

Evolved *Saccharomyces cerevisiae* grows three times faster than the parental strain in unfavourable medium

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Abstract

Evolutionary engineering is an approach in biotechnological studies to investigate the physiology of microorganisms and/or to obtain industrial relevant strains [1-2]. In this work, a genetically modified *Saccharomyces cerevisiae* strain was submitted to sequential cultivations in conditions in which it barely grows. After many generations, we obtained an evolved strain with increased specific growth rate compared to the un-evolved parental strain.

Key words: *Saccharomyces cerevisiae*, evolutionary engineering, biotechnology.

Introduction

Microorganisms have special importance for biotechnological applications in industry [1-2] and genetic techniques have been successfully used to generate robust and optimized microbial production systems [2]. In this context, evolutionary engineering is a powerful strategy to obtain a strain with a desirable phenotype [1]. During sequential cultivations, spontaneous mutagenesis of the initial population results in the formation of various phenotypes. Under a certain selective pressure, the fitter variants can survive and grow better than the original cells [1]. A genetically modified *S. cerevisiae* strain has a lower growth rate in a particular culture medium. The goal of this work is to obtain a strain, by evolutionary engineering, from this one which grows faster in same conditions (strain genotype and medium composition is not revealed here due to confidentiality concerns).

Results and Discussion

S. cerevisiae strain was submitted to sequential cultivations in a specific medium (Figure 1).

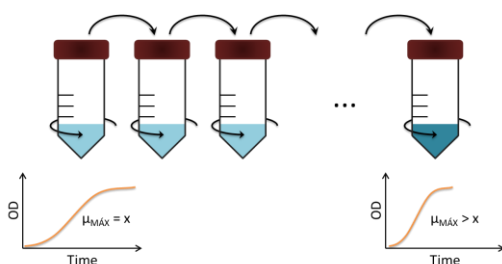


Image 1. Sequential cultivations. An aliquot of the previous falcon content is used as inoculum for the next one. Growth was measured by the change in optical density (OD).

After several generations, colonies were isolated in solid medium. To be sure that differences in

growth rate of initial and final populations are a consequence of selection by the medium – and not a transitory metabolic condition – the final strain was cultivated in non-selective medium. Then, the evolved strains were characterized through shake flasks cultivation. The evolved strains can grow almost three times faster than the un-evolved parental population (Figure 2).

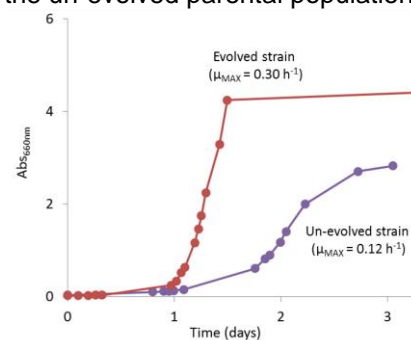


Image 2. Growth curves of un-evolved and evolved strains. Cultivations were performed in the same medium used in sequential cultivations.

Conclusions

By evolutionary engineering, we obtained a *S. cerevisiae* strain that grows faster in an unfavorable medium compared to the un-evolved strain. Selection of positive mutations during the serial cultivations could explain the better phenotype achieved. Further experiments will investigate the mutations that are present in the evolved strains and how they are linked to the acquired phenotype.

Acknowledgement

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¹ Çakar, Z. P. et al, J. C. J. *FEMS Yeast Res.* **2012**, *12*, 171.

² Dragosits, M. & Mattanovich, D. *Microb. Cell Fac.* **2013**, *12*, 64.