Molecular Mechanisms of Interaction of Bacteriocins with Bacterial Cells Based on an Example of Acidocin M

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Bacteriocins are antimicrobial proteins or polypeptides produced by bacterial cells. Currently, they are being intensively analysed due to their potential as alternatives to chemical food preservatives or commonly used antibiotics. The main purpose of this study was to characterize the mechanism of action of acidocin M, a previously unexamined bacteriocin produced by a Lactobacillus acidophilus strain. Furthermore, it was intended to compare the similarity of acidocin M mechanism of action with another known bacteriocin, garvicin Q, and their efficacy against bacteria. Firstly, in the course of this research, by spotting the bacteriocin on a medium with applied bacteria, was proved that acidocin M has antibacterial potential directed against the Enterococcus and Listeria genera. The receptor which binds acidocin M on the bacterial surface is a four-component system transporting sugar-mannose into the cell (Man-PTS). In the model bacterial strain Lactococcus lactis IL1403, specific amino acids in Man-PTS, which are probably involved in binding of acidocin M, were identified via molecular biology methods and bioinformatic analyses. Furthermore, it has been shown that garvicin Q can interact with Man-PTS via a distinct mechanism than acidocin M. The combination of in silico modelling of the structure of the Man-PTS receptor in the cell membrane and the identification of the amino acids which bind acidocin M allow us to propose the molecular action mechanism of this bacteriocin on L. lactis cells. In result, it is hypothesized that acidocin M firstly binds to the surface part of Man-PTS's (IID) subunit, then penetrates to the second subunit (IIC) and stabilizes the open mannose channel. It causes cell death due to the leakage of intracellular substances.

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