

Expression, Characterization, and Stability of Milk Exosomal Mirnas and Their Potential as Biomarkers for Sub-Clinical Mastitis in Buffaloes

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Abstract:

Milk exosomal microRNAs (miRNAs) are bioactive molecules that regulate cellular communication at the post-transcriptional level. These miRNAs have gained significant attention due to their stability and potential biological roles. This study aimed to evaluate the expression of exosomal miR-148a and miR-186 in normal, sub-clinical mastitis and pasteurized milk to explore their potential as biomarkers for early diagnosis of sub-clinical mastitis. We investigated their stability under extreme boiling conditions, making this the first study to examine miRNA expression and exosome characterization in boiled and pasteurized milk. The size, morphology, and integrity of exosomes were characterized by TEM. A total of 30 milk samples were collected from the Mumbai region, including 20 samples from buffalo farms, categorized into normal (n=10) and sub-clinical mastitis (n=10) groups. Additionally, 10

commercial pasteurized milk samples were analyzed, with half subjected to boiling. Before boiling, the somatic cell count (SCC) differed significantly ($p < 0.001$) among all groups. The expression of miR-148a and miR-186 was upregulated in sub-clinical mastitis and pasteurized milk compared to normal milk, both before and after boiling. Notably, miR-148a and miR-186 expression levels showed significant differences ($p < 0.001$) before boiling, while after boiling, miR-186 expression remained significantly different ($p < 0.001$) among sub-clinical mastitis, pasteurized, and normal milk samples. The strong correlation between SCC and miR-148a/miR-186 expression across all groups suggests their potential as biomarkers for sub-clinical mastitis in buffaloes. Furthermore, the ability of miR-148a and miR-186, linked to various diseases, including cancer, to withstand commercial pasteurization and boiling raises concerns about milk safety. These findings highlight the importance of clean milk production and the need for further research to understand miRNA transfer mechanisms between species, which could have significant implications for animal health and dairy production.

Keywords:

miRNA, sub-clinical mastitis, buffaloes.