Joint Department of

BIOMEDICAL ENGINEERING

UNC CHAPEL HILL | NC STATE UNIVERSITY

Coulter Seminar Series Presents

"Medicine by Design: Preparing the ground for endogenous repair"

Michael V Sefton, ScD, PEng

University Professor
Department of Chemical Engineering & Applied Chemistry
Institute of Biomedical Engineering
University of Toronto

MICHAEL V. SEFTON is University Professor in the Department of Chemical Engineering and Applied Chemistry and the Institute of Biomedical Engineering, University of Toronto. He was Director of the latter from 1999-2005 and President of the US Society For Biomaterials in 2006. He is currently Executive Director of Medicine by Design, http://mbd.utoronto.ca/. He has degrees in Chemical Engineering from the University of Toronto (1971) and MIT (1974) and has been at the University of Toronto since 1974. He has received the Acta Biomaterialia Gold award in 2011 and the Terumo Global Science prize in 2016 (among others). He was elected an international member of the US National Academy of Medicine in 2014 and the US National Academy of Engineering in 2020. He was made an Officer of the Order of Canada in 2018.

ABSTRACT

In 1899, Stephen Paget wrote "When a plant goes to seed, its seeds are carried in all directions…But they can only live and grow if they fall on congenial soil" [Lancet v1, p571]. Thus was born the seed and soil hypothesis for cancer metastasis. In the context of regenerative medicine, the seed is the stem cell and the soil is the niche and focus is shifting to "preparing the ground" to enable stem cell engraftment [Nature Medicine, 20, p857, 2014]. However, rather than transplanting exogenous cells, an alternative approach would be to enable quiescent tissue resident, endogenous cells to repair injuries through a regeneration-like response that restores tissue function. But this requires minimizing the dysregulation that occurs on injury and preparing the ground: providing cues to the niche to enable endogenous regeneration. We are focused on a biomaterial that induces vascularization as a consequence of an alternative foreign body response, without cells or growth factors. This methacrylic acid (MAA) rich material caused a significant increase in the number of vascular structures in several subcutaneous models. A recent study (Biomaterials 2017) pointed to the role of insulin growth factor 1 (IGF-1), since its inhibition abrogated the effect of MAA on vessel formation and on macrophage polarization. Intriguingly we are also seeing effects on subcutaneous nerve regeneration and are now exploring the impact of this material (available as an injectable gel) on skeletal muscle regeneration. Regeneration inducing biomaterials, like MAA, prepare the tissue for endogenous repair responses. These efforts are supported by Medicine by Design, which was created by a $114 million grant from the Canadian government, through the Canada First Research Excellence Fund. This is the largest ever research grant in Canada and supports the regenerative community at the University of Toronto and its partner hospitals.

Friday, October 16th
12:00 Noon

Seminar will be presented virtually via Zoom:

https://go.unc.edu/f3QHx