

18th Biotechnology Congress

October 19-20, 2017 | New York, USA

Biosurfactant production by lactic acid bacteria and its possible use in microbial fuel cells

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A microbial fuel cell (MFC) generates electrical current from the metabolism of living cells. In a MFC, a microorganism degrades organic matter transferring its electrons to an anode. Biosurfactants are surface active molecules produced by microorganisms, with the ability to disrupt the plasma membrane, thereby reducing the resistance to electron transfer. In this work, the biosurfactant production of Lactic Acid Bacteria (LAB) was screened and evaluated in order to apply it to an MFC. The blood agar method and MRS broth were used for the screening of biosurfactant production in two LAB strains. LAB was grown in MRS medium for 72h (30°C-120 rpm). Biosurfactant was extracted using a PBS buffer after centrifugation and washing of the cells. The MRS medium was modified so that the effect of carbon and nitrogen sources could be studied. Surface tension (ST) was measured using the ring method at room temperature (reference PBS buffer: 70.6 ± 0.6 mNm⁻¹). The critical micelle concentration (CMC) of the freeze dried biosurfactant was also determined. The degradation halo in the blood agar and the reduction in ST of the PBS cell extract indicated the ability of *Lactobacillus plantarum* and *Lactobacillus* sp to produce cell bound biosurfactant. *L. plantarum* showed better biosurfactant production, giving a decrease in ST of 7.7 ± 1.3 mNm⁻¹. The use of MRS-lac promoted bacterial growth and biosurfactant production (10.7 ± 1.3 mNm⁻¹ reduction of ST). The presence of at least two complex nitrogen sources out of peptone, yeast extract and beef extract was required to obtain the maximum growth rate of 0.090 ± 0.003 h⁻¹. The kinetic study indicates that the maximum production occurred at 48h under stationary conditions. The CMC of the biosurfactant was found to be 100mgL⁻¹. Characterization of the biosurfactant obtained will allow it to be used in MFCs and in other pharmaceutical or food applications

Biography

Carolina Montoya Vallejo is a Biological Engineer from National University of Colombia, with a Master's degree in Chemical Engineering from the University of Antioquia. Nowadays, she is studying PhD in Chemical Engineering at the same university. Her experience in research has focused on microalgal, environmental and plant biotechnology. She has participated in several research projects, for example; microalgae and zooplankton culture at pilot scale for the production of live food in the Explora Aquarium, *in-vitro* culture of *Canavalia ensiformis* to control ants and black sigatoka, and cadmium bioremediation using native microalgae.

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