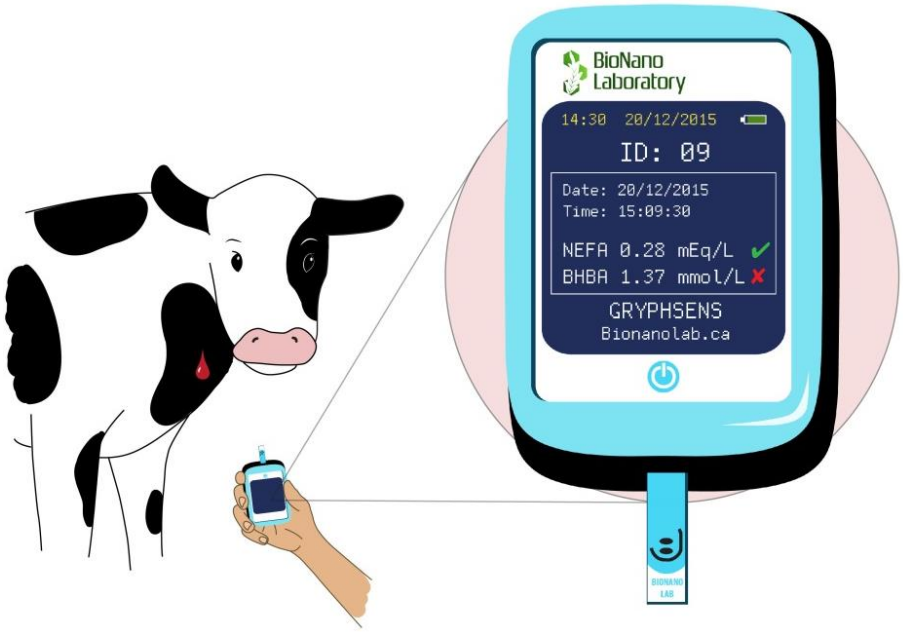
Electrochemical Nanobiosensor for On-Farm Monitoring of Bovine Metabolic Disease

Opportunity

Elevated serum concentrations of non-esterified fatty acid (NEFA) and beta-hydroxybutyrate (BHBA) are vital **biomarkers**, and have been monitored for early diagnosis of metabolic diseases in dairy cows. This technology comprises nanobiomaterial and enzymes which can be printed as an electrode while retaining their sensitivity. Unlike conventional methods, developed electrochemical biosensor modified with selective enzymes can be used to simultaneously detect both NEFA and BHBA concentrations in biological fluids of dairy cows at the farm environment, without time consuming or labor intensive operation.



The experiments from Dr. Suresh Neethirajan's bionanolab have shown that enzymes modified on the nanomaterial based electrode is able to detect the critical clinical range of NEFA and BHBA concentrations in real serum or in buffer samples. This invention (US Serial No. 62/239,474) meets the feasibility of cost-efficient dual sensing at the single electrode chip, with the same blood serum sample.

Applications and Advantages

- Electrochemical enzymatic detection of NEFA and BHBA is rapid, specific and sensitive compared to existing methods
- Fabrication of nanomaterials and enzymes modified on the electrode interface is inexpensive
- Minimal sample requirement (only microliters of bloods from cows) and cost-effective real-time assessment at the cow-side could benefit the dairy animal health management and farmers

Keywords: Non-esterified fatty acid, beta-hydroxybutyrate, metabolic disease, electrochemical nanobiosensor, biomarker detection.

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