

Research Application Summary

Estimation of the total viable bacterial counts of raw and processed milk from selected smallholder dairy farms of Zimbabwe

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Abstract

A study conducted in several dairy farms in Zimbabwe revealed high levels of bacteria in both processed and raw milk. This is a public health concern. Efforts need to be put in place to minimize such high loads of bacterial counts.

Key words: Bacterial counts, milk, Zimbabwe

Résumé

Une étude menée dans plusieurs fermes au Zimbabwe a révélé des niveaux élevés de bactéries aussi bien dans le lait traité que dans le lait non traité. Il s'agit ici d'un problème de santé publique. Des efforts doivent être fournis pour réduire au minimum ces charges élevées de bactéries.

Mots clés: nombre de bactéries, le lait, le Zimbabwe

Background

Milk is regarded as one of the most perfect foods available on the food market worldwide. It is naturally a good provider of a whole range of nutrients such as vitamins, minerals, proteins and fats, which are essential for growth, development and maintenance of the human body. However, milk can easily be contaminated by pathogenic bacteria such as *Mycobacterium bovis*, *Escherichia coli*, *Salmonella* and *Staphylococcus aureus*. Milk contaminated by microorganisms usually becomes unsuitable for further processing since it cannot meet the consumer's expectations in terms of health (nutritional value), safety (hygienic quality) and satisfaction (sensory attributes). Therefore a study aimed at estimating the total viable bacterial counts of raw and processed milk from selected smallholder dairy farms of Zimbabwe was carried out.

Literature Summary

The population of bacteria in milk has a decisive effect on the quality and safety of dairy products (Szteny *et al.*, 2005). In Zimbabwe milk containing total viable bacterial counts of more than 500, 000 cfu/ml is rejected for consumption and further processing. Despite this regulation high total viable bacterial counts have still been reported for Zimbabwe. This has mainly

been attributed to improper handling, mismanagement practices and unhygienic environment (Shojae and Yadollahi, 2008).

Study Description

A cross-sectional study was carried out at Marirangwe, Nharira and Dowa smallholder dairy schemes in Zimbabwe. All farms that were actively producing and sending milk to the collection centres in their respective areas were sampled. Processed milk, produced from the bulk tank milk at the milk collection centres, such as boiled and cultured milk, were sampled from Nharira and Dowa dairy schemes. Samples were collected in two seasons, the dry (October - November, 2009) and wet (January-February, 2010). Collected raw and processed milk samples were immediately cooled to 4°C in order to minimise the growth of microorganisms and transported to the laboratory.

In order to identify variables associated with total viable bacterial counts in raw milk a structured questionnaire was used. Microbiological analyses were carried out according to the procedures described by Chessbrough (2000) and Quinn *et al.* (2002). Statistical analysis was performed using descriptive statistics and linear regression in STATA version SE 10.0 for Windows (StataCorp. College Station, Texas, USA).

Research Application

The mean total viable bacterial counts for raw milk for the three smallholder dairy schemes were significantly different ($p < 0.05$) with the lowest (4.1×10^5 cfu/ml) and highest (5.3×10^6 cfu/ml) being recorded from Marirangwe and Nharira, respectively. The mean total viable bacterial counts for processed milk for the two schemes were significantly different ($p < 0.05$) with the lowest (2.9×10^6 cfu/ml) and the highest (5.4×10^6 cfu/ml) being recorded from Nharira and Dowa respectively. Processed milk had a significantly ($p < 0.05$) higher (3.9×10^6 cfu/ml) mean total viable bacterial count compared to raw milk (2.9×10^6 cfu/ml).

The linear regression model revealed time taken to deliver the milk to the collection centre and the season when milk was collected as having an association with increased total viable bacterial counts in raw milk samples from smallholder dairy sectors. There were no significant interactions between the main effects and post-fit testing did not reveal major influence of outliers on the model. No evidence of confounding was detected. The *F*-test ($F = 8.00$, $p = 0.0001$, d.f = 69), showed that the variables collectively added significant information to the model.

Recommendation	The high bacterial loads of raw and processed milk obtained in this study are of public health concern. Thus, measures to control and reduce bacterial contamination of raw and processed milk are required in the smallholder dairy sector.
Acknowledgement	The authors thank SADC/EU for providing financial resources for the implementation of this study.
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