MSE-Colloquium@NTU

30 August 2017, 4.00 pm

Lecture Theatre 4, Nanyang Technological University, Singapore

Spontaneous Assembly of Bio-Nanoparticles for Next Generation Cardiovascular Disease Diagnostics

Assoc. Prof. Colby Shad Thaxton

Feinberg School of Medicine

Northwestern University

About the Talk

Natural high density lipoproteins (HDL) are critical due to their function as carriers of cholesterol and the role they play in cardiovascular disease (CVD). My research group has pioneered the use of gold nanoparticles as core templates to synthesize biomimetic nanoparticles, called high density lipoprotein nanoparticles (HDL NPs). The HDL NPs are synthesized using a 5 nm (in diameter) gold nanoparticle, which supports a phospholipid bilayer and the HDL defining apolipoprotein A-I (Apo-A1). The phospholipids bind to the nanoparticle surface through chemical and biological self-assembly mechanisms. Apo-A1 self assembles on the surface of the nanoparticle similarly to how it is found on native HDLs. Recently, we have taken advantage of the ability of lipid functionalized nanoparticles to specifically bind apolipoproteins, namely Apo-A1, from complex biological matrices, like serum. Spontaneous binding and assembly of Apo-A1 on phospholipid-functionalized nanoparticles provide a method to detect Apo-A1 and to measure some functions of HDLs in the serum compartment. As such, the spontaneous and stable self-assembly of Apo-A1 on lipid-functionalized nanoparticles provides an avenue for designing the next generation of biosensors for CVD risk assessment.

About the Speaker

Assoc. Prof. Colby Shad Thaxton graduated from the University of Colorado with a BA in Environmental Biology. He earned his MD and PhD from Northwestern University in 2004 and 2007, respectively. Joining Northwestern University as a full time faculty member in 2008, Assoc. Prof. Thaxton's research efforts focus on translational nanotechnology, which is the study of the fabrication, directed self-assembly, and characterization of materials which have size dimensions between 1 and 100 nm. In the context of biological nanostructures, this is the size regime of the molecular machinery which constitutes, for example, functional viruses, bacteria, and human cells. The challenge of bio-nanotechnology, and the focus of The Thaxton Laboratory, is to control the synthesis of structures which naturally interface with biological systems to develop exquisitely targeted, practical, safe, and effective nanoparticle therapeutics, imaging agents, and biosensors.

NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

SCHOOL OF MATERIALS SCIENCE AND ENGINEERING