

## CERTIFICATE OF ANALYSIS

PRODUCT NAME: GLYKO® ASIALO-, AGALACTO- TETRAANTENNARY COMPLEX  
N-GLYCAN (NGA4)

PRODUCT CODE: GKC-006300

LOT NUMBER: DP15H0703a

PACK SIZE: 10 µg (qualitative standard for glycan identification)

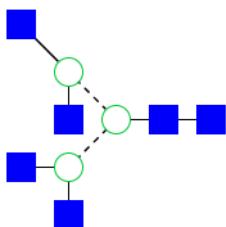
PURITY: ≥90% of glycan by UPLC®

FORM: Dry solid

STORAGE: Store at -20°C before and after reconstitution

EXPIRATION: January 2022, may be used for 1 year after reconstitution

STRUCTURE<sup>1,2,3</sup> :

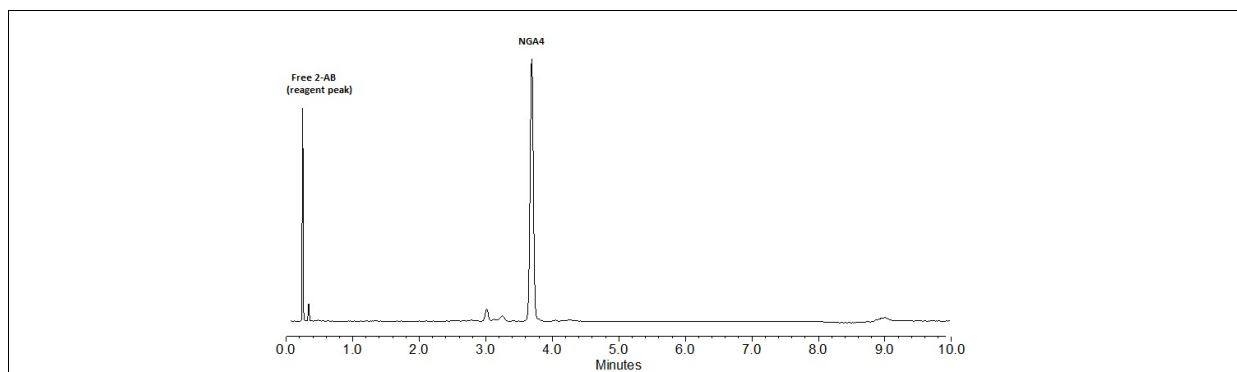


### Structure Key:

Monosaccharide symbol:	Linkage position:	Linkage type:
□ Glucose	6 8	— β-linkage
◇ Galactose	4	--- α-linkage
○ Mannose	3 2	~ Unspecified β-linkage
◆ Fucose		- - - Unspecified α-linkage
△ Xylose		
■ N-Acetylglucosamine (GlcNAc)		
◆ N-Acetylgalactosamine (GalNAc)		
★ N-Acetylneuraminic acid (Neu5Ac or NANA)		
☆ N-Glycolyneuraminic acid (Neu5Gc or NGNA)		

## Quality Control:

**Sample Preparation:** NGA4 was labeled with 2-aminobenzamide (2-AB) by reductive amination<sup>4</sup> using the Signal™ 2-AB Labeling Kit (product code GKK-404).



**Figure 1 - UPLC® Results:** 3-6 pmol (1 µl) of the 2-AB-labeled glycan was injected on a Waters ACQUITY UPLC® H Class System utilizing a 10-minute method under the conditions below:

Time (min)	Flow (ml/min)	% ACN	% Buffer
0	1.0	75	25
8.0	1.0	60	40
8.1	0.5	40	60
8.5	0.5	40	60
8.6	1.0	40	60
8.8	1.0	75	25
10.0	1.0	75	25

Column: Waters ACQUITY UPLC BEH Glycan Column (1.7 µm, 2.1 x 100 mm)

ACN: Acetonitrile

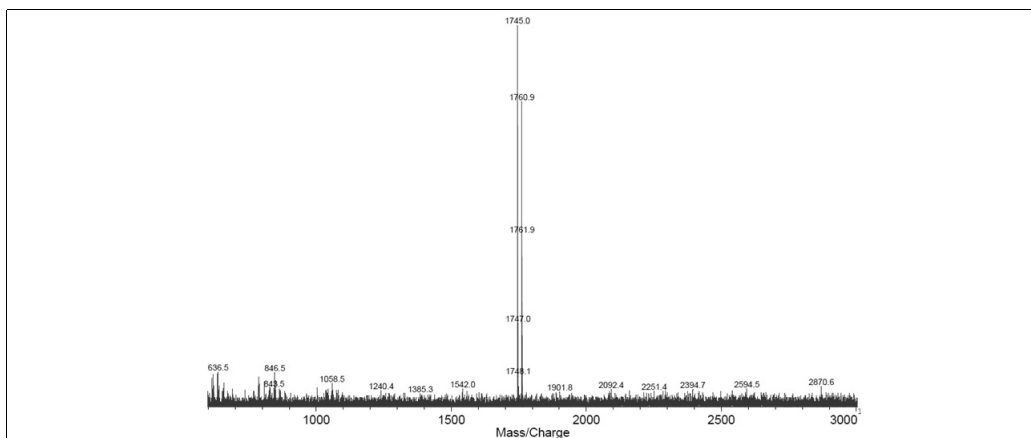
Buffer: 100 mM ammonium formate, pH 4.4

Flow rate: As stated in table, in ml/min

Temperature: 60°C

Max Pressure: 15,000 psi

Fluorescence Detection:  $\lambda_{\text{ex}} = 330 \text{ nm}$   
 $\lambda_{\text{em}} = 420 \text{ nm}$



**Figure 2 - Mass Spectrum of NGA4 [M + Na]<sup>+</sup>**

**Average Mass<sup>5</sup>:** 1723.6

**Monoisotopic Mass<sup>5</sup>:** 1722.6454

**Structural Analysis:** The purity and structural integrity of the glycan was assessed by UPLC<sup>6</sup> (as described above) and MALDI-TOF<sup>7,8</sup> or LC-MS. Agreement was found between the results from mass spectrometry and UPLC.

**Applications:**

- qualitative standard for various analytical procedures
- fluorescent-labeling or formation of a variety of oligosaccharide derivatives
- substrate for glycosidase and glycosyl transferase assays

**Reconstitution:** Use HPLC-grade water or an aqueous buffer to dissolve the glycan. Store the reconstituted glycan at -20°C in working aliquots. Avoid multiple freeze/thaw cycles.

**Handling:** The oligosaccharide is shipped as a dried solid. Allow the unopened vial to reach ambient temperature and tap on a solid surface to ensure that most of the material is at the bottom of the vial. Gently remove the cap, add the desired volume of water or buffer, re-cap and mix thoroughly to redissolve all the oligosaccharide. For maximal recovery, ensure that the cap lining is also rinsed, and centrifuge the reconstituted vial briefly before use.

Make sure that any glassware, plasticware, solvents or reagents which come into contact with the glycan are free of glycosidases and carbohydrate contaminants.

Minimize exposure to elevated temperatures or extremes of pH.

## REFERENCES

1. Ceroni A, Maass K, Geyer H, Geyer R, Dell A, Haslam, SM. GlycoWorkbench: a tool for the computer-assisted annotation of mass spectra of glycans. *J Proteome Res.* 2008 Apr;7(4):150-9.
2. Harvey DJ, Merry AH, Royle L, Campbell MP, Dwek RA, Rudd PM. Proposal for a standard system for drawing structural diagrams of N- and O-linked carbohydrates and related compounds. *Proteomics* 2009 Aug;9(15):3796-801.
3. Harvey DJ, Merry AH, Royle L, Campbell MP, Rudd PM. Symbol nomenclature for representing glycan structures: Extension to cover different carbohydrate types. *Proteomics* 2011 Nov;11(22):4291-5.
4. Bigge JC, Patel T, Bruce JA, Goulding PN, Charles SM, Parekh RB. Nonselective and efficient fluorescent labeling of glycans using 2-amino benzamide and anthranilic acid. *Anal Biochem* 1995 Sep 20;230(2):229-238.
5. Average mass and monoisotopic mass were calculated using the ExPASy GlycanMass calculator:  
<http://web.expasy.org/glycanmass/>
6. Ahn J, Bones J, Yu YQ, Rudd PM, Gilar M. Separation of 2-aminobenzamide labeled glycans using hydrophilic interaction chromatography columns packed with 1.7 microm sorbent. *J Chromatogr B Analyt Technol Biomed Life Sci.* 2010 Feb 1;878(3-4):403-8.
7. James DC and Jenkins N. Analysis of N-glycans by matrix-assisted laser desorption/ionization mass spectrometry. In: Jackson P, Gallagher JT, editors. *A laboratory guide to glycoconjugate analysis*, BioMethods Vol. 9. Basel: Birkhäuser; 1997. p. 91-112.
8. Papac DI, Wong A and Jones AJS. Analysis of acidic oligosaccharides by matrix-assisted laser desorption/ionization time of flight mass spectrometry. *Anal Chem* 1996 Sep 15;68(18):3215-3223.

---

Authorized Signature