Cell and its surroundings: A tug-of-war that determines cell fate



Our health depends on health of the cells that constitute our body. The trillions of cells in our body must function properly and synchronously day in and day out to keep us healthy. As a result, it is very important to identify and understand the role of different factors that keeps cells happy. One of such important factors is the tissue micro-environment. Just like us, different cells function best in different environments. That's why micro-environment of brain is different from liver. However, micro-environment is not a single parameter rather a combination of many factors including mechanical ones such as tissue rigidity, stretching, vibration, fluid stress, etc.

In our lab, we try to understand the roles of such physical/mechanical factors for cell functioning in healthy and disease conditions. We ask questions





such as what is the best physical environment to grow stem cells in the lab that can be clinically relevant? Or, what causes a cancer cell to travel from one location to the other causing the cancer to spread all over the body? Or, how a tumour cell behaves when they are placed on brain like soft substrate vs. stiffer substrate as bone? Can we mimic in our lab the natural patterns of cellular arrangements that is found in body to engineer tissue structure? What role the physical factors play to make some cancer cells drug resistant?

To address such questions, we prepare materials of different mechanical properties. We also employ microfabricated structures and microfluidic channels to capture the effect of small scale geometry and fluid flow. We work in collaboration with many labs in and outside IIT Bombay. The knowledge gained from our research will help in designing efficient scaffolds for tissue engineering, cell delivery systems for stem cell based treatments and will indicate new treatment target to control diseases related to cellular migration including cancer.





Prof. Abhijit Majumdar, Department of Chemical Engineering, abhijitm@iitb.ac.in