CPS: Synergy: Cost-effective Mastitis Control and Biosecurity for Sustainable Dairy Farming

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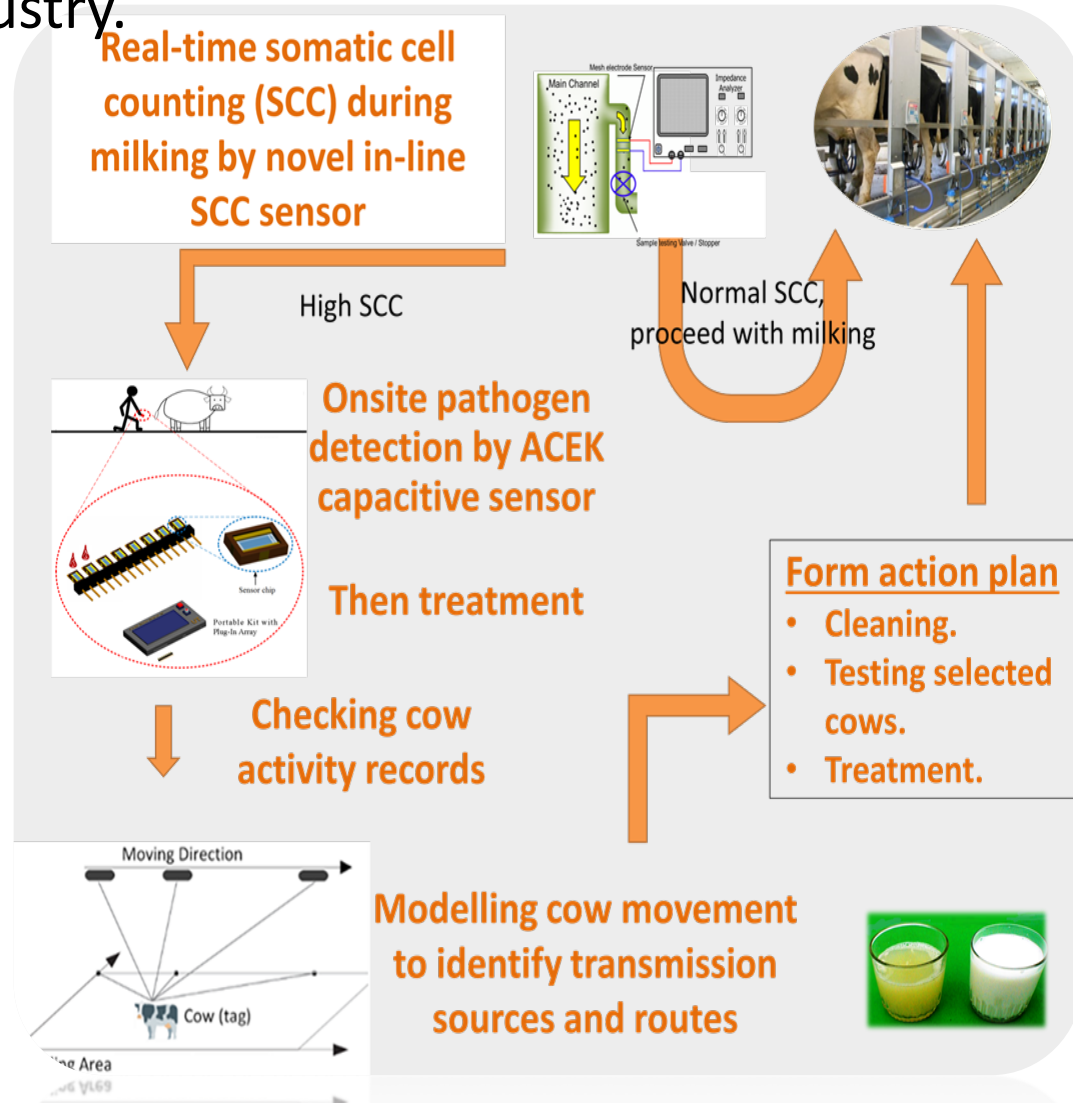**The University of Tennessee, Knoxville 37996**

http://nanobio.eecs.utk.edu

Goals

To provide dairy farmers with an integrated low-cost solution for effective control of cattle mastitis, increasing the sustainability and biosecurity of global dairy industry.

1. Novel biosensors for low-cost, cow-side and real-time somatic cell counting and multiple causative pathogen identification.

2. Pattern recognition of biosensor signals for much improved accuracy and speed in bio-event detection.

3. Cow tracking and mastitis propagation modeling for pathogen transmission

Real-time somatic cell counting (SCC) during milking by novel in-line SCC sensor

High SCC

Normal SCC, proceed with milking

Onsite pathogen detection by ACEK capacitive sensor

Then treatment

Checking cow activity records

Modelling cow movement to identify transmission sources and routes

Form action plan
- Cleaning.
- Testing selected cows.
- Treatment.

Moving Direction

Cow (tag)

Findings

- Novel biosensors for rapid, sensitive and cow-side detection of SCC and a variety of targets, including bacteria, protein, nuclei acids (DNA, RNA and miRNA).

- Aided by pattern recognition to resolve mixture samples of similar biotargets, such as antimicrobial resistance (AMR) gene detection.

- Animal tracking and disease propagation modeling, in order to reduce antibiotic use and the spread of AMR.
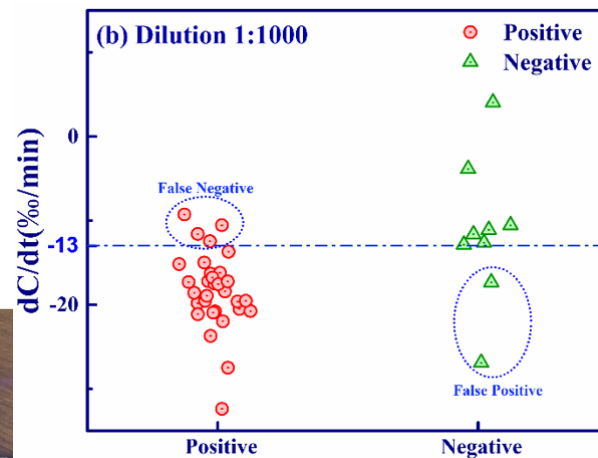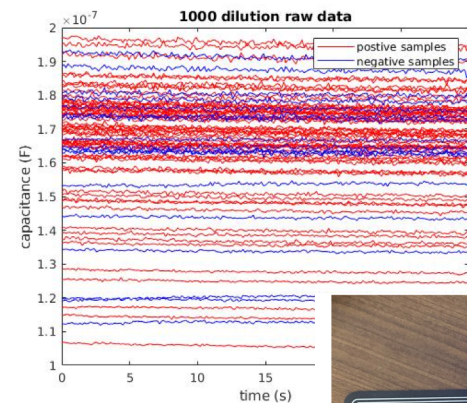
Sensitivity: 94.92%
Specificity: 38%