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Materials Engineering

at 3:30 PM on 24th August, 2015 (Monday)

Lecture Theatre, Materials Engineering

Engineering Biomaterials and Drug Delivery Systems for Next Generation Cardiovascular Medical Devices

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Abstract:

Cardiovascular diseases (CVDs) are the leading cause of death for both men and women throughout the world. These diseases are primarily caused by atherosclerosis, which is the accumulation of plaque causing blockages in the blood vessels throughout the body. This restricts the blood flow resulting in a decreased oxygen supply to the tissue, leading to heart attack, stroke, amputation, and renal failure to name a few. The CVDs are currently treated by angioplasty, stenting, and open surgery procedures using cardiovascular medical devices such as balloons, stents, and vascular grafts, respectively. However, a number of serious concerns such as thrombosis, neointimal hyperplasia, and inflammation still exist with these devices. Hence, our research is aimed at engineering biomaterials and drug delivery systems for improving the efficacy of these devices. This presentation addresses the following areas of our research on stents, balloons, and vascular grafts: (a) self-assembled monolayers (SAMs) based drug-eluting stent, bidirectional dual drug-eluting stent, and vitamin-c eluting stent; (b) the use of dextran sulfate platform for controlled drug delivery from the balloons; (c) interactions of vascular cells, blood cells, and immune cells with different types of polytetrafluoroethylene (PTFE) for applications in vascular grafts.