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CONTROL OF FLOW-GENERATED BIOFILMS WITH SURFACTANTS - EVIDENCE OF RESISTANCE AND RECOVERY

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ABSTRACT

The action of the cetyltrimethylammonium bromide (CTAB) and sodium dodecyl sulfate (SDS), respectively a cationic and an anionic surfactant were investigated to control biofilms formed under turbulent (u=0,532 m/s) and laminar (u=0,204 m/s) flow by *P.fluorescens*. *P. fluorescens* are known to be good biofilm producer and are a major unwanted microorganism found in industrial environments. The disinfectant action of different concentrations of CTAB and SDS on biofilms was assessed by means of cellular respiratory activity and variation of biofilm mass, immediately, 3, 7 and 12 h after the application of the surfactants. The experiments along 12 h after surfactant treatment were made in order to assess the biofilm recovery. The results showed that, laminar biofilms were more susceptible to the action of CTAB than those formed under turbulent flow. Total inactivation of the cells within the biofilms was not achieved for both types of biofilms. CTAB application by itself did not promote the detachment of biofilms from the surface. Concerning SDS, higher concentrations applied promoted significant biofilm inactivation. Turbulent and laminar flow had analogous susceptibility to SDS application. SDS did not promoted the detachment of biofilms from the metal surfaces. Furthermore, the structure of the biofilms was changed after the application of both surfactants (scanning electron microscopy). The biofilms recovered its respiratory activity, after surfactant application that in some cases reached higher values than the ones found for the control experiments (without chemical treatment). The CTAB application promoted similar recovery in the respiratory activity for both biofilms. Concerning the biofilm behaviour after SDS treatment, turbulent biofilms had a higher potential to recover their metabolic activity than laminar biofilms. Metabolic activity results were corroborated with microscopic analysis with a viability stain, demonstrating the increase in the number of viable cells along time after surfactant treatment. The biofilm mass did not experienced any significant variation after the treatment, for both surfactants tested. This study highlights the need of care in choosing the correct procedure for biofilm control and the influence of hydrodynamic conditions on the persistent and recalcitrant properties of *P. fluorescens* biofilms.