

Quantitative assessment of microbial risk in processing and application of pasteurized frozen human milk

Pavel Mericka¹, Milan Houska^{2*)}, Ales Landfeld², and Pavel Cermak³

¹Charles University Hospital Hradec Kralove, Tissue Bank

²Food Research Institute Prague, Department of food engineering

³Charles University Hospital Hradec Kralove, Department of clinical microbiology
Czech Republic

*) corresponding author: tel:+420296792306, fax:+420272701983, e-mail: m.houska@vupp.cz

The raw human milk microbial contamination was studied during three years. Microbe strain detection and quantitative analysis of the concentration (CFU/g) have been done. The most frequent microbe was the *Staphylococcus epidermis* that is entering the human milk during the milk collection at homes. The second most frequent microbes found were *Acinetobacter* and *Pseudomonas aeruginosa*. Also *Staphylococcus aureus* was found randomly together with other microbes such as *Enterococcus faecium* and *Enterococcus faecalis* (former *Streptococcus faecium* and *Streptococcus faecalis*).

The processing procedures of the Milk bank of the Charles University hospital Hradec Kralove, Czech Republic are described. These procedures are given together with time-temperature history of milk from starting acceptance of the frozen milk to the final freezing. The time-temperature history of the application procedure of thawing and heating before the milk utilization at new-borne and infant departments is also given.

The pasteurized milk chilled to 15°C is filled into the smaller doses (100 ml glass beakers) in the laminar flow box within one hour. This filling procedure is necessary because of the availability of smaller doses for new-borne children. The relatively high filling temperature is also necessary for good manipulation with milk during filling and sampling (to avoid the fat crystallization). The samples of this milk are analyzed for the presence of any microbes. The results of this screening are provided. The positive samples are analyzed after freezing and thawing by quantitative microbial analysis and these results are also given.

The water activity and pH were predicted for typical samples of human milk to be able to use the tool of predictive microbiology such as Food Micromodel (Leatherhead Food Research Association, UK).

The most suspicious procedure for potential growth of survivors of mild pasteurization seems the filling of pasteurized and chilled milk at 15°C. Therefore the quantitative predictive analysis focused mainly on this part of the time-temperature history has been done. The quantitative analysis of the risk of growth of microbes during the whole time-temperature history of human milk production and application is also provided. The logarithmic ratio of initial vs final counts is given for selected microbes. These results showed that the utilized pasteurization regime is capable to decrease the initial concentration of different microbes to different levels and that the potential growth of survivors during filling procedure is not substantial to be the source of any harm. The most dangerous procedure is the utilization and application procedure (thawing, heating and serving) which is out of the control of Milk bank staff. If the prescribed safety rules of application are adhered the risk of growth of any survivor is minimized. The most important feature of the safety issue of the product is the total microbiological control of the milk. The analysis done was used for HACCP plan development and prediction of critical limits and precision of safety rules for utilization of pasteurized frozen product.