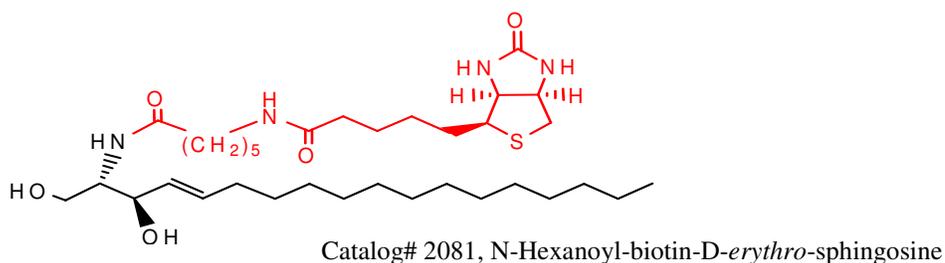
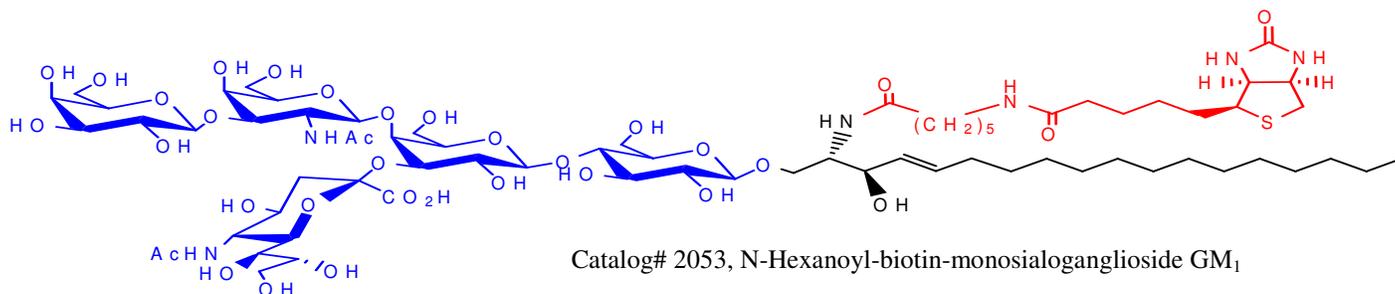


MATREYA NEWSLETTER

FOR GLYCO/SPHINGOLIPID RESEARCH

OCTOBER 2013

Biotinylated Sphingolipids



Matreya is pleased to offer ceramide and monosialoganglioside GM₁ acylated with biotin. These sphingolipid analogues contain a biotin label attached to the amine of the sphingosine moiety via a hexanoic acid linker and are ideal for use in sphingolipid research. The biotin structure allows for attachment of the ganglioside to streptavidin and avidin making them extremely useful for binding to substrates and for toxin detection^(1,2).

<u>Product Description</u>	<u>Catalog #</u>	<u>Selling Size</u>	<u>Purity</u>
N-Hexanoyl-biotin-monosialoganglioside GM ₁	2053	500 µg	98+%
N-Hexanoyl-biotin-D-erythro-sphingosine	2081	5 mg	98+%

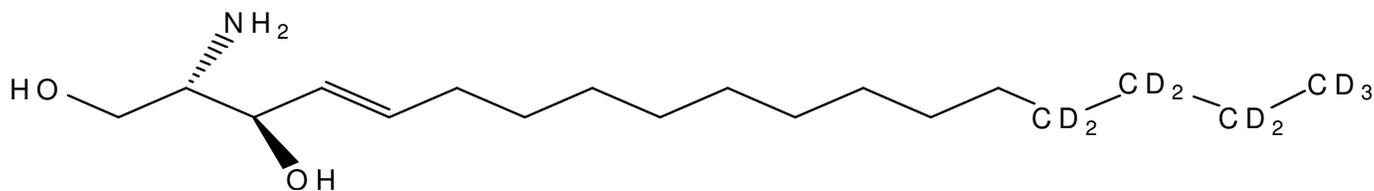
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References:

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2. A. Mukhopadhyay et al. (2009) *FASEB*, 23(3):751-763

Deuterated, Odd-Chain, & Fluorescent Standards for Sphingolipidomics



Over the past decade sphingolipids have gained enormous recognition as vital and complex components of biological systems. For many years lipids in general, and sphingolipids in particular, have received far less attention than their critical functions deserve. Many reasons contributed to this oversight including the difficulty of extraction and analysis as well as their tremendous diversity in structure and function^(1,2). Another problem was the very limited availability of appropriate natural and synthetic sphingolipid standards. Recently there has been a welcome advance in making standards available, as well as methods, which allow for the relatively quick extraction and analysis of whole classes of sphingolipids from small samples. This advance has greatly accelerated the approach known as sphingolipidomics and has tremendously accelerated the understanding and classification of sphingolipids.

Sphingolipidomics is the determination of the complete sphingolipid profile of a given system and the metabolism and pathways of those sphingolipids. It is the sphingolipid subfield of the greater lipidomic discipline and began to appear as a distinct discipline around 2005^(3,4). There are tens of thousands of possible sphingolipids that vary in their polar head groups, acyl chains, and sphingoid bases. The metabolic pathway of these sphingolipids has been extensively studied in an attempt to understand and treat diseases related to sphingolipids and to use sphingolipids to correct various diseases. Many of these sphingolipids are present in only nanomole to picomole/mg amounts, making detection difficult. However, with the incorporation of soft ionization techniques in mass spectrometry the detection of very small amounts of sphingolipids has been accomplished. The two major approaches of sphingolipidomics studies are the liquid chromatography (LC)-MS based methods and the shotgun lipidomics approach⁽¹⁾. In both methods internal standards for each individual sphingolipid detected would be ideal. However, due to the vast number of possible sphingolipids in a system this is impractical. Therefore the preferred method is to use internal standards for each class of sphingolipid expected to be found in a sample. To meet the need for standards in sphingolipidomic studies sphingolipids have been synthesized that are modified on either the oligosaccharide head, ceramide acyl chain, or the sphingosine tail. These standards are usually stable isotope, unusual chain length, or fluorescent sphingolipids.

One of the most preferred internal standards for LC-MS and shotgun lipidomic studies are stable isotope labeled standards. These standards can be detected by mass spectrometry while demonstrating nearly identical physical properties with natural sphingolipids. This is very important to ensure similar losses during extraction between the analytes and the internal standards⁽¹⁾. Usually deuterium or ¹³C atoms are introduced in the acyl chain of the ceramide (see stable isotope sphingolipids below). However the label can also be introduced in the sphingosine tail allowing for lyso-sphingolipids to be used (see cat. 2079). Another useful internal standard is one that has an acyl or sphingosine chain that has been modified to a length not commonly found in nature, usually C₁₇ or C₁₉ (see odd chain sphingolipids below).

Fluorescent standards have also been developed that can be detected in cultures and in biological systems making them ideal for studies involving the metabolism of sphingolipids (see fluorescent sphingolipids below). These are very advantageous for determining the localization of various sphingolipids in membranes and organelles⁽⁵⁾. The NBD fluorescent group attached to hexanoic acid has been shown to be readily taken up by cells and used in the biosynthesis of more complex sphingolipids⁽⁶⁾. In addition to the internal standards mentioned above there is a need for standards that are natural sphingolipids and that can be compared to the analytes detected in samples. Methods have been developed to both synthesize these compounds and to extract them from natural sources. Matreya has many years of experience working with lipids and offers an extensive selection of these naturally occurring compounds. For our complete list please call us at (800) 342-3595 or visit us at www.matreya.com. Our catalog is also available on our website.

References:

1. Han, X., Jiang X., (2009) *Eur J Lipid Sci Technol.* 111(1):39–52
2. Futerman, A. and Hannun, Y., (2004) *EMBO Reports*, 5:777-782
3. Maceyka, M., Milstien, S., Spiegel, S., (2005) *Prostaglandins Other Lipid Mediat.* 77:15–22. [PubMed: 16099387]
4. Merrill, A.H. Jr., Sullards, M.C., Allegood, J.C., Kelly, S., Wang, E. (2005) *Methods* 36:207–224. [PubMed: 15894491]
5. Merrill, A.H. Jr., (2011) *Chemical Reviews* 111:6387-6422
6. Lipsky, N., Pagano, R., (1985) *Journal of Cell Biology* 100:27-34

<u>Product Description</u>	<u>Catalog #</u>	<u>Selling Size</u>	<u>Purity</u>
<u>Stable Isotope Sphingolipids</u>			
D-erythro-sphingosine, D ₉	2079	1 mg	98+%
N-Octadecanoyl-D ₃ -D-erythro-sphingosine	2201	1 mg	98+%
N-1- ¹³ C-Hexadecanoyl-sphingosylphosphorylcholine	2200	1 mg	98+%
N-Octadecanoyl-D ₃₅ -psychosine	1914	5 mg	98+%
N-Hexadecanoyl-D ₃ -glucopsychosine	1533	1 mg	98+%
N-Octadecanoyl-D ₃ -sulfatide	1536	1 mg	98+%
N-Hexadecanoyl-D ₃ -lactosylceramide	1534	1 mg	98+%
N-Octadecanoyl-D ₃ -ceramide trihexoside	1537	0.5 mg	98+%
N-omega-CD ₃ -Octadecanoyl monosialoganglioside GM ₁	2050	0.5 mg	98+%
N-omega-CD ₃ -Octadecanoyl monosialoganglioside GM ₂	2051	0.5 mg	98+%
N-omega-CD ₃ -Octadecanoyl monosialoganglioside GM ₃	2052	0.5 mg	98+%
<u>Odd Chain Sphingolipids</u>			
N-Pentadecanoyl-D-erythro-sphingosine	2037	10 mg/100 mg	98+%
N-Heptadecanoyl-D-erythro-sphingosine	2038	10 mg/100 mg	98+%
N-Nonadecanoyl-D-erythro-sphingosine	2039	10 mg/100 mg	98+%
N-Heptadecanoyl-sphingosylphosphorylcholine	1890	5 mg	98+%
N-Pentadecanoyl-psychosine	1335	5 mg	98+%
N-Heptadecanoyl-sulfatide	1934	1 mg	98+%
N-Nonadecanoyl-sulfatide	1935	1 mg	98+%
N-Heptadecanoyl-lactosylceramide	1538	1 mg	98+%
N-Heptadecanoyl ceramide trihexoside	1523	0.5 mg	98+%
<u>Fluorescent Sphingolipids</u>			
omega-N-NBD-D-erythro-C14-Sphingosine	1634	1 mg	98+%
N-Hexanoyl-NBD-D-erythro-sphingosine	1841	0.1 mg/1 mg	98+%
N-Dodecanoyl-NBD-D-erythro-sphingosine	1618	0.1 mg/1 mg	98+%
N-Hexanoyl-NBD-L-threo-sphingosine	1857	0.1 mg/1 mg	98+%
N-Dodecanoyl-NBD-L-threo-sphingosine	1620	0.1 mg/1 mg	98+%
N-Hexanoyl-NBD-L-threo-sphingosine	1624	0.1 mg/1 mg	98+%
N-Dodecanoyl-NBD-L-threo-dihydrosphingosine	1623	0.1 mg 1 mg	98+%
N-Hexanoyl-NBD-D-erythro-dihydrosphingosine	1626	0.1 mg/1 mg	98+%
N-Dodecanoyl-NBD-D-erythro-dihydrosphingosine	1625	0.1 mg/1 mg	98+%
N-Hexanoyl-NBD-phytosphingosine	1628	0.1 mg/1 mg	98+%
N-Dodecanoyl-NBD-phytosphingosine	1627	0.1 mg/1 mg	98+%
N-Hexanoyl-NBD-sphingosylphosphorylcholine (mixture of D-erythro and L-threo isomers)	1912	0.1 mg/1 mg	98+%
N-Dodecanoyl-NBD-sphingosylphosphorylcholine (mixture of D-erythro and L-threo isomers)	1619	0.1 mg/1 mg	98+%
N-Hexanoyl-NBD-galactosylceramide	1621	0.1 mg/1 mg	98+%
N-Dodecanoyl-NBD-galactosylceramide	1633	0.1 mg/1 mg	98+%
N-Hexanoyl-NBD-glucosylceramide	1622	0.1 mg/1 mg	98+%
N-Dodecanoyl-NBD-sulfatide	1632	0.1 mg/1 mg	98+%
N-Hexanoyl-NBD-lactosylceramide	1629	0.05 mg/1 mg	98+%
N-Dodecanoyl-NBD-lactosylceramide	1630	0.05 mg/1 mg	98+%
N-Dodecanoyl-NBD-ceramide trihexoside	1631	0.1 mg/1 mg	98+%

Amerlioration of Renal Cancer in a Mouse Model

D-threo-PDMP is an inhibitor of glucosylceramide synthase and lactosylceramide synthase. In a recent study from Dr. S Chatterjee's laboratory from the John Hopkins University claim that mice fed with *D-threo*-PDMP showed marked reduction in tumor volume which was accompanied by reduction in lactosylceramide and increase in glucosylceramide level. *D-threo*-PDMP inhibited cell proliferation and angiogenesis by inhibiting the p44MAPK, p-AKT-1 pathway and mammalian target of rapamycin (mTOR). They further claimed "By linking glycosphingolipid synthesis with tumor growth, renal cancer progression and regression can be evaluated. Thus inhibiting glycosphingolipid synthesis can be a bonafide target to prevent the progression of other types of cancer".

In summary:

1. A 30-fold increase in tumor volume in mice kidney was accompanied by a 32-fold increase in the level of lactosylceramide.
2. *D-threo*-PDMP treatment reduced tumor volume about 50% and was not toxic to the mice.
3. Reduction in tumor volume could be due to the inhibition of angiogenesis. *D-threo*-PDMP did not affect apoptosis in kidney tumor.
4. *D-threo*-PDMP reduced ceramide mass in kidney tumors in mice as well the levels of glucose and lactosylceramide but not the level of sphingomyelin.

S. Chatterjee et al. (2013) 8(5):e63726

Tocotrienols

Research in vitamin E was done on tocopherols and very little is known about tocotrienols. Recent publications indicate that tocotrienols are superior in their biological properties and are listed below⁽¹⁾:

- a) Unique protection against heart diseases, atherosclerosis, stroke, and fatty liver disease.
- b) Offer neuroprotection⁽²⁾.
- c) Improves carotid vascular flow and inflammation help reduce stroke-induced damages.
- d) Improves the elasticity of arteries and lowers cholesterol and triglycerides, and inhibition of sticky adhesion molecules in early atherosclerosis.

Tocotrienols are proving truly to be next generation of vitamin E for heart, brain, liver, and to life.

Matreya can provide from milligram to multigram quantities of purified tocotrienols >98+%.

<u>Product Description</u>	<u>Catalog #</u>	<u>Selling Size</u>	<u>Purity</u>
α -Tocotrienol	2109	25 mg	98+%
β -Tocotrienol	2110	25 mg	98+%
γ -Tocotrienol	2111	25 mg	98+%
δ -Tocotrienol	2112	25 mg	98+%

References:

1. B. Aggarwal et al. (2010) *Biochemical Pharmacology* 80:1613
2. C. Sen et al. Tocotrienol Neuroprotection: The Most Potent Biological Function of All Natural Forms of Vitamin E. Micronutrient & Brain Health. CRC Press, 2009