Title of the project

Cellular Engineering Using Biomicrofluidics

Category (translational/bioengineering/biodesign): Bioengineering

List of all investigators (IISc and clinical institutions)

1.Prof. Bikramjit Basu, Materials Research Centre, Indian Institute of Science, Bangalore

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Statement of research

Biomicrofluidics applies an integrative approach of using biomaterials and biologically inspired structural designs, together to mimic the physiological microenvironment of cells, in vitro. In this context, this project will enable us to investigate the intriguing synergistic effect of electric field towards differentiation of myoblast cells (C2C12) co-cultured of myoblasts with human mesenchymal stem cells (hMSc), using an artificially created culture system under dynamic flow conditions. The work is based on the hypothesis that, hMSc(s), the pluripotent adult stem cells can itself differentiate, as well as, can establish paracine signaling to motivate the neighbouring cells to undergo differentiation. Another hypothesis is that, myoblasts, precursor cells of striated muscles, can manifest non-muscular differentiation under suitable chemokine signaling. hMSc cell line is chosen to be co-cultured along with myoblasts to establish the role of cell to cell communication through paracrine signaling in cellular differentiation. The epigenetics of the transdifferentiation of the myoblast will be investigated by quantitative assays. The planned set of in vitro experiments will enable us to understand the efficacy of electric field stimulated hMSc, in driving the myoblasts into the fate of transdifferentiation other than muscular lineage. Together with the cell biological analysis and electrophysiological study, we plan to establish the phenomenon of transdifferentiation of cells under the influence of external cues.

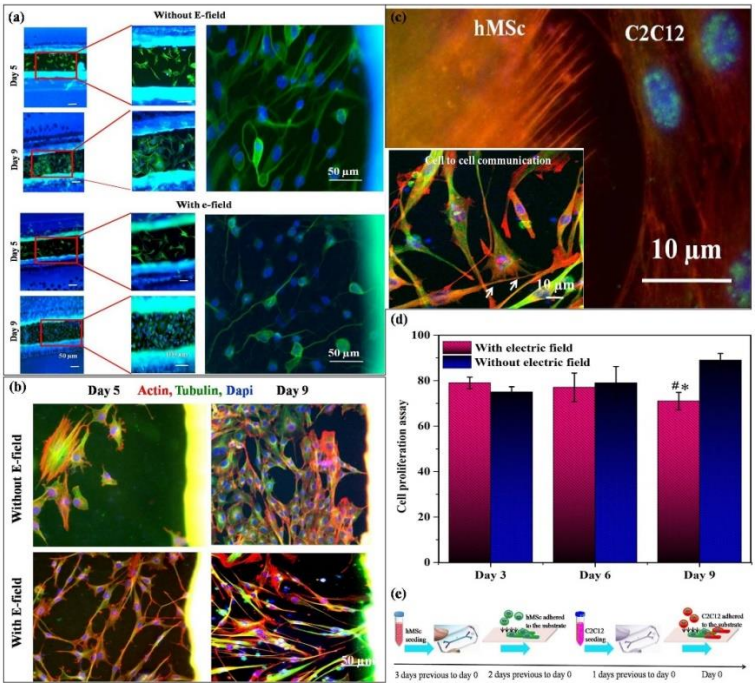

Figure. Cytocompatibility of the PMMA based LOC device