A/Anhui/1/2013		• • •			
A/Shanghai/1/2013	Α				
A/Hangzhou/1/2013					
A/Zheijang/DTID-ZIU01/2013					
A/Hangzhou/2/2013					
A/Hangzhou/3/2013					
A/Shanghai/3/2013					
A/Shanghai/4/2013					
A/Zhejiang/01/2013					
A/Zhejiang/1/2013					
A/Zhejiang/2/2013					
A/Taiwan/1/2013					
A/Fujian/1/2013		• • •			
A/Shanghai/4664T/2013		• • •			
A/Snanghai/Patient3/2013		• • •			
A/Taiwan/S02076/2013					
A/Taiwan/T02081/2013					
A/Naniing/1/2013		• • •			
A/Nanjing/1/2013		• • •			
A/Huzhou/1/2013		• • •			
A/Huzhou/10/2013					
A/Huzhou/3/2013					
A/Huzhou/4/2013					
A/Huzhou/5/2013					
A/Huzhou/6/2013					
A/Wuxi/1/2013					
A/Wuxi/2/2013					
A/environment/Wuxi/1/2013					
A/Jiangsu/1/2013					

Fig. S5. Sequence alignment of full-length H7N9 HA sequences deposited in Global Initiative on Sharing All Influenza Data (GISAID).

	H7 HA	H7 HA	H7 HA	H7 HA
Ligand	аро	LSTa	LSTa	LSTc
Soaking condition		10mM, 10min	16mM, 2 hours	10mM, 10min
Data collection	•			
Beamline	SSRL 12-2	SSRL 12-2	APS 23ID-B	SSRL 12-2
Wavelength (A)	1.0000	1.0000	1.0331	1.0000
Space group	P2 ₁ 3	P2 ₁ 3	P2 ₁ 3	P2 ₁ 3
Unit cell parameters	a = b = c = 154.5	a = b = c = 154.7	a = b = c = 153.9	a = b = c = 154.8
(A,) Pasalution $(Å)$	$\alpha = \beta = \gamma = 90$	$\alpha = \beta = \gamma = 90$	$\alpha = \beta = \gamma = 90$	$\alpha = \beta = \gamma = 90$
Resolution (A)	$(2.80-2.70)^{a}$	(2.80-2.70)	(2.69-2.60)	(3.00-2.90)
Observations	223,195	187,164	234,550	183,548
Unique reflections	33,899 (3,363)	33,887 (3,362)	37,501 (3,705)	27,559 (2,712)
Completeness (%)	99.8 (100.0)	99.8 (99.9)	99.9 (100.0)	99.9 (100.0)
$< I/\sigma_l >$	19.2 (2.6)	19.6 (2.2)	16.9 (2.1)	18.0 (2.8)
R_{sym} (%) ^b	8.9 (75.7)	7.6 (86.3)	9.8 (94.0)	10.6 (93.5)
R_{pim} (%) ^c	3.8 (30.8)	3.4 (38.4)	4.0 (37.1)	4.5 (34.2)
$Z_a^{\ d}$	2	2	2	2
Refinement				
Resolution (Å)	46.6 -2.70	48.9 -2.70	48.7 -2.60	46.7 -2.90
Reflections (total)	33,870	33,863	37,471	27,534
Reflections (test)	1,718	1,718	1,873	1,385
R_{cryst} (%) ^e	22.9	22.7	21.3	22.6
R_{free} (%) ^f	27.7	26.7	25.9	26.2
Average B-value ($Å^2$)	100	122	105	119
Protein: protomer 1	59	80	72	73
Protein: protomer 2	141	163	139	166
Wilson B-value (Å ²)	63	68	67	72
Protein atoms	7,600	7,600	7,600	7,600
Carbohydrate atoms	129	132	132	143
Waters	105	35	67	56
RMSD from ideal geor	netry			
Bond length (Å)	0.002	0.004	0.005	0.003
Bond angles (°)	0.67	0.82	0.93	0.76
Ramachandran statistic	cs (%) ^g			
Favored	94.0	94.0	93.0	93.0
Outliers	1.0	1.3	1.3	1.0
PDB code	4N5J	4N5K	4N61	4N60

Table S1. Data collection and refinement statistics for Sh2 H7 HA and glycan complexes

	H7 HA	H7 HA	Н7 НА
Ligand	glycan #3	glycan #21	glycan #23
Soaking condition	10mM, 2 hours	10mM, 2 hours	10mM, 2 hours
Data collection			
Beamline	APS 23ID-B	APS 23ID-B	APS 23ID-B
Wavelength (A)	1.0331	1.0331	1.0331
Space group	P2 ₁ 3	P2 ₁ 3	P2 ₁ 3
Unit cell parameters	a = b = c = 153.8	a = b = c = 153.6	a = b = c = 153.9
(A,) Percention $(Å)$	$\alpha = \beta = \gamma = 90$	$\alpha = \beta = \gamma = 90$	$\alpha = \beta = \gamma = 90$
Observations	30-2.30 (2.39-2.30) 202 287	127 292	200.028
Unique reflections	<i>392,387</i> <i>42,010 (4,158)</i>	137,382 21 225 (2 124)	209,938
Omque renections	42,019 (4,138)	31,333 (3,134) 00.1 (100.0)	55,550 (5,550)
Completeness (%)	100.0(100.0)	99.1 (100.0) 14.7 (1.0)	100.0(100.0)
$< I/O_{I} >$	23.1(3.3)	14.7(1.9)	10.3 (2.3)
R_{sym} (%)	8.9 (77.2)	9.5 (79.4)	11.2 (77.9)
R_{pim} (%)	2.8 (25.3)	4.8 (36.8)	4.6 (33.9)
Za	2	2	2
Refinement			
Resolution (Å)	48.6 -2.50	42.6 -2.75	48.7 -2.70
Reflections (total)	41,990	31,323	33,505
Reflections (test)	2,121	1,584	1,695
R_{cryst} (%) ^e	23.0	21.6	22.5
R_{free} (%) ^f	26.7	26.5	26.5
Average B-value (Å ²)	101	98	95
Protein: protomer 1	67	68	52.
Protein: protomer 2	133	126	136
Wilson B-value (Å ²)	53	64	54.
Protein atoms	7,600	7,600	7,600
Carbohydrate atoms	181	215	172
Waters	100	79	178
RMSD from ideal geome	etry		
Bond length (Å)	0.004	0.003	0.003
Bond angles (°)	0.79	0.75	0.79
Ramachandran statistics	(%) ^g		
Favored	93.0	93.0	93.0
Outliers	1.3	0.6	1.3
		42162	42164
PDB code	4IN62	4IN63	41N64

Table S2. Data collection and refinement statistics for Sh2 HA glycan complexes

^aNumbers in parentheses refer to the highest resolution shell. ^b $R_{sym} = \sum_{hkl} \sum_i |I_{hkl,i} - \langle I_{hkl} \rangle | / \sum_{hkl} \sum_i I_{hkl,i}$, where $I_{hkl,i}$ is the scaled intensity of the *i*th measurement of reflection h, k, l, and $\langle I_{hkl} \rangle$ is the average intensity for that reflection. ^c $R_{pim} = \sum_{hkl} (1/(n-1))^{1/2} \sum_i |I_{hkl,i} - \langle I_{hkl} \rangle | / \sum_{hkl} \sum_i I_{hkl,i}$, where n is the redundancy. ^d Z_a is the number of HA protomers per crystallographic asymmetric unit. ^e $R_{cryst} = \sum_{hkl} |F_o - F_c| / \sum_{hkl} |F_o| \ge 100$

 ${}^{\rm f}R_{\rm free}$ was calculated as for $R_{\rm cryst}$, but on a test set of 5% of the data excluded from refinement. ^gCalculated using Molprobity (47).

Glycan #	Name	Structure
1	$Gal\beta(1-4)$ -GlcNAc β -ethyl-NH ₂	
2	$ \begin{array}{l} Gal\beta(1-4)\text{-}GlcNAc\beta(1-2)\text{-}Man\alpha(1-3)[Gal\beta(1-4)\text{-}GlcNAc\beta(1-2)\text{-}Man\alpha(1-6)]\text{-}\\ Man\beta(1-4)\text{-}GlcNAc\beta(1-4)\text{-}GlcNAc\beta\text{-}Asn\text{-}\\ NH_2 \end{array} $	$\begin{array}{c} & & & & & \\ & & & & \\ & & & & \\ & & & \\ & & & \\ & & & & \\ & & & \\ & & & & \\ & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & &$
3	NeuAca(2-3)-Gal β (1-4)-6-O-sulfo-GlcNAc β -propyl-NH ₂	$\mathbf{A}_{\alpha} \mathbf{A}_{\beta} \mathbf{A}_{\beta} \mathbf{A}_{\beta}$
4	NeuAc α (2-3)-Gal β (1-4)-[Fuc α (1-3)]-6-O- sulfo-GlcNAc β -propyl-NH ₂	$ \begin{array}{c} $
5	NeuAca(2-3)-6-O-sulfo-Gal β (1-4)-GlcNAc β -ethyl-NH ₂	$\mathbf{A}_{\alpha} \mathbf{A}_{\beta} \mathbf{A}_{\beta} \mathbf{A}_{\beta}$
6	NeuAca(2-3)-6-O-sulfo-Galβ(1-4)- [Fuca(1-3)]-GlcNAcβ-propyl-NH ₂	$\begin{array}{c} 6S \\ \bullet \alpha 3 \\ \bullet \beta 4 \\ \bullet \alpha 3 \end{array}$
7	NeuAca(2-3)-Gal β (1-3)-6-O-sulfo-GlcNAc β -propyl-NH ₂	$\mathbf{A}_{\alpha} \mathbf{A}_{\beta} \mathbf{A}_{\beta} \mathbf{A}_{\beta} \mathbf{A}_{\beta}$
8	NeuAca(2-3)-Gal β (1-4)-Glc β -ethyl-NH ₂	$\mathbf{A}_{\alpha} 3 \mathbf{O}_{\beta} 4 \mathbf{A}$
9	NeuAca(2-3)-Gal β (1-4)-GlcNAc β -ethyl-NH ₂	$\mathbf{A}_{\alpha} 3_{\beta} 4_{\beta}$
10	$\label{eq:alpha} \begin{split} NeuAc\alpha(2\text{-}3)\text{-}Gal\beta(1\text{-}4)\text{-}GlcNAc\beta(1\text{-}3)\text{-}\\ Gal\beta(1\text{-}4)\text{-}GlcNAc\beta\text{-}ethyl\text{-}NH_2 \end{split}$	$\mathbf{A}_{\alpha} \mathbf{A}_{\beta} \mathbf$
11	$\label{eq:alpha} \begin{split} NeuAc\alpha(2\text{-}3)\text{-}Gal\beta(1\text{-}4)\text{-}GlcNAc\beta(1\text{-}3)\text{-}\\ Gal\beta(1\text{-}4)\text{-}GlcNAc\beta(1\text{-}3)\text{-}Gal\beta(1\text{-}4)\text{-}\\ GlcNAc\beta\text{-}ethyl\text{-}NH_2 \end{split}$	$ \mathbf{A}_{\alpha} \mathbf{B}_{\beta} \mathbf{A}_{\beta} \mathbf{B}_{\beta} \mathbf{A}_{\beta} \mathbf{B}_{\beta} \mathbf{A}_{\beta} \mathbf{B}_{\beta} \mathbf{A}_{\beta} \mathbf{B}_{\beta} \mathbf{A}_{\beta} $
12	NeuAc α (2-3)-GalNAc β (1-4)-GlcNAc β - ethyl-NH ₂	$\mathbf{a} 3 \mathbf{-} \mathbf{\beta} 4$
13	NeuAca(2-3)-Gal β (1-3)-GlcNAc β -ethyl-NH ₂	$\mathbf{A}_{\alpha} \mathbf{B}_{\beta} \mathbf{B}_{\beta} \mathbf{B}_{\beta}$
14	$\label{eq:alpha} \begin{split} NeuAc\alpha(2\text{-}3)\text{-}Gal\beta(1\text{-}3)\text{-}GlcNAc\beta(1\text{-}3)\text{-}\\ Gal\beta(1\text{-}4)\text{-}GlcNAc\beta\text{-}ethyl\text{-}NH_2 \end{split}$	$ \mathbf{A}_{\alpha} \mathbf{A}_{\beta} $
15	$\label{eq:alpha} \begin{split} NeuAc\alpha(2\text{-}3)\text{-}Gal\beta(1\text{-}3)\text{-}GlcNAc\beta(1\text{-}3)\text{-}\\ Gal\beta(1\text{-}3)\text{-}GlcNAc\beta\text{-}ethyl\text{-}NH_2 \end{split}$	$ \begin{array}{c} \bullet_{\alpha} 3 \\ \bullet_{\beta} 3 $
16	$NeuAc\alpha(2-3)-Gal\beta(1-3)-GalNAc\beta(1-3)-Gal\alpha(1-4)-Gal\beta(1-4)-Glc\beta-ethyl-NH_2$	$\mathbf{A}_{\alpha} 3_{\beta} 3_{\beta} 3_{\beta} 3_{\alpha} 4_{\beta} 4_{\beta} 4$
17	NeuAca(2-3)-Gal β (1-3)-GalNAca-Thr-NH ₂	$\mathbf{A}_{\alpha} \mathbf{A}_{\beta} \mathbf{A}_{\alpha}^{\mathbf{D}_{\alpha}}$ Thr
18	NeuAc α (2-3)-Gal β (1-3)-[GlcNAc β (1-6)]-GalNAc α -Thr-NH ₂	$\begin{array}{c} \beta & 6 \\ \hline \alpha & 3 \\ \hline \beta & 3 \\ \hline \alpha \end{array} \text{Thr}$

Table S3. Glycans imprinted on the microarray.

Glycan #	Name	Structure
19	NeuAc α (2-3)-Gal β (1-4)-GlcNAc β (1-6)- [Gal β (1-3)]-GalNAc α -Thr-NH ₂	$ \begin{array}{c} \bullet \\ \alpha 3 \\ \beta 4 \\ \beta 3 \\ \alpha \end{array} \begin{array}{c} \beta 6 \\ \hline \\ \beta 3 \\ \alpha \end{array} $ Thr
20	NeuAca(2-3)-Gal β (1-4)-GlcNAc β (1-3)-Gal β (1-4)-GlcNAc β (1-6)-[Gal β (1-3)]-GalNAca-Thr-NH ₂	$ \begin{array}{c} \bullet_{\alpha} 3 \\ \bullet_{\beta} 4 \\ \bullet_{\beta} 3 \\ \bullet_{\beta} 4 \\ \bullet_{\beta} 3 \\ \bullet_{\alpha} \\ \bullet_{\beta} 3 \\ \bullet_{\alpha} \\ \bullet_{\alpha} \\ \bullet_{\alpha} \\ \bullet_{\alpha} \\ \bullet_{\alpha} \\ \bullet_{\alpha} \\ \bullet_{\beta} \\ \bullet_{\alpha} \\ \bullet_{\beta} \\ \bullet_{\alpha} \\ \bullet_{\beta} \\ \bullet_{\alpha} \\ \bullet_{\beta} \\ \bullet_{\beta} \\ \bullet_{\alpha} \\ \bullet_{\beta} \\ \bullet_{\alpha} \\ \bullet_{\beta} \\ \bullet_{\alpha} \\ \bullet_{\beta} \\ \bullet_{\alpha} \\ \bullet_{\beta} \\ \bullet_{\beta} \\ \bullet_{\alpha} \\ \bullet_{\beta} \\ \bullet_{\alpha} \\ \bullet_{\beta} \\ \bullet_{\alpha} \\ \bullet_{\beta} \\ \bullet_{\alpha} \\ \bullet_{\alpha} \\ \bullet_{\beta} \\ \bullet_{\alpha} \\ \bullet_$
21	NeuAca(2-3)-Gal β (1-4)-GlcNAc β (1-3)-GalNAca-Thr-NH ₂	$\mathbf{A}_{\alpha} \xrightarrow{\mathbf{A}}_{\beta} \xrightarrow{\mathbf{A}}_{\alpha} \xrightarrow{\mathbf{A}}_{\alpha}$ Thr
22	NeuAca(2-3)-Gal β (1-4)-GlcNAc β (1-3)-Gal β (1-4)-GlcNAc β (1-3)-GalNAc α -Thr-NH ₂	$ \mathbf{A}_{\alpha} \mathbf{B}_{\beta} \mathbf{A}_{\beta} \mathbf{B}_{\beta} \mathbf{A}_{\beta} \mathbf{B}_{\beta} \mathbf{A}_{\alpha}^{\mathbf{D}} \mathbf{A}_$
23	NeuAca(2-3)-Gal β (1-4)-GlcNAc β (1-3)- [NeuAca(2-3)-Gal β (1-4)-GlcNAc β (1-6)]- GalNAca-Thr-NH ₂	$\begin{array}{c} \bullet \alpha 3 \\ \bullet \alpha 3 \\ \bullet \alpha 3 \\ \bullet \alpha 3 \\ \bullet \beta 4 \\ \bullet \beta 3 \\ \bullet \alpha \end{array} $ Thr
24	NeuAca(2-3)-Gal β (1-4)-GlcNAc β (1-3)-Gal β (1-4)-GlcNAc β (1-3)-[NeuAca(2-3)-Gal β (1-4)-GlcNAc β (1-3)-Gal β (1-4)-GlcNAc β (1-6)]-GalNAc α -Thr-NH ₂	$\begin{array}{c} \bullet_{\alpha} 3 \\ \bullet_{\alpha} 3 \\ \bullet_{\alpha} 3 \\ \bullet_{\beta} 4 \\ \bullet_{\beta} 4 \\ \bullet_{\beta} 3 \\ \bullet_{\beta} 4 \\ \bullet_{\beta} 3 \\ \bullet_{\beta} 4 \\ \bullet_{\beta} 3 \\ \bullet_{\beta} 4 \\ \bullet_{\beta} 3 \\ \bullet_{\beta} 4 \\ \bullet_{\beta} 3 \\ \bullet_{\beta} 4 \\ \bullet_{\beta} 3 \\ \bullet_{\beta} 4 \\ \bullet_{\beta} 3 \\ \bullet_{\beta} 4 \\ \bullet_{\beta} 3 \\ \bullet_{\beta} 4 \\ \bullet_{\beta} 3 \\ \bullet_{\beta} 4 \\ \bullet_{\beta} 3 \\ \bullet_{\beta} 4 \\ \bullet_{\beta} 3 \\ \bullet_{\beta} 4 \\ \bullet_{\beta} 3 \\ \bullet_{\beta} 4 \\ \bullet_{\beta} 3 \\ \bullet_{\beta} 4 \\$
25	NeuAca(2-3)-Gal β (1-4)-GlcNAc β (1-2)- Man α (1-3)-[NeuAc α (2-3)-Gal β (1-4)- GlcNAc β (1-2)-Man α (1-6)]-Man β (1-4)- GlcNAc β (1-4)-GlcNAc β -Asn-NH ₂	$\begin{array}{c} & \alpha & 3 \\ & \alpha & 3 \\ & \alpha & 3 \\ & \alpha & 3 \\ & \beta & 4 \\ \end{array} \begin{array}{c} \alpha & \beta & 2 \\ & \beta & 2 \\ & \alpha & 3 \\ & \beta & 4 \\ & \beta & 2 \\ \end{array} \begin{array}{c} \alpha & 6 \\ & \alpha & 3 \\ & \beta & 4 \\ & \beta & 4 \\ \end{array} $
26	$\label{eq:alpha} \begin{split} &NeuAc\alpha(2\text{-}3)\text{-}Gal\beta(1\text{-}4)\text{-}GlcNAc\beta(1\text{-}3)\text{-}\\ &Gal\beta(1\text{-}4)\text{-}GlcNAc\beta(1\text{-}2)\text{-}Man\alpha(1\text{-}3)\text{-}\\ &[NeuAc\alpha(2\text{-}3)\text{-}Gal\beta(1\text{-}4)\text{-}GlcNAc\beta(1\text{-}3)\text{-}\\ &Gal\beta(1\text{-}4)\text{-}GlcNAc\beta(1\text{-}2)\text{-}Man\alpha(1\text{-}6)]\text{-}\\ &Man\beta(1\text{-}4)\text{-}GlcNAc\beta(1\text{-}4)\text{-}GlcNAc\beta\text{-}Asn\text{-}\\ &NH_2 \end{split}$	$\begin{array}{c} & \alpha & 3 \\ & \alpha & 3 \\ & \alpha & 3 \\ & \alpha & 3 \\ & \beta & 4 \\ & \beta & 3 \\ & \beta & 4 \\ & \beta & 3 \\ & \beta & 4 \\ & \beta & 2 \\ & \beta & 2 \\ & \alpha & 3 \\ & \beta & 4 \\ & \beta & 2 \\ & \alpha & 3 \\ & \beta & 4 \\ & \beta & 4 \\ & \beta & 4 \\ & \beta & 4 \\ & \beta & 2 \\ & \alpha & 3 \\ & \beta & 4 \\ & \beta & 4 \\ & \beta & 4 \\ & \beta & 4 \\ & \beta & 4 \\ & \beta & 4 \\ & \beta & 4 \\ & \beta & 4 \\ & \beta & 4 \\ & \beta & 4 \\ & \beta & 4 \\ & \beta & 4 \\ & \beta & 4 \\ & \beta & 2 \\ & \alpha & 3 \\ & \beta & 4 \\$
27	$\label{eq:alpha} \begin{split} & NeuAc\alpha(2-3)\text{-}Gal\beta(1-4)\text{-}GlcNAc\beta(1-3)\text{-}\\ & Gal\beta(1-4)\text{-}GlcNAc\beta(1-3)\text{-}Gal\beta(1-4)\text{-}\\ & GlcNAc\beta(1-2)\text{-}Man\alpha(1-3)\text{-}[NeuAc\alpha(2-3)\text{-}\\ & Gal\beta(1-4)\text{-}GlcNAc\beta(1-3)\text{-}Gal\beta(1-4)\text{-}\\ & GlcNAc\beta(1-3)\text{-}Gal\beta(1-4)\text{-}GlcNAc\beta(1-2)\text{-}\\ & Man\alpha(1-6)]\text{-}Man\beta(1-4)\text{-}GlcNAc\beta(1-4)\text{-}\\ & GlcNAc\beta\text{-}Asn\text{-}NH_2 \end{split}$	$\begin{array}{c} & \alpha & 3 \\ & \alpha & 3 \\ & \alpha & 3 \\ & \alpha & 3 \\ & \beta & 4 \\ & \beta & 3 \\$
28	NeuAca(2-3)-[GalNAc β (1-4)]-Gal β (1-4)-GlcNAc β -ethyl-NH ₂	$\begin{array}{c} & \beta \\ \bullet \\ \alpha \\ 3 \\ \beta \\ 4 \\ \end{array}$
29	NeuAca(2-3)-[GalNAc β (1-4)]-Gal β (1-4)-Glc β -ethyl-NH ₂	$\begin{array}{c} & \beta \\ \bullet \\ \alpha \\ 3 \end{array} \xrightarrow{\beta \\ \beta \\ 4 \end{array}$
30	$ \begin{array}{l} Gal\beta(1-3)\text{-}GalNAc\beta(1-4)\text{-}[NeuAc\alpha(2-3)]\text{-}\\ Gal\beta(1-4)\text{-}Glc\beta\text{-}ethyl\text{-}NH_2 \end{array} \end{array} $	$\begin{array}{c} & & & & \\ & & & & \\ & & & & \\ & & & & $
31	NeuAca(2-3)-Gal β (1-4)-[Fuca(1-3)]-GlcNAc β -propyl-NH ₂	$\alpha 3 \beta 4 \alpha 3$

Glycan #	Name	Structure
32	NeuAca(2-3)-Gal β (1-3)-[Fuca(1-4)]- GlcNAc β (1-3)-Gal β (1-4)-[Fuca(1-3)]- GlcNAc β -ethyl-NH ₂	$\begin{array}{c} \alpha 4 \\ \alpha 3 \\ \beta 3 \\ \beta 3 \\ \beta 3 \\ \beta 3 \\ \beta 4 \\ \alpha 3 \\ \end{array}$
33	NeuAca(2-3)-Gal β (1-4)-[Fuca(1-3)]- GlcNAc β (1-3)-Gal β (1-4)-[Fuca(1-3)]- GlcNAc β -ethyl-NH ₂	$\begin{array}{c} & & & \\ & \alpha & 3 \end{array} \xrightarrow{\beta & 4} \begin{array}{c} & \beta & 3 \\ \alpha & 3 \end{array} \xrightarrow{\beta & 4} \begin{array}{c} & \beta & 3 \\ \alpha & 3 \end{array} \xrightarrow{\beta & 4} \begin{array}{c} & \alpha & 3 \end{array}$
34	NeuAca(2-3)-Gal β (1-4)-[Fuca(1-3)]- GlcNAc β (1-3)-Gal β (1-4)-[Fuca(1-3)]- GlcNAc β (1-3)-Gal β (1-4)-[Fuca(1-3)]- GlcNAc β -ethyl-NH ₂	$\begin{array}{c} & \alpha \end{array} \\ & \alpha \end{array} \\ & \beta \end{array} \\ & \beta \end{array} \\ & \beta \end{array} \\ & \beta \end{array} \\ & \beta \end{array} \\ & \beta \end{array} \\ & \beta \end{array} \\ & \beta \end{array} \\ & \beta \end{array} \\ & \beta \end{array} \\ & \beta \end{array} \\ & \beta \end{array} \\ & \beta \end{array} \\ & \beta \end{array} \\ & \alpha \end{array} \\ & \alpha \end{array} \\ & \alpha \end{array} \\ & \alpha \end{array} \\ & \alpha \end{array} \\ \\ & \alpha \end{array} \\ \\ & \alpha \end{array} \\ \\ & \alpha \end{array} \\ \\ & \alpha \end{array} \\ \\ & \alpha \end{array} \\ \\ & \alpha \end{array} \\ \\ & \alpha \end{array} \\ \\ & \alpha \end{array} \\ \\ & \alpha \end{array} \\ \\ & \alpha \end{array} \\ \\ & \alpha \end{array} \\ \\ \\ & \alpha \end{array} \\ \\ \\ & \alpha \end{array} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$
35	NeuGca(2-3)-Gal β (1-4)-GlcNAc β -ethyl-NH ₂	$\Phi_{\alpha 3} \Theta_{\beta 4}$
36	NeuAca(2-6)-Gal β (1-4)-6-O-sulfo-GlcNAc β -propyl-NH ₂	$\mathbf{A}_{\alpha} \stackrel{\mathbf{A}}{\mathbf{A}}_{\beta} \stackrel{\mathbf{A}}{\mathbf{A}}_{\mathbf{A}}$
37	$NeuAc\alpha(2\text{-}6)\text{-}Gal\beta(1\text{-}4)\text{-}Glc\beta\text{-}ethyl\text{-}NH_2$	$\mathbf{A}_{\alpha} \mathbf{A}_{\beta} \mathbf{A}_{\beta} \mathbf{A}_{\beta}$
38	NeuAca(2-6)-Gal β (1-4)-GlcNAc β -ethyl-NH ₂	$\mathbf{A}_{\alpha} \mathbf{B}_{\beta} \mathbf{A}_{\beta}$
39	$\label{eq:alpha} \begin{split} NeuAc\alpha(2\text{-}6)\text{-}Gal\beta(1\text{-}4)\text{-}GlcNAc\beta(1\text{-}3)\text{-}\\ Gal\beta(1\text{-}4)\text{-}GlcNAc\beta\text{-}ethyl\text{-}NH_2 \end{split}$	$\mathbf{A}_{\alpha} \mathbf{A}_{\beta} \mathbf$
40	$\label{eq:alpha} \begin{split} NeuAc\alpha(2-6)-Gal\beta(1-4)-GlcNAc\beta(1-3)-\\ Gal\beta(1-4)-GlcNAc\beta(1-3)-Gal\beta(1-4)-\\ GlcNAc\beta-ethyl-NH_2 \end{split}$	$ \mathbf{A}_{\alpha} \mathbf{A}_{\beta} $
41	NeuAca(2-6)-Gal β (1-4)-GlcNAc β (1-3)- [NeuAca(2-6)]-Gal β (1-4)-GlcNAc β -ethyl-NH ₂	$ \begin{array}{c} & \alpha & 6 \\ & \alpha & 6 \\ & \beta & 4 \\ & \beta & 3 \\ \end{array} \begin{array}{c} \alpha & 6 \\ & \beta & 4 \\ \end{array} $
42	NeuAca(2-6)-GalNAc β (1-4)-GlcNAc β - ethyl-NH ₂	$\mathbf{A}_{\alpha} 6_{\beta} 4_{\beta}$
43	NeuAca(2-6)-[Gal β (1-3)]-GalNAca-Thr-NH ₂	$ \begin{array}{c} \bullet \alpha \ 6 \\ \bullet \alpha \ 5 \\ \bullet \alpha \end{array} $ Thr
44	NeuAca(2-6)-Gal β (1-4)-GlcNAc β (1-6)- [Gal β (1-3)]-GalNAca-Thr-NH ₂	$ \begin{array}{c} \bullet \alpha & 6 \\ \bullet \alpha & 6 \\ \bullet \beta & 4 \\ \bullet \beta & 3 \\ \hline \alpha & \\ \bullet \end{array} $ Thr
45	NeuAca(2-6)-Gal β (1-4)-GlcNAc β (1-3)-Gal β (1-4)-GlcNAc β (1-6)-[Gal β (1-3)]-GalNAca-Thr-NH ₂	$ \begin{array}{c} \bullet_{\alpha \ 6} \bullet_{\beta \ 4} \bullet_{\beta \ 3} \bullet_{\beta \ 4} \bullet_{\beta \ 3} \bullet_{\beta \ 4} \bullet_{\beta \ 3} \bullet_{\beta \ 4} \bullet_{\beta \ 3} \bullet_{\alpha \ \alpha} \text{Thr} $
46	NeuAca(2-6)-Gal β (1-4)-GlcNAc β (1-3)-GalNAca-Thr-NH ₂	$\Phi_{\alpha \ 6} \Theta_{\beta \ 4} \Phi_{\beta \ 3} \Phi_{\alpha}^{-} Thr$
47	NeuAca(2-6)-Gal β (1-4)-GlcNAc β (1-3)-Gal β (1-4)-GlcNAc β (1-3)-GalNAc α -Thr-NH ₂	$\Phi_{\alpha 6} \Phi_{\beta 4} \Phi_{\beta 3} \Phi_{\beta 4} \Phi_{\beta 3} \Phi_{\alpha}$ Thr
48	NeuAc α (2-6)-Gal β (1-4)-GlcNAc β (1-3)- [NeuAc α (2-6)-Gal β (1-4)-GlcNAc β (1-6)]- GalNAc α -Thr-NH ₂	$\begin{array}{c} & & & & & & \\ & \alpha & 6 & \beta & 4 & \beta & \\ & & & & & \\ & & \alpha & 6 & \beta & 4 & \beta & 3 & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ \end{array}$

Glycan #	Name	Structure
49	$\label{eq:calibratic} \begin{split} & \text{NeuAca}(2\text{-}6)\text{-}\text{Gal}\beta(1\text{-}4)\text{-}\text{GlcNAc}\beta(1\text{-}3)\text{-}\\ & \text{Gal}\beta(1\text{-}4)\text{-}\text{GlcNAc}\beta(1\text{-}3)\text{-}[\text{NeuAca}(2\text{-}6)\text{-}\\ & \text{Gal}\beta(1\text{-}4)\text{-}\text{GlcNAc}\beta(1\text{-}3)\text{-}\text{Gal}\beta(1\text{-}4)\text{-}\\ & \text{GlcNAc}\beta(1\text{-}6)]\text{-}\text{GalNAc}\alpha\text{-}\text{Thr}\text{-}\text{NH}_2 \end{split}$	$\begin{array}{c} & & & & & & & \\ & \alpha & 6 \\ & & \alpha & 6 \\ & & \alpha & 6 \\ & & & & & & \\ & & & & & & \\ & & & &$
50	$ \begin{array}{l} Gal\beta(1-4)\mbox{-}GlcNAc\beta(1-2)\mbox{-}Man\alpha(1-3)\mbox{-}\\ [NeuAc\alpha(2-6)\mbox{-}Gal\beta(1-4)\mbox{-}GlcNAc\beta(1-2)\mbox{-}\\ Man\alpha(1-6)\mbox{-}Man\beta(1-4)\mbox{-}GlcNAc\beta(1-4)\mbox{-}\\ GlcNAc\beta\mbox{-}Asn\mbox{-}NH_2 \end{array} $	$\begin{array}{c} & & & & \\ & & & & \\ & & & & \\ & & & & $
51	NeuAc α (2-6)-Gal β (1-4)-GlcNAc β (1-2)- Man α (1-3)-[Gal β (1-4)-GlcNAc β (1-2)- Man α (1-6)]-Man β (1-4)-GlcNAc β (1-4)- GlcNAc β -Asn-NH ₂	$\begin{array}{c} & & & & & & & \\ & & & & & & \\ & & & & $
52	$ \begin{array}{l} GlcNAc\beta(1-2)-Man\alpha(1-3)-[NeuAc\alpha(2-6)-Gal\beta(1-4)-GlcNAc\beta(1-2)-Man\alpha(1-6)]-\\ Man\beta(1-4)-GlcNAc\beta(1-4)-GlcNAc\beta-Asn-\\ NH_2 \end{array} $	$\begin{array}{c} \bullet \alpha & 6 \\ \hline \alpha & 6 \\ \hline \beta & 4 \\ \hline \beta & 2 \\ \hline \beta & 2 \\ \hline \alpha & 3 \\ \hline \beta & 4 \\ \hline \beta & 4 \\ \hline \beta & 4 \\ \hline \end{array}$
53	NeuAc α (2-6)-Gal β (1-4)-GlcNAc β (1-2)- Man α (1-3)-[NeuAc α (2-6)-Gal β (1-4)- GlcNAc β (1-2)-Man α (1-6)]-Man β (1-4)- GlcNAc β (1-4)-GlcNAc β -Asn-NH ₂	$\begin{array}{c} \alpha & 6 \\ \alpha & 6 \\ \hline \alpha & 6 \\ \hline \beta & 4 \\ \hline \beta & 4 \\ \hline \beta & 2 \\ \hline \alpha & 3 \\ \hline \beta & 4 \\ \hline \beta & 4 \\ \hline \beta & 2 \\ \hline \alpha & 3 \\ \hline \beta & 4 \\ \hline \beta & 4 \\ \hline \beta & 4 \\ \hline \end{array}$
54	$\label{eq:constraint} \begin{array}{l} NeuAc\alpha(2-6)\mbox{-}Gal\beta(1\mbox{-}4)\mbox{-}GlcNAc\beta(1\mbox{-}3)\mbox{-}\\ Gal\beta(1\mbox{-}4)\mbox{-}GlcNAc\beta(1\mbox{-}2)\mbox{-}Man\alpha(1\mbox{-}3)\mbox{-}\\ [NeuAc\alpha(2\mbox{-}6)\mbox{-}Gal\beta(1\mbox{-}4)\mbox{-}GlcNAc\beta(1\mbox{-}2)\mbox{-}Man\alpha(1\mbox{-}6)]\mbox{-}\\ Gal\beta(1\mbox{-}4)\mbox{-}GlcNAc\beta(1\mbox{-}2)\mbox{-}Man\alpha(1\mbox{-}6)]\mbox{-}\\ Man\beta(1\mbox{-}4)\mbox{-}GlcNAc\beta(1\mbox{-}4)\mbox{-}GlcNAc\beta\mbox{-}Asn\mbox{-}\\ NH_2 \end{array}$	$\begin{array}{c} & \alpha & 6 \\ \hline \alpha & 6 \\ \hline \alpha & 6 \\ \hline \beta & 4 \\ \hline \beta & 4 \\ \hline \beta & 3 \\ \hline \beta & 4 \\ \hline \beta & 3 \\ \hline \beta & 4 \\ \hline \beta & 2 \\ \hline \alpha & 3 \\ \hline \beta & 4 \\ \hline \beta & 2 \\ \hline \alpha & 3 \\ \hline \beta & 4 \\ \hline \beta & 4 \\ \hline \beta & 4 \\ \hline \end{array}$
55	$\label{eq:constraint} \begin{split} & NeuAc\alpha(2-6)\text{-}Gal\beta(1-4)\text{-}GlcNAc\beta(1-3)\text{-}\\ & Gal\beta(1-4)\text{-}GlcNAc\beta(1-3)\text{-}Gal\beta(1-4)\text{-}\\ & GlcNAc\beta(1-2)\text{-}Man\alpha(1-3)\text{-}[NeuAc\alpha(2-6)\text{-}\\ & Gal\beta(1-4)\text{-}GlcNAc\beta(1-3)\text{-}Gal\beta(1-4)\text{-}\\ & GlcNAc\beta(1-3)\text{-}Gal\beta(1-4)\text{-}GlcNAc\beta(1-2)\text{-}\\ & Man\alpha(1-6)]\text{-}Man\beta(1-4)\text{-}GlcNAc\beta(1-4)\text{-}\\ & GlcNAc\beta\text{-}Asn\text{-}NH_2 \end{split}$	$\begin{array}{c} & \alpha & 6 \\ \hline \alpha & 6 \\ \hline \beta & 4 \\ \hline \alpha & 6 \\ \hline \beta & 4 \\ \hline \beta & 3 \\ \hline \beta & 4 \\$
56	NeuGca(2-6)-Gal β (1-4)-GlcNAc β -ethyl-NH ₂	$\Phi_{\alpha \ 6} \Theta_{\beta \ 4}$
57	$\label{eq:alpha} \begin{split} & \text{NeuAca}(2\text{-}3)\text{-}\text{Gal}\beta(1\text{-}4)\text{-}\text{GlcNAc}\beta(1\text{-}2)\text{-}\\ & \text{Man}\alpha(1\text{-}3)\text{-}[\text{NeuAc}\alpha(2\text{-}6)\text{-}\text{Gal}\beta(1\text{-}4)\text{-}\\ & \text{GlcNAc}\beta(1\text{-}2)\text{-}\text{Man}\alpha(1\text{-}6)]\text{-}\text{Man}\beta(1\text{-}4)\text{-}\\ & \text{GlcNAc}\beta(1\text{-}4)\text{-}\text{GlcNAc}\beta\text{-}\text{Asn}\text{-}\text{NH}_2 \end{split}$	$\begin{array}{c} \alpha & 6 \\ \alpha & 6 \\ \alpha & 3 \\ \alpha & 3 \\ \beta & 4 \\ \beta & 2 \\ \end{array} \begin{array}{c} \alpha & 6 \\ \beta & 2 \\ \alpha & 3 \\ \beta & 4 \\ \end{array} \begin{array}{c} \alpha & 6 \\ \beta & 4 \\ \beta & 2 \\ \end{array} \begin{array}{c} \alpha & 6 \\ \beta & 4 \\ \beta & 4 \\ \end{array} \begin{array}{c} \beta & 4 \\ \beta & 4 \\ \end{array} $
58	NeuAc α (2-6)-Gal β (1-4)-GlcNAc β (1-2)- Man α (1-3)-[NeuAc α (2-3)-Gal β (1-4)- GlcNAc β (1-2)-Man α (1-6)]-Man β (1-4)- GlcNAc β (1-4)-GlcNAc β -Asn-NH ₂	$\begin{array}{c} & \alpha & 3 \\ \hline \alpha & 3 \\ \hline \alpha & 6 \\ \hline \alpha & 6 \\ \hline \beta & 4 \\ \hline \beta & 2 \\ \hline \alpha & 3 \\ \hline \beta & 4 \\ \hline \beta & 2 \\ \hline \alpha & 3 \\ \hline \beta & 4 \\ \hline \beta & 4 \\ \hline \beta & 4 \\ \hline \end{array}$

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