

THE INFLUENCE OF STORAGE TEMPERATURE OF CHEESE ON THE INCIDENCE OF *STAPHYLOCOCCUS AUREUS* IN SOME MARKETS IN ALBANIA

NDIKIMI I TEMPERATURES SE RUAJTJES SE DJATHIT NE INCIDENCEN E *STAPHYLOCOCCUS AUREUS* NE DISA TREGJE NE SHQIPERI

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Abstract: The aim of this study is to isolate *Staphylococcus aureus* in cheeses stored in different temperature in some markets in Albania. In these markets the cheese is stored not in the good conditions and in some cases the cheese is sold no in refrigerated temperature. This study is developed from June 2007 to June 2008. We have analyzed 176 of different cheese samples, 72 of these samples were positive with *Staphylococcus aureus*. From these 48 were samples of cheese stored in temperature $> 10^0\text{C}$ with microbiological level $10^2\text{cfu/gr} - 10^4\text{cfu/gr}$, this temperature is favourable for the production of the toxin, and 24 were samples of cheese stored in temperature $< 10^0\text{C}$ with microbiological level $10^2\text{cfu/gr} - 10^5\text{cfu/gr}$. This is due to contamination of the cheese with *Staphylococcus aureus* and its growth is favoured from the no refrigerated storage of cheeses.

Përmbledhje: Ky studim ka për qëllim të izolojë *Staphylococcus aureus* në djathra të ruajtur në temperatura të ndryshme në treg në Shqipëri. Në këto tregje kushtet në të cilat tregtohet djathi nuk janë të mira, dhe në disa raste djathi tregtohet në kushte jo frigoriferike. Studimi është zhvilluar në Qershor 2007 - Qershor 2008. Janë analizuar 176 mostra djathi të llojeve të ndryshme, 72 prej tyre janë pozitive me *Staphylococcus aureus*. Nga këto 48 janë mostra djathi të ruajtura në temperaturë $> 10^0\text{C}$ në nivelet nga $10^2\text{ cfu/gr} - 10^4\text{cfu/gr}$, temperaturë e favorshme për prodhimin e enterotoksinës, dhe 24 janë mostra djathi të ruajtura në temperaturë $< 10^0\text{C}$ në nivelet nga $10^2\text{ cfu/gr} - 10^5\text{ cfu/gr}$. Ky studim tregon për kontaminim të djathrave me *Staphylococcus aureus* dhe favorizim i zhvillimit të tij nga temperatura të larta të ruajtjes në treg.

Key words: *Staphylococcus aureus*, cheese, temperature, market.
Cuvinte cheie: *Staphylococcus aureus*, djath, temperatura, treg.

INTRODUCTION

Recently there have been more than a few reports of cheese born food infections, and food poisoning cases reported. Many such outbreaks have been associated with *Staphylococcus aureus* (WILLIAMSON et al. 2005, JORGENSEN et al. 2005, JELASTOPULU et al. 2006).

Staphylococcus aureus food poisoning is caused by ingestion of food containing preformed enterotoxins (SE). Consumption of food containing enterotoxin leads to a symptomatic illness, usually of approximately 24-h duration. Symptoms have a rapid onset and may include nausea, vomiting and diarrhea (JORGENSEN, H.J 2005, JABLONSKI and BOHACH, 1997).

The production of enterotoxin usually is associated with the multiplication of staphylococci under favourable conditions during storage of the milk or cheese.

Eighteen different SE have been described and designated SEA-SEE, SEG-SER and SEU (DINGES et al., 2000; FITZGERALD et al., 2001; JARRAUD et al., 2001; LETERTRE et al., 2003). In favourable condition, *Staphylococcus aureus* may grow and produce SE in foods, and

because the SE are stable with respect to heat and storage they may present in foods where viable *Staphylococcus aureus* are present (ZOTTOLA et al. 1993, JABLONSKI and BOHACH, 1997).

Environmental conditions such as temperature, pH, water activity, salt concentration and competing microflora influence *Staphylococcus aureus* growth and SE production (GENIGEORGIS, 1989).

The storage temperature probably is the most important factor in microbial growth. The prevalence of pathogenic microorganisms in cheese depends upon the temperatures of holding at the plant, during transport and through marketing channels (KRAMER et al., 1994, LINDQVIST et al., 2002).

In some markets in Albania the cheese is stored not in good conditions and in some cases the cheese is sold no in refrigerated temperature. The aim of this study is to isolate *Staphylococcus aureus* in cheeses stored in different temperature in these markets in Albania.

MATERIAL AND METHODS

A total of 176 cheese samples (112 soft cheeses, 64 hard cheeses) were taken and submitted for bacteriological analyses for the presence of *Staphylococcus aureus*.

The samples were randomly selected. They were packed in sterile plastic bags, placed in an isothermal container, and transported under cooling conditions (4-8°C) to the Department of Food Control at the Food Safety and Veterinary Institute, Tirana. Each product consists in 5 unit of 150gr. The same day of their arrival at laboratory, bacteriological analysis of the samples, was carried out.

To carry out the laboratory test were used International standard method as ISO method 6888. Each analytical sample, consisted of 25 g cheese, was homogenized with 225 ml Buffered Peptone Water (Merck 1.07228.0500), in a horizontal mixer type "Stomacher 400" for 2 minutes.

After are done the following dilutions with same diluent. A loopful from each dilution was streaked on Baird -Parker agar) and incubated for 48 h at 37°C respectively. After 48-hours incubation at 37°C (ISO/FDIS 2003) the suspected *S. aureus* colonies were submitted for the gram test and coagulases test and also were further identified biochemical profile, using the API 20E staph.

RESULTS AND DISCUSSIONS

We have analyzed 176 of different cheese samples, 72 of these samples were positive with *Staphylococcus aureus*. From these 48 were samples of cheese stored in temperature > 10°C, this temperature is favourable for the production of the toxin, and 24 were samples of cheese stored in temperature < 10°C. Fig.1.

In the markets of Tirana the cheese was stored in environmental condition (Temp. >10°C) and in supermarket in low temperature (<10°C). The incidence of *S. aureus* was higher in environmental condition than in law temperature. Although the temperature higher then 10°C is more favourable for the production of the toxin (Lindqvist et al., 2002) and if the microbiological level of *Staphylococcus aureus* is higher then 10⁵ cfu/g (Tiecco, et al. 1990): Jablonski and Bohach, 1997, Robinson et al. 2002) in this figure we are showing the positive samples with *Staphylococcus aureus* in chesses stored in temperature higher and lower then 10°C.

The figure 1 shows that the number of positive samples with *Staphylococcus aureus* is higher in temperature > 10°C. This temperature is the temperature in the time where the cheese is sold. From positive samples of cheese stored in temperature > 10°C the microbiological level was 10²cfu/gr - 10⁴cfu/gr, and from positive samples of cheese stored in temperature < 10°C

the microbiological level was 10^2 cfu/gr– 10^5 cfu/gr. figure 2.

The figure 2 shows that the number of positive samples with *Staphylococcus aureus* is higher in chesses stored in temperature higher then 10^0 C, but the microbiological level higher then 5 log cfu/g is in the chesses stored in temperature lower then 10^0 C. This is due to contamination of the cheese with *Staphylococcus aureus*.

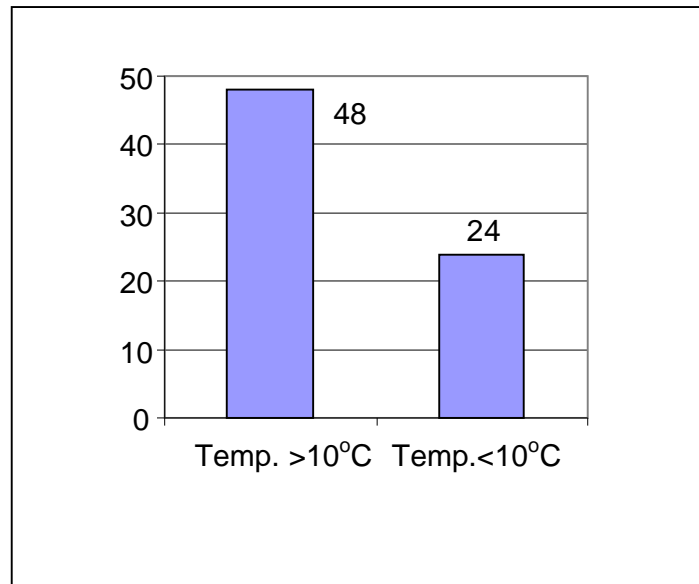


Figure 1. Incidence number of *S. aureus* in cheese stored in environmental conditions (Temp. >10°C) and in temperature (<10°C)

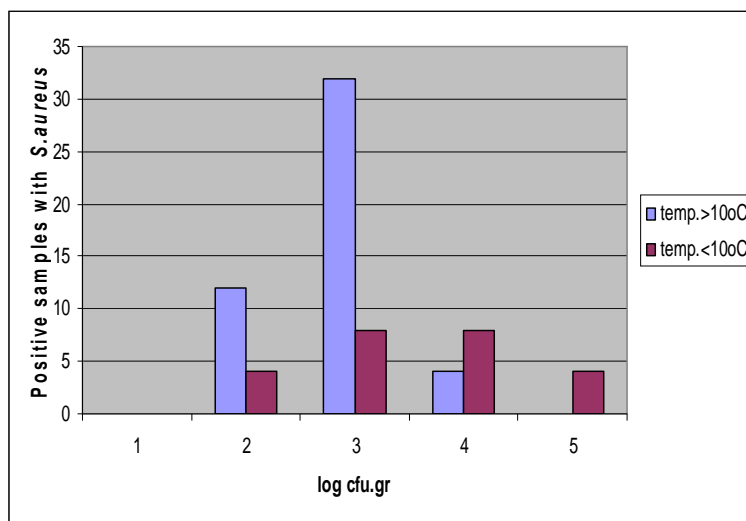


Figure 2. The microbiological level of *S.aureus* in chesses stored in temperature >10°C and <10°C

CONCLUSIONS

Growth of *Staphylococcus aureus* in food does not cause any perceptible changes in appearance, smell or taste. Because of their ability to grow at relatively low water activity (Aw) and at high NaCl concentrations, the potential for toxin production in low acid soft cheeses exist.

Therefore, good sanitation among plant workers, general sanitation in cheese plant, effective refrigeration, the use of active starters and good packaging are important in preventing *Staphylococcus aureus* related food poisoning.

Although in our study the microbiological level is lower than 5 log cfu/gr in temperature higher than 10⁰C for the production of the toxin, this does not mean that the risk does not exist. Therefore for deviation of the possible risk cheeses in these markets have to store in refrigerated condition and respective authorities have to forbid the sale of the cheese in no favourable condition.

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