

Seminario sobre:

Therapeutic strategies for cardiac disease using soft materials, structures and devices

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Aula de grados de la Escuela de Ingenierías Industriales, jueves 12 de septiembre 2019, 16h
Paseo del Cauce, 59 - 47011 Valladolid

Abstract

Future implantable cardiovascular devices should be a multi-targeted, synergistic combination of (i) structural repair (ii) active assistance and (iii) biological therapy. This seminar will focus on representative implantable cardiac devices that I have worked on in each of these three areas, each addressing an identified shortcoming of existing technologies. In terms of structural repair devices, I will discuss a minimally invasive delivery system for atraumatic repair of intracardiac defects. As regards active assist devices I will discuss the modelling and design of a bioinspired soft active material technology that enabled the fabrication of a robotic direct cardiac compression device whose design mimics the orientation of the heart muscle. In vivo testing of this device has demonstrated that it is possible to improve cardiac output without the need for a blood-contacting approach in an acute heart failure animal model. Building on the platform of soft robotic approaches to enhance organ function, I will discuss pediatric cardiac assist devices and mechanical devices to enhance respiratory function. Lastly, to illustrate examples of enhanced biological therapy, I will discuss the use of biomaterials as vehicles for cell delivery and a targeted, refillable bio-implant for increasing retention of therapy in the heart, which enables repeated local administration of biological or pharmacological delivery, and some preliminary steps to combine these mechanical and biological therapies in order to improve delivery of drugs and modulate the host response.

Short Bio:



Ellen Roche is currently the W.M Keck Foundation Career Development Assistant Professor at the Institute for Medical Engineering and Science and the Department of Mechanical Engineering at the Massachusetts Institute of Technology. She directs the Therapeutic Technology Design and Development Lab. She completed her PhD at Harvard University School of Engineering and Applied Sciences. Her research focuses on applying innovative technologies to the development of cardiac devices. Her research includes development of novel devices to repair or augment cardiac function using disruptive approaches such as soft robotics, combination of mechanical actuation with delivery of cell therapy, and use of light activated biodegradable adhesives. Dr. Roche was employed in the medical device industry for over five years as a research and development engineer, and understands the regulatory pathways to medical device commercialization. She holds 4 issue patents, with ten pending and is the authors of over 40 conference/journal papers. She is the recipient of multiple awards including the Fulbright International Science and Technology Award, the Wellcome Trust Seed Award in Science, an American Heart Association Pre-Doctoral Award, a National Science Foundation CAREER Award and a Charles H. Hood Award for Excellence in Child Health Research.