Nanomechanical Response of Bacterial Cells to Cationic Antimicrobial Peptides

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We hope to provide the usual refreshments.

ABSTRACT: We have developed an atomic force microscopy (AFM)-based creep deformation technique to measure changes to the time-dependent mechanical properties of individual Gram-negative Pseudomonas aeruginosa PAO1 cells as a function of time of exposure to two cationic peptides: polymyxin B (PMB), a cyclic antimicrobial peptide, and the structurally-related compound, polymyxin B nonapeptide (PMBN), which has a significantly lower antimicrobial activity. These measurements reveal that there is a qualitative difference in the mechanical response of the cells to PMB and PMBN, and provide an unambiguous signature for the loss of integrity of the bacterial cell envelope following exposure to either PMB or PMBN. Time-resolved creep deformation experiments revealed that PMB acts quickly, producing an abrupt change in the mechanical properties after several minutes, followed by a slow recovery by the cell. In contrast, exposure to PMBN causes a distinctive two-step change in the viscoelastic properties of the bacterial cells after exposure to the cationic peptides: an initial abrupt change due to a very fast change in the turgor pressure, and a second abrupt change at a later time that coincides with the loss of integrity of the bacterial cell envelope. These measurements on two structurally related cationic peptides provide new insight into the kinetics and mechanism of action of antimicrobial peptides on bacterial cells.

ALL ARE WELCOME!!!