

Screening for Enterotoxigenic *Staphylococcus* spp. Strains Isolated From Raw Milk and Dairy Products in R. N. Macedonia

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Abstract : Staphylococci, which are widely found in the environment, animals, humans, and food products, include *Staphylococcus aureus* (*S. aureus*), the most significant pathogenic species in this genus. The virulence and toxicity of *S. aureus* are primarily attributed to the presence of specific genes responsible for producing toxins, biofilms, invasive components, and antibiotic resistance. Staphylococcal food poisoning, caused by the production of staphylococcal enterotoxins (SEs) by these strains in food, is a common occurrence. Globally, *S. aureus* food intoxications are typically ranked as the third or fourth most prevalent foodborne intoxications. For this study, a total of 333 milk samples and 1160 dairy product samples were analyzed between 2016 and 2020. The strains were isolated and confirmed using the ISO 6888-1:1999 "Horizontal method for enumeration of coagulase-positive staphylococci." Molecular analysis of the isolates, conducted using conventional PCR, involved detecting the 23s gene of *S. aureus*, the nuc gene, the mecA gene, and 11 genes responsible for producing enterotoxins (sea, seb, sec, sed, see, seg, seh, sei, ser, sej, and sep). The 23s gene was found in 93 (75.6%) out of 123 isolates of *Staphylococcus* spp. obtained from milk. Among the 76 isolates from dairy products, either *S. aureus* or the 23s gene was detected in 49 (64.5%) of them. The mecA gene was identified in three isolates from raw milk and five isolates from cheese samples. The nuc gene was present in 98.9% of *S. aureus* strains from milk and 97.9% from dairy products. Other *Staphylococcus* strains carried the nuc gene in 26.7% of milk strains and 14.8% of dairy product strains. Genes associated with SEs production were detected in 85 (69.1%) strains from milk and 38 (50%) strains from dairy products. In this study, 10 out of the 11 SEs genes were found, with no isolates carrying the see gene. The most prevalent genes detected were seg and sei, with some isolates containing up to five different SEs genes. These findings indicate the presence of enterotoxigenic staphylococci strains in the tested samples, emphasizing the importance of implementing proper sanitation and hygienic practices, utilizing safe raw materials, and ensuring adequate handling of finished products. Continued monitoring for the presence of SEs is necessary to ensure food safety and prevent intoxication.

Keywords : dairy products, milk, Staphylococci, enterotoxins, SE genes

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