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Engineering endogenous hexose transporters in *Saccharomyces cerevisiae* for efficient D-xylose transport

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peroxisomes, respectively. This and following projects were carried out in collaboration with the industrial partner DSM Biotechnology Center in Delft. In 2003 the STW project was completed and Jeroen started working in an NWO-IBOS project where he was involved in the isolation and identification of (carbamoyl) cephalosporin MFS (Major Facilitator Superfamily) transporters to be used in cephalosporin producing *P. chrysogenum* strains. This project yielded a manuscript published in Fungal Genetics and Biology, as well as a patent and Jeroen was honored with the patent award of the ACTS (Program IBOS) in 2007. In 2006, a new project involving *P. chrysogenum* started, this time in a B-Basic Project called “Fine Chemicals - Improving (un)natural biosynthesis”. In this study specific transporters for antibiotic secretion were identified and this led to further scientific publications. In 2010, he switched to bioethanol production research using *Saccharomyces cerevisiae* in a EOS-LT project that was carried out in collaboration with Nedalco B.V., Bergen op zoom, The Netherlands. After DSM acquired Nedalco B.V. the project continued in a Be-Basic program “Improving pentose transport in *Saccharomyces cerevisiae*”. This research program focused on the conversion, via evolutionary engineering and/or genetic modification, of the endogenous hexose transporters (HXTs) into D-xylose transporters. This work led to several publications and patents. Being part of this Be-basic program, his research allowed for close collaboration with industry and academic partners outside Groningen and the results of this research are described in this thesis.

LIST OF PUBLICATIONS AND PATENTS

PUBLICATIONS:

- 1: Verhoeven MD, Bracher JM, **Nijland JG**, Bouwknecht J, Daran JG, Driessen AJM, van Maris AJA, Pronk JT. Laboratory evolution of a glucose-phosphorylation-deficient, arabinose-fermenting *S. cerevisiae* strain reveals mutations in GAL2 that enable glucose-insensitive L-arabinose uptake. FEMS Yeast Res. 2018 Sep 1;18(6).
- 2: Bracher JM, Verhoeven MD, Wisselink HW, Crimi B, **Nijland JG**, Driessen AJM, Klaassen P, van Maris AJA, Daran JG, Pronk JT. The *Penicillium chrysogenum* transporter PcAraT enables high-affinity, glucose-insensitive L-arabinose transport in *Saccharomyces cerevisiae*. Biotechnol Biofuels. 2018 Mar 13;11:63.
- 3: **Nijland JG**, Shin HY, de Waal PP, Klaassen P, Driessen AJM. Increased xylose affinity of Hxt2 through gene shuffling of hexose transporters in *Saccharomyces cerevisiae*. J Appl Microbiol. 2018 Feb;124(2):503-510.
- 4: Shin HY, **Nijland JG**, de Waal PP, Driessen AJM. The amino-terminal tail of Hxt11 confers membrane stability to the Hxt2 sugar transporter and improves xylose fermentation in the presence of acetic acid. Biotechnol Bioeng. 2017 Sep;114(9):1937-1945.
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- 6: **Nijland JG**, Vos E, Shin HY, de Waal PP, Klaassen P, Driessen AJ. Improving pentose fermentation by preventing ubiquitination of hexose transporters in *Saccharomyces cerevisiae*. Biotechnol Biofuels. 2016 Jul 26;9:158.
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- 9: **Nijland JG**, Shin HY, de Jong RM, de Waal PP, Klaassen P, Driessen AJ. Engineering of an endogenous hexose transporter into a specific D-xylose transporter facilitates glucose-xylose co-consumption in *Saccharomyces cerevisiae*. *Biotechnol Biofuels*. 2014 Nov 29;7(1):168.
- 10: Ali H, Ries MI, **Nijland JG**, Lankhorst PP, Hankemeier T, Bovenberg RA, Vreeken RJ, Driessen AJ. A branched biosynthetic pathway is involved in production of roquefortine and related compounds in *Penicillium chrysogenum*. *PLoS One*. 2013 Jun 12;8(6):e65328.
- 11: Veiga T, Gombert AK, Landes N, Verhoeven MD, Kiel JA, Krikken AM, **Nijland JG**, Touw H, Luttik MA, van der Toorn JC, Driessen AJ, Bovenberg RA, van den Berg MA, van der Klei IJ, Pronk JT, Daran JM. Metabolic engineering of β -oxidation in *Penicillium chrysogenum* for improved semi-synthetic cephalosporin biosynthesis. *Metab Eng*. 2012 Jul;14(4):437-48.
- 12: Veiga T, **Nijland JG**, Driessen AJ, Bovenberg RA, Touw H, van den Berg MA, Pronk JT, Daran JM. Impact of velvet complex on transcriptome and penicillin G production in glucose-limited chemostat cultures of a β -lactam high-producing *Penicillium chrysogenum* strain. *OMICS*. 2012 Jun;16(6):320-33.
- 13: Kovalchuk A, Weber SS, **Nijland JG**, Bovenberg RA, Driessen AJ. Fungal ABC transporter deletion and localization analysis. *Methods Mol Biol*. 2012;835:1-16.
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oxaloacetase encoding gene and elimination of oxalate formation in the β -lactam producer *Penicillium chrysogenum*. *Fungal Genet Biol*. 2011 Aug;48(8):831-9.

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