Rapid Diagnosis of Bacterial Sepsis Using a Plasmonic Sensor Based POC System

Collaborators

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Customer Benefits

- Most of existing technologies for procalcitonin detection cannot be performed as point-of-care. This system is compact and fast, thereby enabling point-of-care detection of procalcitonin with the advantages of:
  - Procalcitonin level in blood can be used to differentiate viral and bacterial infection. Bacteria can be treated with antibiotics while viruses cannot. Hence, point-of-care detection of procalcitonin can reduce unnecessary use of antibiotics during viral infection.
  - Procalcitonin levels indicate severity of bacterial sepsis, and algorithms have been developed to monitor duration of antibiotic use. This system can be used to guide the therapy of sepsis.
- Reduced blood sample volume
- Lower cost

Technology Overview

Nanotechnology and microfluidics are incorporated in the point-of-care (POC) system to enhance the detection sensitivity and reduce the amount of blood sample needed. Compared to existing methods being used in the healthcare industry, this system is faster and more compact, thereby enabling it to perform point-of-care detection at well-planned locations, such as at doctor's office or hospital accident & emergency (A&E) department to deliver instant results, or at rural areas where medical resources are limited.

Potential Applications

- In primary care, for general practitioners and polyclinics to differentiate bacterial from non-bacterial infection and diagnose serious bacterial infection early.
- In the emergency departments to exclude serious bacterial infection and subsequently guide judicious referral decision.
- In general and specialist clinics, for hospitals and intensive care units (ICUs) to improve antibiotic prescription and have procalcitonin-guided antibiotic therapy.
- In rural areas, for clinicians to achieve on-time bacterial sepsis diagnosis, despite of the limited or unavailable laboratory facilities.

Features & Specifications

This standalone fully automatic point-of-care diagnostic prototype includes a nanosensor chip, microfluidic solution dispensation system, optical source and detector, and a control cum switching software program, which are incorporated within a small footprint to provide user-friendly and sensitive procalcitonin detection. The prototype takes only 50 microliters of sample, and within 30 mins, it provides the quantified procalcitonin concentration in blood at a detection limit of 1 ng/ml. This detection limit meets the sensitivity required by clinicians for real-time diagnosis and treatment, and the cost per test on this prototype is estimated at S$10, several times cheaper than the procalcitonin tests conducted in central laboratories using bulky equipment.

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