

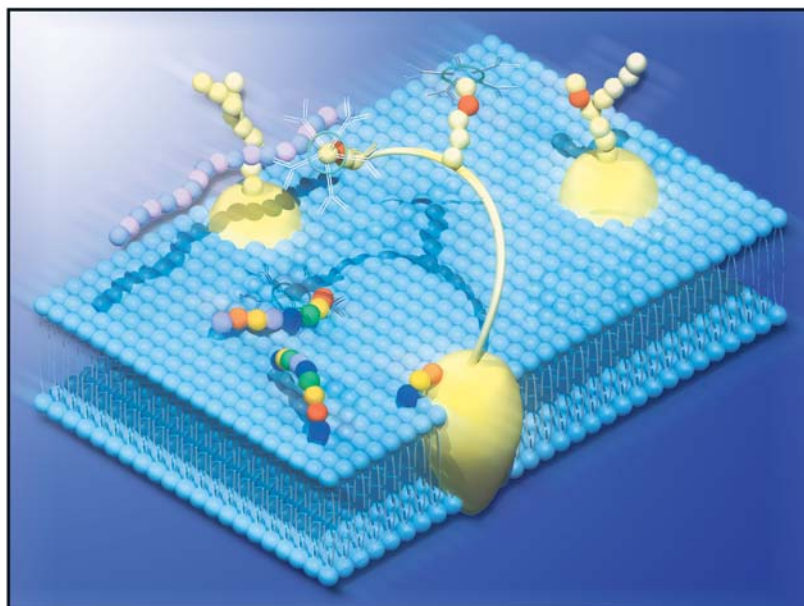


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A Division of Associates of Cape Cod, Inc.

GLYCOLIPIDS

MONOCLONAL ANTIBODIES TO SUGAR CHAINS



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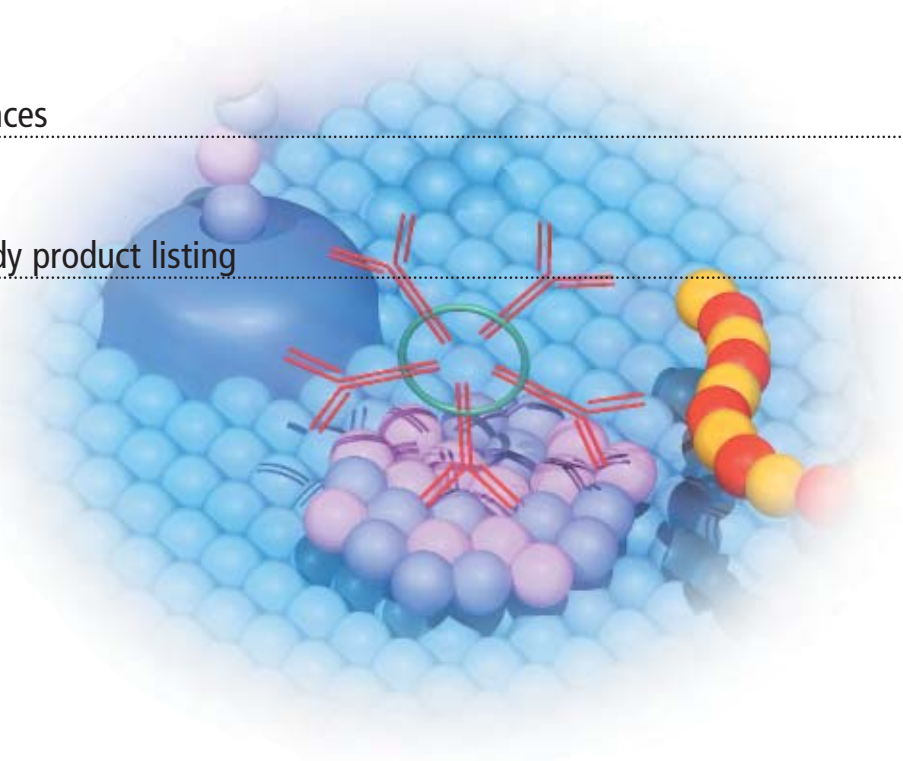
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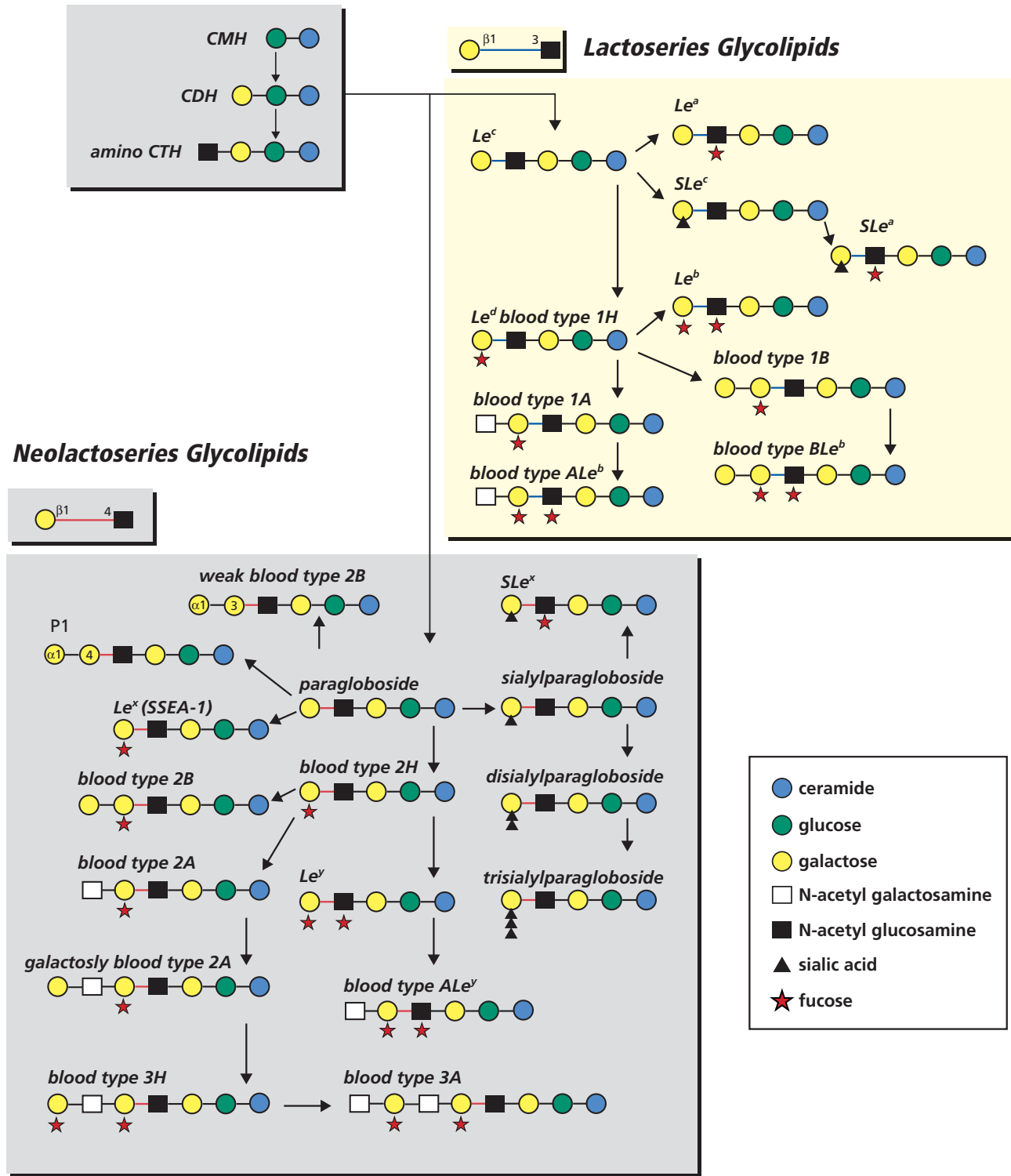
one

LIST OF ANTIBODIES

Specificity	Clone	Immunogen	Subclass	Form	Cat. #	Size	Form	Cat. #	Size
GANGLIOSIDE A PATH									
N-acetyl GM2	MK1-16	Emulsion of N-acetyl GM2 and lipid A	m-IgM	Purified	370640	0.2 mg			
N-glycolyl GM2	MK2-34	Emulsion of N-glycolyl GM2 and lipid A	m-IgM	Purified	370650	0.2 mg			
GM1	GMB16	Purified ganglioside	m-IgM	Purified	370685	0.2 mg			
Asialo GM1	AG-1	Liposome made by LPS and GgOse4Cer	m-IgM	Purified	370610	0.2 mg			
GD1a	GMR17	Purified ganglioside	m-IgM	Purified	370705	0.2 mg			
GT1a	GMR11	Purified ganglioside	m-IgM	Purified	370700	0.2 mg			
GM3	GMR6	Purified ganglioside	m-IgM	Purified	370695	0.2 mg			
GANGLIOSIDE B PATH									
GD3	GMR19	Purified ganglioside	m-IgM	Purified	370635	0.2 mg			
GD3	S2-566	Human SK MEL28 Cell	m-IgM	Purified	270554	0.2 mg			
O-acetyl GD3	GMR2	Purified ganglioside	m-IgM	Purified	370670	0.2 mg			
GD2	GMR7	Purified ganglioside	m-IgM	Purified	370630	0.2 mg			
GD2	S220-51	Human IMR-32 Cell	m-IgG3	Purified	270553	0.2 mg			
GD1b	GGR12	Purified ganglioside	m-IgG3	Purified	370660	0.2 mg			
GT1b	GMR5	Purified ganglioside	m-IgM	Purified	370675	0.2 mg			
GQ1b	GMR13	Purified ganglioside	m-IgM	Purified	370665	0.2 mg			
GLOBOSERIES									
Gb3	BGR23	Purified glycolipid	m-IgG2b	Purified	370680	0.2 mg			
SULFATIDE									
SM3	49-D6	HepG2 cell	m-IgM	Purified FITC	270897 280357	0.2 mg 0.1 mg			
SD1a	2H6G5	Acidic glycolipid extracted from PLC/PRF/5 cell	m-IgM	Purified FITC	270895 280355	0.2 mg 0.1 mg			
LACTOSERIES									
Le^a	7LE	Mucin extracted from ovarian cyst	m-IgG1	Purified FITC	370620 370623	0.2 mg 0.1 mg			
Le^b	2-25LE	Mucin extracted from ovarian cyst	m-IgG1	Purified	370625	0.2 mg			
Sialyl Le^a	1H4	Colo201 cell	m-IgG3	Purified	270444	0.2 mg			
Sialyl Le^a	2D3	Colo201 cell	m-IgM	Purified	270443	0.2 mg			
NEOLACTO SERIES									
Le^x	73-30	Lewis X glycolipid	m-IgM	Purified	270441	0.2 mg			
Le^y	H18A	MKN cell	m-IgG3	Purified	270442	0.1 mg			
Sialyl Le^x	KM-93	Membrane isolated from lung adenocarcinoma	m-IgM	Purified	270448	0.1 mg			
SGPG	NGR50	Purified sulfoglucuronosyl paragloboside	m-IgG2a	Purified	370683	0.2 mg			

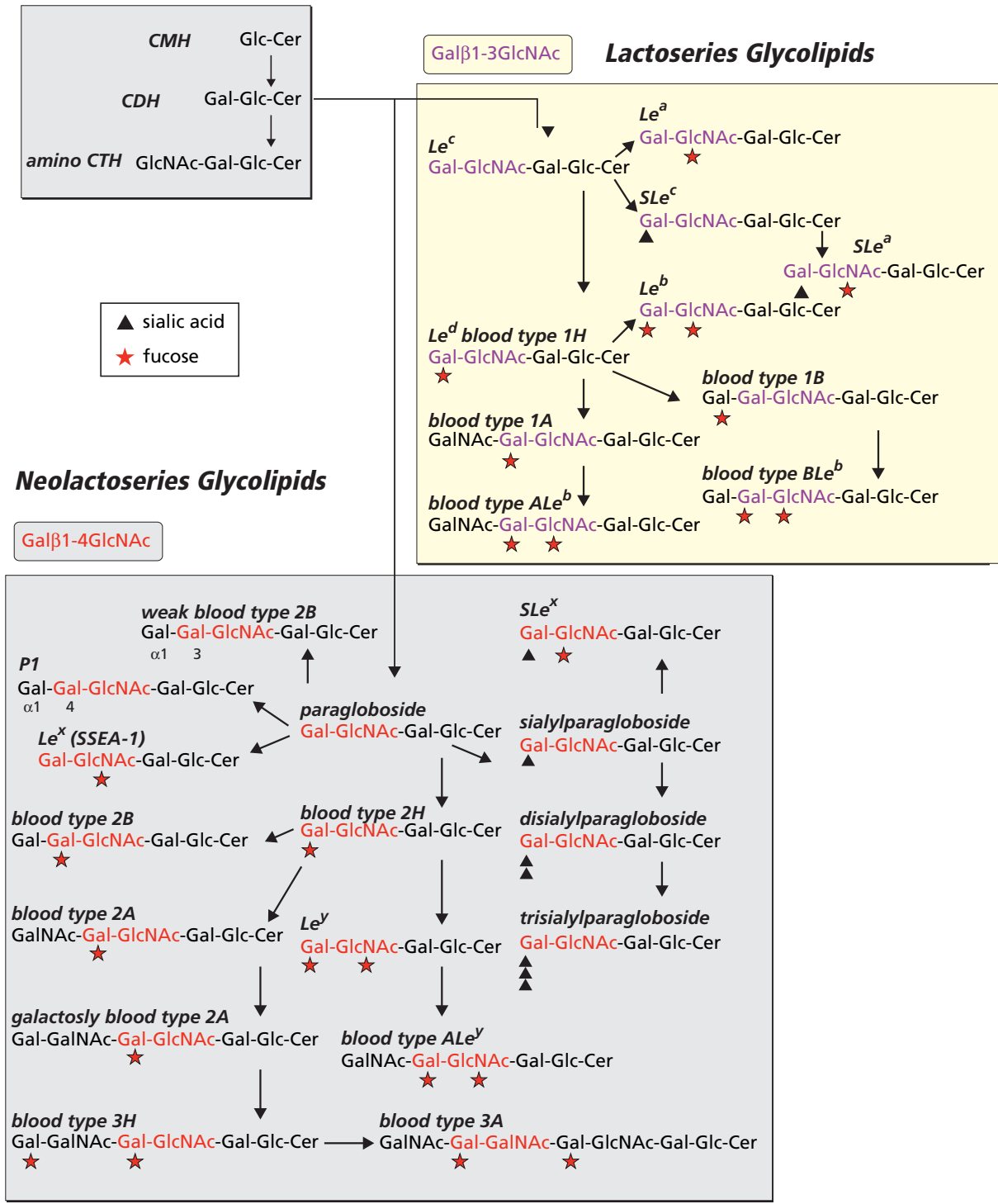
PATHWAY IN GLYCOLIPID BIOSYNTHESIS

Lacto/Neolactoseries Glycolipids



PATHWAY IN GLYCOLIPID BIOSYNTHESIS

Lacto/Neolactoseries Glycolipids



three

SPECIFICITY OF ANTIBODIES

Summary of Reactivity of Monoclonal Antibodies with Various Glycolipids.

Glycolipids	MK1-16*	MK2-34*	GMB16*	AG-1 [#]	2A3D2*	GMR6*	GMR11*	GMR17*
CMH	-	-	-	-	-	-	-	-
CDH	-	-	-	-	-	-	-	-
CTH	-	-	-	-	-	-	-	-
Asialo GM2	-	-	-	-	-	-	-	-
Asialo GM1	-	-	-	++	-	-	-	-
GM3 (N-acetyl)	-	-	-	-	-	+++	-	-
GM3 (N-glycolyl)	-	-	-	-	-	-	-	-
GM2 (N-acetyl)	++	-	-	-	+	-	-	-
GM2 (N-glycolyl)	-	++	-	-	-	-	-	-
GM1 (N-acetyl)	-	-	+++	-	-	-	-	-
GM1 (N-glycolyl)	-	-	++	-	-	-	-	-
GD1a	-	-	-	-	-	++	-	+++
GT1a	-	-	-	-	-	-	+++	-
GD1b	-	-	-	-	-	-	-	-
GD2	-	-	-	-	-	-	-	-
GT1b	-	-	-	-	-	++	-	++
SPG	-	-	-	-	-	-	-	-
IV ³ GalNAc β -GD1a	-	-	-	-	+	-	-	-

Glycolipids	GMR19 ⁺	S2-566	GMR2 ⁺	GMR7 ⁺	S220-51	GGR12 ⁺	GMR5 ⁺	GMR13 ⁺
GD1a	-	-	-	-	-	-	-	-
GT1a	++	+	-	-	-	-	-	-
GD3	+++	++	-	-	-	-	-	-
O-acetyl GD3	+	-	+++	-	-	-	-	-
GD2	-	-	-	+++	++	-	-	-
GD1b	-	-	-	-	-	+++	-	-
GT1b	-	-	-	-	-	-	+++	-
GQ1b	+	+	-	-	-	-	-	+++
GM4	-	-	-	-	-	-	-	-
IV ³ NeuAc α -nLc4Cer	-	-	-	-	-	-	-	-
IV ³ NeuGc α -nLc4Cer	-	-	-	-	-	-	-	-

Glycolipids	7LE	2-25LE	1H4*	2D3
Le ^a	++	+	-	-
Le ^b	-	++	-	-
Sialyl Le ^c	-	-	-	+
Sialyl Le ^a	-	-	+	+
Disialyl Le ^a	-	-	-	-

Glycolipids	73-30*	H18A*	KM-93*
Le ^x	++	-	-
Sialyl Le ^x	-	-	++
Le ^y	-	++	-

Glycolipids	BGR23 ⁺	NGR50 ⁺
Gb3RCer	+++	-
III ³ RGal α -Gb3Cer	-	-
Gb4Cer	-	-
IV ³ GalNAc α -Gb4Cer	-	-
IV ³ Gal α -Gb4Cer	-	-
IV ³ Fuc α -III ³ Gal α -Gb3Cer	-	-
IV ³ GalNAc α -III ³ Gal α -Gb3Cer	-	-
LM1	-	-
SGPG	-	+++
SGLPG	-	+++

Glycolipids	49-D6*	2H6G5
GM1	-	-
GD1a	-	-
GD1b	-	-
Asialo GM2	-	-
Asialo GM1	-	-
SM4s	-	-
SM4g	-	-
SM3	+	±
SM2	-	-
SM1a	-	-
SD1a	+	+
SB2	-	-

Distribution of Major Gangliosides in Rat Nervous System Detected by Monoclonal Antibodies

Rat Region	Ganglioside				
	GM1	GD1a	GD1b	GT1b	GQ1b
Cerebellar cortex					
Molecular layer	+	+++	+	++	-
Purkinje cell layer	-	-	-	-	-
Granular layer	+	+	+++	+++	++
White matter	+++	-	-	+	-
Cerebral cortex*					
Molecular layer (I)	+	+++	-	+	-
Ext. granular layer (II)	+	+++	+	-	-
Ext. pyramidal layer (III)	+	+++	++	++	-
Int. granular layer (IV)	+	-	+++	+	+
Int. pyramidal layer (Va)	+	+	+++	++	-
Int. pyramidal layer (Vb)	+	-	+++	++	+
Polymorphic cell layer (VI)	+	+	+++	+	+
White matter	++	-	+	+++	-
Hippocampal formation					
Hippocampus					
Alveus	++	-	++	++	+++
Stratum oriens	++	++	-	+	+
Stratum pyramidale	-	-	+	-	++
Stratum radiatum	-	++	-	+	-
Stratum lacunosummoleculare	++	-	++	+	-
Dentate gyrus					
Polymorphic layer	+	++	+	+	-
Granular layer	-	-	++	-	-
Molecular layer	+	++	-	++	-
Spinal cord					
Gray matter					
Anterior horn	+	-	+++	+++	++
Posterior horn	+	+++	+++	+++	++
White matter					
Anterior funiculus	+	-	+	++	-
Lateral funiculus	+	-	+	++	-
Posterior funiculus	+	-	+	++	-

Four grades have been assigned to each ganglioside labeling density. +++ = strong, ++ = moderate, + = weak, - = negative

Gangliosides GM1, GD1b, GD1a, GT1b and GQ1b were detected by five MAbs. GMB16, GMR17, GGR12, GMR5 and GMR13, respectively, with indirect immunofluorescence technique.

* Kotani, M. et al.: *Glycobiology*, 4, 855-865 (1994)

DISTRIBUTION OF GLYCOLIPIDS IN RAT BRAIN

Distribution Patterns of Gangliosides During Postnatal Development of Rat Cerebellar Cortex

Age	Ganglioside									
Layer of Cerebellar Cortex	GM1	GD1a	GD1b	GT1b	GQ1b	GM3	GD3/LD1a	GD2	O-Ac GD3	O-Ac LD1
1 Day										
Ext. granular layer ^b	++ ^d	-	++	-	-	-	+++	-	++	-
Molecular layer	+	+	+	+	-	-	+	-	-	-
Purkinje cell layer	-	-	-	-	-	-	-	-	-	-
Int. granular layer ^c	++	+	+	+	-	-	++	-	-	-
White matter	-	-	-	-	-	-	-	-	-	-
5 Day										
Ext. granular layer	++	-	++	-	-	-	+++	+	+++	-
Molecular layer	++	++	+	+	-	-	+	+	++	-
Purkinje cell layer	-	-	-	-	-	-	-	-	-	+
Int. granular layer	+	+	+	+	-	-	++	+	-	-
White matter	-	-	-	-	-	-	-	-	-	-
10 Day										
Ext. granular layer	++	-	++	-	-	+	+++	+	+++	-
Molecular layer	+	++	+	+	+	+	+	+	+	-
Purkinje cell layer	-	-	-	-	-	-	-	-	-	+
Int. granular layer	+	++	++	++	+	-	++	+	-	-
White matter	-	-	-	-	-	-	-	-	-	-
20 Day										
Ext. granular layer	+	-	-	-	+	-	++	-	++	-
Molecular layer	+	++	+	+	+	+	+	+	+	+
Purkinje cell layer	-	-	-	-	-	-	-	-	-	++
Int. granular layer	+	+	++	++	-	-	++	+	-	-
White matter	+	-	++	+++	-	++	++	+	-	-
30 Day										
Molecular layer	+	++	+	+	+	+	+	+	-	++
Purkinje cell layer	-	-	-	-	-	-	-	-	-	+++
Granular layer	+	+	++	+++	++	+	+++	+	-	-
White matter	+	-	+	++	-	+++	+++	-	-	-
Adult										
Molecular layer	+	+++	+	++	-	-	-	+	-	+++
Purkinje cell layer	-	-	-	-	-	-	-	-	-	+++
Granular layer	+	+	+++	+++	++	+	++	+++	-	-
White matter	+++	-	-	+	-	+++	++	-	-	-

a MAb GMR19 reacts with both GD3 and LD1. GD3 was detected from 1 day to adulthood, whereas LD1 was expressed at later postnatal days.

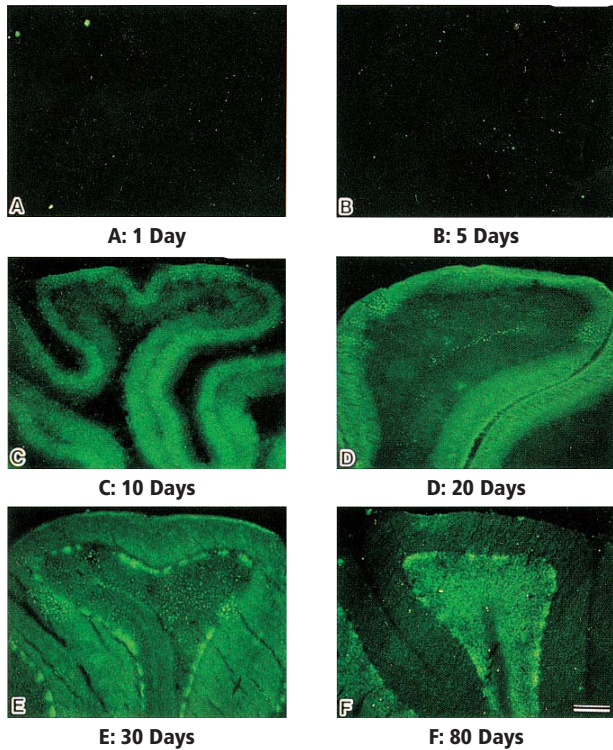
b External granular layer

c Internal granular layer

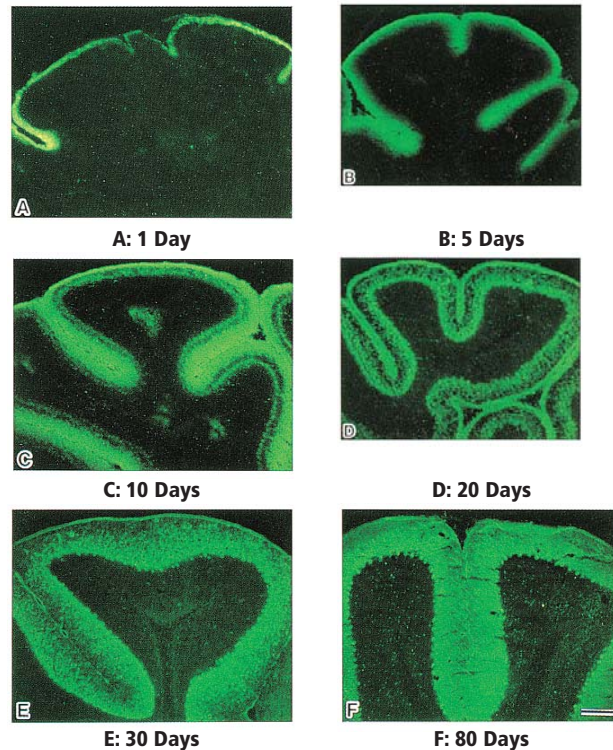
d Four grades have been assigned to each ganglioside labeling density.

+++ = strong, ++ = moderate, + = weak, - = negative

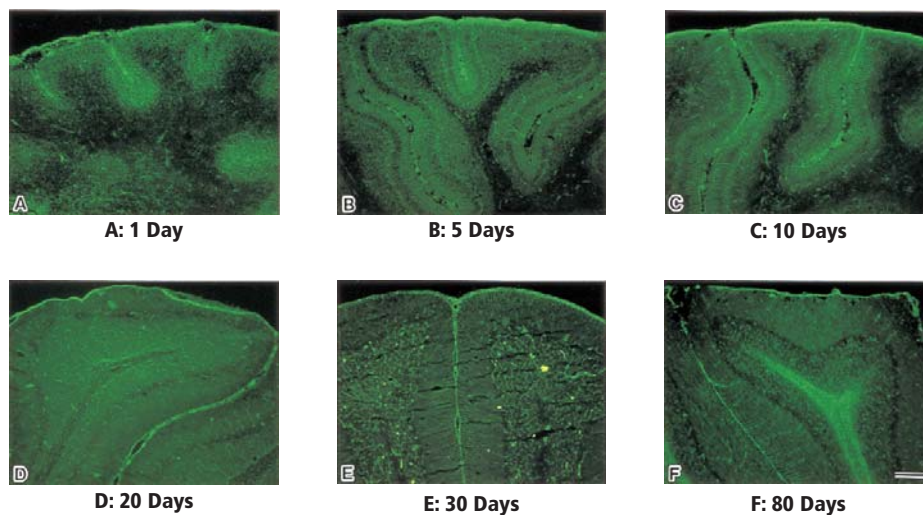
Indirect Immunofluorescence Analysis of GQ1b Expression in Postnatal Rat Cerebellum



Indirect Immunofluorescence Analysis of O-Ac-disialoganglioside Expression in Postnatal Rat Cerebellum



Indirect Immunofluorescence Analysis of GM1 Expression in Postnatal Rat Cerebellum



APPLICATION OF ANTIBODIES

Immunohistochemical Localization of Gangliosides in Rat Cerebellum

A: anti-GM1 B: anti-GD1a

C: anti-GD1b D: anti-GT1b

E: anti-GQ1b F: K-B Stain

Immunofluorescence Analysis of Ganglioside Expression in Rat Hippocampal Formation

A: anti-GM1 B: anti-GD1a

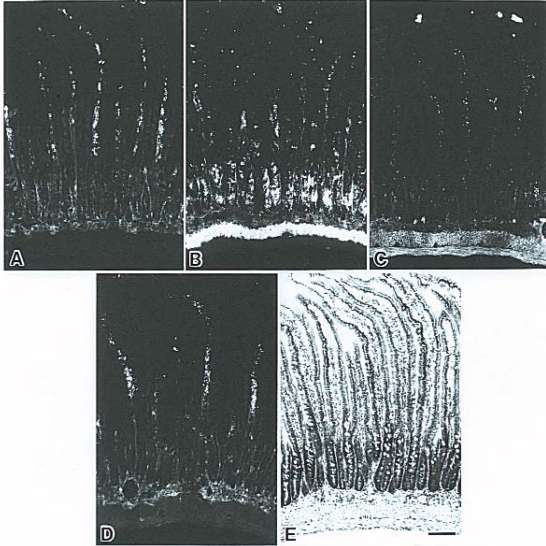
C: anti-GD1b D: anti-GT1b

E: anti-GQ1b F: K-B Stain

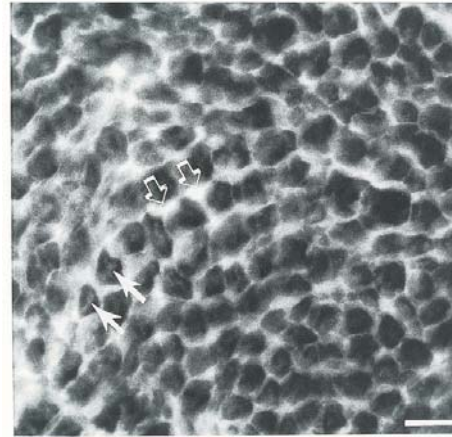
Immunofluorescence Staining of Small Neurons in Primary Cultured Rat Cerebellum

Anti-GD1b MAb Anti-NSE Ab Phase Contrast

Indirect Immunofluorescence Analysis of Glycolipids in Adult Rat Small Intestine

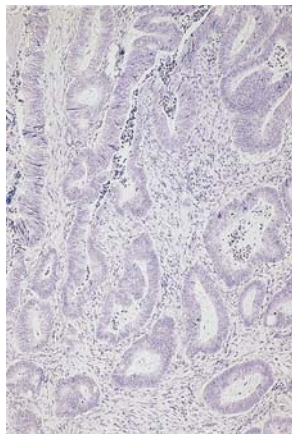


A: anti-Gb₃Cer
 B: anti-III^βGalα-Gb₃Cer
 C: anti-Gb₄Cer
 D: anti-IV^βGalNAcα-Gb₄Cer
 E: H-E Stain

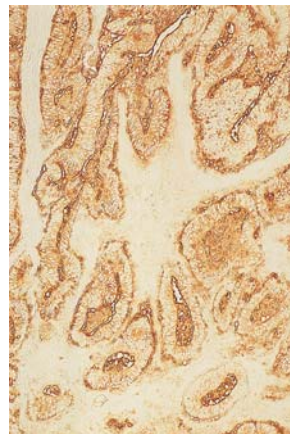


Immunocytochemistry localization of anti-SGPG (NGR50) binding in acetone-fixed, fresh-frozen sections of rat sciatic nerve. Immunoreactivity was present on the outer surface of the myelin sheath and Schwann cells (open arrows), as well as in the intervening connective tissue. Faint staining was also visible at the axolemmal-myelin interface (solid arrows). Compact myelin, however was unstained. Bar: 20μm.

Immunohistochemistry of Human Colon Cancer Using MAb to Sialyl Lewis Le^x:2D3



A: Control - HE Staining

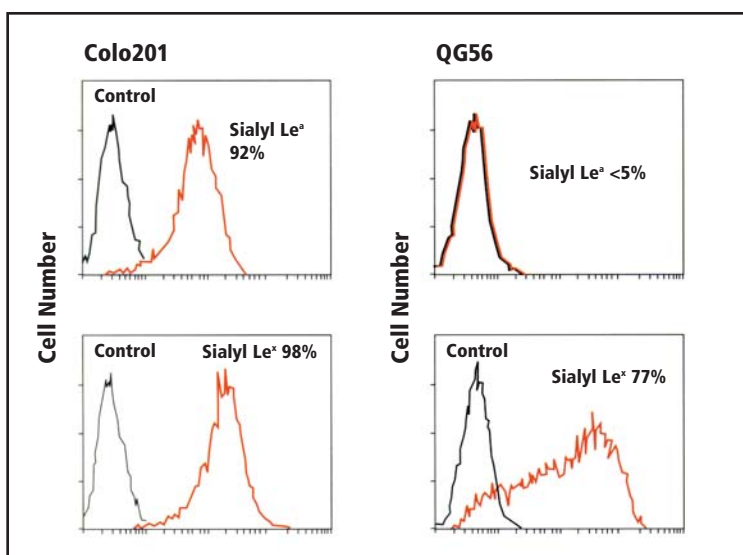


B: Immunostaining using 2D3

APPLICATION OF ANTIBODIES

Identification of Involved Carbohydrate Ligand by Monolayer Cell Inhibition Assay

	Colo 201 (Colon Cancer)	QG56 (Lung Cancer)
Positive Control (IL-1+)		
Negative Control (IL-1-)		
Anti-Sialyl Le ^x		
Anti-Sialyl Le ^a		



Expression of the two carbohydrate antigens, sialyl Le^a and sialyl Le^x, at the surface of the cultured human cancer cells as ascertained by flow cytometry.

Immunohistochemistry for Glycolipids

Reagents

Antibodies to Glycolipids:

Anti-GM3 (GMR6), Anti-GM1 (GMB16), Anti-GD1a (GMR17), Anti-GT1a (GMR11), Anti-GD3 (GMR19), Anti-O-Ac GD3 (GMR2), Anti-GD2 (GMR7), Anti-GD1b (GGR12), Anti-GT1b (GMR5), Anti-GQ1b (GMR13)

Procedures

Procedure for Rat Brain

1. Cut frozen sample at 7 μ m thickness and thaw-mount on glass slides.
2. Air-dry the mounted sections for 2 hours.
3. Fix in cold acetone for 5 minutes at -20°C.
4. Remove the cold acetone by airing for 1 hour.
5. Incubate with 1% BSA in PBS for 15 minutes at room temperature.
6. Incubate with the anti-glycolipid antibody (3 μ g/mL) overnight at 4°C. Wash.
7. Incubate with FITC-conjugated anti-mouse IgG F(ab')₂ or IgM F(ab')₂ for 1 hour at room temperature. Wash.
8. Observe by fluorescence microscopy.

Procedure for Primary Culture Cell

1. Grow cells on micro cover glasses.
2. Fix with 4% paraformaldehyde in PBS for 15 minutes at room temperature.
3. Incubate with 2% BSA in PBS for 1 hour at room temperature.
4. Incubate with anti-glycolipid antibody (3 μ g/mL) for 1 hour at room temperature. Wash.
5. Incubate with FITC-conjugated anti-mouse IgG F(ab')₂ or IgM F(ab')₂ for 1 hour at room temperature. Wash.
6. Observe by fluorescence microscopy.

References

Procedure for Rat Brain

1. Kotani, M. et al. *Glycobiology*, 4, 855-865 (1994)
2. Kotani, M. et al. *Brain Res.*, 700, 40-58 (1995)
3. Kotani, M. and Tai, T. *Brain Research Protocols*, 1, 152-156 (1997)

Procedure for Primary Culture Cell

1. Kawashima, I. et al. *Brain Res.*, 732, 75-86 (1996)
2. Kawashima, I. and Tai, T. *Brain Research Protocols*, 2, 299-305 (1998)

Flow Cytometry for Glycolipids

Reagents

Antibodies to Glycolipids:

Anti-sialyl Le^a (2D3; 5-20 μ g/mL at final concentration), Anti-sialyl Le^x (SNH3; 5-20 μ g/mL at final concentration)

Cells:

QG56, Colo201

Procedures

1. Incubate cells with anti-glycolipid antibody for 20 minutes at 4°C.
2. Incubate cells with FITC conjugated F(ab')₂ fragment anti-mouse IgG or IgM for 30 minutes at 4°C.
3. Analyze using manufacturer's instructions.

References

1. Takada, A. et al. *Cancer Res.*, 53, 354-361 (1993)

MK1-16; Monoclonal antibody (MAb) to N-acetyl GM2

1. Miyake, M. et al.: Generation of two murine monoclonal antibodies that can discriminate N-acetyl neuraminic acid residues of GM2 ganglioside. *Cancer Res.*, 48, 6154-6160 (1988)
2. Miyake, M. et al.: The abnormal occurrence and the differentiation-dependent distribution of N-acetyl and N-glycolyl species of the ganglioside GM2 in human germ cell tumors. *Cancer*, 65, 499-505 (1990)

MK2-34; Monoclonal antibody (MAb) to N-glycolyl GM2

1. Miyake, M. et al.: Generation of two murine monoclonal antibodies that can discriminate N-acetyl neuraminic acid residues of GM2 ganglioside. *Cancer Res.*, 48, 6154-6160 (1988)
2. Miyake, M. et al.: The abnormal occurrence and the differentiation-dependent distribution of N-acetyl and N-glycolyl species of the ganglioside GM2 in human germ cell tumors. *Cancer*, 65, 499-505 (1990)

GMB16; Monoclonal antibody (MAb) to GM1

1. Kotani, M. et al.: Generation of one set of monoclonal antibodies specific for a-pathway ganglio-series gangliosides. *Biochem. Biophys. Acta*, 1117, 97-103 (1992)
2. Kawashima, I. et al.: Characterization of ganglioside expression in human melanoma cells: Immunological and biochemical analysis. *J. Biochem.*, 114, 186-193 (1993)
3. Kotani, M. et al.: Developmental changes of ganglioside expressions in postnatal rat cerebellar cortex. *Brain Res.*, 700, 40-58 (1995)
4. Kubo, H. et al.: Differential distribution of ganglioside GM1 and sulfatide during the development of *Xenopus* embryos. *Develop. Growth Differ.*, 37, 243-255 (1995)
5. Kawashima, I. et al.: Immunocytochemical analysis of gangliosides in rat primary cerebellar cultures using specific monoclonal antibodies. *Brain Res.*, 732, 75-86 (1996)
6. Tai, T. et al.: Cell type-specific expression of ganglioside antigens in the central nervous system. *Pure and Appl. Chem.*, 69, 1903-1910 (1997)

AG-1; Monoclonal antibody (MAb) to Asialo GM1

1. Watari, S. et al.: Application of liposomes to generation of monoclonal antibody to glycosphingolipid: Production of monoclonal antibody to GgOse4Cer. *J. Biochem.*, 102, 59-67 (1987)
2. Chen, X-P. et al.: The control of IL-4 gene expression in activated murine T lymphocytes. *J. Immunology.*, 158, 3070-3080 (1997)

2A3D2; Monoclonal antibody (MAb) to GalNAc-GD1a

1. Hiraiwa, N. et al.: Gangliosides and sialoglycoproteins carrying a rare blood group antigen determinant, Cad, associated with human cancers as detected by specific monoclonal antibodies. *Cancer Res.*, 50, 5497-5503 (1990)
2. Zenita, K. et al.: Northern hybridization analysis of VH gene expression in murine monoclonal antibodies directed to cancer associated ganglioside antigens having various sialic acid linkages. *J. Immunology.* 144, 4442-4451 (1990)

GMR11; Monoclonal antibody (MAb) to GT1a

1. Kotani, M. et al.: Generation of one set of monoclonal antibodies specific for a-pathway ganglio-series gangliosides. *Biochem. Biophys. Acta*, 1117, 97-103 (1992)
2. Kawashima, I. et al.: Characterization of ganglioside expression in human melanoma cells: Immunological and biochemical analysis. *J. Biochem.*, 114, 186-193 (1993)
3. Kotani, M. et al.: Immunohistochemical localization of minor gangliosides in the rat central nervous system. *Glycobiology*, 4, 855-865 (1994)
4. Kotani, M. et al.: Developmental changes of ganglioside expressions in postnatal rat cerebellar cortex. *Brain Res.*, 700, 40-58 (1995)
5. Kawashima, I. et al.: Immunocytochemical analysis of gangliosides in rat primary cerebellar cultures using specific monoclonal antibodies. *Brain Res.*, 732, 75-86 (1996)
6. Tai, T. et al.: Cell type-specific expression of ganglioside antigens in the central nervous system. *Pure and Appl. Chem.*, 69, 1903-1910 (1997)

GMR2; Monoclonal antibody (MAb) to O-acetyl GD3

1. Ozawa, H. et al.: Generation of one set of monoclonal antibodies specific for b-pathway ganglio-series gangliosides. *Biochim. Biophys. Acta*, 1123, 184-190 (1992)
2. Kawashima, I. et al.: Characterization of ganglioside expression in human melanoma cells: Immunological and biochemical analysis. *J. Biochem.*, 114, 186-193 (1993)
3. Kotani, M. et al.: Immunohistochemical localization of minor gangliosides in the rat central nervous system. *Glycobiology*, 4, 855-865 (1994)
4. Kotani, M. et al.: Developmental changes of ganglioside expressions in postnatal rat cerebellar cortex. *Brain Res.*, 700, 40-58 (1995)
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6. Kotani, M. and Tai, T.: An immunohistochemical technique with a series of monoclonal antibodies to gangliosides, their differential distribution in the rat cerebellum. *Brain Research Protocols*, 1, 152-156 (1997)
7. Tai, T. et al.: Cell type-specific expression of ganglioside antigens in the central nervous system. *Pure and Appl. Chem.*, 69, 1903-1910 (1997)
8. Kawashima, I. and Tai, T.: An immunocytochemical technique with monoclonal antibodies to glycosphingolipids in rat cerebellar cultures, influence of detergent permeabilization. *Brain Research Protocols*, 2, 299-305 (1998)

GMR7; Monoclonal antibody (MAb) to GD2

1. Ozawa, H. et al.: Generation of one set of monoclonal antibodies specific for b-pathway ganglio-series gangliosides. *Biochim. Biophys. Acta*, 1123, 184-190 (1992)
2. Kawashima, I. et al.: Characterization of ganglioside expression in human melanoma cells: Immunological and biochemical analysis. *J. Biochem.*, 114, 186-193 (1993)
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5. Kawashima, I. et al.: Immunocytochemical analysis of gangliosides in rat primary cerebellar cultures using specific monoclonal antibodies. *Brain Res.*, 732, 75-86 (1996)
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S220-51; Monoclonal antibody (MAb) to GD2

1. Fukuda, M. et al.: Enhancement of in vitro and in vivo anti-tumor activity of anti-GD2 monoclonal antibody 220-51 against human neuroblastoma by granulocyte-macrophage colony stimulating factor and granulocyte colony stimulating factor. *Int. J. Mol. Med.*, 2, 471-475 (1998)

GGR12; Monoclonal antibody (MAb) to GD1b

1. Ozawa, H. et al.: Generation of one set of monoclonal antibodies specific for b-pathway ganglio-series gangliosides. *Biochim. Biophys. Acta*, 1123, 184-190 (1992)
2. Kawashima, I. et al.: Characterization of ganglioside expression in human melanoma cells: Immunological and biochemical analysis. *J. Biochem.*, 114, 186-193 (1993)
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7LE; Monoclonal antibody (MAb) to Le^a

1. Blood transfusion and immunohaematology, PH. Rouger, D. Anstee and Ch. Salmon (eds)-Arnette, France 30(5) 353-720 (1987)
2. Torrado, J. et al.: Prospective study of Lewis antigen alterations in the gastric precancerous process. *Cancer Epidemiology, Biomarkers & Prevention*, 1, 199-205 (1992)
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2-25LE; Monoclonal antibody (MAb) to Le^b

1. Blood transfusion and immunohaematology, PH. Rouger, D. Anstee and Ch. Salmon (eds)-Arnette, France 30(5) 353-720 (1987)
2. Bara, J. et al.: Immunochemical characterization of mucins; polypeptide (M1) and polysaccharide (A and Le^b) antigens. *Biochem. J.*, 254,185-193 (1988)
3. Good, A.H. et al.: Serological and chemical specificities of twelve monoclonal anti-Le^a and anti-Le^b antibodies. *Vox Sanguinis*, 62, 180-189 (1992)
4. Torrado, J. et al.: Prospective study of Lewis antigen alterations in the gastric precancerous process. *Cancer Epidemiology, Biomarkers & Prevention*, 1, 199-205 (1992)
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1H4; Monoclonal antibody (MAb) to SLe^a

1. Takada, A. et al.: Adhesion of human cancer cells to vascular endothelium mediated by a carbohydrate antigen, sialyl Lewis A. *Biochem. Biophys. Res. Commun.*, 179, 713-719 (1991)
2. Zenita, K. et al.: Northern hybridization analysis of VH gene expression in murine monoclonal antibodies directed to cancer associated ganglioside antigens having various sialic acid linkages. *J. Immunology*. 144, 4442-4451 (1990)
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2D3; Monoclonal antibody (MAb) to SLe^a

1. Takada, A. et al.: Adhesion of human cancer cells to vascular endothelium mediated by a carbohydrate antigen, sialyl Lewis A. *Biochem. Biophys. Res. Commun.*, 179, 713-719 (1991)
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3. Takada, A. et al.: Contribution of carbohydrate antigens sialyl Lewis A and sialyl Lewis X to adhesion of human cancer cells to vascular endothelium. *Cancer Res.*, 53, 354-361 (1993)
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73-30; Monoclonal antibody (MAb) to SLe^x

1. Hakomori, S. and Kannagi, R.: Glycosingolipids as tumor-associated and differentiation markers. *J. Natl. Cancer Inst.*, 71, 231-251 (1983)
2. Hakomori, S.: Aberrant glycosylation in tumors and tumor-associated carbohydrate antigens. *Adv. Cancer Res.*, 52, 257-331 (1989)

H18A; Monoclonal antibody (MAb) to Le^y

1. Hirashima, G. et al.: High idiotypic connectivity of the VH7183-encoded antibodies directed to a murine embryonic carbohydrate antigen, Lewis Y, as ascertained by syngenic anti-idiotypic monoclonal antibodies. *J. Immunol.*, 145, 224-232 (1990)
2. Kaneko, T. et al.: Preparation of mouse-human chimeric antibody to an embryonic carbohydrate antigen, Lewis Y. *J. Biochem.*, 113, 114-117 (1993)

KM-93; Monoclonal antibody (MAb) to SLe^x

1. Hanai, N. et al.: Generation of monoclonal antibodies against human lung squamous cell carcinoma and adenocarcinoma using mice rendered tolerant to normal human lung. *Cancer Res.*, 46, 4438-4443 (1986)
2. Shitara, K. et al.: Distribution of lung adenocarcinoma-associated antigens in human tissues and sera defined by monoclonal antibodies KM-52 and KM-93. *Cancer Res.*, 47, 1267-1272 (1987)
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