BACTERIOLOGICAL ANALYSIS OF RAW COW'S MILK QUALITY FROM MILK COLLECTION CENTRES IN PERAK FOR YEAR 2017-2018

PRAVINA VATHI R.*, FHITRI M., ZAMILA Z., ROSELIZA R., KHOO E., NAFIZAH M., NORAZARIYAH M.N., SITI NOR HANANI R., SAIFU NAZRI R. AND NOORMAH M.A.

Veterinary Research Institute, 59 Jalan Sultan Azlan Shah, 31400 Ipoh, Perak, Malaysia.
* *Corresponding author:* pravina@dvs.gov.my

ABSTRACT. Bacteriological milk quality is a crucial element for quality checking of locally produced milk at the milk collection centres (MCCs). It determines the safety level of the milk and also the price of the milk under the Price Incentive Programme (PIP). This paper reports the total plate count (TPC) level of raw cow's milk samples received by the Veterinary Research Institute, Ipoh (VRI) from year 2017 to 2018 from four MCCs in Perak state from the districts of Sungai Siput, Tapah, Taiping and Parit. TPC level of less than 10^6 cfu/ml is the standard set and used by the Department of Veterinary Services Malaysia (DVS) for the PIP. Total of 4,902 milk samples received from the year 2017 to 2018 comprised of 2,165 samples from Sungai Siput, 1,560 from Tapah, 1,058 from Parit and 119 from Taiping districts. An overall of 27.8% of the milk samples collected in Perak MCCs were heavily contaminated with the TPC count of 10^6 cfu/ml and above. Analysis of this study revealed that 43.0% of milk samples from Sungai Siput had TPC value of 10^6 cfu/ml and above, followed by Taiping (25.2%), Tapah (18.3%) and Parit (11.1%). In conclusion, this study indicates that the raw milk quality from the collecting centres is still not in the acceptable quality range and emphasis needs to be given to produce quality milk to enhance the food safety strategy. The compromised milk quality also influences the income for dairy farms.
Keywords: bacteriological analysis, raw milk quality, cow, milk collection centre, total plate count

INTRODUCTION

MCCs which is operated by the DVS serves as a formal market for local farmers to sell their raw milk for a stable income (Loong *et al.,* 2019). The DVS's role is to negotiate with large dairy processors in Malaysia to purchase raw milk from MCCs on a contractual basis (Suntharalingam, 2019). Even though most of the milk-borne pathogens could be destroyed through pasteurisation, milk with high bacterial count is often rejected by dairy processors due to its low shelf life. Furthermore, the quality of pasteurised milk highly depends on the quality of the starting material which is the raw milk (Angelidis *et al.,* 2016). As a result, income of dairy farmers would be disrupted and affected.

Bacteriological quality control of raw milk is crucial for public health protection and to ensure compliance with the regulatory standards (Chatterjee *et al.,* 2006; Muehlhoff *et al.,* 2013). In Malaysia, the level of microbial load in milk is used as a parameter to determine the selling price of milk at MCCs under the PIP (Chye *et al.,* 2004). The TPC method is used worldwide by the dairy industry and regulatory authorities to determine the bacteriological quality of

milk (Laird *et al.,* 2004; Mhone *et al.,* 2011). A TPC level less than 10^6 cfu/ml is the standard requirement of milk set by the DVS for PIP (Chye *et al.,* 2004).

There are four MCCs in Perak located at the districts of Sungai Siput, Tapah, Taiping and Parit which collects raw milk from the local dairy farmers. To determine the price of raw milk according to the standard of PIP, all the four centres submit raw milk samples to VRI for microbiological quality testing to determine the TPC level. This paper reports the TPC level in samples of raw cow's milk received by VRI from 2017 to 2018 from four MCCs in Perak in the districts of Sungai Siput, Tapah, Taiping and Parit.

MATERIALS AND METHOD

Samples

A total of 4,902 raw samples of cow's milk were collected from four MCCs in Perak in the districts of Sungai Siput, Tapah, Taiping and Parit. They were received by VRI throughout 2017 to 2018. The milk samples were sent to VRI by the centres on a weekly basis on the same day or a day after collection. The samples were sent in chilled condition or at the temperature of 4 °C or below.

Bacteriological analysis

The samples were processed immediately upon arrival at VRI for enumeration of TPC according to the Standard Method of the American Public Health Association (Vanderzant and Splittstoesser, 1992). For enumeration of TPC, the samples were serially diluted up to 5 series in 0.1% peptone water. Dilution serial 3, 4 and 5 were cultured on plate count agar and incubated at 37 °C for 48 hours. After 48 hours, visible bacteria colonies were counted and recorded accordingly. The counts are expressed as the number of colony forming units per millilitre (cfu/ml).

RESULTS AND DISCUSSION

Table 1 shows the summary of TPC for raw milk samples from MCCs in Perak for the year 2017 to 2018.

From the 4,902 milk samples received, an overall of 1,364 or 27.8% of the milk samples were heavily contaminated, i.e. TPC of 10^6 cfu/ml and above, exceeding the limit set by DVS. Analysis showed that, Sungai Siput MCC had the highest percentage (43.0%) of milk samples that failed the standard TPC, followed by Taiping (25.2%), Tapah (18.3%) and Parit (11.1%). These results reveal that there were still a number of farmers producing or supplying bacteriologically low quality milk.

In a study by Khoo *et al. (*2011), it was reported that 26.7% of raw milk samples delivered to MCCs in Perak was heavily contaminated with TPC 10^6 cfu/ml and above. A similar result with this study revealed that there was not much improvement in the bacteriological quality of raw milk produced by farmers in Perak from 2011 to 2018. The lack of good hygiene practice in the herd and throughout the milking chain was one of the major factors which contributed to the large number of samples failing the standard (Lin *et al.,* 2016). Dirty or unwashed milker's hand, udder of animals and milking utensils is the most

Table 1: Total plate count (TPC) of raw milk samples from milk collecting centres (MCCs) in Perak from 2017 to 2018.

MCC	Total number of samples	Number of samples with TPC of 10^6 cfu/ml and above
Sg. Siput	2,165	931 (43.0%)
Tapah	1,560	286 (18.3%)
Parit	1,058	117 (11.1%)
Taiping	119	30 (25.2%)
Total	**4,902**	**1,364 (27.8%)**

common source of milk contamination (Kim, 1996). According to Gillespie *et al.,* (2009), good sanitary and hygiene practices are crucial to reduce contamination of milk from environment pollutants, faeces, soil or mud and also to reduce dissemination of pathogens which may take place during the milking process.

It is common for small-scale farmers in Malaysia to transport raw milk to MCCs in normal milk churns under extreme hot tropical climate (Suntharalingam, 2019). Thus, there is a probability the milk quality is compromised due to the transportation of raw milk under hot temperatures or without chilling. As temperature is one of the important factors for the prevalence and proliferation of microorganism in milk (Reta and Addis, 2015), this allows multiplication of bacteria in milk between the travel time from farm to MCCs. Chye *et al.* (2004), reported that improper temperature control or handling of raw milk prior delivery to MCCs contributed to the high bacterial count in milk produced by the local farmers in Malaysia.

Another factor which contributed to the high level of microbial load in milk was due to improper milking management of cows with infected udders, includubg mastitis. Farmers should be educated that cows with udder infection or mastitis should be milked last and the milk should be discarded (Lore *et al.,* 2006). Furthermore, Chye *et al.* (2004), mentioned that poor health conditions of the milked animals and poor knowledge of dairy animal management was one of the factors contributing to production of low quality milk in Malaysia.

To improve the bacteriological quality of milk supplied to MCCs, regular training and awareness programmes on good animal husbandry practices for dairy herd is essential for farmers. The private sector could also lend a hand as part of their corporate social responsibility to assist, by mentoring farms to increase the quality of milk production. Apart from that, it is crucial to design an affordable and practical milk chiller tank to address the risk of deteriorating quality of milk due to transportation under hot temperatures and improper storage prior delivery to the MCCs, particularly for small-scale dairy farmers. This is because, the majority of dairy farms in Malaysia are operated on a small scale basis in rural areas and are far from the MCCs

often located in the town (Suntharalingam, 2019).

CONCLUSION

TPC results of raw milk in Perak MCCs indicated that the bacteriological quality of raw milk produced by farmers in Perak needed improvement. Hence, the key factors affecting the quality of milk need to be tackled to ensure that raw milk supplied to MCCs fulfills the local dairy processors requirement in terms of quality, which will then decrease dependence on imported milk and simultaneously help the farmers have a sustaining income through dairy farming.

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