



Universiteit
Leiden
The Netherlands

Bacterial glycomimetics: synthesis and applications

Enotarpi, J.

Citation

Enotarpi, J. (2023, October 19). *Bacterial glycomimetics: synthesis and applications*. Retrieved from <https://hdl.handle.net/1887/3644016>

Version: Publisher's Version

License: [Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden](#)

Downloaded from: <https://hdl.handle.net/1887/3644016>

Note: To cite this publication please use the final published version (if applicable).

Bacterial glycomimetics: synthesis and applications

PROEFSCHRIFT

ter verkrijging van
de graad van doctor aan de Universiteit Leiden,
op gezag van rector magnificus prof.dr.ir. H. Bijl,
volgens besluit van het college voor promoties
te verdedigen op donderdag 19 oktober 2023
klokke 10:00 uur

door

Jacopo Enotarpi
geboren te Genova, Italy
in 1991

Promotor:

Prof.dr. J.D.C. Codée

Co-promotor:

Prof.dr. G.A. van der Marel

Promotiecommissie:

Prof.dr. M. Ubbink

Prof.dr. H.S. Overkleeft

Dr. D.V. Filippov

Dr. M.E. Artola Perez de Azanza

Prof.dr. L. Lay (Università degli Studi di Milano)

Prof.dr. G.J.P.H. Boons (Universiteit Utrecht)

Table of contents

	List of abbreviations	4
Chapter 1	Design and synthesis of glycoconjugate vaccines	7
Chapter 2	Synthesis of stabilized <i>Neisseria meningitidis</i> serotype A analogues	33
Chapter 3	Synthesis of stabilized <i>Neisseria meningitidis</i> serotype A analogues carrying C-3 and C-4 acetyl esters on a repeating unit	61
Chapter 4	Synthesis and biological evaluation of oligomers mimicking <i>E. faecalis</i> Diheteroglycan Capsular Polysaccharide	87
Chapter 5	The development of a new tandem ring-closing metathesis linker system for solid phase synthesis	119
Chapter 6	The synthesis of well-defined alanylated LTA fragments	137
Chapter 7	Conclusions and future prospects	175
	Nederlandse samenvatting	183
	List of publications	185
	Curriculum Vitae	187

List of abbreviations

Å	angstrom	DNA	2-deoxyribonucleic acid
Ac	acetyl	DPX	degree of polymerization of X
AGA	automated glycan assembly	DT	diphtheria toxoid
avDPX of X	average degree of polymerization of X	dt	doublet of triplets
Bn	benzyl	EDTA	ethylenediaminetetraacetic acid
BSA	bovine serum albumin	ELISA assay	enzyme-linked immunosorbent assay
Bz	benzoyl	EPSs	exopolysaccharides
CAN	cerium ammonium nitrate	Et	ethyl
Cbz	benzyloxycarbonyl	Fmoc	fluorenylmethyloxycarbonyl
CNE	2-cyanoethyl	Gal	galactose
CPG	controlled-pore glass	GalNAc	N-acetylgalactosamine
CPSs	capsular polysaccharides	GBS	group-B streptococci
CRM197	cross-reactive material 197	Glc	glucose
CSO	(10-camphorsulfonyl)oxaziridine	GNPs	gold nanoparticles
d	doublet	GroP	glycerol phosphate
DBU ene	1,8-Diazabicyclo[5.4.0]undec-7-ene	Hib H.	influenzae type b
DCA	dichloroacetic acid	HPLC	high-performance liquid chromatography
DCI	4,5-dicyanoimidazole	HRMS	high-resolution mass spectrometry
DCM	dichloromethane	Hz	herz
dd	doublet of doublets	i	iso
DDQ	2,3-Dichloro-5,6-dicyano-1,4-benzoquinone	IgG	immunoglobulin isotype G
DIC	N,N'-Diisopropylcarbodiimide	IgM	immunoglobulin isotype M
DIPEA	N,N-diisopropylethylamine	IR	infrared
DMAP	4-dimethylaminopyridine	J	coupling constant
DMF	dimethylformamide	kDa	kilodalton
DMTr	4,4'-dimethoxytrityl	Lev	levulinoyl

LPS	lipopolysaccharide	PyBOP	(benzotriazol-1-yl-oxy)tripyrrolidino
LPSs	lipopolysaccharides	q	quartet
LTA	lipoteichoic acid	RCT	Randomized controlled trials
m	multiplet	RNA	ribonucleic acid
m/z	mass over charge ratio	s	singlet
MALDI ionisation	matrix-assisted laser desorption ionisation	sn	stereospecific numbering
m-CPBA	meta-chloroperbenzoic acid	SPIOs	SuperParamagnetic Iron Oxide Nanoparticles
Me	methyl	SPR	surface plasmon resonance
MenA	Neisseria meningitidis serotype A	ST8	serotype 8
Nap	naphthylmethyl	t	triplet
NIS	N-iodosuccinimide	TAs	teichoic acids
NMI	N-methylimidazole	TBAF	tetra-butylammonium fluoride
NMR	nuclear magnetic resonance	TBDPS	tert-butyl-di-phenyl-silyl
OMPC	outer membrane protein complex of serogroup B meningococcus	TBS	tert-butyl-di-methyl-silyl
OPA	opsonophagocytic killing assay	TCA	trichloroacetic acid
OPIA	opsonophagocytic killing inhibition assay	TDS	thexyldimethyl-silyl
PADRE	Pan HLA-DR Epitope	TES	triethylsilane
PAMP	pathogen-associated molecular pattern	Tf	triflate
PBS	phosphate-buffered saline	THF	tetrahydrofuran
PD	Haemophilus protein D	THP	tetrahydropyranyl
PLD	pneumolysoid	TLC	thin-layer chromatography
PMB	4-methoxybenzyl	TMS	tetramethylsilane
PNAG	non-acetylated poly-N-acetyl-D-glucosamine	TT	Tetanus Toxoid
Pr	propyl	tt	triplet of triplets
PRP	β -D-ribose-D-ribitol-5-phosphate	UDP	uridine diphosphate
pTsOH	4-toluenesulfonic acid	VRE	vancomycin-resistant enterococci
		WTA	wall teichoic acid
		δ	chemical shift

