

What Does the Future Hold for Mastitis Detection through the use of Technology?

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As discussed in previous issues of Kentucky Dairy Notes, Precision Dairy Farming is the use of technologies to measure physiological, behavioral, and production indicators on individual animals to improve management strategies and farm performance. Given the economic importance of both clinical and subclinical mastitis, early detection of mastitis is one of the most exciting Precision Dairy Farming applications. This is particularly true given increased emphasis on lowering SCC at the farm level. Early detection of mastitis may increase the likelihood of bacteriological cure; thus, the economic losses associated with a case of mastitis may be reduced. An alert provided by a mastitis detection system may be used to determine when to collect a bacteriological culture. Then, if the case of mastitis results in clinical symptoms, the producer is armed with the information needed to determine what the best treatment options are for the cow in question. Additionally, the portion of mastitis cases that become chronic, resulting in lower SCC, may also decrease. Reductions in the duration of pain associated with mastitis may also improve animal well-being. Potential also exists to separate abnormal milk automatically reducing the likelihood that abnormal, contaminated, or treated milk ends up in the bulk tank. These tools may also help reduce the likelihood of transmission of mastitis between cows and prevent the infection from becoming chronic.

So, what are the technology options for mastitis detection? Because of their simplicity and low cost, systems to measure electrical conductivity have been widely available for many years. Mastitis changes the concentration of anions and cations in milk. Adoption of electrical conductivity systems has been limited because they have tended to provide too many false alerts; however, new computer algorithms and quarter based measurement systems hold potential for improved results. In-line sensors that essentially automate the California Mastitis Test or Wisconsin mastitis test have been developed and are being marketed in some countries. These systems could provide valuable herd management information for identifying cows contributing to changes in bulk tank SCC. Dairy producers would have a “hot sheet” for their herd every milking. Various temperature monitoring technologies have also been proposed as mastitis detection tools; however, it’s important to remember that not all causes of mastitis result in a temperature response.

Color variation (red, blue, and green) sensors have been included in some automatic milking systems to detect blood in milk and color pattern changes in infected quarters. Image analysis may potentially differentiate between changes in the physical content in milk (i.e. flakes and clots) and other foreign materials (i.e. bedding and manure particles). Spectroscopy, or the measurement of changes in light, (visible, near-infrared, mid-infrared, or radio frequency) has been applied in commercial sensors systems to identify changes in milk constituents including SCC and mastitis-causing pathogens. Biosensors designed to detect a specific biological component of milk may also be used for mastitis detection. For example, the enzyme, L-Lactate dehydrogenase (LDH), is released because of the immune response and changes in cellular membrane chemistry and has recently been commercialized as a mastitis detection tool. Chemical sensors to detect changes in chloride, potassium, and sodium ions, volatile metabolites resulting from mastitis, haptoglobin, and hemoglobin have recently been developed.

Only a few of these technologies are actively marketed to dairy producers now. But, many will become commercially available in the next few years. As with all technologies, it’s important to consider whether there is a real need on farm, the economic benefits of technology adoption, and ease of use. The potential for early detection of mastitis is exciting. These technologies will improve mastitis detection and reduce the economic impact of mastitis on-farm.

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