

Biomedical Research Laboratory

Laboratory Coordinator: Dr. Niraj Sinha

List of Major Equipment:

- Polymer based additive manufacturing machine
- Ceramic based additive manufacturing setup
- Filament maker for 3D printing
- UV Vis Spectrophotometer
- Ball milling machine
- Probe sonicator
- Semi-automatic grinding and polishing machine
- Muffle furnace
- Tubular furnace

Laboratory research keywords:

Additive manufacturing; Scaffold fabrication; Prosthetic devices; Water treatment; Drug delivery simulation

Major Research and Development Contribution of the Laboratory

Year	Major research and development activity
2020-2021	<p>The laboratory has been involved in both theoretical as well as experimental work. On the purely theoretical front, we have focused on simulating the drug delivery in brain tumors and bone mechanics. Our study on bone mechanics mainly involved investigating the role of centroidal profile in tibia for implant design and the role of bone marrow in tibia as a damper. In the domain of work involving combination of theory and experiments, we have developed an in-house ceramic-based 3D printing system for fabricating scaffolds. We have developed a methodology for determination of their properties such as interconnectivity, tortuosity and pore size distribution in addition to predicting their mechanical strength and fluid flow properties. We have also developed prosthetic devices such as artificial hand for below elbow disability and artificial leg for above knee disability. Finally, we have successfully fabricated nanomaterials-reinforced membranes for water purification and have demonstrated its capability to purify contaminated water.</p> <p>During this time, we have filed 4 patents in addition to publishing more than 30 journal papers. We have received funding from several sources such as SERB, DST, DRDO, Portescap and POSOCO.</p>

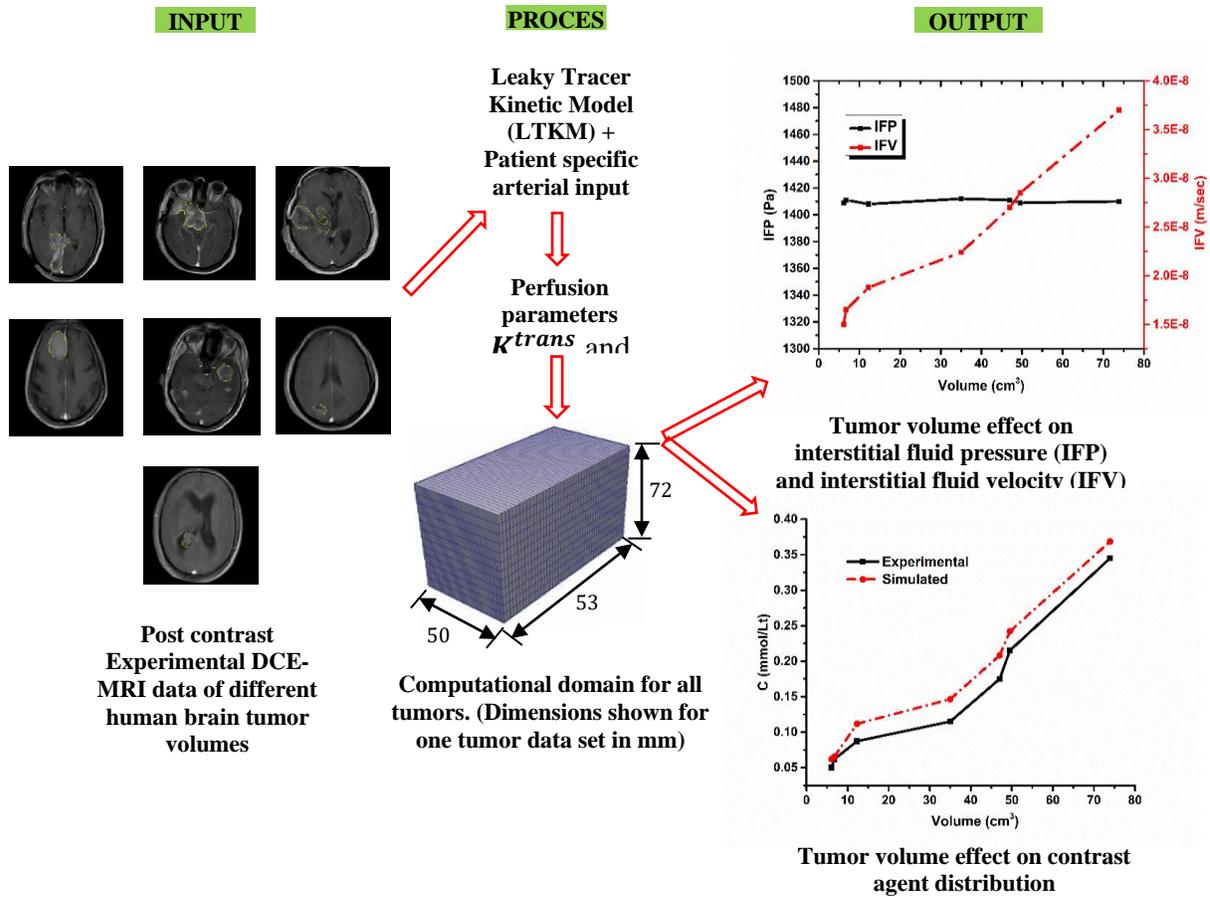


Figure #1: Effect of tumor volume on drug delivery in heterogeneous vasculature of human brain tumors.

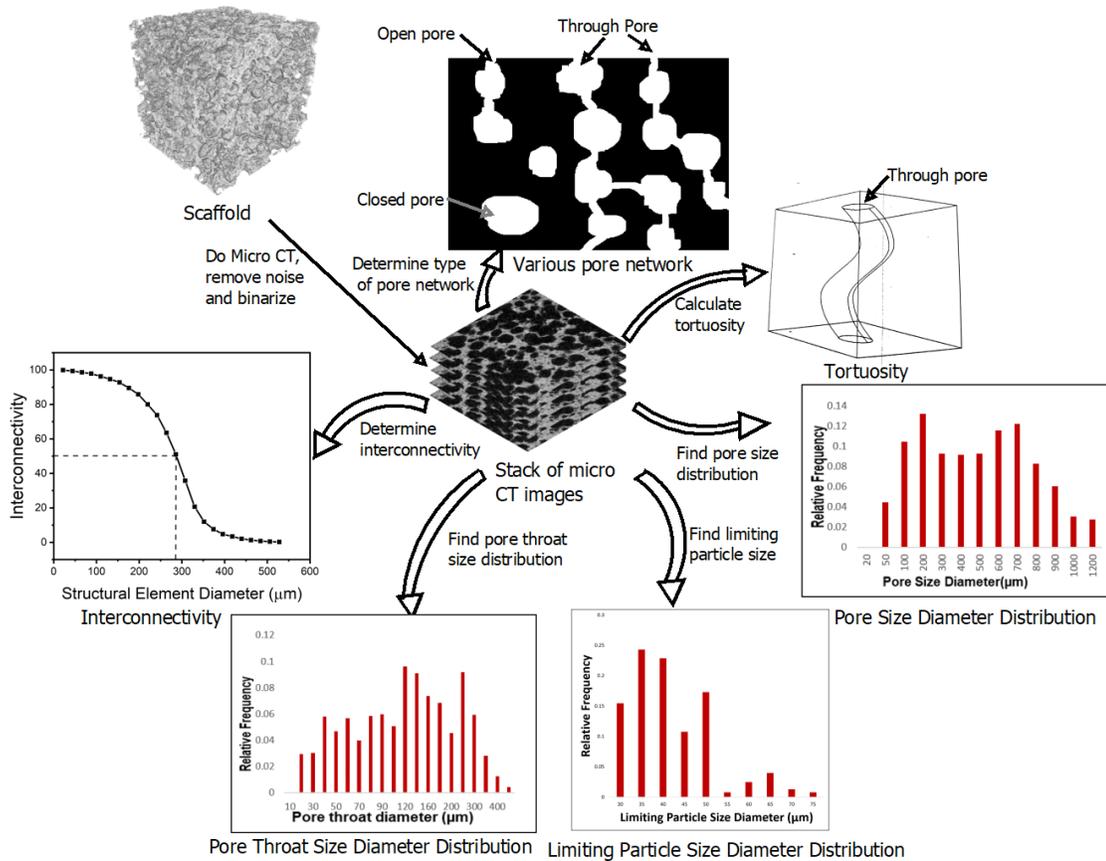


Figure #2: Structural analysis of porous bioactive glass scaffold using micro computed tomographic images.

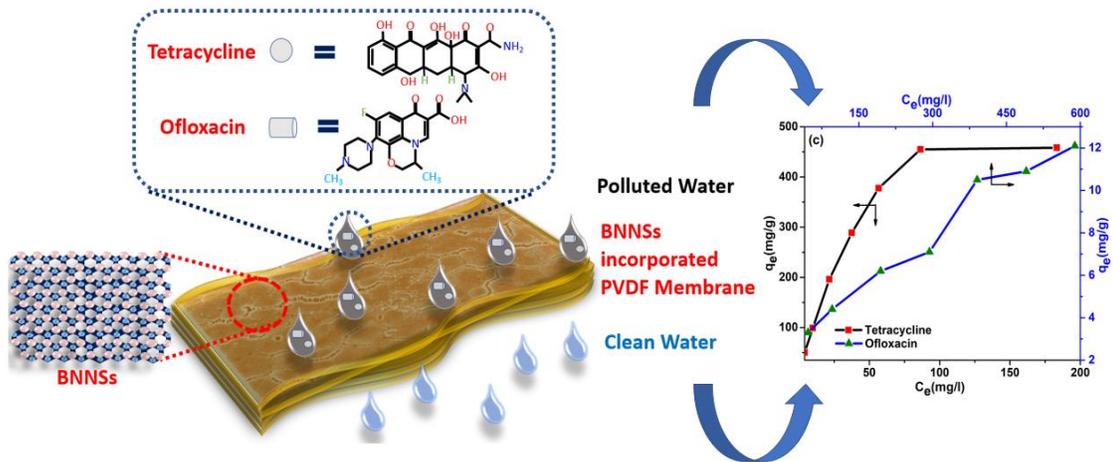


Figure #3: Nanomaterial-reinforced polymeric membranes for simultaneous removal of antibiotic contaminants from water.