

## Abbreviations

<i>A. caulinodans</i>	<i>Azorhizobium caulinodans</i>
<i>A. protophormiae</i>	<i>Arthrobacter protophormiae</i>
AA	amino acid
AAL	auxiliary assisted ligation
ADCC	antibody-dependent cellular toxicity
ADP	adenosine diphosphate
Asn	asparagine
Asp	aspartic acid
ATP	adenosine triphosphate
<i>B. bifidum</i>	<i>Bifidobacterium bifidum</i>
<i>B. breve</i>	<i>Bifidobacterium breve</i>
<i>B. halodurans</i>	<i>Bacillus halodurans</i>
<i>B. licheniformis</i>	<i>Bacillus licheniformis</i>
<i>B. subtilis</i>	<i>Bacillus subtilis</i>
Boc	tert-butoxycarbonyl
<i>C. albicans</i>	<i>Candida albicans</i>
<i>C. cellulolyticum</i>	<i>Clostridium cellulolyticum</i>
<i>C. elegans</i>	<i>Caenorhabditis elegans</i>
<i>C. fimi</i>	<i>Cellulomonas fimi</i>
<i>C. japonicus</i>	<i>Cellvibrio japonicus</i>
<i>C. jejuni</i>	<i>Campylobacter jejuni</i>
<i>C. neoformans</i>	<i>Cryptococcus neoformans</i>
<i>C. parapsilosis</i>	<i>Candida parapsilosis</i>
(C-2 <sup>I</sup> -Br) β-Cel-Me	methyl 6-bromo-6-deoxy-β-D-celluloside
(C-6 <sup>II</sup> -Br) β-CelF	6 <sup>II</sup> -bromo-6 <sup>II</sup> -deoxy-α-D-cellulosyl fluoride
CBD	chitin-binding domain
CD2	cluster of differentiation 2
Cel-F	cellulosyl fluoride
Cel-Me	methyl celluloside
Cel-MU	4-methylumbelliferyl celluloside
Cel-OPh-4-OMe	4-methoxyphenyl celluloside
Cel-pNP	4-nitrophenyl celluloside
CEMTS	carboxyethylmethanethiosulfonate
CH	chondroitin
CHO	Chinese hamster ovary
CID	chemically induced heterodimerization domain
CMP	cytidine monophosphate
CMAS	cytidine monophosphate-sialic acid synthetase
CS	chondroitin sulfate
CST	cytidine monophosphate-sialic acid transporter
CTP	cytidine triphosphate
Cys	cysteine
<i>D. melanogaster</i>	<i>Drosophila melanogaster</i>
DCC	<i>N,N'</i> -dicyclohexylcarbodiimide
DMF	<i>N,N</i> -dimethylformamide
DMPU	1,3-dimethyl-3,4,5,6-tetrahydro-2(1H)-pyrimidinone
Dol	dolichol
<i>E. coli</i>	<i>Escherichia coli</i>
EGF	epidermal growth factor
Endo	endoglycosidase
ENGase	<i>endo</i> -β- <i>N</i> -acetylglucosaminidase
EPL	expressed protein ligation
ER	endoplasmic reticulum
Fmoc	9-fluorenylmethoxycarbonyl
Fmoc-OSu	9-fluorenylmethyl succinimidyl carbonate
Fuc	fucose
Fuc-F	fucosyl fluoride
Fuc-N <sub>3</sub>	fucosyl azide
FucT	fucosyltransferase
Fut8	α1,6-fucosyltransferase
FX	UDP- <i>N</i> -acetylglucosamine 2-epimerase/ <i>N</i> -acetylmannosamine kinase <i>Geobacillus stearothermophilus</i>
<i>G. stearothermophilus</i>	glycosaminoglycan
GAG	galactose
Gal	<i>N</i> -acetylgalactosamine
GalNAc	<i>N</i> -acetylgalactosaminyltransferase
GalNAcT	galactosyltransferase
GalT	2,4-dinitrophenyl galactopyranoside
Gal-DNP	

Gal-F	galactosyl fluoride
Gal- <i>p</i> NP	4-nitrophenyl galactoside
GalUA- <i>p</i> NP	4-nitrophenyl galacturonopyranoside
GdmCl	guanidine hydrochloride
GDP	guanosine diphosphate
Gent- <i>p</i> NP	4-nitrophenyl gentiobioside
Glc	glucose
Glc-1-S-Ph	1-thio-glucopyranoside
Glc-2-BPh-Me	2-biphenylmethyl-glucopyranoside
Glc-2-Cl-2,4-DNP	2,4-dinitrophenyl 2-chloro-2-deoxy-glucopyranoside
Glc-2-F-2,4-DNP	2,4-dinitrophenyl 2-deoxy-2-fluoro-glucopyranoside
Glc-2-NP	2-nitrophenyl glucopyranoside
Glc-3S- <i>p</i> NP	4-nitrophenyl 3-deoxy-3-thio-glucopyranoside
Glc-4-CN-Ph	4-cyanophenylglucopyranoside
Glc-4S- <i>p</i> NP	4-nitrophenyl 4-deoxy-4-thio-glucopyranoside
GlcA	glucuronic acid
GlcAT	glucuronyltransferase
Glc-DNP	2,4-dinitrophenyl glucopyranoside
Glc-F	glucosyl fluoride
Glc-MU	4-methylumbelliferyl glucopyranoside
GlcNAc	N-acetylglucosamine
GlcNAc-4S- <i>p</i> NP	4-nitrophenyl 2-acetamido-2,4-dideoxy-4-thio-glucopyranoside
GlcNAc- <i>p</i> NP	4-nitrophenyl 2-acetamido-2-deoxy-glucopyranoside
GlcNAcT	N-acetylglucosaminyltransferase
GlcNH <sub>2</sub> -β-(1-4)-GlcNAc	N-acetyl chitobiose
Glc-OBn	benzyl glucopyranoside
Glc-OPh-4-OMe	4-methoxyphenyl glucopyranoside
Glc- <i>p</i> NP	4-nitrophenyl glucopyranoside
Glc-Ph	phenyl glucopyranoside
GlcNAc-2-NP	2-nitrophenyl 2-acetamido-2-deoxy-glucopyranoside
GlcUA- <i>p</i> NP	4-nitrophenyl glucuronopyranoside
GlcT	glucosyltransferase
GLDH	GDP-6-deoxy-D-lyxo-4-hexulose
Glu	glutamic acid
GlyCAM-1	glycosylation-dependent cell adhesion molecule 1
GMD	GDP-mannose-4,6-dehydratase
GnE	N-acetylglucosamine epimerase
GnT	N-acetylglucosaminyltransferase
gp41	human envelope glycoprotein 41
gp120	human envelope glycoprotein 120
gSAR	glycan-related structure-activity relationship
GTase	glycosyltransferase
<i>H. hepaticus</i>	<i>Helicobacter hepaticus</i>
<i>H. influenzae</i>	<i>Haemophilus influenzae</i>
<i>H. insolens</i>	<i>Humaccola insolens</i>
<i>H. pylori</i>	<i>Helicobacter pylori</i>
<i>H. sapiens</i>	<i>Homo sapiens</i>
<i>H. vulgare</i>	<i>Hordeum vulgare</i>
HA	hyaluronin
HAS1	hyaluronin synthase 1
HEK	human embryonic kidney
HexNAc	N-acetyl-hexosamine
HS	heparin sulfate
His	histidine
HIV	human immunodeficiency virus
HNK	human natural killer
IgG	immunoglobulin G
KFBP	human rapamycin-associated protein
FRB	rapamycin-binding domain of mTOR
<i>L. stagnalis</i>	<i>Lymnaea stagnalis</i>
Lac	lactose
LacNAc	N-acetyllactosamine
Lac-4S- <i>p</i> NP	4-nitrophenyl 4-deoxy-4-thio-lactopyranoside
Lac-F	lactosyl fluoride
LacY	β-galactoside permease
Lam-4-MU	4-methylumbelliferyl laminaribioside
Lam-Bn	benzyl laminaribioside
Lam-F	laminaribiosyl fluoride
Lam-2-NP	2-nitrophenyl laminaribioside
Lam-MU	4-methylumbelliferyl laminaribioside

LCA	Lens Culinaris Agglutinin
Lec <sup>R</sup>	lectin resistant
LLO	lipid-linked oligosaccharide
LOS	lipooligosaccharide
<i>M. hiemalis</i>	<i>Mucor hiemalis</i>
<i>M. smegmatis</i>	<i>Mycobacterium smegmatis</i>
Mal-pNP	4-nitrophenyl maltoside
Man	mannose
Man-2-F-2,4-DNP	2,4-dinitrophenyl 2-deoxy-2-fluoro-mannoside
Man-DNP	2,4-dinitrophenyl mannopyranoside
Man-F	mannosyl fluoride
ManNAc	<i>N</i> -acetylmannosamine
Man- <i>p</i> NP	4-nitrophenyl mannopyranoside
Man-S- <i>p</i> NP	4-nitrophenyl 1-thio-mannopyranoside
ManT	mannosyltransferase
min	minutes
MPAA	<i>p</i> -mercaptophenyl acetic acid
NANP	UDP- <i>N</i> -acetylglucosamine 2-epimerase/ <i>N</i> -acetylmannosamine kinase
NANS	<i>N</i> -acetylneuraminc acid phosphate synthase
<i>N. gonorrhoeae</i>	<i>Neisseria gonorrhoeae</i>
<i>N. meningitidis</i>	<i>Neisseria meningitidis</i>
NCL	native chemical ligation
Neu5Ac	<i>N</i> -acetylneuraminc acid
OST	oligosaccharyltransferase
<i>P. damsela</i>	<i>Photobacterium damsela</i>
<i>P. multocida</i>	<i>Pasteurella multocida</i>
PBS	phosphate buffered saline
PCL	protease catalyzed ligation
PEP	phosphoenolpyruvate
Ph-S-Cell	phenyl thio-celllobioside
P <sub>i</sub>	phosphate
PNGase	Peptide: <i>N</i> -Glycosidase
PP <sub>i</sub>	pyrophosphate
PSGL-1	P-selectin glycoprotein ligand-1
PTM	posttranslational modification
PYR	pyruvate
RNase	ribonuclease
<i>S. cerevisiae</i>	<i>Saccharomyces cerevisiae</i>
<i>S. frugiperda</i>	<i>Spodoptera frugiperda</i>
<i>S. pombe</i>	<i>Schizosaccharomyces pombe</i>
<i>S. solfataricus</i>	<i>Sulfolobus solfataricus</i>
SAL	sugar-assisted ligation
SAR	structure-activity relationship
CST	sialic acid transporter
SCE	2-carboxyethylthio
Ser	serine
SiaB	engineered cytidine monophosphate- <i>N</i> -acetylneuraminc acid synthetase
SiaT	sialyltransferase
SLe <sup>X</sup>	sialyl Lewis X
sp.	Species
SPPS	solid-phase peptide synthesis
SPS	<i>N</i> -acetylneuramate-9-phosphate synthase
<i>T. aggregans</i>	<i>Thermococcus aggregans</i>
<i>T. cruzi</i>	<i>Trypanosoma cruzi</i>
<i>T. maritima</i>	<i>Thermotoga maritima</i>
<i>T. ni</i>	<i>Trichoplusia ni</i>
<i>T. thermophilus</i>	<i>Thermus thermophilus</i>
TCEP	tris(2-carboxyethyl)phosphine
TEV	tobacco etch protease
TFA	trifluoroacetic acid
THF	tetrahydrofuran
Thr	threonine
TMSOTf	trimethylsilyl trifluoromethanesulfonate
Trp	tryptophan
UDP	uridine diphosphate
UTP	uridine triphosphate
Xyl	xylose
Xyl-2-F	$\alpha$ -xylobiosyl fluoride
Xyl-2-SBn	benzylthio xylobioside

Xyl-4P	4-penten-1-yl xylopyranoside
Xyl-4S- <i>p</i> NP	4-nitrophenyl 4-deoxy-4-thio-xylopyranoside
Xyl-OBn	benzyl $\beta$ -D-xyloside
Xyl- <i>p</i> NP	4-nitrophenyl $\beta$ -D-xyloside