AN MBG FOCUS TALK

hosted by Section for Structural Biology
Dept. Molecular Biology & Genetics, Aarhus University


Focus talks in Molecular Biology at MBG

Monday 4 November 2013 at 11:15-12:00

The conference room (3130-303), 3. floor, Gustav Wieds Vej 10C, Aarhus

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Structural insight into how prebiotic oligosaccharides are recognized and handled by probiotic bacteria

The interplay between diet and probiotic bacteria has major impact on human health with respect to pathogen protection, gastrointestinal disorders and allergies. Prebiotic non-digestible oligosaccharides selectively stimulate growth of probiotics resulting in modulation of the balance in the gut microbiota. Carbohydrate uptake and catabolism are key in the mechanism of probiotic action. Utilization of different natural and synthetic oligosaccharides was investigated in well-characterized, commercial probiotic strains *Lactobacillus acidophilus* NCFM and *Bifidobacterium animalis* subsp. *lactis* Bl-04 growth analysis ("Bioscreen"), difference proteomics (DIGE), and transcriptomics.[1-5] Selected up-regulated glycoside hydrolases and transport proteins were produced and their specificity and 3D structures determined.[6-8] Studies of effects on the microbiome in a colon simulator and by human intervention.[9] The results were brought together by using phylogenetics and comparative genomics to illustrate the utilization of oligosaccharide prebiotics by probiotic bacteria highlighting oligosaccharide transport proteins and glycoside hydrolases.

1. O Gilad et al (2010) Combined transcriptome and proteome analysis of Bifidobacterium animalis subsp. lactis BB-12 grown on xylo-oligosaccharides and a model of their utilization. Appl Environ Microbiol 76, 7285-91
2. A Majumder et al (2011) Proteome reference map of Lactobacillus acidophilus NCFM and quantitative proteomics towards understanding the prebiotic action of lactitol. Proteomics 11, 3470-81
3. JM Andersen et al (2011) Transcriptional and functional analysis of galactooligosaccharide uptake by lacS in Lactobacillus acidophilus. Proc Natl Acad Sci USA 108, 17785-90
4. O Gilad et al (2012) Insights into physiological traits of Bifidobacterium animalis subsp. lactis BB-12 through membrane proteome analysis. J Proteomics 75, 1190-1200
5. LK Vigsnaes, H Nakai et al (2013) In vitro growth of four individual human gut bacteria on oligosaccharides produced by chemoenzymatic synthesis. Food & Function 5, 784-93
6. F Fredslund et al (2011) Crystal structure of α-galactosidase from Lactobacillus acidophilus NCFM: insight into tetramer formation and substrate binding. J Mol Biol 412, 466-480
7. MS Moeller et al (2012) Enzymology and structure of the GH13_31 glucan 1,6-α-glucosidase that confers isomaltooligosaccharide utilisation in the probiotic Lactobacillus acidophilus NCFM. J Bacteriol 194, 4249-59
8. M Ejby et al: Structural basis for arabioxylo-oligosaccharide capture by the probiotic Bifidobacterium animalis subsp. lactis B1-04. Mol Microbiol, in press
9. GC van Zanten et al (2012) The effect of selected synbiotics on microbial composition and short-chain fatty acid production in a model system of the human colon. PLoS ONE 7, e7212

Host:
Poul Nissen, Section for Structural Biology
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