
Lack of Induction of Direct and Cross Tolerance To Salts and Organic Acids in Enterotoxigenic *Staphylococcus aureus* After Habituation To Origanum Vulgare L. Essential Oil

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Resumo

The exposure of food-related bacteria to stressing factors during food processing can cause sublethal damage to bacterial cells and during the injury repair process these cells could acquire abilities to adapt to these stress-inducing agents, leading to impacts on food safety. *Staphylococcus aureus* is one of the most common causes of foodborne diseases worldwide, causing a intoxication through the ingestion of enterotoxins pre-formed in foods. This bacterium is capable of developing tolerance to heat, acidic pH and salts when exposed to sublethal stress conditions. The aim of this study was to assess the ability of enterotoxigenic *S. aureus* strains isolated from foods to develop direct- and cross-tolerance to sodium chloride (NaCl), potassium chloride (KCl), lactic acid (LA) and acetic acid (AA) after habituation to *Origanum vulgare* L. essential oil (OVEO). Four strains (FRI-S-6; FRI-196-3; FRI-326; ATCC 13565) producing enterotoxins A, B, D or E were used as test-organisms. The Minimum Inhibitory Concentration (MIC) to tested antimicrobial agents were determined by the microdilution method and the induction to direct- and cross-tolerance was

Referência:

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evaluated after the exposure of strains to sublethal amounts ($\frac{1}{2}$ MIC and $\frac{1}{4}$ MIC) of OVEO in Brain Heart Infusion Broth for 24, 48 and 72 hours, followed by new MIC determination. The induction of tolerance was assessed by comparing the MIC values before and after the habituation treatment. Control systems were assayed similarly. MIC values of OVEO ranged from 2.5 to 10 $\mu\text{L mL}^{-1}$; NaCl, KCl, AA and LA showed MIC values of 200 mg mL^{-1} , 300 mg mL^{-1} , 2.5 $\mu\text{L mL}^{-1}$ and 10 $\mu\text{L mL}^{-1}$, respectively, against all the assayed strains. The habituation of *S. aureus* to $\frac{1}{2}$ MIC and $\frac{1}{4}$ MIC of OVEO did not induce direct tolerance or cross-tolerance in the tested strains. Strains habituated to sublethal concentrations of OVEO maintained or increased the sensitivity to the tested stressing agents because the MIC values of OVEO, NaCl, KCl, LA and AA against the cells that were previously habituated to OVEO remained the same or decreased when compared with non-habituated cells. These data indicate that OVEO does not have an inductive effect on the acquisition of direct or cross-tolerance in the tested enterotoxigenic strains of *S. aureus* to antimicrobial agents that are typically used in food industry.

Palavras-Chave: Adaptation, Oregano, Staphylococcus, Tolerance

Agência de Fomento: