

# A Microfluidic System with Dielectrophoresis (DEP) On-Chip Concentration Module

## Technology Overview

Urinary tract infection (UTI) is among the most common bacterial infections around and poses a significant healthcare burden to society. In this project, a rapid, cost-effective, sensitive and easy-to-use device for diagnosing UTI at the point of care (POC) has been developed. This POC system allows physicians to accurately diagnose UTI during the initial office visit by patients. The system utilizes a sandwiched immunoassay developed on micro fabricated biosensor chip for UTI Escherichia coli (E.coli) detection. Results show that the DEP-enhanced microfluidic immunoassay can detect E.coli at the concentration level of  $10^5$  colony forming unit per millilitre (CFU/ml).



## Features & Specifications

Sandwiched immunoassay for urinary detection.

- Sandwiched immunoassay has been developed for detecting bacteria in urinary sample. To establish the assay, several different antibodies were screened on traditional micro-well immunoassay platform. A pair of antibodies which are highly sensitive and specific against E.coli, the most common bacteria found in UTI patients' urine sample were selected.

DEP-enhanced microfluidic immunoassay.

- The bacteria retained by DEP forces react with anti-E.Coli capture antibodies immobilized on the surface and remain after the electrical field is removed. The amount of captured bacteria are expected to be much higher than under normal conditions without DEP enrichment.

Point-of-care system.

- A stand-alone automated point-of-care diagnostic prototype comprising a simple apparatus and small footprint for detecting UTI, has been developed. Using Micro-Electro Mechanical Systems (MEMS), various functions including dilution, mixing, pumping and waste collection, have been integrated into a compact-sized automated POC system for UTI detection.

## Collaborator

Camtech Diagnostics Pte Ltd

## Customer Benefits

The point-of-care system is low-cost, portable, user-friendly and able to test with small-volume samples.

## Potential Applications

- In primary care, for general practitioners (GPs) and polyclinics to detect UTI early.
- In general and specialist clinics, for hospitals and intensive care units (ICUs) to improve antibiotic prescription and have UTI-guided antibiotic therapy.
- In rural areas, for clinicians to achieve on-time UTI diagnosis, despite of the limited or unavailability of laboratory facilities.