

Variation in pH gradients and FLO11 expression in mat biofilms from environmental isolates of the yeast *Saccharomyces cerevisiae*

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Abstract

Saccharomyces cerevisiae produces a multicellular phenotype, known as a mat, on a semi-solid medium. This biofilm phenotype was first described in the lab strain ?1278b and has been analyzed mostly in this same background. Yeast cells form a mat by spreading across the medium and adhering to each other and the surface, in part through the variegated expression of the cell adhesin, FLO11. This process creates a characteristic floral pattern and generates pH and glucose gradients outward from the center of the mat. Mats are encapsulated in a liquid which may aid in surface spreading and diffusion. Here, we examine thirteen environmental isolates that vary visually in the phenotype. We predicted that mat properties were universal and increased morphological complexity would be associated with more extreme trait values. Our results showed that pH varied significantly among strains, but was not correlated to mat complexity. Only two isolates generated significant liquid boundaries and neither produced visually complex mats. In five isolates, we tracked the initiation of FLO11 using GFP under the control of the endogenous promoter. Strains varied in when and how much GFP was detected, with increased signal associated with increased morphological complexity. Generally, the signal was strongest in the center of the mat and absent at the expanding edge. Our results show that traits discovered in one background vary and exist independently of mat complexity in natural isolates. The environment may favor different sets of traits, which could have implications for how this yeast adapts to its many ecological niches.

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