TITLE: Evaluation of the interaction between polymyxin B in Pseudomonas aeruginosa: Reactive oxygen species induction, calorimetry, and zeta potential analyses

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ABSTRACT:

The mechanisms of action of polymyxin B are related to bacterial lysis by disruption of the Pseudomonas aeruginosa cell membrane. In the present study, the role of endogenous reactive oxygen species (ROS) produced by polymyxin B in whole P. eruginosa cells was examined along with energy and electrical activities of these interactions. ROS were quantified in planktonic cells and those derived from P. aeruginosa P9C biofilm, and minimum inhibitory concentrations were determined by cell viability assays in response to different polymyxin B concentrations. Furthermore, isothermal titration calorimetry and zeta potential measurements were used to monitor the direct interactions between polymyxin B and whole bacterial cells. The data demonstrated that polymyxin B led to ROS formation in P. aeruginosa cells derived from biofilm and planktonic cells. Calorimetric titration showed an initial endothermic contribution, indicating participation by hydrophobic interactions, presumably during lipopolysaccharide binding. Moreover, cells derived from biofilm exhibited little change in surface electrical properties, as shown by the zeta potential, indicating that polymyxin B may neutralize the surface charges on whole cells. The generation of ROS from sub-lethal concentrations of polymyxin B may be indirectly responsible for the appearance of features that enable selection of more tolerant sub-populations. P. aeruginosa cells derived from biofilm appeared to significantly change cell surface biophysical characteristics in response to polymyxin B, as indicated by changes in electrical load and binding energy.

Keywords: *Pseudomonas aeruginosa*, calorimetry, Polymyxin B, ROS.

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