



Comparison of milk somatic cell counts by On-line ATP monitoring instrument LUCI® and Flow Cytometry.

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Introduction

Healthy cows are essential for a dairy farm. A healthy cow produces more and better quality milk and uses fewer antibiotics. One of the most obvious health indicators for lactating cows is the somatic cell count (SCC) in milk. High cell counts are indicative of infection. Mastitis is such an infection that leads to inflammation of the udder and negatively impacts the production of milk. The rise of automatic milking systems (AMS) has created a demand for an on-line monitoring device.

Here we present our newest data from LUCI® and compare our on-line ATP measurement with traditional laboratory results.

Aim

To improve cow health in dairy farming by on-line monitoring ATP in milk.

Methods

Automated monitoring ATP concentrations were integrated into the automatic milking system (AMS). LUCI® consists of a sampling unit, reaction chamber and detection module. The chemical method is based on ATP analysis using customized reagents with a shelf life optimized for usage in the stall. Milk samples were collected in Friesland at the Wageningen University Dairy Campus and at several other test farms and analysed on-line and in the laboratory via flow cytometry.

Results

Our data indicate an advantage to increase the sample frequency without increasing time at the robot to detect early on-set (sub-clinical) mastitis. Statistical correlation between the methods is good. LUCI's® advantage is the automation she brings to sample analysis: reducing operator time and transport costs.

Conclusion

In the Netherlands milk samples are typically taken and analyzed once every six weeks in a regional laboratory. To ensure the requested hygienic status of the milk fast and reliable methods for on-line measurement of relevant infections are required. LUCI® is a reliable method to measure ATP in a range between fifty thousand and several million cells/ml.

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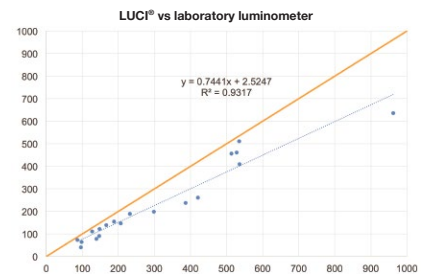


Figure 1. Here we show the data from LUCI® vs. data obtained from a Celsis Advance coupe Luminometer. Data shows good agreement between the two detectors from (80 nM – 1 uM) or approximately 80,000 – 1 million cells per mL. Results based on duplicate analyses in raw milk samples at the Dairy Campus in Leeuwarden.

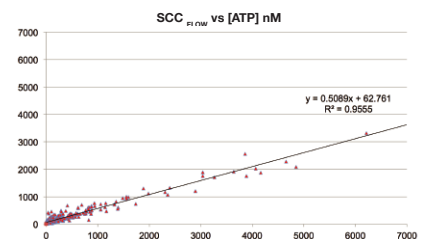


Figure 2. Here we show data from LUCI® vs. data obtained from flow cytometry. Approximately 600 samples were collected over the course of four weeks during September and October 2017. Here we show a composite of all samples. Duplicates are also plotted above. Good correlation is shown and consistent with the relationship between SCC_FLOW and ATP concentration previously published.

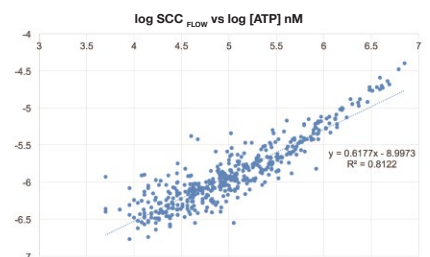


Figure 3. Data plotted here shows the log 10 plot more commonly referred to in published literature. It takes into account that ATP is measured in nanomoles per Liter and SCC is measured in cells per mL. Here we show a composite of all 600 samples. Duplicates are also shown above. Good linearity is consistent with the relationship between log SCC_FLOW and log ATP.

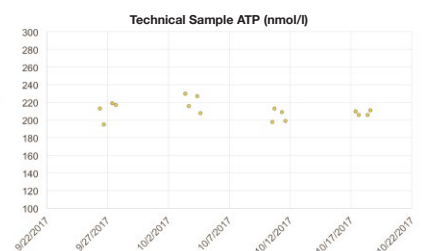


Figure 4. All samples are run with an internal standard addition. Additionally Every day a technical sample was also run at the beginning and end of the day. The repeatability over the course of a month was 4.4% at 200 nM.



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