Biocide and antibiotic susceptibility of Salmonella isolates obtained before and after cleaning at six Danish pig slaughterhouses

Salmonella sp. continues to be one of the most important foodborne pathogens. Control measures in terms of cleaning and disinfection on food production plants are very important for limiting the risk of contaminated food products to reach the consumer. In the last decade concern has arisen that bacteria exposed to disinfectants can develop resistance toward disinfectants and can have a higher risk of developing antibiotic resistance. The objectives of this study were to examine the prevalence of biocide resistant Salmonella sp. in Danish pig slaughterhouses, to evaluate if there was a correlation between susceptibilities to biocides and antibiotics, and to examine if cleaning and disinfection select isolates with changed susceptibility toward biocides or antibiotics. Salmonella sp. was isolated from the environment in Danish pig slaughterhouses before and after cleaning and disinfection. The susceptibility toward three different biocides, triclosan and two commercial disinfection products: Desinfect Maxi, a quaternary ammonium compound, and Incimaxx DES, an acetic compound, was determined. We found no resistance toward the biocides tested, but we did find that isolates obtained after cleaning had higher minimum inhibitory concentration (MIC) values toward one of the disinfectants (Incimaxx DES) compared to isolates obtained before cleaning and disinfection. This could indicate selection of strains that are more tolerant, due to the cleaning and disinfection. Furthermore, we found that there was a weak statistical correlation between MICs toward the biocides and some antibiotics, but no difference in log(MIC)s toward antibiotics between isolates obtained before and after cleaning, nor did we find any difference in the number of resistances of isolates obtained before and after cleaning and disinfection.