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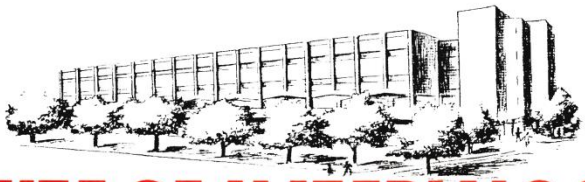

INSTITUTE OF MATERIALS SCIENCE

POLYMER PROGRAM SEMINAR

"Engineering Immunity with Synthetic Materials"

Prof. Darrell J. Irvine
Massachusetts Institute of Technology

Friday, October 23, 2015
11:00 AM, IMS Room 20

ABSTRACT

We have recently focused on engineering strategies to enhanced vaccines and immunotherapy based on two different approaches to the design of "hitchhiking" therapeutics: First, an approach to enhance adoptive cell therapy (ACT) for cancer will be described. ACT using patient-derived tumor-specific T-cells is a promising approach for cancer treatment, but strategies to enhance ACT T-cell functionality *in vivo* are needed. We developed a strategy combining nanomedicine with ACT, based on the chemical conjugation of drug-loaded nanoparticles (NPs) to the surfaces of live lymphocytes for ACT. ACT T-cells carrying cytokine-loaded NPs (to permit pseudo-autocrine self-stimulation following transfer into tumor-bearing hosts) are capable of massive *in vivo* expansion and robust anti-tumor responses, while avoiding side effects commonly observed with systemically-administered immunomodulatory drugs. Novel protein nanogels that enable T-cells to be loaded with very high doses of supporting drug will be described, which support their continued expansion/function for up to two weeks *in vivo*.

Second, a novel strategy for targeting antigens and immunostimulatory agents to lymph nodes will be described. Lymph node targeting is achieved clinically is sentinel lymph node mapping in cancer patients, where small-molecule dyes are efficiently delivered to lymph nodes by binding to serum albumin. To mimic this process in vaccine delivery, we synthesized amphiphiles designed to non-covalently bind vaccine antigens and adjuvants to endogenous albumin. These "albumin-hitchhiking" amphiphiles were efficiently delivered to lymph nodes following injection, leading to as much as 30-fold amplified cellular immune responses and anti-tumor immunity. These examples illustrate the power of bioengineering approaches in shaping the immune response and studying immune cell biology.

**For further information, please contact YH Chudy at younghee.chudy@uconn.edu.*

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