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Elucidation of the Mechanism of Action of Salt for Maintaining Microbiological Safety of Non-Heated Meat Products

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Summary

In our previous study, alkaline electrolyzed water (AlEW; pH 11.5) and strong acidic electrolyzed water (StAEW; pH 2.5) treatment on fresh chicken breasts significantly reduced the inoculated pathogens as compared with untreated controls. The pH value of the waste fluid becomes neutral (approximately pH 7.0) by continuously-mixing AlEW and StAEW, consequently, waste solutions produces NaCl. Therefore we expected that salts had inhibitory effect on bacterial adhesion to meat surfaces. First, elucidating the factors influencing the invasion of food poisoning bacteria to the meat inside by and antimicrobial effect of various salts (NaCl, KCl, $CaCl_2$ and $MgCl_2$) on fresh meat were evaluated in this study. When the skin side of meat samples dipped with 5 % NaCl solution were inoculated with 0.1 mL of *Salmonella* Enteritidis (at a level of 4～5 log CFU/skin) and stored for 24 h at 4 °C, bacteria invaded 1 cm in depth from the inoculated side of meat samples. Next, the effect of NaCl solutions (0, 1, 5 and 10%) on attachment of *Staphylococcus aureus*, *S.* Enteritidis, and *Escherichia coli* to dominant extracellular matrix (ECM) proteins: collagen I, collagen IV, fibronectin and laminin were assessed. Each strain showed significant attachment to any ECM proteins. However, NaCl solutions inhibited attachment of each bacterial strain to ECM protein in a concentration-dependent manner. We also investigated the expression of staphylococcal enterotoxin A (*sea*) and biofilm master regulator genes (*ica*D and *csg*D) after treatment with 5 % NaCl solution using real-time RT-PCR. Five present NaCl solution significantly inhibited the gene transcription of *sea* and *ica*D in *S. aureus* and *csg*D in *S.* Enteritidis, and *E. coli*. These results will assist to develop the novel control method using salts to prevent contamination of meat surfaces, for improving food safety and quality.