THE IMPACT OF DISINFECTANT'S CONCENTRATION AS CCP LIMIT ON SELECTED MICROBES IN DAIRY INDUSTRY

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Abstract

Cleaning and disinfection are an integrated part of every food production process, hence is addressed in every HACCP plan. The resistance of: TPC (Total aerobic plate count), E. coli, Staphylococcus aureus, Streptococcus group D, and Proteus vulgaris against different concentrations of the OXY-ANIOS 5 TC, the disinfectant used usually in the dairy industry of Beni Tamou in Algeria was performed. The resistance was performed by the isolation of above microbes, from raw milk. After isolation, the microbes were reisolated a second time to test the effect of disinfectant at concentration 1 : 1000, 1 : 10, 1%, 2% and 0.3% in 1% of acid (the concentration usually used in the dairy)Results revealed that it is a big correlation between disinfectant concentration and disinfection effect on selected microbes.

Key words*:* HACCP, disinfection, critical control points

INTRODUCTION

The milk reached in nutritive elements, present an ideal medium for microbial flora

The main aim of the food manufacturers is to produce high quality and safe foods (Ergonul and Gunç, 2004). HACCP is defined as "an effective system based on Good Manufacturing Practices (GMP) and Standard Sanitation Operation Procedures (SSOP), for providing safe and healthy foods" (Pierson and Corlett, 1992).

HACCP is an effective system because this food safety system is designed to provide the information flow for preventive and corrective actions and can easily be established on the production lines of all kinds of foods (Unnevehr and Jensen, 1998).

The HACCP program contains seven important steps which must be realised in industry in order to minimise contamination. This principals are defined on :conducting of a hazard analysis, determination the critical control points, establishment of critical limits for each HACCP, establishment of monitoring system for each CCP, establishment of a corrective actions plan, verification of the HACCP plan than establishment of record-keeping and documentation procedures (LUNING, 2002).

Cleaning and disinfection are an integral part of a food production process and therefore need to be addressed in every HACCP plan (Sande and Smeulders, 1997). The first CCP to be identified when the cleaning solution is prepared is the concentration. A too low concentration will result in insufficient cleaning and will have an additional negative impact on the disinfection step after wards (Sande and Smeulders, 1997). *Streptococcus D-group* and *E. coli* are generally more resistant to adresse conditions (salt concentration, temperature, ...). The resistance of TPC, *E .coli*, *Streptococcus D-group*, *Staphylococcus aureus*, *Proteus vulgaris* against OXY-ANIOS 5 TC used in the dairy in Algeria was performed.

MATERIALS AND METHODS

In accordance with project objectives and prof. Sovjak recommendation, the selected microbes (TPC, *Staphylococcus aureus, Streptococcus D-group, Proteus vulgaris, E. coli)* were isolated from raw tank's milk and accounted.

The pasteurized milk was examined too, and results obtained were compared to official Algerian norms.

The rinsing water was microbiologically analysed also in order to find out its microbiological quality and to estimate disinfection effect on selected microbes.

In order to assess the effect of disinfectant concentration on selected microbes, a discs of disinfectant at different concentration 1 : 1000, 1 : 10, 1%, 2% (0.3% in 1% of acid) concentration habitually used were tested against the above stated germs specie.

Raw milk and pasteurized milk have been examined in accordance with the norm ISO 6887 for preparation of dilution, norm ISO 4833 for TPC/ml (total plate aerobic count), norm ISO 4831:1991 for *E. coli*, norm ISO 6888 for *Staphylococcus aureus*, ISO:78 99-2 for *Streptococcus D-group* , ISO 4833:1991 for *Proteus vulgaris.*

RESULTS

A total of 25 samples of raw milk, pasteurized milk, rinsing water before rinsing, and after device cleaning, have been analyzed.

Raw milk was conforming to requirement on the TPC/ml of raw milk.

E. coli was present in one sample only.

Microbiological examination of pasteurized milk, showed that 12% of samples didn't complain with requirements on *Staphylococcus aureus* in pasteurized milk.

Rinsing water before rinsing:
Results showed that all samples analyzed corresponded to hygienic norms which mean that water used for rinsing is of good microbiological quality.

Rinsing water after device cleaning: all samples analysed were in conformity to hygienic norms.

Resistance test against disinfectant's concentration:
From Tables 1–4, it is obvious that it is correlation between disinfectant concentration and disinfection effect on selected microbes present in dairy isolated from raw milk.

Tab.1: Test of disinfectant concentrations against TPC

N° of dishes / concentration	1/1000	1/10	1%	2%	C.U.U
1	-	+	+	+	+
2	-	+	+	+	+
3	-	+	+	+	+
4	-	+	+	+	+

Tab.2: Test of disinfectant concentrations against *E. coli*

N° of dishes / concentration	1/1000	1/10	1%	2%	C.U.U
1	-	+	-	+	-
2	-	+	+	+	-
3	-	+	+	+	-
4	-	+	+	+	-

Tab. 3: Test of disinfectant concentrations against *Streptococcus D-group*

N° of dishes / concentration	1/1000	1/10	1%	2%	C.U.U
1	-	+	+	+	-
2	-	+	+	-	-
3	-	+	+	+	-
4	-	+	+	+	-

Tab. 4. Test of disinfectant concentrations against *Staphylococcus aureus*

N° of dishes / concentration	1/1000	1/10	1%	2%	C.U.U
1	-	+	+	+	+
2	-	+	+	+	+
3	-	+	+	+	+
4	-	+	+	+	+

Note: (C.U.U**):** concentration usually used in the dairy (0, 3% of disinfectant in 1% of acid).

It was found that *E. coli* and *Streptococcus D-group* are resistant against disinfection concentration used usually in dairy.

DISCUSSION

The dairy industry takes food safety very seriously (NDC, USA, 2004). Enumeration of bacteria in raw milk is of public health and economic importance (Brovko et al., 1999).

From the result gained, the contamination by microorganism of milk presents a serious problem if it is not controlled.

12% of pasteurized milk samples, did not complain with requirement in *Staphylococcus aureus* in milk, though microbiological analysis showed absence of *Staphylococcus aureus* in raw milk, this no correlation between microbiological, analysis of raw milk before and after pasteurization is due to recontamination of pasteurized milk, which can be occurred in the cooling section due to possible contact with raw milk, water, without elimination of possibility of disinfection process problems (low concentration, contact time, …)

The application of specific hygienic roles is required in the moment of milking, carriage, and storage of milk.

Streptococcus D-group are generally rather more resistant to address conditions (salt concentration, temperature, ...) so a non respect of disinfection process (temperature, concentration and contact time) occur development of resistance.

The test of disinfectant's discs at different concentration showed that the resistance of microbes increases by decrease of disinfectant concentration.

It means that disinfection must be applied in every HACCP plan and the indication of disinfectant use (concentration and time recommended by producer) is always CCP limit.

CONCLUSION

The resistance of selected microbes (TPC, *E. coli, Streptococcus D-group, Staphylococcus aureus, Proteus vulgaris*) to the different concentration of disinfectant used in the dairy industry in Algeria was performed.

The results revealed that it is a high correlation between concentration of disinfectant and its effect on microoragnisms.

The use of disinfectant with low concentration is causing a failure to eliminate all micro organisms which can become a biological hazard from recontamination milk.

To indicate the disinfectant concentration as CCP is important in every HACCP plan in dairy industry.

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