A Pasteurella multocida sialyltransferase displaying dual trans-sialidase activities for production of 3'-sialyl and 6'-sialyl glycans

This study examined a recombinant Pasteurella multocida sialyltransferase exhibiting dual trans-sialidase activities. The enzyme catalyzed trans-sialylation using either 2-O-(p-nitrophenyl)-d-N-acetylneuraminic acid or casein glycomacropeptide (whey protein) as the sialyl donor and lactose as the acceptor, resulting in production of both 3'-sialyllactose and 6'-sialyllactose. This is the first study reporting 2,6-trans-sialidase activity of this sialyltransferase (EC 2.4.99.1 and 2.4.99.4). A response surface design was used to evaluate the effects of three reaction parameters (pH, temperature, and lactose concentration) on enzymatic production of 3- and 6-sialyllactoses using 5% (w/v) casein glycomacropeptide (equivalent to 9 mM bound sialic acid) as the donor. The maximum yield of 3-sialyllactose (2.75 ± 0.35 mM) was achieved at a reaction condition with pH 6.4, 40°C, 100 mM lactose after 6 h, and the largest concentration of 6-sialyllactose (3.33 ± 0.38 mM) was achieved under a condition with pH 5.4, 40°C, 100 mM lactose after 8 h. 6-sialyllactose was presumably formed from -2,3 bound sialic acid in the casein glycomacropeptide as well as from 3-sialyllactose produced in the reaction. The kcat/Km value for the enzyme using 3-sialyllactose as the donor for 6-sialyllactose synthesis at pH 5.4 and 40°C was determined to be 23.22 ± 0.7 M−1s−1. Moreover, the enzyme was capable of catalyzing the synthesis of both 3- and 6-sialylated galactooligosaccharides, when galactooligosaccharides served as acceptors.

General information
State: Published
Organisations: Department of Chemical and Biochemical Engineering, Center for BioProcess Engineering, University of Southern Denmark
Number of pages: 8
Pages: 60-67
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Journal of Biotechnology
Volume: 170
ISSN (Print): 0168-1656
Ratings:
BFI (2019): BFI-level 1
Web of Science (2019): Indexed yes
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 2.64 SJR 0.929 SNIP 0.86
Web of Science (2017): Impact factor 2.533
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.88 SJR 1.004 SNIP 0.929
Web of Science (2016): Impact factor 2.599
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 2.87 SJR 1.068 SNIP 0.988
Web of Science (2015): Impact factor 2.667
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 2.95 SJR 1.116 SNIP 1.13
Web of Science (2014): Impact factor 2.871
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 3.22 SJR 1.183 SNIP 1.175
Web of Science (2013): Impact factor 2.884
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1