Title of the project

Microfluidic-based 3D cell culture system to evaluate the response of primary breast tumor cells to therapeutics

Category (translational/bioengineering/biodesign): Translational research

Investigators (IISc and clinical institutions)

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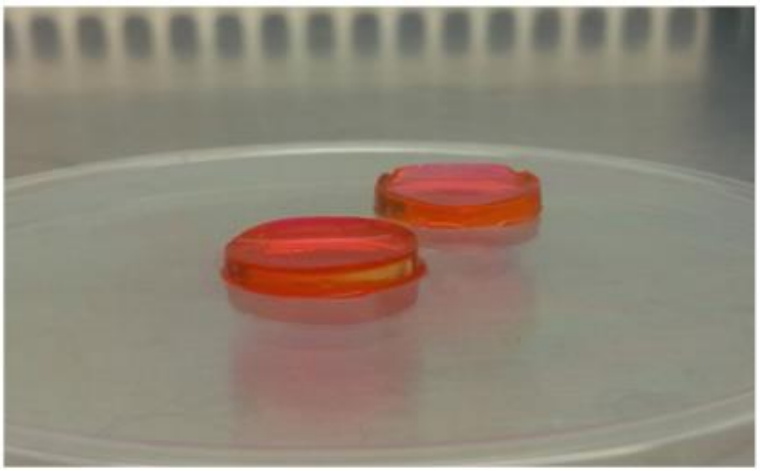
Statement of research

Combining a 3D culture model of primary breast tumor tissues with a perfusion-based microfluidic system with active scaffolds has the advantages of offering micro-scale dimensions similar to that observed in *in vivo* conditions along with reduced requirement for tissue, spatial control of tumor microsphere formation, and low-reagent consumption, leading to an efficient, low cost, high throughput bioassay platform to enable personalized medicine.

We propose to culture primary tumor cells excised from individual breast cancer/GBM patients in a perfusion-based microfluidic platform incorporating a biomimetic 3D culture environment with active scaffolds, to generate a large number of micro tumors. These primary micro tumors (3D spheroids) would be treated with appropriate chemotherapeutic drugs and the corresponding drug response will be evaluated *via* standardized bioassays.

This work builds on the project in Phase 1 at IISc wherein a miniature perfusion bioreactor was designed, built, tested, and extensively used (Balakrishnan et al., 2016). The bioreactor allows high-magnification view, accommodates scaffolds on a coverslip, and is as easily usable as a normal culture-well to put into various instruments. We had tested drug-efficacy at the single cell level using mechanical response techniques. In this project, that project will be taken further with close collaboration with an oncologist.



Collagen-based biomimetic hydrogel for culturing primary cancer cells