Review Article

Mini review on Contribution of HACCP system in raw and fermented milk quality in small dairy industries of Burkina Faso

Savadogo Aly[1], Ouattara Cheik .A.T[1], Ilboudo A. Jules[1], Traoré Alfred. S.[1]

[1]Laboratoire de Microbiologie et de Biotechnologie
Centre de Recherche en Sciences Biologiques, Alimentaires et Nutritionnelles(CRSBAN). Département de Biochimie-Microbiologie (DBM) ; Unité de Formation et de Recherche en Sciences de la Vie et de la Terre (UFR/SVT) ; UNIVERSITE DE OUAGADOUGOU**,** 03BP 7131 BURKINA FASO.

alysavadogo@gmail.com

Short running title: HACCP system in raw and fermented milk quality in small dairy

Abstract: This paper deals with the use of HACCP and how to do it implementation in small dairy industries or companies for production of microbiologically, biochemical and chemical safe and /or high quality raw and fermented milk. In Burkina Faso small food industries become more and more important but food quality assessment methods are not know and used. Different critical control point in milk small industries were summarized and analysed. The HACCP system offers an approach to the control of hazards in all dairy food processing, food technology and properly applied, identifies areas of concern and appropriate control for improving foods quality. The study shows the need of use of HACCP, Good Hygiene Practices (GHP), Food Safety Management Systems (FSMS), Product Process technologies, Education and training of food handlers and consumers in Burkina Faso.

[Savadogo Aly, Ouattara Cheik .A.T, Ilboudo A. Jules, Traoré Alfred. S. Mini review on Contribution of HACCP system in raw and fermented milk quality in small dairy industries of Burkina. New York Science Journal 2011;4(1):83-91]. (ISSN: 1554-0200).

Keywords: HACCP; raw and fermented milk; quality, microorganisms.

1. Introduction

Milk is an essential part of the daily diet for many people in the western world and in the world in generally. It is used on our breakfast cereals, in our tea and coffee, in cooking, and as the only source of nutrition for infants for the first few months of their life. In the latter case, preferably by the mother's own supply, otherwise, infant formula produced from cow's milk (Peter, 2006). Milk quality control has been practiced and performed since many years ago (IDF, 1991a; IDF, 1991b ; Henson et al. 1999a; Henson et al., 1999b; Roberto et al., 2006; Tamine, 2008).

Raising activity is omnipresent in all regions of Burkina Faso and to the level of all farming households of Burkina. It occupies a place of choice for an activity that was not the subject of meaningful investments practically, is the expression of an incontestable potential that the country conceals in matters of animal productions. In spite of the difficulties that this sector meets, bound as well to the elevated animals that to the environmental and technical conditions in which they are driven and exploited.

The economy of Burkina Faso essentially rests on agriculture and the raising that represent about 40% of the Product Interior Brut, 86.6% of the exports of the country and use more than 85% of the population. In 2003, according to the results of the National investigation on the Strengths of the livestock, the livestock of Burkina was estimated to 7 311 544 of bovine, 6702640 of ovine and 10035687 of caprins biggest part of the national productions is to carry to the credit of the "small companies" holders an extensive raising system. These systems generate indeed close to 90% of the total production of meat (out game) and 95% of the milk production.

Small food companies have often difficulties (Panisello and Quantic, 2001; Soriano et al., 2002; Vela, Fernadez, 2003; Bas et al., 2006) to enter or in addressing national and international legislation on food safety and Quality (lack of technical trained personnel, human resource constraints, lack of expertise and/or technical support, economical constraints). In general HACCP is considered as indispensable prerequisite system should a food producer wish his products to enter or recognize by international market (Buchanan and Whiting, 1998; NACMC, 1998; Adam, 2000; Wallace and Williams, 2001; Ramirez and Martin, 2003; Walker et al., 2003; Bas et al., 2006). Since pathogens incidence are still

increasing in food , developments of food process control giving best hygienic products to all consumer become a urgent task for all food industries business promoters or governments (World Health Organisation,1999; Tamine et al.,2002) . HACCP is a systematic approach to the identification, evaluation and control of Hazards (biological, physical and chemical) in particular food operation (Codex Alimentarus Commissions, 1997). The HACCP concept has been proposed as strategy to address all products and process. This fact contributes to improve the welfare and public health (Cullor, 1997; World Health Organisation, 1999).

This study aims to improvement the milk and its products quality in Burkina Faso by the application of method HACCP (give to the consumers fermented milk of nutritional and medical good quality , ensure microbiological and physico-chemical quality dairy products , control technologies of the dairy products , develop the sector of the dairy products).

2. Milk production in Burkina Faso

Burkina Faso counts a bovine livestock estimated to 73115544, the import of milk in 2002 was estimated to 3 billions 176 million FCFA. Milk produced in Burkina was estimated of 180 million liters according to the study IEPC, study carried out between April 2002 and January 2004 against 130 millions. There exists about fifty mini-dairies in Burkina Faso, of which a score around the Ouagadougou capital. Some dairies of the country process milk produced locally, but also of dried milk imported and "reconstituted". In Ouagadougou capital of Burkina Faso, one finds good about thirty yoghourt marks manufactured by the mini-dairies of the place. Burkina Faso imports about 10 billions of FCFA of dairy products and a potential important of development of the local dairy products exists if it is possible to assure the quality to competitive prices. The consumers appreciate the cool milk and they are ready to pay for a little dearer the cool milk-based products if quality was assured. The different stages and dangers of the milk production in Burkina are presented in the Table 1 and in the Figure 1. The Table 2 summarizes critical points, critical Risks and limits Critical Point, Risks Critical limits in small dairy industries of Burkina.

2.1The collection, the storage and the distribution of milk in small dairy industries or companies of Burkina Faso.

The collection of milk is more or less a circuit complex (intermediate and professional collectors) and takes place to the level of the breeder or the among the owners of farms; it gets used more or less to rays varied. Milk is collected in bulk in cans. The collectors are in charge of the purchase of the cool milk among the producers (breeder, farmers) to escort it by dairies. The collectors use the bicycles or motorcycles for the transportation of milks collected. This fact leads to long time of transportation and elevation of milk temperature.

2.2 To the level of the distribution

The local distribution poses problem, because most boutiques don't have means of conservation of the cool products. This inconvenience is in part shaped by the dairy that aims, among others, the market of Ouagadougou. Once besides, the dairy won't benefit the local distributors.

2.3 Milk consummation in Burkina Faso

To the level of the consumers: The food habits of the consumers don't have, until our investigation (and the one of the survey office), been studied not again in the region. The dairy products imported, little dear and of comfortable conservation, take back the hand loud the palm of the products the more clear soups. However, the cool milk and yogurt, all two traditional, are also strong appreciated. These two products would represent an interesting outlet for the dairy, if on top of it they are distributed extensively in the region and that the prices are competitive**.**

The consumption of bad quality dairy products puts in danger the health of the consumers. The setting up of a quality politics in the enterprises like HACCP, even smallest, is therefore a priority in terms of public health.

The prevalence of the tuberculosis and the bovine brucellosis in Burkina Faso as in of other West African countries, impose a big vigilance on the processes of transformation admissible for milk. Milk is a media particularly favourable to the development of the micro-organisms, notably the *Bacillus cereus, Listeria monocytogenes*, *Yersinia enterocolitica*, *Salmonella typhimurium*, *Escherichia coli* O157, susceptible to provoke serious food toxi-infections. The dairy transformation requires the respect of a strict hygiene all along all the chain of transformation. According of this fact HACCP implementation needed and some advantages bound to the application of the HACCP system in the small dairy industries are: milk produced or collected is good quality, the prevention foreseen in the HACCP is very important to avoid the contamination of milk, improvement in the process and efficacy in the whole chain of milk production, reduction of the production costs and better health of the whole personal, better health of the cows producers.

3. Raw milk hygiene

Raw milk quality depends of the producer animal health, the animal feeding. We can have Biological hazards (pathogenic microorganisms),

Chemical hazards (antibiotics, aflatoxins and others chemical substances), Physical hazards (extraneous material). *Staphylococcus aureus* and *E. coli* were the most common pathogens causing both clinical and subclinical mastitis. Mastitis can be caused when the micro flora associated with this condition enter the udder usually through the duct at the teat tip. *S. aureus* in particular is able to colonise the duct itself and other typical micro flora includes *Staphylococcus aureus*, *Streptomyces agalactiae*, *Streptococcus uberis*, and *E. coli*.

Chemical hazards of raw milk (Pb, As, Se, F, Hg, Mb, Cu), substances from toxic plants (*Phlalaris minor*, *Melilotus alba*), Aflatoxins M1 and M2 (animals feed with cereals and silage contamined by *Aspergillus flavus* and *Aspergillus parasiticus* (Applebaum et al., 1982).

Raw milk hygiene (Table 1) must follow many steps (production, processing, manufacturing and handling). Also hygienic practices for milk and milk products should be implemented following the Annex to the *Codex Recommended International Code of Practice – General Principles of Food Hygiene* (IDF/FAO, 2004).

Table 1. Identification of the Dangers sources and reasons at different levels of production in small dairy industries of Burkina for HACCP application

At the level of the Farm (or in the industries)		**During Transportation (product distribution)**		**Products collection center**	
The Dangers can come	The reasons of these dangers	The dangers can come:	The reasons of these dangers	The Dangers can come	The reasons of these dangers
1.fecal contamination (E. coli, Salmonella, Clostridium) 2. contamination by the germs of the environment (Listeria, Pseudomonas) , the Enterobacteria and yeasts 3. multiplication of the bacteria on the material 4. the proteolysis , lipolyse and rancissement of the raw milk	1.tranmission of the microorganisms by the milker's hands 2. contamination by the animal at the time of the bill 3. let milk at the free air during the bill 4. cleaning and decontamination inefficient of the material and/or bad drying 5.animal healthy carriers (*Mycobacterium*, *Brucella*), animals affected by mammite (*Staphylococcus*, *E.coli*), the men (Staphylococcus, Streptococcus) and the environment (*Listeria*)	1. growth of the microbial flora 2. contamination of the material 3. transportation conditions (temperature)	1. time of too long transportation, has the temperature too elevated 2. cleaning and decontamination inefficient of the material and/or bad drying 3.	1. crossed contamination; human contamination; contamination by germs of the environment 2. development of the psychrotrophe flora (synthesis of enzymes proteolytic thermostables); the development of the coliforms flora	1. inefficient cleaning and decontamination 2. material; absence or bad quality of control of the quality of milks before mixture 3. contacts hands milk at the time of the withdrawals 4. use of water contaminated for the cleaning of the material 5. temperature of the tanks refrigerated controlled badly and too long storage length 6. absence of refrigeration

4. Milk Microbiology

Milk is a highly perishable due to it composition that is ideal for the growth of spoilage microorganisms including those cause food poisoning and for enzymatic changes such as those that cause rancity in milk fat (Jay, 1992; Van den berg, 1988).

Microorganisms cause milk spoilage: coliforms, yeast and mould, *Pseudomonas fluorescens, Pseudomonas fragi* can produce proteolytic and lipolytic extracellular enzymes which are heat stable and capable of causing spoilage.

Microorganisms pathogens generally occur in milk: *Staphylococcus aureus, Staphylococcus intermedius, Mycobacterium tuberculosis, Mycobacterium bovis, Brucella melitensis, Brucella abortus, Bacillus cereus, Listeria monocytogenes, Yersinia enterocolitica, Salmonella typhimurium, Escherichia coli* O157:H7, *Campylobacter jejuni* (Mantis, 1985; Skovgaard, 1990; Teuber, 1992). Toxigenic species of fungi are often met in milk: *Aspergillus, Fusarium, Acremonium, Phomopsis.*

The enterococci involved either originates from environmental contamination or from raw milk and may well survive mild heat treatments (Garcia-Armesto et al., 1993). Enterococci (especially *Enterococcus faecium* and *Enterococcus faecalis)* are part of the natural microbiota of the ruminal ecosystem both in wild and domestic ruminants (Laukovd, 1996), and they are released in large numbers in faeces, from where they may contaminate the udder and the milk.

The presence of *E. coli* and *Enterobacter* species in the samples also indicates that they are likely to contain other enterobacteriaceae, as the presence of *E. coli* in foods is an indication of faecal contamination of products.

The presence of *Aspergillus flavus,* in the product might probably make its consumption hazardous to health. Some strains of *A. flavus* produce Aflatoxin, a potent toxin that has been implicated in Hepatoxin and Cancer in mammals including man (Frazier and Westhoff, 1978).

The contaminating organisms could also be through air microflora which sticks to the smoothening stick, calabash spoons and bowls used for the sale of the products due to traditional process method. Moreover, normal human flora of the customers could also serve as contaminants especially when one bowl is used for mixing the product for all customers without cleaning between uses.

The major producers should be educated on sanitary practices during milking of cows and further processing (Soriano et al., 2002; Reij, Den Aantrekker, 2004). The use of portable clean water should be encouraged. The calabash spoon and smoothening stick should always be kept clean and protected from houseflies, while the beverage could also be packed in polythene sachets. Also, more than one calabash cup should be used to serve the consumers and these must always be kept clean to avoid contamination.

4.1 Beneficial Microorganisms in milk (Lactic acid bacteria)

Probiotics: By definition, probiotics are a mono or mixed culture of live microorganisms which, when applied to animal or man, beneficially affect the host by improving the properties of the indigenous flora (Havenaar et al., 1992). Suggested functional effects contributed by probiotics include: inhibition of pathogenic microorganisms, strengthening of the gut mucosal barrier, antimutagenic and anticarcinogenic activities, stimulation of the immune system and lowering of blood cholesterol levels (Fuller, 1989; Holzapfel et al., 1998; Pool zobel et al., 1993; Salminen et al., 1993; Salminen et al., 1996). Most probiotic strains are of intestinal origin and belong to the genera *Bifidobacterium* and *Lactobacillus. Enterococci*, as natural inhabitants of the human gastrointestinal system, are also used occasionally as probiotics.

One special benefit of the presence of enterococci in cheeses is that such strains also may have bactertocin activity. Bacteriocins are antimicrobial peptides (small proteins) which can inhibit the growth of related strains, including some food pathogenic bacteria (Klaenhammer, 1993). Because of this antimicrobial activity towards some foodborne pathogens, bacteriocins are often considered as natural preservatives.

5. Fermented Milk Production

Fermented milks are acidified or soured milks produced by the natural fermentation of milk sugar (lactose) to lactic acid or by addition to a starter culture. In the countries in development, the major part of milk is transformed by small units and the program of the Division of the production and health animal offers an aid and of the advice to the various regions on the techniques of transformation of the milk of consumption and the traditional dairy products coming from various animal species.

The addition of value is another aspect important of the transformation of milk and contributes to increase the incomes of the agriculturists, the food security and the activities of merchandising in the communities.

Traditionally in Burkina Faso, milk is curdled naturally to the free air thanks to the lactic ferments contents in milk and the ambient air. These ferments encrust in the porosities of the calabashes dragging curdled milk after the bill. This method of manufacture is adapted for the domestic transformation or to very small scale with a very fast consumption of the product. From the

moment one wishes to market its production by an urban clientele, it agrees to use the technologies permitting to increase the productivity, to master fermentation and therefore the final features of the product (notably the taste) while guaranteeing the sanitary quality of the products. *Lactobacillus* sp. is a *lactic* acid bacterium probably involved in fermentation of the product.

6. Yoghurt

Yoghurt is defined by *Codex Alimentarius* as a coagulated milk product obtained by lactic acid fermentation through the action of *Lactobacillus bulgaricus* and *Streptococcus thermophilus* from milk and milk products. Microorganisms in the final product must be viable and abundant.

Yogurt and curdled milk are milks fermented the more consumed. This fermentation drives to the hold in mass of milk. The gotten coagulum is firm, without exudation of lactoserum. It can be consumed in the state or after brewing giving him a creamy or liquid consistence. It can also be frozen and clear soup like an ice but one cannot consider this product anymore as yogurt. With the evolution of the food styles and the conditions of life in city, yogurt is appreciated very by the urban consumers in West Africa, notably the young.

7. Sources of contamination in small dairy industries of Burkina Faso

Milk is essentially sterile at the point of production. Problems occur if the animal is diseased, or poor hygienic practices are employed on the farm. Milk can become contaminated from an infected udder, utensils, environnement dust.

It has been suggested that the milking parlour equipment is responsible, actually pushing the bacteria into the teat. Once into the milk in this way, bacterial numbers will rise through multiplication in the collection chain.

Microorganisms are found everywhere on animal, people, in air, soil, water (Table 1). The main sources of contamination in raw milk are: surface such as udder, utensils, and hands.

Personal hygiene, Personal illness, cleanliness must be controlled.

People known or suspected to be suffering from illness (such as diarrhoea, fever, discharges from ear, eye or nose), likely to be transmitted through food are not allowed to handle food or enter in processing area, or handle utensils or materials.

Big steps requiring a control and a checking: the cows producers of milk (their health, their habitat, their food), Hygiene of the draft (material, personnel of the draft), the personnel (formation to Good Hygiene Practice), Hygiene of the collection, transport, the reception, the conservation of milk.

Here we gave some reasons or explanations which can be given about milk contamination in two phases (Phase 1 and Phase 2).

Phase 1: At the level of producers

The dangers can come from: the crossed contamination; the re-contamination by germs of the environment; the persistence of the microorganisms.

The reasons of these dangers can be due: to the absence or to the bad quality of control of the quality of milk before transformation; the bad hygiene of the conditioning; to the absence of thermal treatments, or badly achieved treatments (non respect of the time and temperature during the treatments).

Phase 2: At the level of the consumers

The dangers can come from: the food Toxi-Infections (diarrhea, listeriosis); of the Tuberculosis, of the Brucellosis; of the bad conservation of milk during milk collection and storage.

The reasons of these dangers can be due: to the consumption of raw milk contaminated; to the bad quality (fragility) of the containing, temperature and length of conservation too elevated

8. HACCP contribution to the quality and security in small dairies industries

HACCP system has been applied in food industry since 1971 in the developing countries. HACCP is a hazard management approach to preventive quality assurance. It is a tool that identifies specific hazard, evaluates their significance and specifies control measures that eliminate or reduce hazards to an acceptable level.

The benefits of HACCP implementation are:

Complements other quality management systems; Enhance food safety; Better use of resources ; Improved productivity and quality; Provides more security than inspections, reduced inspection rates; More timely response to problems; Increased cooperation in international trade.

There are seven principles to HACCP: Analyze hazards, Determine CCPs, Establish critical limits, Establish monitoring procedures, Establish deviation procedures, Establish verification procedures, Establish record keeping procedures.

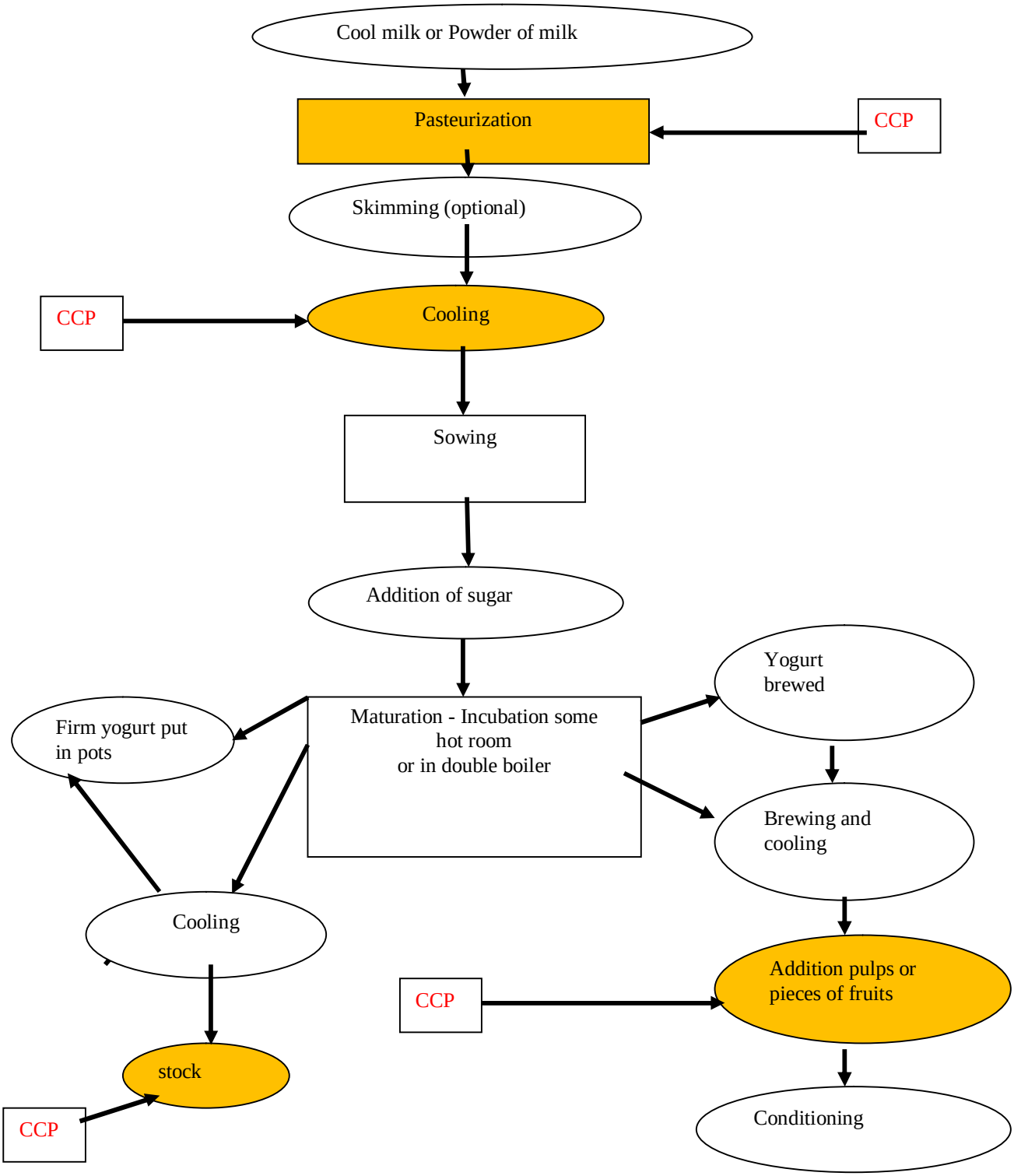

Figure 1. **Diagram of Yogurt manufacture in Burkina and CCP**

8.1 Role and Importance of HACCP

HACCP principles should be followed:

- Analysis of the potential food hazards in the food business operation and technology;
- Identification of the operational steps where hazards may occur during the process;
- Determination of different points critical to food safety;
- Definition and implementation of effective control and monitoring procedures at those critical points;
- Periodical review, and whenever the food business operations change, of the analysis of food hazards, critical control points and the control and monitoring procedures.

8.2 Application of HACCP in small dairy industries

HACCP application, critical points, critical Risks and limits Critical Point, Risks Critical limits and CCP determination were given in Table 2 and Figure 1.

The Identification of the Dangers sources and reasons at different levels of production in small dairy industries for HACCP application are made in Table 1.

Food quality can be enhanced by Good Hygiene Practices (GHP), Food Safety Management Systems (FSMS), Product Process technologies, Education and training of food handlers and consumers.

ISO 9000 is a self-regulation standard within food industry to assure food quality (Henson and Caswell, 1999).

Food Control aimed to improve good hygiene practices, food safety management systems reinforcement, consumers education and training level.

Table 2. Critical points, critical Risks and limits Critical Point, Risks Critical limits in small dairy industries of Burkina Faso

Critical Points	**Risks**	**Critical limits**
1. Bill of cows Treated	Chemical: Pharmaceutical products *Exemples*: antibiotics and others drugs	Critical limit Negative result of a test.
2. Milk Cooling and storage	Biological : Pathogenic bacteria *Examples : Bacillus cereus, Listeria monocytogenes, Yersinia enterocolitica, Salmonella* spp., *Escherichia coli* O157:H7, *Campylobacter jejuni* Physical-any physical hazards	Critical limit 1st draft: 1°C with 4°C in the two hours following the draft. Subsequent drafts: temperature not exceeding never 10°C and dropping between 1°C and 4°C. Physical hazards: Prerequisite Program needed in place to prevent contamination
3. Forwarding of the animals	Chemical: Pharmaceutical products, pesticides, produced biological	Negative result of a test. Physics: Broken needles Tolerance zero or transmission (Prerequisite Program needed in place to prevent contamination).

9. Conclusion

All potential dangers that could threaten the consumer's health or the quality bargains the finished products, following a bad quality of the raw milk, or to a failing during the manufacture or during the storage, have been identified by the HACCP system. In the dairy industry, the insurance of the quality, it is the business of all. The quality and the healthiness of milk are verified after the bill by the producer, before even the picking by the carrier and the discharge at the transformer.

In the dairy sector, the main key of success consists in producing milk in good conditions of hygiene.

Milk being a very perishable commodity, it is essential to apply good practices of hygiene and to have a system efficient of collection and transportation.

Milk, when it comes out of a healthy udder, contains very few bacteria and the system of natural defenses that he/it contains prevent that the number of bacteria doesn't increase a sensitive manner during the three or four first hours, to ambient temperature. Cooling milk to 4°C during this phase permits to keep the initial quality of it and constitute the best method to guarantee the quality of it, to the transformation and to the consumption. It is not always possible to apply this method in the countries in development and several other options have been studied to make lower the

temperature and/or to delay the reproduction of the harmful organisms.

Corresponding Author:
Dr Savadogo Aly,
Laboratoire de Microbiologie et de Biotechnologie Centre de Recherche en Sciences Biologiques, Alimentaires et Nutritionnelles(CRSBAN). Département de Biochimie-Microbiologie (DBM) ; Unité de Formation et de Recherche en Sciences de la Vie et de la Terre (UFR/SVT) ; UNIVERSITE DE OUAGADOUGOU, 03BP 7131 BURKINA FASO.
E-mail:aly.savadogo@univ-ouaga.bf ,
alysavadogo@gmail.com

References

1. Adams C. HACCP applications in the foodservice industry. Journal of the Association of Food and Drug Officials 2000; 94 (4): 22–25.
2. Applebaum RS, Brackett RE, Wiseman DW, Marth EH. Responses of dairy cows to dietary aflatoxin: Feed intake and yield, toxin content and quality of milk of cows treated with pure and impure aflatoxin. Journal of Dairy Science 1982; 65: 1503-1508.
3. Bas M , Ersun A O , KÂvanç G. Implementation of HACCP and prerequisite programs in food businesses in Turkey. Food Control 2006; 17: 118–126.
4. Buchana RL, Whiting RC. Risk assessment: a means for linking HACCP plans and public health. Journal of Food Protection 1998; 61(11): 1531-1534.
5. Codex Alimentarus Commissions. Hazard Analysis and Critical Control Point (HACCP) system and guidelines for its application (2nd ed). In FAO/WHO (Eds). General requirements (Food hygiene) supplement to vol. 1B, 1997 ; 33-45.
6. Cullor J.S. HACCP (hazard analysis critical control points): is it coming to the dairy? Journal of Dairy Science 1997; 80(12): 3449-3452.
7. Frazier WC Westhoff DC. Food Microbiology. McGraw-Hill, New York, 1978.
8. Fuller R. Probiotics in man and animals. Journal of Applied Bacteriology 1989; 66(5): 365-378.
9. Garcia-Armesto MR, Prieto M, Alonso C, Garcia-Lopez M L, Garcia-Fernández MC, Otero A. Numerical taxonomy of psychrotrophic bacteria isolated from raw ewe's milk. Journal of Dairy Research 1993; 60: 371-383.
10. Havenaar R, Brink BT, Huis in't. Veld J H J. Selection of strains for probiotic use. In Fuller R, (Eds). Probiotics : The Scientific Basis, ch. 2. 1992; 209–224. Chapman & Hall, London.
11. Henson SJ, Caswell J. Food safety regulation: an overview of contemporary issues. Food Policy 1999; 24(6): 589–603.
12. Henson S, Holt G, Northen J. Costs and benefits of implementing HACCP in the UK dairy processing sector. In Unnevehr L J (Ed.), The economics of HACCP: costs and benefits, Eagen Press, Minnesota, USA, 1999a; 347–364.
13. Henson S J, Holt G, Northen J.. Cost and benefits of implementing HACCP in the UK dairy processing sector. Food Control 1999b; 10(2): 99–106.
14. Holzapfel WH, Haberer P, Snel J, Schillinger U, Huis in 'T Veld JHJ. Overview of gut flora and probiotics. International Journal of Food Microbiology 1998; 41: 85-101.
15. IDF/FAO. Guide to Good Dairy Farming Practice. Food and Agriculture Organization of the United Nations, Rome and International Dairy Federation, Brussels, 2004.
16. IDF. Methods for assessing the bacteriological quality of raw milk from farm. Bulletin no. 256/1991, International Dairy Federation (IDF), Brussels, 1991a.
17. IDF. Detection and confirmation of inhibitors in milk and milk products. Bulletin no. 258/1991, 2nd edn, International Dairy Federation (IDF), Brussels, 1991b.
18. Jay JM. Intrinsic and extrinsic parameters of foods that affect microbial growth. In Modern Food Microbiology , CBS Publishers & Distributors, New Delhi, 1992; 237.
19. Klaenhammer TR. Genetics of bacteriocins produced by lactic acid bacteria. FEMS Microbiology Review 1993; 12: 39-86.
20. Laukovd A. Enterococci associated with the rumen of different ruminants. Biomedecine Letter 1996; 54 (213): 27-30.
21. Mantis A I. Hygiene problems of goat's and shep's milk and their products. Report of International seminar on production and profitability of Dairy products. Athens (Greece), 1985.
22. NACMCF. Hazard Analysis and Critical Control Point principles and application guideline. Journal of Food protection 1998; 61(9): 1246-1259.
23. Panisello PJ, Quantick P C. Technical barriers to hazard analysis critical control point (HACCP). Food Control 2001; 12(3): 165–173.
24. Peter W. On farm HACCP for milk production. Dowloaded from http:www.Milkproduction.com, 2006.
25. Pool Zobel BL, Bertram B, Knoll M, Lambertz R, Neudecker C, Schillinger U, Schmezer P, Holzapfel WH. Antigenotoxic properties of lactic acid *bacteria in vivo* in the gastrointestinal tract of rats. Nutrition Canada 1993; 20: 271-281.

26. Ramirez Vela A, Martin Fernandez T. Barriers of the implementation of HACCP plans : results from a spanish regional survey. Food Control 2003; 14(5): 333-337.
27. Reij MW, Den Aantrekker ED. ILSI Europe Risk Analysis in Microbiology Task Force: Recontamination as a source of pathogens in processed foods. International Journal of Food Microbiology 2004; 91(1): 1–11.
28. Roberto CD, Brandäo SCC, da Silva CAB. Costs and investments of implementing and maintaining HACCP in a pasteurized milk plant. Food Control 2006; 17(8): 599–603.
29. Rodriguez E. Characterization of the lactic acid bacteria in artisanal dairy products. International Dairy Research 1997; 64(3): 409-421.
30. Salminen S, Deighton M, Gorbach S. Lactic acid bacteria in health and disease. In Lactic Acid Bacteria. Marcell Dekker Inc, New York (USA), 1993; 199-225,
31. Salminen S, Isolauri F, Salminen E. Clinical uses of probiotics for stabilizing the gut mucosal barrier: Successful strains for future challenges. Antonie van Leeuwenhoek 1996; 70 (2-4): 347-358.
32. Skovgaard N. Facts and treends in microbial contamination of dairy products. Bull. of the IDF 1990; 250: 31-33.
33. Soriano JM, Rico H, Molto JC, Manes J. Effect of introduction of HACCP on the microbial quality of some restaurant meals. Food Control 2002; 13(4-5): 253–261.
34. Tamime AY, Robinson RK, Wszolek M. Microbiology of Fermented Milks. In Robinson, R.K. (Eds). Dairy Microbiology Handbook, 3rd ed. Wiley-Interscience, New York (USA), 2002; 367-430.
35. Tamime AY. Milk Processing and Quality Management. Wiley Blackwell 2008.
36. Teuber M. Microbiological problems facing the dairy industry. Bulletin of the IDF, 1992; 276: 6-9.
37. Van den berg JCT. Dairy technology in the tropics and subtropics. Pudoc, Wageningen, 1988.
38. Vela A R, Fernandez J M . Barrier for the developing and implementation of HACCP plans: Results from a Spanish regional survey. Food Control 2003 ; 14(5): 333–337.
39. Walker E, Pritchard C , Forsythe S. Hazard analysis critical control point and prerequisite implementation in small and medium size food businesses. Food Control 2003, 14(3): 169–174.
40. Wallace C, Williams T. Pre-requisites: A help or a hindrance to HACCP. *Food* Control 2001; 12(12): 235–240.
41. World Health OrganisationStrategies for implementing HACCP in small and/or Less developed Business. WHO/SDE/PHE/FOS/99.7, 1999; Available at http://www.who.int/fsf.