P326. Cell-surface display engineering of industrial *Saccharomyces cerevisiae* for hemicellulosic-to-ethanol consolidated bioprocesses

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The utilization of lignocellulosic biomass to produce biofuels and commodity chemicals has appeared as a solution to alleviate the envisioned depletion of fossil resources. Nevertheless, the attainment of economically viable lignocellulosic-based processes requires an effective utilization of the hemicellulosic fraction, which may comprise up to 40% of the total biomass[1]. This represents a major bottleneck, mainly due to the requirement of chemical/enzymatic treatments for the hydrolysis of hemicellulose into fermentable sugars, and the fact that hemicellulose is mainly composed of xylose, a sugar that is not readily consumed by *Saccharomyces cerevisiae*–the most used organism in industrial biotechnology. In this context, consolidated bioprocessing, which combines saccharolytic and fermentative abilities in a single microorganism/consortium, appears as a solution to decrease environmental and economic costs in lignocellulosic biorefineries. Therefore, in this work, hemicellulolytic enzymes were displayed on the cell surface of robust industrial *S. cerevisiae* strains with advantageous traits (e.g. thermotolerance and inhibitor tolerance). These strains were also engineered for xylose consumption with both the isomerase and the oxidoreductase pathways, which was previously optimized for fermentation of inhibitor-containing hydrolysates[2]. The combination of these modifications allowed the direct production of 11.1 g/L of ethanol from non-detoxified hemicellulosic liquor obtained by hydrothermal pretreatment of corn cob, representing an ethanol yield of 0.327 g/g of potential xylose/glucose. To the extent of our knowledge, this is the highest ethanol concentration reported from direct conversion of a lignocellulosic-derived hemicellulose by *S. cerevisiae* without the addition of external hydrolytic catalysts. Additionally, the cell-surface display of hemicellulases presented a fermentative advantage in simultaneous saccharification and fermentation of corn cob hemicellulosic fraction, greatly decreasing the necessity for commercial enzymes. These results prove the value of industrial *S. cerevisiae* strains as hosts for the construction of whole-cell biocatalysts for hemicellulosic-based processes, without the need for expensive exogenous enzymes, chemical catalysts or laborious detoxification steps.

[1] Microb Cell Fact(2017)16:1–15 [2]Biotechnol Biofuels(2019)12:20

Acknowledgments

Portuguese Foundation for Science and Technology (FCT, Portugal) strategic funding of UID/BIO/04469/2019 unit and COMPETE2020(POCI-01-0145-FEDER-006684). MIT-Portugal Program (Ph.D. Grant PD/BD/128247/2016 to Joana T. Cunha). BioTecNorte operation (NORTE-01-0145- FEDER-000004) funded by European Regional Development Fund under the scope of Norte2020— Programa Operacional Regional do Norte and MultiBiorefinery project (POCI-01–0145-FEDER-016403).