Raw milk microbial quality : Effect on dairy products quality

Dr Valérie MICHEL
Head of Food Safety Unit

Actilait
Institut Technique du Lait et
des Produits Laitiers
La Roche sur Foron (74801)
France
www.actilait.com

Raw milk microbial quality : Effect on dairy products quality

I – Raw milk : definition, microbial quality

II – Raw milk microorganisms origin and nature

III – Effects on dairy products sanitary quality

I - Raw milk : definition

Definition of raw milk (CE 853/2004, section IX – raw milk and dairy products) :

Raw milk must come from animals:

(a) that do not show any symptoms of infectious diseases communicable to humans through milk;

(b) that are in a good general state of health, present no sign of disease that might result in the contamination of milk and, in particular, are not suffering from any infection of the genital tract with discharge, enteritis with diarrhoea and fever, or a recognisable inflammation of the udder;

(c) that do not have any udder wound likely to affect the milk;

(d) to which no unauthorised substances or products have been administered and that have not undergone illegal treatment within the meaning of Directive 96/23/EC; and

(e) in respect of which, where authorised products or substances have been administered, the withdrawal periods prescribed for these products or substances have been observed..

Main point : Milk collected from healthy animals

I - Raw milk : microbial quality

Milk microbiology : milk coming from the udder is sterile, excepted in case of udder infection

→ clinical mastitis e.g. *Escherichia coli*

→ sub-clinical mastitis e.g. *Staphylococcus aureus*

Control of somatic cell (sc) counts
→ EU specifications = 400 000 SC /ML*

Control of SCC has two advantages :
- for dairy operators = a proof of raw milk quality
- for dairy farmers = a proof of animal wellbeing (optimal milk production, no need of veterinary treatment, no milk discarded from milk collect…)

* Mean of SCC over a 3-months period, with at least an analysis each month (CE853/2004)

I - Raw milk : microbial quality

Control of somatic cell counts by farmers

By regular analysis of cows SCC (done by specialized services in France)

→ *From 2004, between 42 and 45 % of dairy cows with SCC results indicating no mastitis **

A high degree of performance achieved by :

- a monthly control of lactating cows
- informations to dairy farmers on the importance of hygiene practices and shedder conditions to maintain low SCC

→ **Importance of good quality breeding practices**

**Contrôle laitier France 2011 ; CR 0012 72 020-Institut de l'Elevage*

I - Raw milk : microbial quality

Raw milk : milk coming from the udder is sterile

Microorganisms inoculation in milk by just after its ejection from udder by different sources :

- microflora present on teat skin
- milking machine and milkers' hand
- water
- milking environment

Level of inoculation is linked to hygiene practices during milking

II - Origin and nature of microbial flora in raw milk

Animal and udders

Milking system

Animal and milking parlour environment

Water

Control of microflora level by the intensity and broadness of hygiene practices

II - Origin and nature of microbial flora in raw milk

Animal and udders

Milking machine

Maintenance of milking system
→ Annual control of machine performances (milking and washing)

Washing of udders before milking

Animal and milking parlour environment

Water

Water of good quality

Adapted and regularly cleaned breeding areas, litter cleanliness, space sufficient for each animals

Milk storage at low temperature
Minimal temperature of 6℃
(CE 853/2004)

II - Origin and nature of microbial flora in raw milk

Hygiene practices have lead to an important decrease of total bacterial count in raw milks collected in France

-1980 : total bacterial counts from 40 000 to 90 000 UFC/ mL of raw milk[1]

- 2000 : total bacterial counts from 1500 to 15 000 UFC/ml of raw milk[2]

→ Importance of these hygiene practices to control milk microbial quality

[1]: Chatelin et Richard, 1981, Le lait 61, 80-94
[2] : Michel et al, 2001, Le lait 81, 575-592

II - Origin and nature of microbial flora in raw milk

Other important point : Feed quality to prevent any animal ingestion of hazardous substances (PCB, dioxins, mycotoxins)
→ In France, regular check-up plans organised by the governmental services (DGAl)

A monitoring of milks collected by dairy factories :

Criteria with specifications :

- Somatic cell counts, total bacterial count
- Antibiotics residues of drugs used in mastitis treatment
- Checking for presence of added water

+ pathogen microorganisms or process hygien criteria according the use of raw milk

→ Milk is paid to diary farmers according to its microbial quality

II - Origin and nature of microbial flora in raw milk

Nature of raw milk microorganisms

A broad range of genus and species of microorganisms as:

1/ lactic acid bacteria and usefull cheese-making flora (role in acidification or ripening) → main part of total microflora

2/ contaminating flora, leading to spoilage

3/ adventitious flora with no effect on cheeses

4/ pathogens in case of poor hygiene practices or unkonwn mastitis

→ rare event

→ Raw milk : a living microbial product

III - Impact on milk quality of dairy products

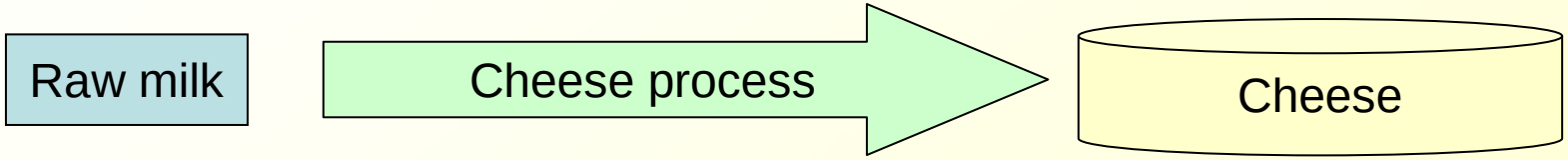
	Raw milk
	Usefull cheese making flora Adventitious flora Unwanted flora

Cheese process

Cheese

Evolution of the environment of microorganisms from milk to ripened cheese (pH, temperature, water activity, oxygen…) that lead to changes in microbial populations

III - Impact on milk quality of dairy products



When the first cheese process act = reduction of microflora by
- Pasteurisation (eg. 72℃ for 15 secondes /63℃ for 30 minutes)
- Bactofugation
- Microfiltration

→cheese process is engaged with a highly reduced level of microflora

When no treatment is performed, microorganisms of raw milk have to face the whole cheese process

→ They will develop in different ways according to cheeses technology.