Treatment of *Weissella confusa* biofilms with low temperature plasma jet at atmospheric pressure

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Several devices of low temperature plasmas at atmospheric pressure have already shown their antimicrobial activity. However bacteria within a biofilm are more resistant to the plasma treatment than the planktonic or adherent ones [1, 2, 3]. The aim of this study was to evaluate the efficiency of a new plasma jet driven by a DC-corona discharge [4] to inactivate biofilms and adherent cells of Gram-positive bacteria. The plasma is generated directly in ambient air used as carrier gas without any admixture of rare gas flow and produces a large variety of active species at a temperature not exceeding 27°C [5]. *Weissella confusa* was selected as a model. These lactic acid bacteria, isolated from a food matrix, excrete a polysaccharide polymer (dextran) when sucrose is present [6]. Exopolysaccharides (EPS) play a major role in the protection of the microbial cells against environmental stresses. In addition, EPS are important components of the extracellular matrix of biofilms [7].

Biofilms or adherent cells were treated with the plasma jet for different exposure times. The antimicrobial efficiency of the plasma treatment was evaluated against adherent cells and 48 h-old biofilms grown with or without sucrose. Bacterial survival was evaluated using both Colony Forming Unit enumeration and tests of LIVE/DEAD Baclight Bacterial viability. The experiments show the ability of the new plasma jet device to inactivate the bacteria. An increased resistance of biofilm is clearly observed. The resistance is also significantly higher with biofilm in presence of sucrose, which indicate that dextran could play a protective role.

Overall, this work demonstrates the good potential of this new device of low temperature plasma jet to inactivate Gram-positive biofilms.

References

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