

Full Length Research Paper

Microflora of biofilm on Algerian dairy processing lines: An approach to improve microbial quality of pasteurized milk

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Bacterial contamination of pasteurized milk may originate from different sources: raw milk, process equipment surfaces and packaging materials. It is hypothesized that post-pasteurization contamination along the milk processing lines is responsible of reducing shelf life of Algerian pasteurized milk. This assumption was investigated through assessment of both the microflora of biofilms in milk pipeline systems at five dairy plants of Northwestern Algeria and the effectiveness of a quaternary ammonium based compound used for the disinfection of the plant equipment. Samples were collected before and after cleaning-in-place (CIP) systems from different segments of pasteurization lines with sterile cotton swabs. Quantitative assessment showed little reduction of the total bacteria count after CIP. On the average bacterial numbers were 5.6×10^3 , 1.2×10^4 , 5.1×10^4 , 2.5×10^5 and 9.7×10^7 cfu/cm², respectively, in the different units. Phenotypic identification of isolates revealed predominance of Gram-positive bacilli belonging to *Bacillus* and notably the *Bacillus cereus* group, at maximal levels of 72 and 21% respectively. The other Gram-positive microflora included *Staphylococcus* (30%) and *Micrococcus* (10%). In contrast, the incidence of the Gram-negative bacteria was relatively low. Two genera, identified as *Pseudomonas* (9%) and *Enterobacter* (6%), were found only in two dairies. Three dairies were Gram-negative bacteria-free. That should be the result of common contamination sources or highly environmental selective pressure. Further studies have to address these hypotheses. Treatment of experimental *Bacillus cereus sensu lato* strains biofilms with a 50, 100 and 150 ppm of quaternary ammonium disinfectant, showed a significant resistance of biofilms to this product even after long exposure time (15 min). This study emphasized the importance of aerobic spore-forming bacteria in dairy-processing equipment as they are able to built recalcitrant biofilms on the inside equipment surfaces with subsequent resistance to conventional CIP system and potential transfer to pasteurized milk. Therefore, in order to reduce the contamination levels of spore-forming bacteria and improve the quality and shelf life of the product, these dairies have, besides improvement in the hygienic status of the plant equipments, also to monitor either the pasteurization process or the contamination from raw material (that is, milk powder).

Key words: Milk contamination, pasteurization, biofilm, cleaning-in-place (CIP).