Study of single-cell dynamics of *S. cerevisiae* in a low-pressure microfluidic device

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***Short Abstract* — *S. cerevisiae* is a model organism used for different studies in Systems Biology. It is usually studied inside microfluidic devices that trap cells by means of mechanical pressure. It has been demonstrated that mechanical pressure affects cell physiology. By means of a novel microfluidic device we study single-cell dynamics of *S. cerevisiae* cell in a low-pressure environment. We present the design and fabrication of this novel microfluidic device as well as initial studies of division strategies and aging made with it.**

***Keywords* — Microfluidics, yeast, *S. cerevisiae*, aging, division strategies, gene expression, slipstreaming, mother machine**

I. Purpose

THE yeast *S. cerevisiae* is a common model organism for aging studies and division strategies [1-5]. Microfluidic devices for studying these cells usually trap cells by means of mechanical pressure. [6-15]. These devices are usually called "Mother Machines" and they allow the observation of mother cells during long periods of time while flowing fresh media so that cells remain in exponential phase. It has been demonstrated that mechanical pressure affects physiological processes such growth rates and diffusion rates of components inside the cells. [16, 17]. The difference of this devices with other trapping devices is that it uses a hydrodynamical trick called slipstreaming to trap cells. In slipstreaming, fluids flowing around a barrier form a low-pressure gradient in the back of the barrier. Mother cells are trapped in this zone while daughter cells are carried away by the flow. Additionally, this device has the advantage of being fabricated with low resolution technology. With this device, we studied the dynamics of growth and division of yeast *S. cerevisiae*. We use mathematical models to describe the division strategies observed in the experiments. Also, we confirm these strategies with some computer simulations. We compare the strategies with the ones observed in other yeast as *S. pombe* [22]

II. Conclusion

We present a microfluidic device that trap cells by means of the hydrodynamical trick of slipstreaming. This device allows the measurement of yeast dynamics

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