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A Novel Point-of-Care Pathogen Testing Technology for the Agricultural Sector

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A novel hand-held point-of-care technology has been developed for "on-farm"detection of pathogens, using the well-established loop-mediated isothermal amplification (LAMP) assay for replicating DNA at constant temperature. The technology uses off-the-shelf primer sets and either a fluorescent DNA binding dye or a fluorescently-labelled DNA probe as the reporter system. LAMP, first described in the late 1990s, has steadily become an alternative to Polymerase Chain Reaction (PCR), due to lower costs, faster response times and higher amplification efficiency. The patented technology incorporates a passive gravity-flow cartridge with microchannels and pre-loaded reagents. The cartridge is filled with sample and inserted into a battery-powered hand-held reader that heats the reaction chamber to 60-65 C. An LED light source excites the fluorescent dye, and a photodiode detector collects the fluorescence in real-time. Data is transmitted to a smartphone via Bluetooth. Data from proof-of-concept design testing will be presented. Temperature control was achieved using feedback from four thermistors situated near the reaction volume. Results of heating and stability trials will be presented. The initial study used Lambda DNA, a temperate Escherichia coli bacteriophage, as the target analyte. In a subsequent study, bovine mastitis was simulated by dosing milk with Staphylococcus aureus bacteria. Detection times ranged from 30-60 minutes in early trials. Design tests using both liquid and lyophilized reagents will be presented. The current focus is in the agricultural sector, to provide "on-farm" detection of pathogens which can save time, effort and cost compared to the current process of shipping samples to a laboratory and waiting for results. This could lead to improved and timely decision making for the management of crops and livestock.

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point of care device

Keyword-2

optical sensors

Keyword-3

DNA amplification

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