VOLUMETRIC POWER INPUT EFFECT ON THE MORPHOLOGY OF *S. lividans* UNDER THREE CONFIGURATIONS OF FLASKS

LD Marin-Palacio [1], RA Gamboa-Suasnavart [1], NA Valdez-Cruz [1], L Servín-González [1], MS Córdova-Aguilar[2], E Soto[2], W Klöckner [3], J Büchs [3], MA Trujillo-Roldán [1].

[1]Instituto de Investigaciones Biomédicas, [2] Centro de Ciencias Aplicadas y Desarrollo Tecnológico. Universidad Nacional Autónoma de México, México, D.F, CP 04510, México. [3] RWTH Aachen University, Germany. lmarinpa@gmail.com

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Introduction. More than 90% of the microbial research is carried out in shake flasks. However, few studies deal with engineering aspects to establish them as reactors [1], and fewer on the use of rheological complex bacterial cultures [2]. Previously, three shake flask configurations, Conventional Normal (NF), Baffled (BF) and Coiled Shake Flasks (CF) were used to provide information on different shear/oxygenation conditions; and the impact of those on the morphology of *S. lividans* and the production of rAPA which was also evaluated [3]. The aim of this study is to determine the changes in volumetric power input (P/V), rheological properties and morphology evolution during recombinant *S. lividans* growth, using three shake flask configurations**.**

Methods. Volumetric power input was measured using the method described by Buchs et al. [4]. This method is based on the torque measurements in the drive of the shaking machine and appropriate compensation of the friction losses [2]. Biomass was evaluated by dry weight and the morphology was analyzed by microscopy [3]. Rheological parameters of the culture broth were measured using a 50 mm plate/plate geometry in a controlled stress rheometer (Physica MCR 101 Rheometer).

Results. Figure 1 shows that the highest P/V was found in BF (0.51 kW/m^3), followed by CF (0.44 kW/m^3) and NF (0.20 kW/m^3), during the first 50 h of culture. After that, in the stationary phase of growth, the behavior of P/V decreases almost 20 % in BF and CF, but increases two times in NF.

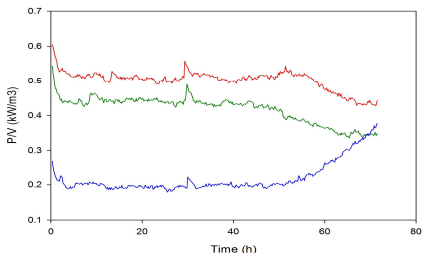

Fig 1. Volumetric power input (P/V) evolution during recombinant *S. lividans* growth in CN (blue), BF (red) and CF (green).

Figure 2 shows that the highest morphology was found during exponential and stationary growth phases in CF while in BF and in CF no significant differences were found. In accordance with the rheological parameters all broths presented a pseudoplastic behavior.

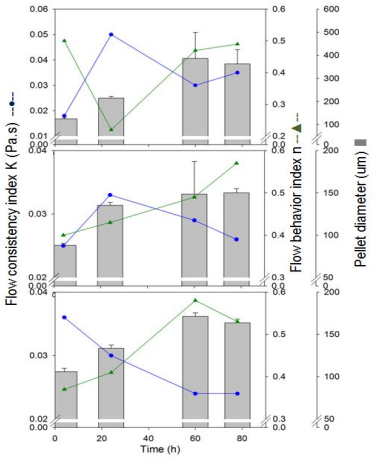

Fig.2. Evolution of flow consistency index (K, ●) , flow behavior index (*n*, ▲) and pellet diameter (▮) in recombinant *S. lividans* growth carried out in NF (a), BF (b) and CF (c)

Conclusions. The power input, local energy dissipation and flow patterns generated in the system are responsible for the morphological changes of *S. lividans*. In addition the rheological parameters (K and n) are influenced by the concentration of biomass and the morphology of the pellets.

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