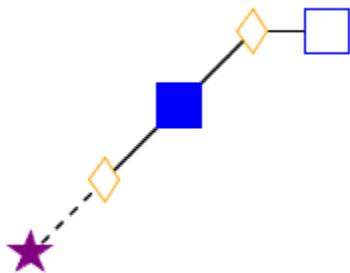


CERTIFICATE OF ANALYSIS

PRODUCT NAME: GLYKO® LS-Tetrasaccharide a (LSTa)
 PRODUCT CODE: GKAD-01017
 LOT NUMBER: DP12K1901
 PACK SIZE: 1 mg (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 2023 (extended from prior exp. date based on re-assay)
 RE-ASSAY DATE: January 2018
 STRUCTURE^{1,2,3}:



Structure Key:

Monosaccharide symbol	Linkage position	Linkage type
◇ Galactose	6	— β-linkage
□ Glucose	8	— α-linkage
■ N-Acetylglucosamine (GlcNAc)	4	
★ N-Acetylneurameric acid (Neu5Ac or NANA)	3	
	2	

Quality Control:

Sample Preparation: LSTa was labeled with 2-aminobenzamide (2-AB) by reductive amination⁴ using the Signal™ 2-AB Labeling Kit (product code GKK-404) under modified labeling conditions.

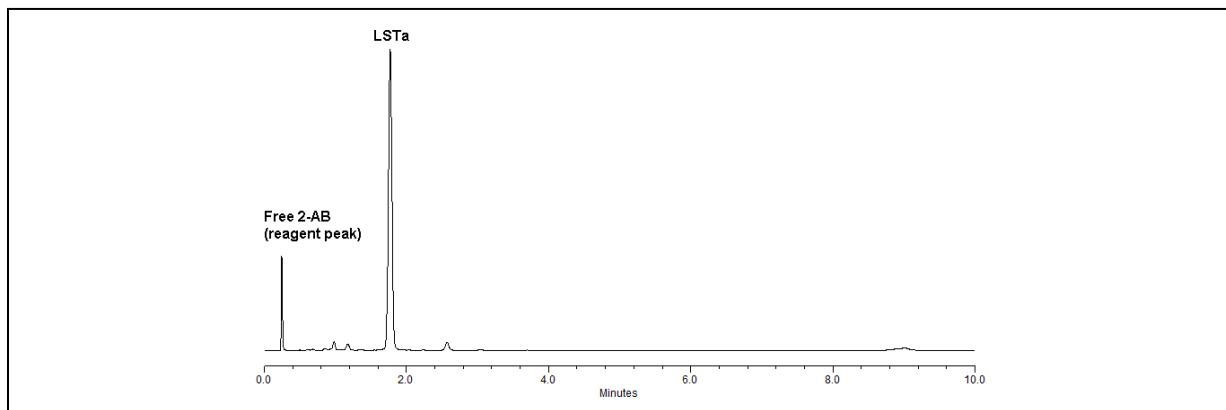


Figure 1 - UPLC® Results: 7 – 10 pmol (1 μ l, aqueous) of the 2-AB-labeled glycan was injected on a Waters ACQUITY UPLC® H Class System utilizing a 10-minute method under the conditions below:

Time (min)	Flow (ml/min)	%ACN	%Buffer
00.0	1.0	75.0	25.0
8.0	1.0	60.0	40.0
8.1	0.5	40.0	60.0
8.5	0.5	40.0	60.0
8.6	1.0	40.0	60.0
8.8	1.0	75.0	25.0
10.0	1.0	75.0	25.0

Column: Waters ACQUITY UPLC BEH Glycan Column (1.7 μ m, 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: $\lambda_{\text{ex}} = 330$ nm, $\lambda_{\text{em}} = 420$ nm

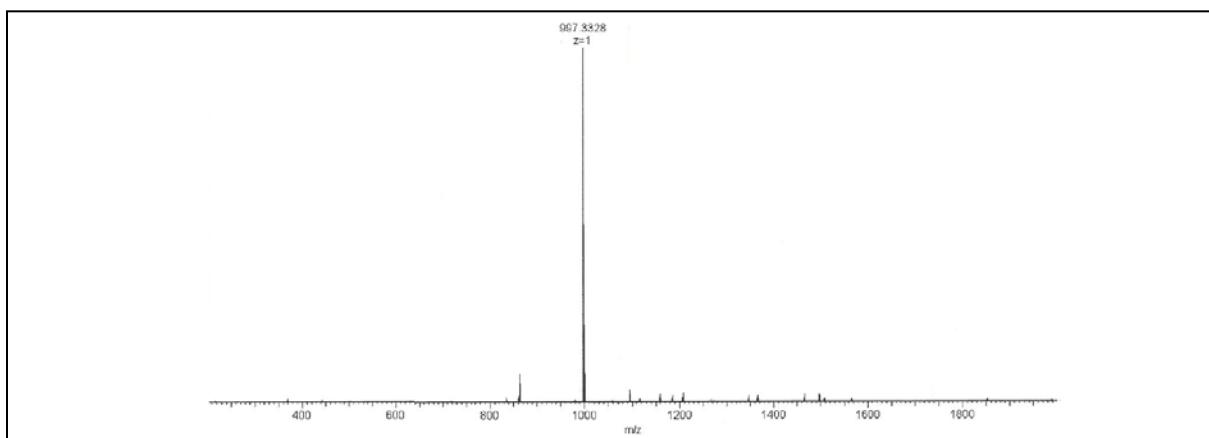


Figure 2 - Mass Spectrum of LSTa $[M-H]^{-1}$

Average Mass⁵: 998.9

Monoisotopic Mass⁵: 998.3438

Structural Analysis: The identity of the glycan is confirmed by MALDI-TOF^{6,7}, ESI-MS or LC-MS. Agreement was found between the results from mass spectrometry and UPLC⁸.

Application:

- Qualitative standard for various analytical procedures
- Fluorescent-labeling or formation of a variety of oligosaccharide derivatives

Handling & Reconstitution: The oligosaccharide is shipped as a dried solid. Use ultra-pure water or an aqueous buffer to dissolve the materials (see Directions for Use for suggested volumes).

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 ultra-pure water or aqueous buffer, re-cap and mix thoroughly to redissolve all the material.

For maximal recovery, ensure that the cap lining is also rinsed. Centrifuge the reconstituted vial briefly before use.

Make sure that any glassware, plasticware, solvents or reagents used are free of glycosidases and carbohydrate contaminants.

Minimize exposure to elevated temperatures or extremes of pH. Store the reconstituted glycan at -20° C. Allow the vial to equilibrate to ambient temperature before use.

REFERENCES

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Authorized Signature