THE UNIVERSITY OF ARIZONA
COLLEGE OF ENGINEERING

Biomedical Engineering

BME is proud to announce the Doctoral Defense of

Cayla Baynes
BME PhD Candidate

"Synthesis and Characterization of Multi-functional Submicron and Nanoparticles for Therapeutic and Biosensing Applications"

Abstract: A variety of polymeric carriers and particles were synthesized, characterized, loaded with drugs or antibodies, and utilized for drug delivery or cancer diagnostics. The drug nanoparticle carriers were prepared using emulsion solvent evaporation and nanoprecipitation methods. These consisted of biodegradable poly(D,L-lactic acid-co-glycolic acid) (PLGA), modified or stabilized with poly(ethylene glycol) (PEG), poly(propylene glycol) (PPG), polyvinyl alcohol (PVA), Pluronic F-68, and/or bovine serum albumin (BSA). The first model therapeutic drug was insulin-like growth factor (IGF1). IGF1-loaded nanoparticles showed that the released protein was able to stimulate an important pathway for effective cell proliferation and cell survival. The proteolytic enzyme, trypsin, was also encapsulated in PLGA nanoparticles. Its release was comparable to most other enzymatic systems, and the released enzyme maintained significant activity within four hours after its release. Similarly, nanoparticles loaded with two anticancer drugs were used as therapeutic agents for lung cancer — erlotinib (Tarceva/OSI-420) and osimertinib (Tagrisso/AZD9291), and evaluated for their effectiveness in treating cancer. In addition, fluorescent, polystyrene submicron particles were utilized to detect and quantify two different cancer markers — carcinoembryonic antigen (CEA) and carbohydrate antigen 19-9 (CA 19-9) from diluted whole blood or undiluted serum, on a paper-based microfluidic platform. These particles were covalently conjugated with anti-CEA and anti-CA 19-9 antibodies and stabilized with BSA. Immunoagglutination of the antibody-conjugated particles in the presence of either CEA or CA 19-9 changed the fluorescent scatter signals (440 nm blue and 660 nm red) upon 365 nm UV excitation. The use of UV excitation and subsequent fluorescence scattering enabled much higher double-normalized intensities compared with elastic Mie scattering, successful detection in the presence of blood or serum, as well as distinct multiplex assays with minimum cross reaction of antibodies.

Tuesday, October 2nd, 2018
Keating 103
9:00 am
Host: Dr. Roberto Guzman & Dr. Jeong-Yeol Yoon

Persons with a disability may request a reasonable accommodation by contacting the Disability Resource Center at 621-3268 (V/TTY).