

Assessment of bacteriological quality of raw bulk tank Milk collected from Dairy Cattle farms in Nay Pyi Taw area by *Staphylococcus Aureus* and Coliforms

Thant Nyi Lin, Soe Soe Wai, Nang Khin Thuzar Aung, Wink Phyto Thu, Yamon Min Nyunt Oo, Ei Myo Thwe and Tin Tin Mying

University of Veterinary Science, Myanmar

Keywords: bulk tank milk, coliform bacteria, dairy cattle, petrifilm methods, *Staphylococcus aureus*

Introduction:

Milk and dairy products are important for healthy life (Lejeune and Rajala-Schultz, 2009) and can provide good nutritive values in every sense (Food and Drug Administration, 2012). Milk products are widely consumed across the world following the rapidly growing global markets. However, on the other hand, milk can harbour microorganisms including the bacteria that can be harmful to the consumers. The occurrence of milk-borne diseases can increase with high consumption of milk, particularly when appropriate hygienic measures are not taken (Singh and Prakash, 2008).

In Myanmar, there has been a sharp increase in the consumption of milk and dairy products in recent decades. Milk is primarily produced in Mandalay, Yangon and Nay Pyi Taw area, which account for 55%, 15%, and 10% of the country's dairy cattle population, respectively According to Livestock Breeding and Veterinary Department (LBVD), the per capita consumption of milk in Myanmar has been increasing and the import of milk and dairy products alone has cost more than 100 million USD annually since 2014 (LBVD, 2017). At the same time, as the consumption increased, the morbidity of diarrhoea and dysentery caused by milk-borne pathogens has also increased. It has been reported that 5.6% of all diarrheal and dysentery cases in Myanmar were caused by milk-borne pathogens (Tin Kyu Kyu Khaing, 2008). This has made the milkborne diarrhea included in the fourth most important group of notifiable diseases of the country (Mar Mar Nyein et al., 2005; Myanmar One Health strategy, 2016, Myint, 2017).

To date, a few studies have been conducted on the bacterial load of raw milk in dairy cattle focusing on the total bacterial count (TBC) and coliform count (CC) in Myanmar. However, as far as studied, only scanty information has been published on the bacterial load in raw cow's milk in Nay Pyi Taw area (Khin Zar Linn, 2015). Therefore, as part of the food safety, it is important to have the raw milk of dairy cattle regularly checked for pathogens and this study was carried out to determine the load of *Staphylococcus aureus* and coliform bacteria in raw bulk tank milk (BTM) in Nay Pyi Taw area.

Materials and methods:

A cross-sectional study was conducted in dairy cattle farms in Nay Pyi Taw, Myanmar. A total of 100 raw bulk tank milk (BTM) samples were collected from 50 dairy cattle farms selling milk to the markets. The sample collection was carried out separately in two seasons, from July to October 2015 during the wet season and from January to March 2016 during the dry season. Approximately 100 ml of BTM sample was collected

from each farm and examined for bacterial content using 3M petrifilm methods. For TBC, the enumeration of *S. aureus* was achieved by using staph express count plate (STX) and disc (3M Company, St. Paul, USA) methods following the AOAC 2003.08 guidelines. For CC, counting was performed with 3M petrifilm coliform plates (3M Company, St. Paul, USA) as recommended by AOAC 986.33 and 989 guidelines. All the test procedures were employed in accordance with the manufacturer's instruction.

Results and discussion:

The occurrence of *S. aureus* and coliforms in BTM was observed to be 100% and 96% in the wet season and 98% and 84% in the dry season, respectively. However, despite higher occurrence during the wet season, no statistically significant association was found between the seasons and occurrence of bacteria.

The average count of *S. aureus* in BTM was 2.6×10^9 cfu/ml in the wet season and 13.9×10^8 cfu/ml in dry season. It was higher than the findings of Khin Zar Linn (2015) in Nay Pyi Taw area whose mean value for bacterial load was 2.67×10^8 cfu/ml in BTM. It was also higher than the mean value of TBC in a recent study in Mandalay Region, Myanmar, which was 2.5×10^7 cfu/ml, (Ye Wint Naing et al., 2019). However, it is to note that since *S. aureus* could be potentially hazardous when higher than 104 cfu/ml in milk (Anonymous, 1996; Han et al., 2005), all the milk samples in this study, as well as those in previous studies, appeared to be potentially risky to consumers, implying that the contamination started at farm levels and the needs of good hygienic measures to reduce the bacterial load in BTM.

For coliforms, the mean value of counts in BTM was 2.05×10^9 cfu/ml in the wet season and 1.75×10^9 cfu/ml in the dry season. A similar study conducted in Mandalay Region, Myanmar reported a lower percentage of coliform contents in raw BTM at the level of 1.59×10^5 cfu/ml (Ye Wint Nang, et al., 2019). Therefore, in comparison with contemporary studies on raw BTM in Myanmar, the bacterial load in this study was higher both in terms of TBC and CC. The presence of positive correlation between TBC and CC (Ye Wint Naing et al., 2019) could be a factor relating to the high percentage of CC in BTM.

In this study, the high percentage of *S. aureus* in BTM might be attributable to low hygienic conditions during milking and milk-handling, as well as due to post-milking contamination by poor management. From this finding, it seemed reasonable to assume that raw milk could become a potential source of harmful pathogens if not properly treated and that would leave the consumers vulnerable to foodborne illnesses and infections (Weigand, 2013). It highlighted the importance of milk hygiene and good manufacturing practices in relation to public health.

Conclusion:

The milk samples were highly contaminated with *S. aureus* and coliforms bacteria that they did not meet the minimum requirement of international raw milk standards. Hence, it is recommended that farmers and producers should be aware of good hygienic practices (GHP), good animal husbandry practices (GAHP), microbiological risk assessment (MRA), hazard analysis and critical control point (HACCP) and good manufacturing procedures (GMP) to make it safe to the consumers of cow's milk.

References:

- 3M Petrifilm™ Staph Express Count Plate, Interpretation Guide, 3M Food Safety, 3M Center, St. Paul, MN 5514-10000, USA. foodsafety@mmm.com www.3M.com/foodsafety
- 3M Petrifilm™ Staph Express Count Plate, Interpretation Guide, 3M Food Safety, 3M Center, St. Paul, MN 5514-10000, USA. foodsafety@mmm.com www.3M.com/foodsafety
- Anonymous (1996). Microbial guidelines for some ready-to-eat foods sampled at point of sale: an expert opinion from the Public Health Laboratory Service (PHLS). *PHLS Microbiol. Digest.* 13: 41-3.
- Food and Drugs Administration (2012). The Dangers of Raw Milk; Unpasteurized milk can pose a serious health risk, Food Facts from the U.S. Food and Drug Administration, August 2012, www.fda.gov. Accessed on 13 December 2015.
- Han BZ, Sesenna B, Beumer RR and Nout MJR (2005). Behaviour of *Staphylococcus aureus* during sufu production at laboratory scale. *Food Control.* 16: 243-247.
- Khin Zar Lin. Isolation and identification of *Escherichia coli* and *Staphylococcus aureus* in raw milk samples collected from Lewe, Pyinmana and Takone Townships. M.V.Sc Thesis. University of Veterinary Science, Myanmar, (2015).
- LBVD (2017). Myanmar Livestock Statistics. Myanmar: Livestock Breeding and Veterinary Department (LBVD).
- Lejeune JT and Rajala-Schultz J (2009) Unpasteurized Milk: A continued public health threat, *Food Safety.* 48: 93-100.
- Mar Mar Nyein, Mi Mi Htwe, Khin Myat Tun and Kyi Kyi Aye (2005). Potential source of infection through vegetables with a note on bacterial pathogens isolated from children with diarrhea. *Myanmar Health Sci. Res. J.* 17:66-71.
- Food and agriculture organization (2016). New Myanmar One Health (OH) Strategy. Online: http://www.fao.org/ag/againfo/programmes/en/empres/news_170316b.html
- Myint PP (2017) Anti-diabetic Potential of Some Myanmar Traditional Medicinal Plants. *Int J Complement Alt Med* 8(2): 00252. DOI: 10.15406/ijcam.2017.08.00252
- Singh P and Praksah A (2008). Isolation of *Escherichia coli*, *Staphylococcus aureus* and *Listeria monocytogenes* from milk products sold under market conditions at Agra region. *Acta agriculture Slovenica.* 92: 83-88.
- Tin Kyu Kyu Khaing (2008). Detection of common microbial contaminations from some preserved fruits and vegetables in Mandalay. MMedSc Thesis. University of Medicine, Myanmar.
- Weigand, G. (2013): ProMed Newsgroup (<http://www.promedmail.org/2013>). Accessed on 12 February 2013.
- Ye Wint Naing, Soe Soe Wai, Thant Nyi Lin, Wink Phyto Thu, Lat Lat Htun, Saw Bawm and Tin Tin Myaing (2019). Bacterial content and associated risk factors influencing the quality of bulk tank milk collected from dairy cattle farms in Mandalay Region. *Food Sci Nutr.* 2019;00:1–9. <https://doi.org/10.1002/fsn3.945>