



**Product Guide for LudgerTag™ DMB
(1,2-diamino-4,5-methylenedioxybenzene.2HCl)
Sialic Acid Release and Labeling Kit**

(Ludger Product Code: LT-KDMB-A1)

Ludger Document # LT-KDMB-A1-Guide-v5.0

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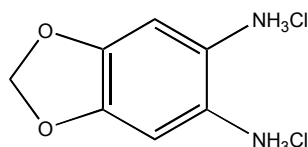
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Specifications for LT-KDMB-A1

Application: For release of sialic acids from glycoproteins and labeling with 1,2-diamino-4,5-methylenedioxybenzene.2HCl (DMB).

Dye Properties: Relative Molecular Mass = 120.11 gmol⁻¹
Fluorescence, λ_{ex} = 373 nm, λ_{em} = 448 nm.

Structure:



Synonyms: DMB
1,2-Diamino-4,5-methylenedioxybenzene Dihydrochloride
1,3-Benzodioxole-5,6-diamine Dihydrochloride
5,6-Diamino-1,3-benzodioxole Dihydrochloride

Description: The kit contains reagents for the release of sialic acids from glycoproteins. Released sialic acids are conjugated with DMB dye by an amination-cyclisation reaction.

Number of Samples: The kit contains reagents and materials for up to 22 glycoprotein samples including a sialic acid reference panel, N-acetyl neuraminic acid and N-glycolyl neuraminic acid).

Amount of Sample: Typically start will 50-100 μg of glycoprotein per sample analysis. Each labeling should work with approximately 10 pmol up to 2.5 nmol sialic acids per sample.

Suitable Samples: Biopharmaceutical glycoproteins. Any sialic acid released from a glycoprotein, glycopeptide or glycan can be labeled.

Labelling efficiency: Typically >85 % (dependent on sample).

Labelling Selectivity: Essentially stoichiometric labeling.

Storage: Store at -18°C in the dark. Protect from sources of heat, light, and moisture. The reagents are stable for at least two years as supplied.

Shipping: The product can be shipped at ambient temperature.

Handling: Ensure that any glassware, plasticware or solvents used are free of glycosidases and environmental carbohydrates. Use powder-free gloves for all sample handling procedures to avoid contamination with environmental carbohydrate. All steps involving labelling reagents must be performed in a dry environment with dry glassware and plasticware. Once individual vials of reagents are opened, their contents should be used immediately and excess then discarded according to local safety rules.

Safety: Please read the Material Safety Data Sheets (MSDS's) for all chemicals used. All processes involving labelling reagents should be performed, where appropriate, in a laboratory fume cupboard using appropriate personal safety protection - eyeglasses, laboratory coat and chemically resistant gloves (e.g. nitrile).

For research use only. Not for human or drug use.

Kit Contents

Each labeling reaction set consists of one vial of each component, except 2M acetic acid, of which two vials are supplied:

Cat. #	Item	Quantity
LT-DMB-01	DMB Dye	0.7 mg
LT-ACETIC2M-01	Acetic Acid 2 Molar	1.1 mL
LT-MERCAPTO-01	Mercaptoethanol in Acetic acid (1.4 Molar)	500 µl
LT-DITHIO-01	Sodium Dithionite (Reductant)	4 mg
CM-NEUAC-01	N-acetylneuraminic acid quantitative standard	1 nmol
CM-NEUGC-01	N-glycolylneuraminic acid quantitative standard	1 nmol
CM-SRP-01	Sialic Acid Reference Panel containing Neu5Ac, Neu5Gc, Neu5,7Ac2, Neu5,Gc9Ac, Neu5, 9Ac2 and Neu 5,7, (8), 9Ac3Gc.	

Additional Reagents and Equipment Required

Heating block, oven, or similar dry heater (a water bath cannot be used) set at 80°C for the sialic acid release step and at 50°C for the sialic acid labelling reaction

Reaction vials (e.g. 0.5 mL polypropylene microcentrifuge vials)

Analytical grade water eg. MilliQ

Glycoprotein Standard eg GCP-Fet-50 available from Ludger.

Time Line for Labeling

The LudgerTag™ labeling procedure, including drying time and the acid release of sialic acids from the analytical samples, typically takes 9 hours:

Procedure	Time
Transfer samples to reaction tube and dry	2 – 3 hours
Addition of sialic acid release agent	15 min
Incubate samples	2 hours
Cool and transfer samples to reaction tube	30 min
Preparation labelling reagent	15 min
Addition of reagent to samples	15 min
Incubate samples	3 hours
Terminate reaction	15 min

Reaction Mechanism

The DMB labeling reaction involves a two-step concerted process, which is carried out *in situ* (Figures 1a and 1b):

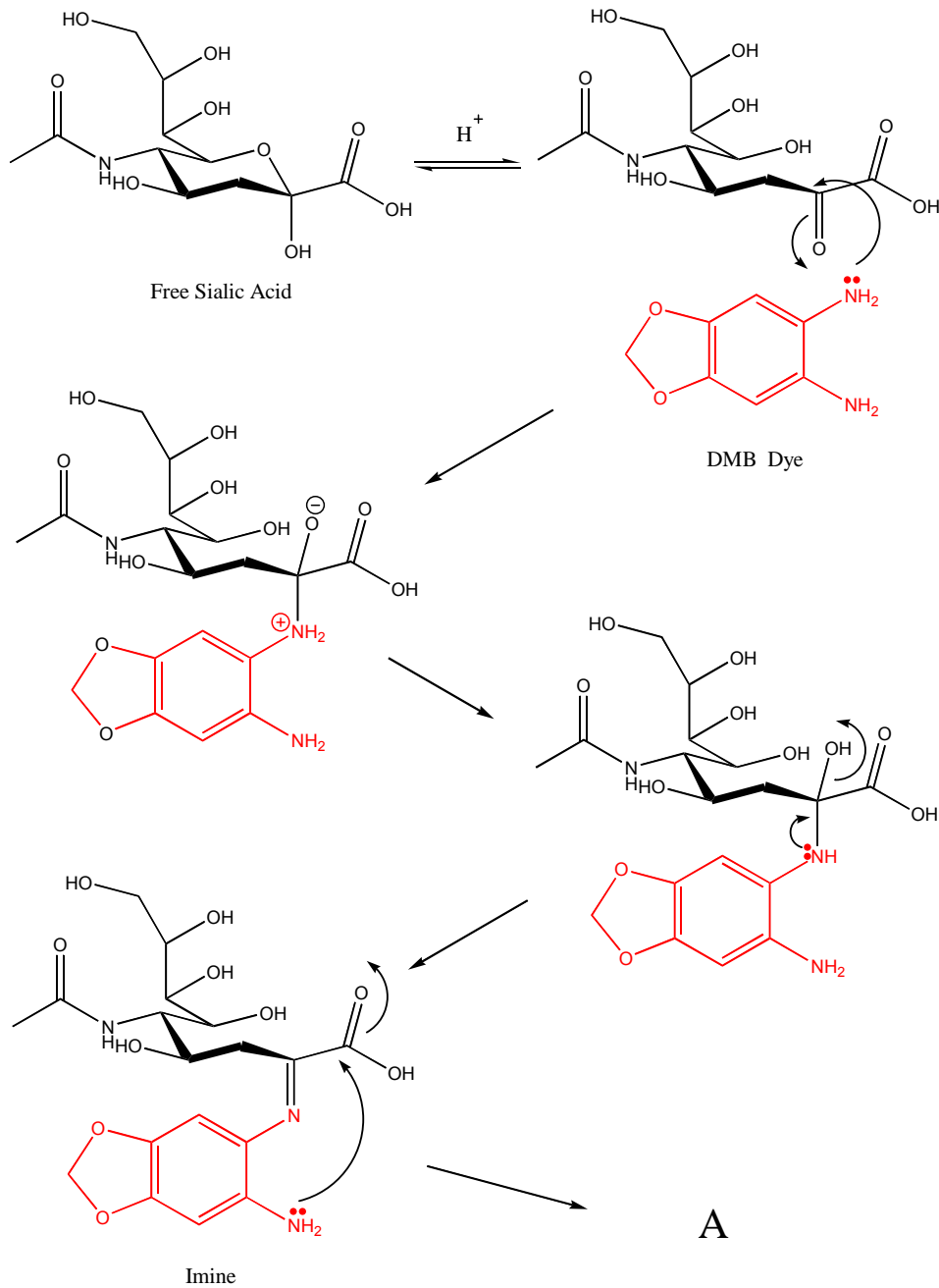


Figure 1a: Labeling of a sialic acid with DMB

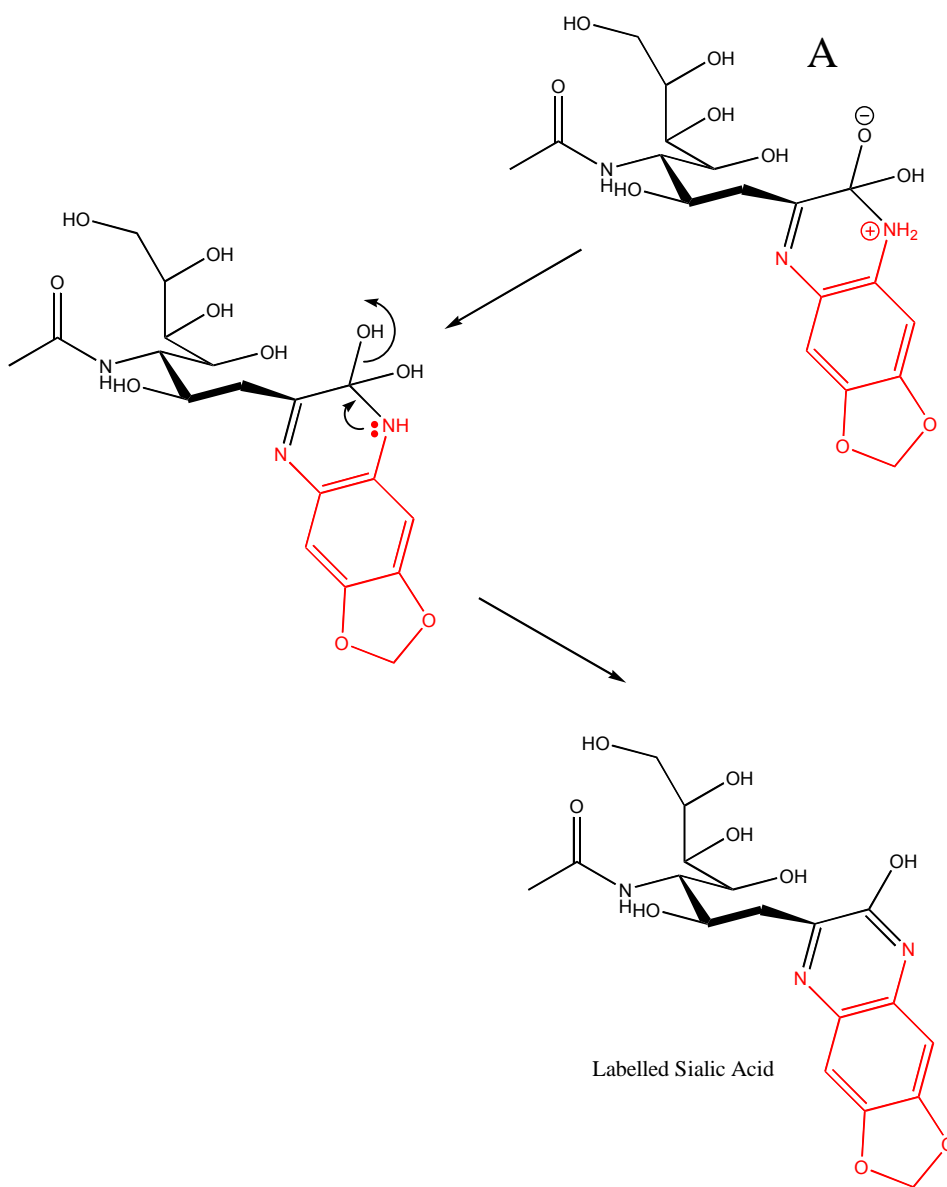


Figure 1b: Labeling of a sialic acid with DMB cont.

Outline of Protocol

Stage 1: Release of Sialic Acids

Dry down glycoprotein/glycopeptide/glycans to be analysed for sialic acid content

Add Sialic acid release reagent (where appropriate)

Incubate

Stage 2: DMB-Labeling of Sialic Acids

Prepare labelling reagent

Add labelling reagent to sample and standards

Incubate

Terminate Reaction

Stage 3: Analysis of DMB Labeled Sialic Acids

Analyze the DMB labeled sialic acids by fluorescence HPLC

Sample Preparation

1 Set oven

Switch on oven or heating block and set to 80°C.

NB: We recommend using an oven for the incubation due to the small amounts of 2M acetic acid used for the release. The acid can evaporate and then condense in the lid when using a heating block.

2 Sample glycoprotein/glycopeptide/glycans

Aliquot 3 x 50 µg of each sample into 3 x 0.5 mL polypropylene vials and dry in vacuum centrifuge.

NB. We recommend triplicate release for each sample to obtain repeatability measurements.

NB. It is preferable for the dried glycoproteins/glycopeptides/glycans to be contained in a small vial, e.g. 0.5 mL polypropylene microcentrifuge vial, due to the small amounts of 2M acetic acid used for the release.

3 Positive and negative glycoprotein controls

Take three vials of 50 µg Fetuin Glycoprotein (cat item: GCP-FET-50 – not supplied in this kit), or other suitable glycoprotein standard, to use as the positive control.

NB. The glycoprotein standard positive control also needs to be dried down in 0.5 mL polypropylene vials in a vacuum centrifuge.

Take 50 µL of water and dry in vacuum centrifuge to use as negative control.

Sialic Acid Release

4 Sialic Acid Release

Add 25 µL of the sialic acid release reagent, LT-ACETIC2M-01, to the sialic acid containing samples, positive control(s) and the negative control(s), centrifuge briefly to ensure the acid has reached the bottom of the tube and incubate at 80°C for 2 hours.

5 Sialic Acid Transfer

Cool each sample to room temperature, vortex and then centrifuge. Remove 5 µL and transfer to a separate 0.5 mL polypropylene microcentrifuge vial ready to be labelled with DMB. Set heating block or oven temperature to 50°C for the labeling step.

Preparation of Labeling Reagent

6 Prepare Labeling Reduction Solution

Partially remove the label from the vial of sodium dithionite, LT-DITHIO-01, so it will be easy to visualise when it has all dissolved. Add 440µl of the mercaptoethanol solution, LT-MERCAPTO-01, to the vial of sodium dithionite (reductant) and mix until all the solid reductant has completely dissolved.

7 Prepare final Labeling Solution

Partially remove the label from the vial of DMB dye, LT-DMB-01, so it will be easy to visualise when it has all dissolved. Add the entire contents of the reduction solution, to the vial of DMB Dye and mix until the dye is dissolved.

NB: Minimise exposure of the labeling reagent to moisture and light and use within 60 minutes

Labeling Reaction

8 Add labeling reagent to samples and standards

Add 20 µL of labeling reagent to each sample, including the Sialic Acid Reference Panel, CM-SRP-01, N-acetyl neuraminic acid standard, CM-NEUAC-01, and N-glycolyl neuraminic acid standard, CM-NEUGC-01. Cap the vials, mix thoroughly, and centrifuge briefly to ensure the labeling solution has reached the bottom of the vial.

9 Incubate

Place the reaction vials in the heating block or oven set at 50°C and incubate for 3 hours in the dark.

10 Terminate Reaction

Terminate the reaction by adding 475 µL of water to each test sample, positive control and negative control and 480 µL water to each standard.

The samples can be stored at -18°C in the dark if they cannot be analysed immediately.

Analyses should be carried out within 24 hours of termination of the reaction.

Preparing Dilutions for Quantitative Analysis

11 Prepare serial dilutions of labeled Neu5Ac quantitative standard

See Appendix 1 for details.

12 Prepare serial dilutions of labeled Neu5Gc quantitative standard

See Appendix 1 for details.

HPLC Analysis

13 Analyse DMB labelled samples by fluorescence HPLC

The DMB labelled sialic acids should be analyzed by reverse phase chromatography. Ludger now provides two HPLC column options for sialic acid separation.

HPLC Option 1 – For HPLC systems that operate at pressures up to 200 Bar.

Ludger sells a reverse phase HPLC column that is optimised for DMB labeled sialic acid separation. The LudgerSep™ R1 HPLC column (Cat. No. LS-R1-4.6x150) is to be used with standard HPLC instruments that have pressure limits of up to 200 Bar.

It is recommended that a system suitability run be carried out prior to the sample run using:

- 1) Sialic acid reference panel (SRP) to check separation of glycans
- 2) Prepare test samples at a range of dilutions e.g. 1 in 10, 1 in 20 and 1 in 30 (to determine the dilution at which optimal peak resolution is achieved) See Appendix A1. Figures 3 and 4 show the NeuAc and NeuGc standards run at 1 in 10 dilution.

For the LudgerSep™ R1 column we recommend a 30 minute isocratic run with temperature control at 30°C.

Flow rate: 0.5 mL/min

Solvent: Methanol:Acetonitrile:Water (7:9:84 v/v)

Fluorescence: Excitation: 373 nm, Emission: 448 nm

Note: Store samples at -18°C in the dark after use (DMB is light sensitive)

The DMB labelled sialic acid reference panel is an excellent sample to run on this column to ensure DMB labelling has performed within your in-house specifications. An example DMB sialic acid reference panel chromatogram is shown below (Figure 2).

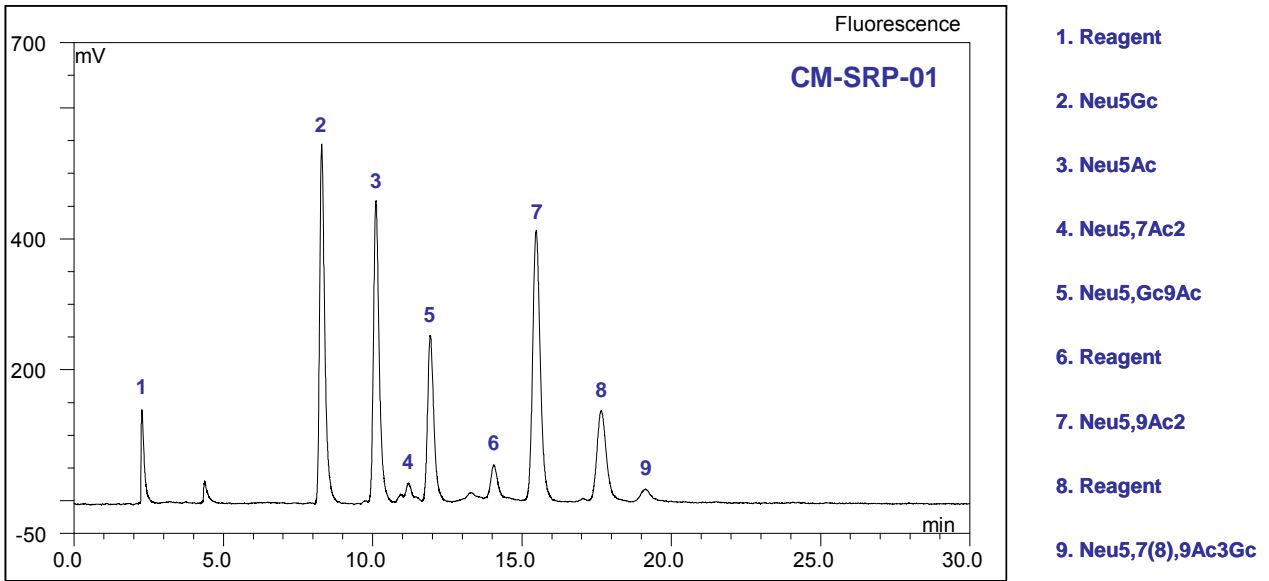


Figure 2: Chromatogram of DMB Labeled Sialic Acid Reference Panel (CM-SRP-01), run on the LudgerSep™ R1 HPLC column.

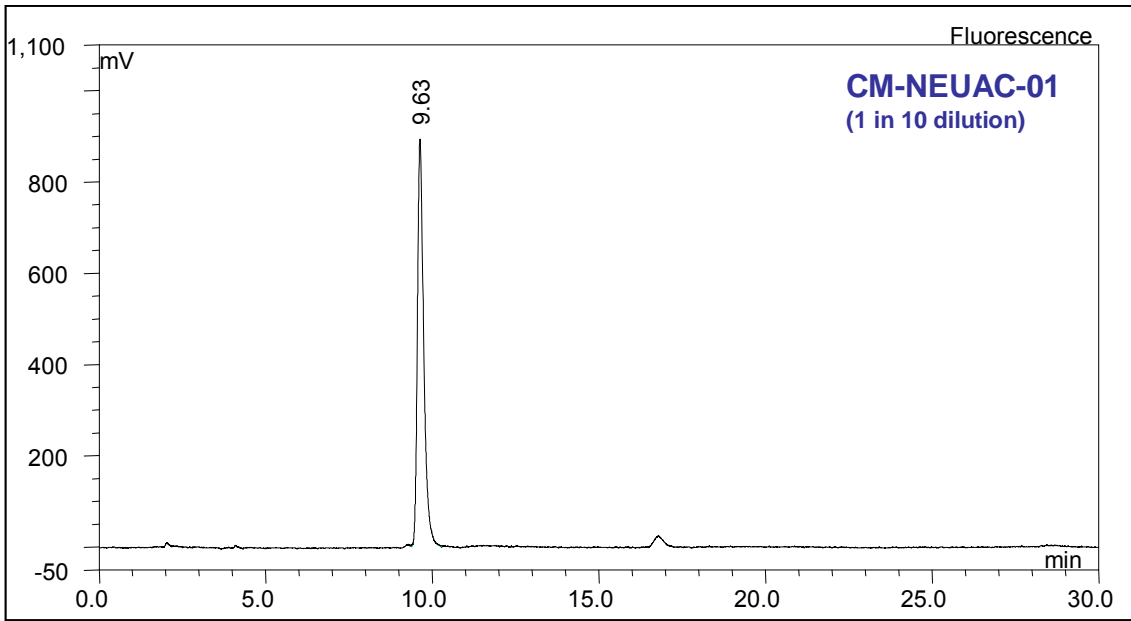


Figure 3: Chromatogram of DMB Labeled Neu5Ac (CM-NEUAC-01) (1 in 10 dilution) run on the LudgerSep™ R1 HPLC column.

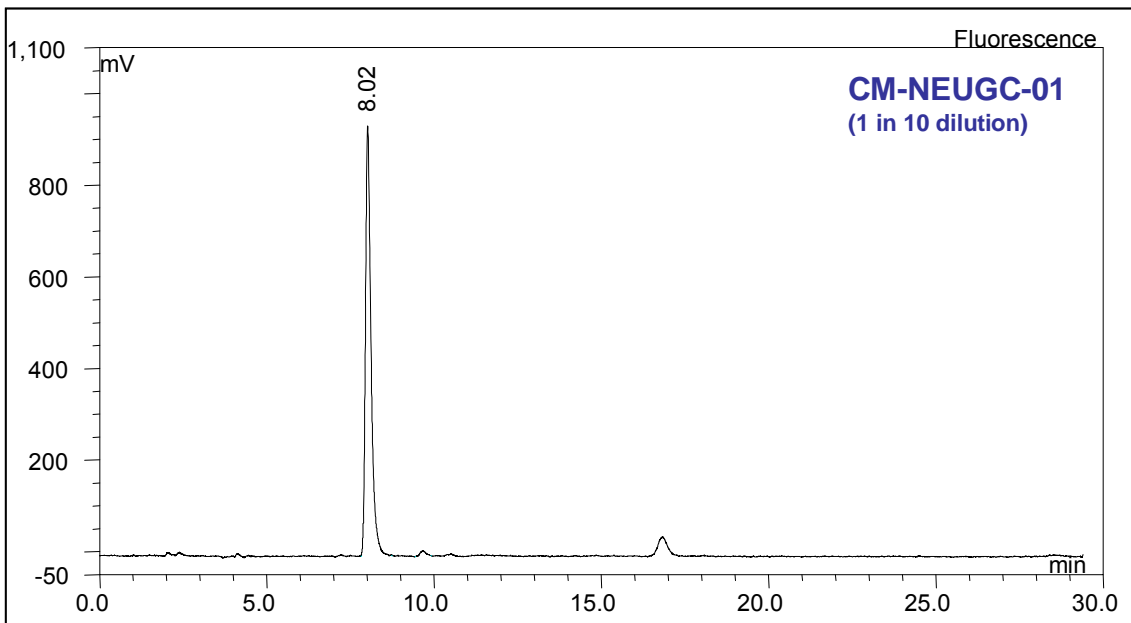


Figure 4: Chromatogram of DMB Labeled Neu5Gc (CM-NEUGC-01) (1 in 10 dilution) run on the LudgerSep™ R1 HPLC column.

HPLC Option 2 – For UHPLC systems that can operate at pressures over 200 Bar.

Ludger now offers a faster, more solvent efficient alternative to the LudgerSepR1 column. The LudgerSep™ uR2 column (LS-UR2-2.1mmx100mm, 1.9 µm particles) is designed for use with the latest generation of UHPLC instruments capable of withstanding high flow pressures and fast sample analyses. In order to take advantage of the high resolving power of sub 3 µm particle size containing columns, we recommend keeping sample injection volumes below 5 µL and minimising system void volumes. Ideally use full loop injection with a sample loop of less than 5 µL. Tubing should be narrow bore (about 0.13 mm diameter or less) and detector flow cell volumes should be 10 µl or less. Although an example chromatogram is shown in this guide, retention times will vary dependent on the UHPLC system used.

With a recommended flow rate of 0.25 mL/min and 10 minute chromatography runs, the LudgerSep™ uR2 uses a fifth of the solvent compared to a standard LudgerSep™ R1 column and enables analyses in a third of the time, dramatically speeding up sample analysis throughput.

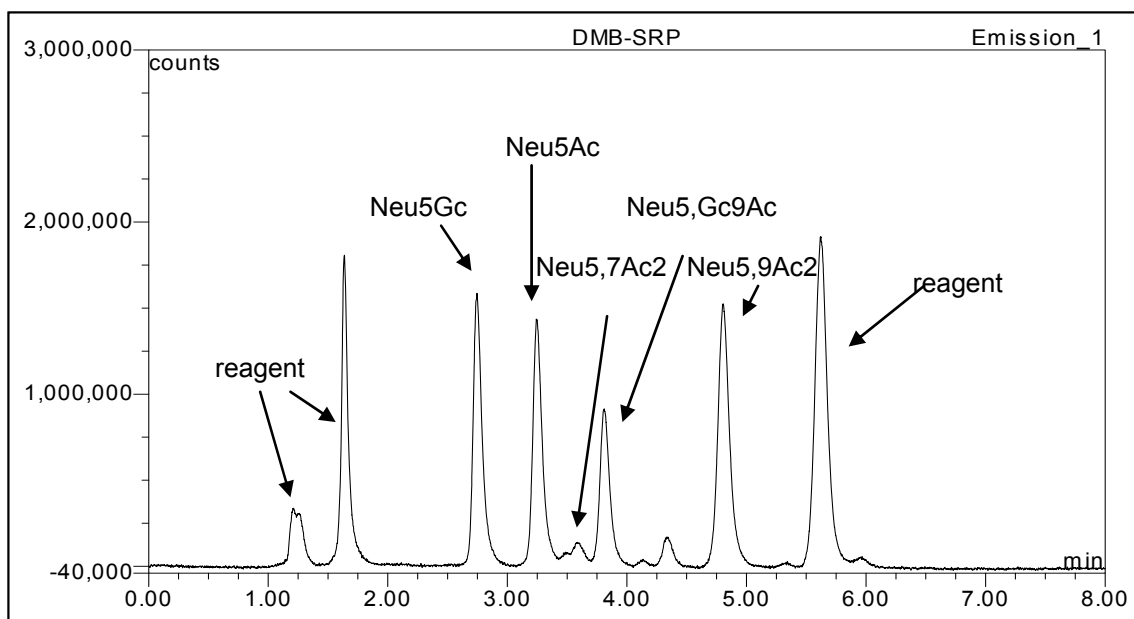


Figure 4: DMB Labeled Sialic Acid Reference Panel Run on the LudgerSep™ uR2 UHPLC column.

Warranties and Liabilities

Ludger warrants that the above product conforms to the attached analytical documents. Should the product fail for reasons other than through misuse Ludger will, at its option, replace free of charge or refund the purchase price. This warranty is exclusive and Ludger makes no other warranties, expressed or implied, including any implied conditions or warranties of merchantability or fitness for any particular purpose. Ludger shall not be liable for any incidental, consequential or contingent damages.

This product is intended for *in vitro* research only.

Document Revision Number

Document # LT-KDMB-A1-Guide-v5.0

Appendix 1: Preparation of Neu5Ac and Neu5Gc standard curves

The preparation of the Neu5Ac standard curve involves labeling the vial of Neu5Ac with DMB and then performing a set of serial dilutions.

- 1 After the DMB labeling reaction, the DMB labelled Neu5Ac (DMB-Neu5Ac) is in a final volume of 500µl. This vial contains 1 nmol (1000 pmol) Neu5Ac that has been DMB labeled.
- 2 Prepare a 1 in 5 dilution of DMB-Neu5Ac by pipetting 40 µL of the DMB-Neu5Ac solution into a vial and adding 160 µL water. Vortex to mix thoroughly.
- 3 Prepare subsequent serial dilutions of the DMB-Neu5Ac (1 in 10, 1 in 20, 1 in 50, 1 in 100 and 1 in 200) using the Table1 (below) as a guide.

Vial #	DMB-Neu5Ac Dilution	Amount of Neu5Ac in solution (pmol)	Recipe
A	1	1000	DMB-Neu5Ac solution (500 µL)
B	1 in 5	200	40 µL vial A + 160 µL water
C	1 in 10	100	100 µL vial B + 100 µL water
D	1 in 20	50	100 µL vial C + 100 µL water
E	1 in 50	20	80 µL vial D + 120 µL water
F	1 in 100	10	100 µL vial E + 100 µL water
G	1 in 200	5	100 µL vial F + 100 µL water

Table 1: A guide to a serial dilution scheme for preparing the Neu5Ac standard curve.

- 4 Repeat steps 1-3 and use the table above as a guide for the preparation of the Neu5Gc standard curve.

Appendix 2: Material Safety Data Sheets

Material Safety Data Sheet: LT-DMB-01

Manufacturer	Ludger Ltd Culham Science Centre, Abingdon OX14 3EB, UK Tel: +44 (0)870 085 7011, Fax: +44 (0)870 163 4620 Email: info@ludger.com, Website: www.ludger.com
Identification of the substance:	DMB Dye (Cat # LT-DMB-01)
Composition:	1,2-diamino-4,5-methylenedioxybenzene dihydrochloride CAS no. 81864-15-5
Physical properties:	MP/MP Range 247 °C Colour: Slightly beige/white semi crystalline solid
Hazard identification:	Irritating to eyes, respiratory system and skin.
First aid measures:	EYE CONTACT: In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. SKIN CONTACT: In case of skin contact, flush with copious amounts of water for at least 15 minutes INGESTION: If swallowed, wash out mouth with water provided person is conscious. Call a physician immediately. Do not induce vomiting. INHALATION: If inhaled, remove to fresh air. If breathing becomes difficult call a physician.
	IF IN DOUBT SEEK MEDICAL ADVICE
Fire fighting measures:	EXTINGUISHING MEDIA: Suitable: Carbon dioxide, Dry chemical powder or appropriate foam. SPECIAL RISKS:

Emits toxic fumes under fire conditions.

SPECIAL PROTECTIVE EQUIPMENT FOR FIREFIGHTERS:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Accidental release measures:

Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves. Place in covered containers. Avoid raising dust. Carefully sweep up and remove. Ventilate area and wash spill site after material pickup is complete.

Handling and storage:

Keep at -20°C

Exposure Controls:

Wear appropriate protective clothing (safety spectacles, gloves, Laboratory coat) in accordance with Good Laboratory Practice.

Stability and reactivity:

Stable: Stable.

Hazardous decomposition products: Nitrogen Oxides

Toxicological information:

Data not available

Ecological information:

Data not available

Disposal considerations:

Contact a licensed professional waste disposal service to dispose of this material.

Transport information:

Contact Ludger for transportation information.

Regulatory information:

Risk phrases: R36/37/38

Safety phrases: S26, 36

Other information:

The advice offered is derived from the currently available information on the hazardous materials in this product or component. Consideration has been made regarding the quantities offered in the pre-dispensed container. The advice offered is, therefore, not all-inclusive nor should it be taken as descriptive of the compound generally.

DISCLAIMER:

For R&D use only. Not for drug, household or other uses.

Material Safety Data Sheet: LT-ACETIC2M-01

Manufacturer	Ludger Ltd Culham Science Centre, Abingdon OX14 3EB, UK Tel: +44 (0)870 085 7011, Fax: +44 (0)870 163 4620 Email: info@ludger.com, Website: www.ludger.com
Identification of the substance:	Acetic Acid (2Molar) (Cat. No LT-ACETIC2M-01)
Composition:	Acetic acid in water (2 Molar). Ingredient Chemical name: Acetic Acid. CAS no. 64-19-7
Physical Properties:	MP/MP Range 16.2 °C, BP/BP Range 117 - 118 °C Colour: Colourless liquid.
Hazard identification:	Flammable. Causes severe burns.
First aid measures:	EYE CONTACT: In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. SKIN CONTACT: In case of skin contact, flush with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. INGESTION: If swallowed, wash out mouth with water provided person is conscious. Call a physician immediately. Do not induce vomiting. INHALATION: If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen. IF IN DOUBT SEEK MEDICAL ADVICE
Fire fighting measures:	EXTINGUISHING MEDIA: Suitable: Carbon dioxide, Dry chemical powder or appropriate foam. SPECIAL RISKS: Combustible liquid. Emits toxic fumes under fire conditions. SPECIAL PROTECTIVE EQUIPMENT FOR FIREFIGHTERS: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Accidental release measures:	Evacuate area. Shut off all sources of ignition. Use non-sparking tools. Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves. Cover with dry-lime, sand, or soda ash. Place in covered containers using non-sparking tools and transport outdoors. Avoid raising dust. Carefully sweep up and remove. Ventilate area and wash spill site after material pickup is complete.
Handling and storage:	Store at room temperature away from sparks and open flames.
Exposure Controls:	Wear appropriate protective clothing (safety spectacles, gloves, laboratory coat) in accordance with Good Laboratory Practice.
Stability and reactivity:	Stability: Stable. Avoid contact with oxidizing agents, carbonates, phosphates, hydroxides, oxides, metals, peroxides, permanganates, amines, alcohols.
Toxicological information:	Harmful if absorbed through skin, inhaled or if swallowed Material is extremely destructive to the tissue of the mucous membranes and upper respiratory tract.
Ecological information:	Data not available.
Disposal considerations:	Contact a licensed professional waste disposal service to dispose of this material.
Transport information:	Contact Ludger for transportation information.
Regulatory information:	Risk phrases: R10, 35 Safety phrases: S26, 36/37/39, 45
Other information:	The advice offered is derived from the currently available information on the hazardous materials in this product or component. Consideration has been made regarding the quantities offered in the pre-dispensed container. The advice offered is, therefore, not all inclusive nor should it be taken as descriptive of the compound generally.
DISCLAIMER:	For R&D use only. Not for drug, household or other uses.

Material Safety Data Sheet: LT-MERCAPTO-01

Manufacturer	Ludger Ltd Culham Science Centre, Abingdon OX14 3EB, UK Tel: +44 (0)870 085 7011, Fax: +44 (0)870 163 4620 Email: info@ludger.com, Website: www.ludger.com
Identification of the substance:	Mercaptoethanol in Acetic Acid (Cat # LT-MERCAPTO-01)
Composition:	2-Mercaptoethanol (CAS no. 60-24-2) Acetic Acid (1.4 Molar) (CAS no. 64-19-7)
Physical Properties:	Colour: Colourless Liquid Odour: Stench
Hazard identification:	Harmful by inhalation and if swallowed. Toxic in contact with skin. Causes burns.
First aid measures:	EYE CONTACT: In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. SKIN CONTACT: In case of skin contact, flush with copious amounts of water for at least 15 minutes INGESTION: If swallowed, wash out mouth with water provided person is conscious. Call a physician immediately. Do not induce vomiting. INHALATION: If inhaled, remove to fresh air. If breathing becomes difficult call a physician. IF IN DOUBT SEEK MEDICAL ADVICE
Fire fighting measures:	EXTINGUISHING MEDIA Suitable: Water Spray, Carbon dioxide, Dry chemical powder or appropriate foam. SPECIAL RISKS Combustible liquid. Emits toxic fumes under fire conditions.

SPECIAL PROTECTIVE EQUIPMENT FOR FIREFIGHTERS

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Accidental release measures:	Evacuate area. Shut off all sources of ignition. Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves. Place in covered containers. Absorb on sand or vermiculite and place in closed containers for disposal. Carefully sweep up and remove. Ventilate area and wash spill site after material pickup is complete.
Handling and storage:	Keep at between 2 to 8°C
Exposure Controls:	Wear appropriate protective clothing (safety spectacles, gloves, Laboratory coat) in accordance with Good Laboratory Practice.
Stability and reactivity:	Stable: Stable. Avoid Heat and Moisture. Avoid: Oxidizing agents, metals, carbonates, phosphates, hydroxides, oxides, peroxides, permanganates, amines and alcohols.
Toxicological information:	Causes burns on skin contact Toxic if absorbed through skin. Readily absorbed through skin. Causes burns on eye contact Harmful if inhaled. Material is extremely destructive to the tissue of the mucous membranes and upper respiratory tract. Harmful if swallowed.
Ecological information:	Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Disposal considerations:	Contact a licensed professional waste disposal service to dispose of this material.
Transport information:	Contact Ludger for transportation information.
Regulatory information:	Risk phrases: R10, 20/22, 24, 34, 35, 51/53 Safety phrases: S26, 36/37/39, 45, 61

Other information:

The advice offered is derived from the currently available information on the hazardous materials in this product or component. Consideration has been made regarding the quantities offered in the pre-dispensed container. The advice offered is, therefore, not all-inclusive nor should it be taken as descriptive of the compound generally.

DISCLAIMER:

For R&D use only. Not for drug, household or other uses.

Material Safety Data Sheet: LT-NADITHIO-01

Manufacturer	Ludger Ltd Culham Science Centre, Abingdon OX14 3EB, UK Tel: +44 (0)870 085 7011, Fax: +44 (0)870 163 4620 Email: info@ludger.com, Website: www.ludger.com
Identification of the substance:	Sodium Dithionite (Cat # LT-NADITHIO-01)
Composition:	Sodium Dithionite CAS no. 7775-14-6
Physical Properties:	MP/MP Range 300 °C Colour: white powder
Hazard identification:	Flammable solid. Harmful if swallowed.
First aid measures:	EYE CONTACT: In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. SKIN CONTACT: In case of skin contact, flush with copious amounts of water for at least 15 minutes INGESTION: If swallowed, wash out mouth with water provided person is conscious. Call a physician immediately. Do not induce vomiting. INHALATION: If inhaled, remove to fresh air. If breathing becomes difficult call a physician. IF IN DOUBT SEEK MEDICAL ADVICE
Fire fighting measures:	EXTINGUISHING MEDIA Suitable: Dry chemical powder. Do NOT use water SPECIAL RISKS Flammable solid. Emits toxic fumes under fire conditions. SPECIAL PROTECTIVE EQUIPMENT FOR FIREFIGHTERS Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Accidental release measures:	Evacuate area. Shut off all sources of ignition. Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves. Place in covered containers. Avoid raising dust. Carefully sweep up and remove. Ventilate area and wash spill site after material pickup is complete.
Handling and storage:	Keep container closed. Keep away from heat, sparks, and open flames. Store in a cool dry place. Avoid contact with water Avoid contact with acid.
Exposure Controls:	Wear appropriate protective clothing (safety spectacles, gloves, Laboratory coat) in accordance with Good Laboratory Practice.
Stability and reactivity:	Stable: Stable. Avoid strong oxidizing agents and Acids Hazardous decomposition products: Sulfur oxides, Sodium/sodium oxides.
Toxicological information:	Data not available
Ecological information:	Data not available
Disposal considerations:	Contact a licensed professional waste disposal service to dispose of this material.
Transport information:	Contact Ludger for transportation information.
Regulatory information:	Risk phrases: R7, 22, 31 Safety phrases: S7/8, 26, 28, 43
Other information:	The advice offered is derived from the currently available information on the hazardous materials in this product or component. Consideration has been made regarding the quantities offered in the pre-dispensed container. The advice offered is, therefore, not all-inclusive nor should it be taken as descriptive of the compound generally.
DISCLAIMER:	For R&D use only. Not for drug, household or other uses.

Material Safety Data Sheet: CM-NEUAC/NEUGC/SRP-01

Identification of the substance	Ludger sialic acid reference standards
Composition	CM-NEUAC & NEUGC-01 standards contain 1 nmole glycan. CAS nos. N-acetylneuraminic acid 131-48-6 N-glycolylneuraminic acid 1113-83-3 Sialic acid reference panel – no CAS number.
Hazard identification	Possible allergic reaction to material if inhaled, ingested or in contact with skin.
First aid measures	In case of contact: Eyes: irrigate with plenty of water. Skin: wash with soap and water. Ingestion: drink plenty of water. Inhalation: move to a well ventilated area and clear nose and throat. If in doubt seek medical advice.
Fire fighting measures	Non hazardous. Water spray or appropriate foam according to surrounding fire conditions.
Accidental release measures	Wash spill site with copious amounts of water.
Handling and storage	Store desiccated at -20 °C. Handle in accordance with Good Laboratory Practice.
Exposure Controls / Personal protection	Wear appropriate protective clothing (safety spectacles, gloves, laboratory coat) in accordance with Good Laboratory Practice.
Physical and chemical properties	Off-white dried material, freely soluble in water.
Stability and reactivity	Not combustible.
Toxicological information	Toxicological, carcinogenic and mutagenic properties have not been investigated.
Ecological information	Data not available.
Disposal considerations	No special requirements. Dispose of according to local requirements.
Transport information	Contact Ludger Ltd for transportation information.
Regulatory information	Data not available.
Contact Details of Manufacturer	Ludger Ltd Culham Science Centre, Abingdon, Oxfordshire OX14 3EB, UK Tel: +44 870 085 7011

Email: info@ludger.com

Web: www.ludger.com

Other information

The advice offered is derived from the currently available information on the hazardous materials in this product or component. Consideration has been made regarding the quantities offered in the pre-dispensed container. The advice offered is, therefore, not all inclusive nor should it be taken as descriptive of the compound generally.