Engineering Biocompatible and Bioactive Stents for Improved Endothelial Integration in Cardiovascular Applications

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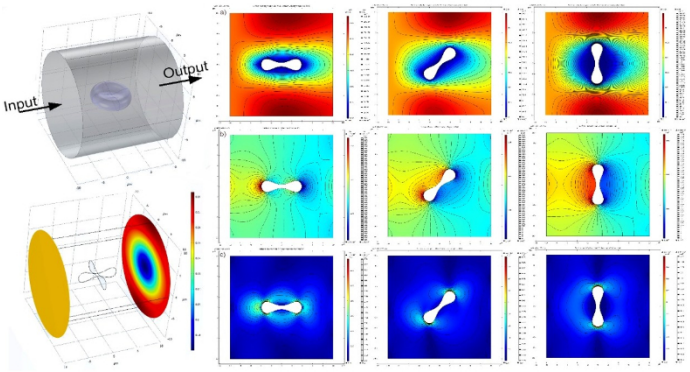
Cardiovascular disease, particularly coronary artery disease (CAD), remains a leading cause of mortality worldwide. The project's aim is to fabricate and evaluate novel biomaterials (a combination of natural and synthetic polymers) for stents by combining casting and 3D bioprinting to develop stents that are slowly biodegradable, mechanically stable, reproducible, and compatible, and that enhance endothelial cell adhesion and promote endothelialisation. The innovative approaches address key challenges in stent biomaterial and design, thus reducing complications such as thrombosis and restenosis while enhancing vascular healing. A key part of the project is to predict the influence of stent shape, rheological, and material properties on blood flow parameters using Computational Fluid Dynamics (CFD) methods.

Keywords:
biomaterials for stents, enhencment of vascular healing, blood flow, computational fluid dynamics



Fluid dynamics around a red blood cell. Model (left): cylindrical tube (marked input and output surfaces), red blood cell shape placed centrally; input velocity is constant. On the right side are 2D maps of a) velocity; b) pressure; c) shear stress for cells rotated by 0 °, 45 °, and 90 °

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