

RESISTANCE OF SELECTED MICROBES AGAINST DISINFECTION MEANS IN MILK INDUSTRY

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Abstract

The milk is a head-food, practically complete its composition rich in nutritive elementary necessary for growth and protection of animal and human, but also ideal media for microbial flora which multiply quickly leading for spoil of milk. Some of these microorganisms can be pathogenic for consumer, for this reason hygienic condition must be harsh and respected to assure a good quality of product and avoid the risk of contaminations for consumer. Some of this processing is disinfection of all materials used in dairy process. The assuring of a good disinfection and cleaning is very important step of production dairy chain.. From this our work was concentrated to study the resistance of bacteria which can be present in milk and pathogenic for consumer to the disinfectants used in milk process in order to try to develop the disinfection's system according to need.

Key words: dairy microbiology, disinfection, UV dairy disinfection, HACCP, cleaning

INTRODUCTION

The milk is a level-headed food, practically complete; his composition rich in nutritive elements and immunoglobulin necessary for growth and protection, so long as it constitute basic food. It constitute also, raw materials that alimentary technology transforms into by-products foods (cheese, yoghurt,...) consummate in high quantity as well by children as adults.

The milk, considering its riches in nutritive elements, constitutes an ideal media for microbial flora, which multiply quickly. The milk may be spoiled very easy if it is not treated goodly and Many of microorganisms can be pathogenic for man such as:

- Staphylococcus aureus which can elaborate toxin that can cause syndrome of common food-borne illness
- Escherichia coli O157:H7, this one is a cause of severe bloody diarrhea and abdominal cramps
- Proteus vulgaris, the responsible in diarrheic stools especially of infant
- Streptococcus Group D which is responsible of many food borne disease result of incomplete processing, poor hygiene, unpasteurized milk

To avoid problems of milk contamination and risks for consumer the condition of hygiene must be harsh from the farm starting by hygiene of animal, milking and milker to respect of hygiene during the carriage of milk from farm to the industry finished by the different process of milk's treatment and preparation to human consumption which must be complete by a series of disinfection realized on milk and materials used for this operation

Definition:

The milk destined to human's alimentation was defined in 1909 by the international congress of Fraud's repression that: « The milk is the integral product of uninterrupted milking of dairy female in good health, well fed and unexhausted. It must be collected cleanly and don't contain the colostrums. The milk with out indication of origin of animal's specie correspond to

cow milk [LARPENT J. P. 1997].

2-/Specification and classification of milk

Specification: The milk must not:

- Be coloured, don't clean or bad smelling
- Derived from animals affected by contagious diseases or mastitis
- Contain antiseptic's residue, antibiotics and pesticides or mastitis
- Coagulate at boiling filtering or thermal process of sanitation susceptible to modify the physical
- Derived from incomplete milking

Furthermore, the milk must not sustain:

- A subtraction or substitution of his nutritive components
- Treatment, other than or chemical milk's composition just if these treatments are authorized.

Classification:

Milks are classified according to the number of total germs to three categories:

- category A: less than 100.000 total germs/ml
- category B: from 100.000 to 500.000 total germs/ml
- category C: more than 500.000 to 2.000.000 total germs/ml

Milk microbiology:

Microorganism in milk

Milk is sterile at secretion in the udder but it is contaminated by bacteria even before it leaves the udder. Milk provides a favorable environment for the growth of microorganism (yeast, moulds and bacteria) particularly at temperature above 16°C;

Further infection of the milk by microorganism can take place during milking, handling, storage and other pre-processing activities.

Significance of microorganisms in milk

- Milk's microbial content designates its sanitary quality and the conditions of production.
- Bacteria in milk can cause spoilage of the product.

- Certain microorganism produce chemical changes that are desirable in the production of dairy product such as cheese, yogurt.

Spoilage microorganisms in milk

Spoilage is a term used to describe the deterioration of a food's texture, color, odor or flavor to the point where it is unappetizing or unsuitable for human consumption. Microbial spoilage of a food often involves the degradation of protein, carbohydrates and fats by the microorganisms or their enzymes.

The microorganisms which involves principally in spoilage in milk are psychrotrophic organisms. Most of them are destroyed by pasteurization temperature.

Some like *Pseudomonas fragi*, *Pseudomonas fluorescens* can produce proteolytic and lipolytic extracellular enzymes which are heat, stable and capable of causing spoilage.

Some species and strains of *Bacillus*, *Streptococcus* for example can survive pasteurization and grow at refrigeration temperatures which can cause spoilage problems.

Pathogenic microorganisms in milk

Milk production, proper handling and storage of pasteurization has decreased the threat of milk borne disease such as Hygienic tuberculosis, brucellosis and typhoid fever.

A number of food borne diseases are resulting from the ingestion of raw milk or dairy products made with milk that was not properly pasteurized or poorly handled.

It should be noted that moulds (mainly *Aspergillus*, *Penicillium*) can grow in milk and dairy products which can produce mycotoxin which can be a health hazard if conditions permits.

Tab. 1. : Bacterial types commonly associated with milk.

<i>Pseudomonas</i>	Spoilage
<i>Brucella</i>	pathogenic
<i>Enterobacteriaceae</i>	Pathogenic and spoilage
<i>Staphylococci</i>	
<i>Staphylococcus aureus</i>	Pathogenic
<i>Streptococcus</i>	
<i>S.agalactiae</i>	Pathogenic
<i>S.thermophilus</i>	Acid fermentation
<i>tionS.lactis</i>	Acid fermentation
<i>S.lactis-diacetyllic</i>	Flavour production
<i>S.cremoris</i>	Acid fermentation
<i>Leuconostoc lactis</i>	Acid fermentation
<i>Bacillus cereus</i>	Spoilage
<i>Lactobacillus</i>	
<i>L.lactis</i>	Acid production
<i>L.bulgaricus</i>	Acid production
<i>L.acidophilus</i>	Acid production
<i>Propionibacterium</i>	Acid production
<i>Mycobacterium tuberculosis</i>	Pathogenic

Disinfection means in milk process

Disinfection by U.V.

A non-chemical method of disinfection which is gaining increasing acceptance is ultraviolet (UV) disinfection.

UV kills all known food spoilage organism including bacteria, viruses, yeasts and mould.

The specific portion of UV spectrum between 200-315 nm has a strong germicidal effect (Damian Corbet, 2006) with a peak at 265nm.

Cleaning and disinfection

Cleaning represent an important step for the dairy plant. Its objective is to achieve chemical and bacteriological cleanness, it means that equipment are cleaned at first by chemical detergents followed by disinfection with disinfectants;

Cleaning in place (C.I.P)

Design of modern dairy equipment allows cleaning and disinfection without equipment's dismantling.

Rinsing water and cleaning solutions are pumped through components which were in contact with products.

Cleaning solutions are distributed to C.I.P circuit from central C.I.P station consisting of several tanks for storing of the cleaning solution (Eva Korsstrom & Matti Lampi, 2001)

The main steps of cleaning are:

- Pre –rinsing with water
- Cleaning by circulation of detergent
- Final rinsing with water
- Disinfection
- Cooling with water

Manual cleaning

This kind of cleaning is required whenever C.I.P is not possible. Floors of the production are cleaned manually and any product spills on the floor or on the outside of the equipment have to be manually flushed.

Special detergents are used in combination with low-pressure cleaners and brushes

Ceaning of milk tankers

Road tankers must be cleaned every day at the end of each collection round. Cleaning takes place in the reception area or in special cleaning solution by connecting tankers to a special cleaning system .The outside of tankers must be cleaned also daily.

Hazard analysis critical control points

The basis for the HACCP system originated from the need for safe supply for manned space flight by the NASA in 1959.The aim of HACCP was to have 100% assurance as possible that the food had a good quality level with any illness or injury.

HACCP system was presented to the general public in 1971, it was not until 1985 that the HACCP system was seriously considered for broad application in the food industry (Bouman, 1996).In Europe; it was in 1993 that European union (EU) recognised officially the HACCP system as a standard production method for food manufacturing to maintain a production control system.

In dairy production "Hazards must be defined differently in food production. Its can include reproductive failure poor forage quality, poor forage quality, poor growth rate in heifers, outbreak of infectious disease.

The HACCP program contains seven important steps which must be realised in the farm and in industry in order to minimise contamination.

Define the goal for the operation

For food manufacturing the goal is zero biological, physical and chemical contamination is given .In dairy farm the goal is to obtain in the calf barn a healthy calf, with good immunity and minimum exposure to infectious disease.

Describe the activity or operation

In food manufacturing they draw a diagram of manufacturing process and identify the points in which can occur hazards.

At a dairy, we can diagram many of the important activities which might be done daily, such as milking; weekly such as pen cleaning, annually such as corn planting or harvest.

The benefit of this approach is to allow us to focus management attention on critical issues and away from details which have no bearing on performance or are of little value establish monitoring procedures in managing future operation or activities.

Identify the potential hazard

While looking at diagram, it must be considered all the things that could happen which might lead to sub-optimal performance of that activity or pose a threat to the outcome of the process such as dystocia , postnatal infection , failure of passive transfer of the antibodies from colostrums.

Describe preventive measures

Critical control points are defined as: a point, step or procedure at which control can be applied and a hazard prevented, eliminated or reduce to an acceptable limit.

Establish critical limits

Critical limits are simply the benchmarks for performance of the preventive measure or control points .The critical limit would be whether the preventive

measure was complied with or not

Establish monitoring procedures

Instead it should be focus on monitoring the input necessary for achieving our goals.

Determine corrective actions

Occasionally any system will break down, even a HACCP system. However, in setting up the HACCP system determines what it must be done ahead of time should of part of the process fail.

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