

An Indian-Australian research partnership

Project Title: **Development of paper based Point of Care microfluidic diagnostic devices**

Project Number **IMURA0628**

Monash Main Supervisor
(Name, Email Id, Phone) Adrian Neild, adrian.neild@monash.edu, +61 3 99054655 *Full name, Email*

Monash Co-supervisor(s)
(Name, Email Id, Phone)

Monash Head of Dept/Centre (Name,Email) Prof Chris Davies, chris.davies@monash.edu *Full name, email*

Monash Department: Dept. Mech. & Aero. Engineering

Monash ADRT
(Name,Email) Prof Emanuele Viterbo, emanuele.viterbo@monash.edu *Full name, email*

IITB Main Supervisor
(Name, Email Id, Phone) Santosh Noronha, noronha@iitb.ac.in, +91 22 25767238 *Full name, Email*

IITB Co-supervisor(s)
(Name, Email Id, Phone)

IITB Head of Dept
(Name, Email, Phone) K. V. Venkatesh, head.che@iitb.ac.in, +91 22 25767200 *Full name, email*

IITB Department: Chemical Engineering

Research Academy Themes:

Highlight which of the Academy's Theme(s) this project will address?

(Feel free to nominate more than one. For more information, see www.iitbmonash.org)

1. Advanced computational engineering, simulation and manufacture
6. Biotechnology and Stem Cell Research

The research problem

Define the problem

We propose to develop portable Point of Care (PoC) devices, using a paper based microfluidic platform, for detection of diseases/ conditions using DNA/Protein biomarkers. This requires precise engineering based on an understanding of the flow phenomena (of body fluid samples) and associated behaviour of suspended matter such as cells; it also involves miniaturization and simplification of long, multi-step bench-scale immunoassays while ensuring the highest specificity and sensitivity possible. The device thus developed needs to be automated with the entire immunoassay triggered with minimal actuation, yielding results in a short duration. We also wish to explore the possibility of using hydrogels in reaction schemes as well as for storage and controlled release of reagents.

Project aims

Define the aims of the project

1. Dynamics of flow of body fluids (blood, urine *etc.*) in a porous media and exploiting them for sample pre-treatment and concentration.
2. Development of paperfluidic hydrogel based biosensors for detection of protein, DNA, and miRNA markers.

Expected outcomes

Highlight the expected outcomes of the project

Design of a robust sample handling system based on understanding of flow dynamics.
Development of a PoC hydrogel-based biosensor for biomarker detection.

How will the project address the Goals of the above Themes?

Describe how the project will address the goals of one or more of the 6 Themes listed above.

The project attempts to address aspects of low cost detection of biomarkers (Theme 6) while using precision and reproducible manufacturing aspects (Theme 1)..

Capabilities and Degrees Required

List the ideal set of capabilities that a student should have for this project. Feel free to be as specific or as general as you like. These capabilities will be input into the online application form and students who opt for this project will be required to show that they can demonstrate these capabilities.

1. Undergraduate degree in mechanical, chemical, biomedical or materials engineering. Alternately, M.Sc., or M.Tech Biochemistry or Biotechnology or equivalent with project-related experience with biochemistry, microbiology and molecular biology techniques.
2. Strong problem solving ability and demonstrated lab research project experience.

Potential Collaborators

Please visit the IITB website www.iitb.ac.in OR Monash Website www.monash.edu to highlight some potential collaborators that would be best suited for the area of research you are intending to float.

Please provide a few key words relating to this project to make it easier for the students to apply.

Microfluidics, biosensors, diagnostics