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Abstract

Towards On-Site Dairy Cow Mastitis Diagnosis in Your Pocket †

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Mastitis has a significant impact on animal welfare and dairy industry profitability (regular losses 5–25%, outbreaks 85%), which is the main reason for antibiotic use (risk to the food chain). Diagnosis is based on clinical observations and measures of the inflammatory response by somatic cell counts (SSC) in milk (crucial in quality and salubrity, with limits of 400,000 cells/mL in the EU and 750,000 cells/mL in the US). SSC is a late indicator of mastitis in milk, while early diagnosis is possible by an increased WBC count in the blood, suggesting probable mastitis (prevention). WBC react to inflammation, are released into the bloodstream, and migrate to the mammary gland to fight infection. Furthermore, the SSC value does not discriminate which cells are being counted, as this value can comprise the number different types of white blood cells and mammary gland cells. In this preliminary study, we recorded spectra of fresh milk obtained from 50 cows during milking. The milk collected was sent to a certified laboratory for butyric acid (BA), total protein (TP), urea (U), and SSC. This preliminary test using a spectroscopy point-of-care (POC) system provided the following metrics for on-site quantification: i. BA: R (correlation coefficient) = 0.79 and CE (coefficient of error) = 10.0%; ii. TP: R = 0.94 and CE = 2.8%; and iii. U: R = 0.73 and CE = 12.0%; and iv. SSC: R = 0.72 and CE = 12%. These results demonstrate the possibility of performing a direct measurement of both milk quality and mastitis detection using reagentless POC spectral technology. Further research is necessary to evaluate the efficiency of POC in large-scale studies, as well as its capacity to discriminate between mammary and immune system cells and the presence of bacteria in milk.

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