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Title of the presentation

Early mastitis detection: Can Lactoferrin evaluation by EU funded project MOLOKO biosensor help?

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Session: Using sensor technologies for health and welfare monitoring and recording as part of dairy herd improvement

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ABSTRACT

Mastitis is the most frequent udder disease in dairy cows. It causes huge economic losses, due to less milk production, less milk quality, increasing of drugs usage and, in most severe cases, early culling.

A healthy herd is a fundamental goal not only for animal welfare but also for the environment. Mastitis reduces herd efficiency by the increasing of environmental impact of milk production. In fact, it was calculated that a sick cow produces 6.3 % CO2 eq./ kg milk more than a healthy one.

To reach efficiency goals, Precision Livestock Farming can give an important contribution. In compliance with that, MOLOKO (Multiplex phOtonic sensor for pLasmonic-based Online detection of contaminants in milK) European funded project aims development of a biosensor to improve milk safety and animal health.

The MOLOKO biosensor working mechanism is based on the optical measurement of an inherent physical property change of the environment in the proximity of the sensing surface.

Lactoferrin was chosen as a mastitis biomarker due to its antimicrobial activities. It is an iron-binding glycoprotein synthesized by neutrophilic polymorphonuclear leukocytes and granular epithelial cells in milk and other exocrine secretions.

A direct immunoassay for the detection of Lactoferrin was developed in buffer and in diluted raw milk using the MOLOKO sensor. The test showed a correct and cross-correlated recognition of Lactoferrin on suitably functionalized channels; promising results were obtained for both buffer (Limit Of Detection ~ 9µg/ml) and diluted raw milk (Limit Of Detection ~40µg/ml) providing information regarding levels of Lactoferrin in only 14 minutes.

A preliminary validation of the sensor for the detection of Lactoferrin was carried out with milk samples collected, from two different dairy herds in the north of Italy, respectively 600 milking cows, with a milking parlour and 100 milking cows with automatic milking system.

Samples analysed in the MOLOKO sensor and by certified laboratory were compared for the estimation of lactoferrin concentration. Additionally, known parameters of udder infections, such as somatic cells count, differential somatic cells count, and finally bacteriologic culture were also determined to better identify true positive.

The preliminary data show that integration of the MOLOKO biosensor on the milking systems could be useful to detect daily lactoferrin fluctuations. Combined with others sensors, it could provide farmers information about inflammatory events.

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