METABOLIC ACTIVITY OF *Staphylococcus epidermidis* IN BIOFILM VERSUS PLANKTONIC CELLS

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ABSTRACT

Staphylococcus epidermidis is at the moment one of the main responsible microorganisms for nosocomial infections due to the colonization of indwelling medical devices and its biofilm forming ability. The reason for that relies on the very low sensibility of biofilms to antibiotics when compared to planktonic cells, making them difficult to eradicate and a serious health problem. Thus, it is of utmost importance to understand and to identify the differences in the physiology and metabolic activity between planktonic and sessile cells in order to define adequate treatment strategies.
The aim of this work was the comparison of the metabolic activity of biofilms formed by 6 strains of *S. epidermidis* among them and with the corresponding planktonic cells. The biofilm biomass and cell concentration were also quantified in order to determine its influence on cell activity and if these factors are strain dependent.
Two reference strains (9142 and 9142-M10) and four clinical isolates (IE75, IE186, IE214 and LE7) were studied in this work. The biofilms were formed on acrylic squares of 2 cm x 2 cm, during eight days, in fed-batch mode. The total attached biomass was quantified by staining with crystal violet and the biofilm cell concentration was determined as CFU/ml. The metabolic activity of biofilms and cells in suspension from the same strains was evaluated through the measurement of glucose consumption along 60 minutes.
The results revealed different abilities of biofilm formation among the different *S. epidermidis* strains, with strain 9142 demonstrating a significantly ($p<0.05$) greater capacity of biofilm formation in opposition with all the remaining five strains, especially 9142-M10, IE75 and LE7, the ones with the lowest values of biofilm biomass formation. This strain variability was also confirmed with the determination of biofilm cell concentration by CFU plating. These results also evidence, together with the biomass quantification results that besides cells, that part of the total biomass is composed of extracellular matrix that may differ according with the strain.
As far as metabolic activity is concerned this study indicates that cells growing in biofilm are metabolically less active than free cells.
In conclusion, this work helps to confirm the phenotypic variability of *S. epidermidis* strains and the different pattern of behaviour between sessile and free cells. When cells are adhered to a surface, such as acrylic, they become involved in a different environment – decreased nutrient and oxygen supply, for example - from that in suspension, and this appears to have a strong influence in cells activity, leading to a decreased metabolic rate and, as a consequence, to a decreased antimicrobial susceptibility.