

PROCESS DIAGRAM OF DAIRY FARMS FROM SOUTHEAST BRAZIL: A STEP TO APPROACH FOOD SAFETY AT THE FARM LEVEL

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Abstract

This study was designed to evaluate the process of milk production in dairy farms, in order to identify biological and chemical hazards and the corresponding points of control. A survey was conducted on 48 dairy farms to obtain data on biosecurity aspects, feeding and milking management, labour, calving and calf raising, milking and storage equipment, and disease treatments. Milk production (litres/day) ranged from 120 to 1,700 and the number of lactating cows ranged from 12 to 240. Cows were kept on pasture (83%), housed in free-stall (4%) or in a mixed system (13%). Pipeline and bucket milking machine systems were used in 27 (56%) and 21 (44%) herds, respectively. Uniformity in management practices among the herds was observed in relation to the dry cow period, management of cows before calving, selling or culling of male calves, separation of lactating and dry cows and joint disposal of organic and cleaning materials from the milking parlor and milk storage room. Differences were observed in relation to the management and housing of female calves and heifers; using of calves to stimulate milk let down; feeding cows during milking; hygiene procedures before and during milking; and supply and quality of water. The majority of the herds were tested for tuberculosis (71%) and brucellosis (81%) and vaccinated against brucellosis (96%). The average BMSCC of all herds was 533,000/ml. According to SCC the herds were classified as follows: $\leq 400,000$ /ml (40%), 401,000-1,000,000 (55%) and $> 1,000,000$ (5%). A diversity of processes was recognized and general flow diagrams of all farms were elaborated. Currently, a more detailed description of each step of the production process is being obtained and laboratory analyses are being conducted to identify biological and chemical hazards.

INTRODUCTION

Consumers are increasingly concerned about food pathogens, chemical residues and other undesirable substances (e.g. aflatoxins, antibiotics and hormones) in milk and dairy products as well as other animal products (Applebaum et al. 1982; Boor, 1997; Blaha 1999). Bacterial pathogens such as *Listeria monocytogenes*, *Salmonella* spp and *Yersinia* spp share a common source, raw milk, and have been linked with foodborne disease world-wide (Donnelly 1990). Good husbandry practices and HACCP (hazard and analysis and critical control point) can be applied to animal health care in the primary production and for assuring milk safety in dairy operations (Heeschen et al., 1997). The HACCP identifies specific hazards and measures for their control to ensure the safety of food. A detailed operation of the process of milk production is an essential step to be fulfilled in order to establish an HACCP system. This study was designed to evaluate the process of milk production in dairy farms, in order to identify biological and chemical hazards and the corresponding points of control.

MATERIALS AND METHODS

The study included 48 dairy farms, located in Southeast Brazil. A survey was conducted to obtain data on biosecurity aspects, feeding and milking management, labour, calving and calf raising, milking and storage equipment, and disease treatments. Special emphasis was put on the use of veterinary drugs and hygiene procedures. The farms were selected based on a 12-month retrospective analysis of the bulk milk somatic cell count (BMSCC) data, adoption of machine milking and their location in relation to the laboratory. The questionnaire and the model used to construct the dairy farm process diagrams were based on Noordhuizen et al. (1997).

RESULTS AND DISCUSSION

The breed composition of the 48 herds was as follows: crossbred (Holstein-Friesian x Zebu) (69%), Holstein-Friesian (21%), Jersey (8%), and Brown Swiss (2%). Milk production (litres/day) ranged from 120 to 1,700 and the number of lactating cows ranged from 12 to 240. Cows were kept on pasture (40 farms, 83%), housed in free-stall (2 farms, 4%) or in a mixed system (6 farms, 13%). Pipeline and bucket milking machines were used in 27 (56%) and 21 (44%) herds, respectively. Uniformity in management practices among the herds was observed in relation to: (a) the dry cow period (around 60 days), (b) management of cows one to two weeks before calving, (c) selling or culling of male calves, (d) separation of lactating and dry cows and (e) joint disposal of organic and cleaning materials from the milking parlour and milk storage room.

Marked differences were observed concerning the management and housing of female calves and heifers, using of calves to stimulate milk let down, feeding cows during milking, hygiene procedures before and during milking, and source and quality of water. Most herds were tested for tuberculosis (71%) and brucellosis (81%). The average BMSCC of all herds was 533,000/ml. According to BMSCC they were classified as follows: $\leq 400,000$ /ml (40%), 401,000-1,000,000 (55%) and $> 1,000,000$ (5%). Routine procedures for mastitis control and hygiene conditions of the milking parlor, equipment and other conditions are presented in Table 1. The results obtained point out the need to implement good farming practices in these herds as a first step to implement an HACCP system.

A diversity of processes was recognized and general flow diagrams of all farms were elaborated. Two examples are presented. Figure 1 is one of herds that used bucket milking machine and figure 2 is another of herds that used a pipeline milking machine. In most farms in the first group, the cows needed to be stimulated by the presence of the calf to allow milk let down and calves were raised in group pens, as opposed to individual pens in the second group. Another distinction between the two groups was the use of artificial insemination that was adopted in most herds of the second group, but in only a few of the first one. Currently, a more detailed description of each step of the production process is being obtained and microbiological analyses and chemical residue tests for antibiotic and aflatoxin are being carried out.

Table 1. Selected variables related to good farming practices adopted in 48 dairy herds in Southeast Brazil

Variable	Description	% of adoption/observed
Tuberculosis testing		71
Brucellosis testing		81
Brucellosis vaccination		96
Feed storage conditions	No visible signs of moldy feedstuffs	100
Foremilk observation		73

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Use of individual towels for teat preparation		48
Teat disinfection (predipping)		60
Teat disinfection (post dipping)		65
Use of dry cow therapy	- treatment of all cows	44
	- treatment of only selected cows	15
	- not used/not done properly	41
Milking parlor conditions before milking	- adequate (clean; dry)	81
	- inadequate (wet)	19
Prevention of antibiotic residues in milk after mastitis treatment	- discard milk of all treated quarters	60
	- discard milk of treated quarter only	35
	- no milk discard	5
Hot water availability		83
Liners cleanness	- adequate	63
	- inadequate	37
Temperature of bulk milk	- less than 4 °C	72
	- above 4 °C	28

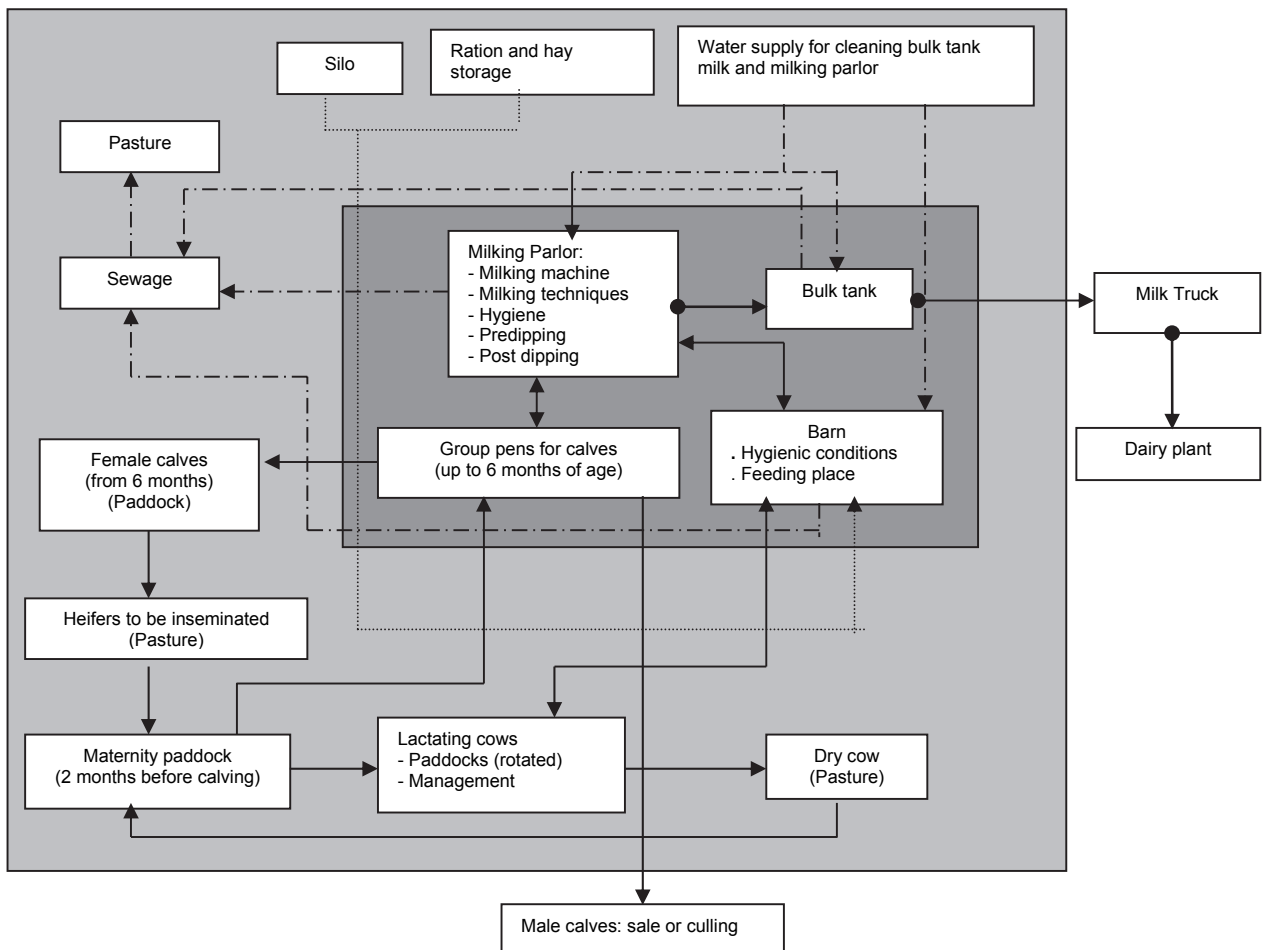


Figure 1. Milk production system diagram: bucket milking system.

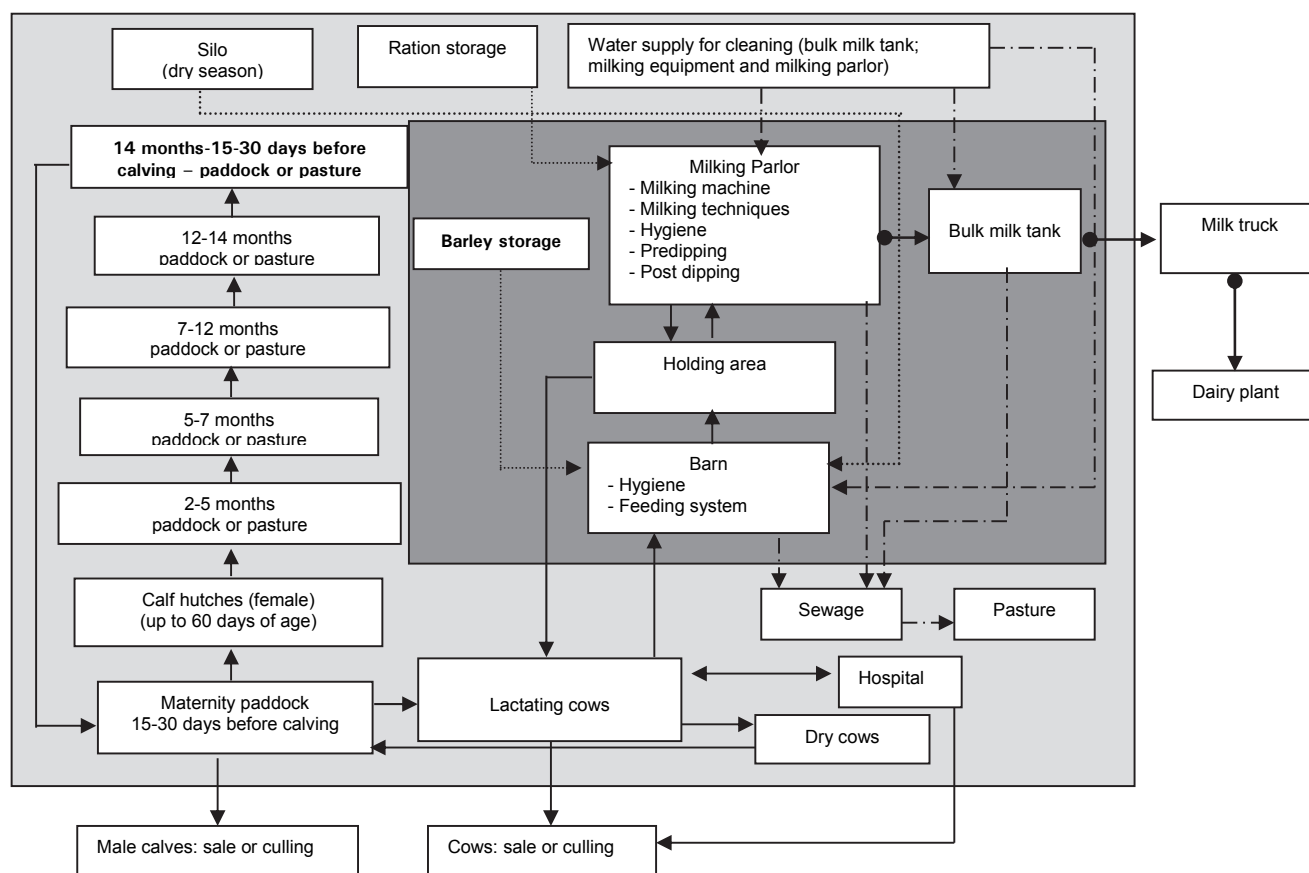


Figure 2. Milk production system diagram: pipeline milking system

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