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Monitoring the Hygiene of Raw Milk from Farms to Milk Retailers

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Abstract

Milk from dairy cattle is a good source of nutrients for humankind around the world. In Thailand, milk from dairy farms is generally transported to milk collection centre (MCC) and then transferred to milk processing plant. However, some milk from MCC is sold to local milk retailers. The quality of raw milk is very important for people's health. Therefore, the aim of this study was to monitor milk hygiene during transfer from dairy farms to the MCC and from bulk tank milk to milk retailers by counting the microorganisms in raw milk using standard plate count (SPC) method. Raw milk samples of 15 dairy farms in Maha Sarakham province were collected in summer (Mar-Jun), raining (July-Oct) and winter (Nov-Feb) seasons. After milking, raw milk was collected for SPC test. Additionally, the time for milk transportation, environmental and milk temperatures in milk bucket were also recorded. Those parameters were repeatedly recorded at MCC before being poured into the bulk tank. Cooled raw milk in the bulk tank was sampled before packed in 5 kg plastic bag and carried to 9 milk retailers in town. The results found that the average of time for milk transport from dairy farm to MCC was 76.29 min. Milk temperatures decreased from farm to MCC for all seasons. The SPC of milk at farm in summer ($5.812 \log_{10} \text{CFU}$) was higher than in raining ($5.743 \log_{10} \text{CFU}$) and winter ($5.713 \log_{10} \text{CFU}$) ($P < 0.05$) seasons. The SPC from farm to MCC significantly increased ($P < 0.05$) in all seasons. The average of time for milk transportation from MCC to milk retailers were 89.44, 178.00 and 156.11 min ($P < 0.05$) in summer raining and winter, respectively. In conclusion, more attention should be paid to milk hygiene and temperature from milking in the farm through milk retailers, especially in the summer. The microorganism could grow rapidly during milk transportation from farm to MCC in raining season. Thus, cooling down the milk or rapid delivery of milk bucket to MCC should be considered seriously.

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1. Introduction

Thailand located in the tropical Southeast Asia. Agriculture is the main occupation of the population. Dairy farming was promoted under the 6th Thai National Economic and Social Development Plan by the government. In that time there were many dairy farms established. Large farm had spread in the Central region. Dairy farm in the North-eastern usually small and medium farms. The farms are the members of the nearest milk cooperative. Mostly milk from dairy farm was sent to milk cooperative and forwards to milk processing factory. Some milk was supply local market nearby farm.

Milk is a good medium for the growth of various microorganisms, especially bacterial pathogens such as *Bacillus cereus*, *Listeria monocytogenes*, *Salmonella spp.*, *Streptococcus*, *Strepptilococcus*, *Campylobacter spp.* etc. Those bacteria are case milk borne diseases for example tuberculosis, brucellosis and disease about gastroenteritis. Raw milk from healthy cow may contain a low microbial load, but the microbial may increase multiply if it stored in some temperature (Richter et al., 1992). Range of temperature for growth of pathogenic bacteria is a normal temperature of atmosphere environment. *Listeria monocytogenes*, temperature ranges for growth = 29.3° to 112°F (-1.5° to 44°C) (Khan et al., 1972). *Staphylococcus aureus*, temperature range for growth = 43.8°- 122°F (6.5°- 50°C) (Halpin-Dohnalek and Marth, 1989). These microorganisms are harmful for consumers. For this reason raw milk should be cooled down immediately after milking. Cold may delay the increase of microorganisms in milk. After milking process, milk buckets were rapidly transported to milk collection centre (MCC). Nevertheless, only large farms can transport their milk to MCC immediately after milking. For the small and medium farms, they did not carry and sent their milk buckets to MCC by themselves. They employed the pickup truck to collect and transport their milk buckets to the MCC. It may take a longer time and the microorganism may multiply during the transport.

In Thailand, like the other developing countries, some people consume milk purchased from milk shops which pasteurize the raw milk by themselves and used in many local drinking menus. Raw milk supplied to milk retailers was from milk cooperatives in the province. Raw milk was tested for the quality at the MCC and cooled down to 4 °C before packaged into 5 kg of plastic bags.

Milk screening check was done at farms by stripping 2–3 milk jets from each cow teats into a foremilk or strip cup. Examination of the milk for flocculation, colour changes, viscosity or other inconsistencies was performed. Abnormal milk cow or sick cows were milked in the last milking separated from the healthy cows. Milk in buckets was assessed again by sensory evaluation and an alcohol test at the MCC. It was found that milk quality monitoring was done only at MCC. There was no milk monitoring previously and after the MCC. The objective of this study was to monitor milk hygiene by counting the microorganism in raw milk using standard plate count (SPC) method during transport from dairy farms to the MCC and from bulk milk tank to milk retailers.

1.1 Material and method

The experiment was done in Maha Sarakham province, 375 km from Bangkok, in the North East of Thailand. Raw milk was monitored for hygiene at 4 stations, separated into 2 steps. Step 1, at dairy farm and at MCC before pour to bulk tank. Step 2, at bulk tank before seal in plastic pack and at the milk retailers.

Step 1, raw milk was collected in the evening from 15 dairy farms for each season, there were 3 seasons, summer (Mar-Jun), raining (July-Oct) and winter (Nov-Feb). All farms used automatic milking. Samples were collected in 10 mL sterile tubes and immersed in ice box and sent to the laboratory in the Faculty of Technology, Mahasarakham University. Samples were processed within 24 h. The time for milk transport, environmental temperatures and milk temperatures in milk bucket were also recorded. After milk bucket arriving the MCC, raw milk sampling and those parameters were recorded again before being poured into the bulk tank.

Step 2, transport from MCC to milk retailers, raw milk from all farms in the evening were poured into the bulk tank and cooled down to 4 °C. Before packing the raw milk in 5 kg plastic bag, milk was sampled and recorded for the bag ID, and time for transportation. At late evening, milk bags were kept in ice box and sent to milk retailers by pickup truck. Those parameters were recorded again at milk retailers (9 milk retailers for each season)

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