MAR11-2010-006700

Abstract for an Invited Paper
for the MAR11 Meeting of
the American Physical Society

Peptide assemblies: from cell scaffolds to immune adjuvants[1]

JOEL COLLIER, University of Chicago

This talk will discuss two interrelated aspects of peptide self-assemblies in biological applications: their use as matrices for regenerative medicine, and their use as chemically defined adjuvants for directing immune responses against engineered antigens. In the first half of the presentation, the design of peptide self-assemblies as analogues for the extracellular matrix will be described, with a focus on self-assemblies displaying multiple different cell-binding peptides. We conducted multi-factorial investigations of peptide co-assemblies containing several different ligand-bearing peptides using statistical "design of experiments" (DoE). Using the DoE techniques of factorial experimentation and response surface modeling, we systematically explored how precise combinations of ligand-bearing peptides modulated endothelial cell growth, in the process finding interactions between ligands not previously appreciated. By investigating immune responses against the materials intended for tissue engineering applications, we discovered that the basic self-assembling peptides were minimally immunogenic or non-immunogenic, even when delivered in strong adjuvants. -But when they were appended to an appropriately restricted epitope peptide, these materials raised strong and persistent antibody responses. These responses were dependent on covalent conjugation between the epitope and self-assembling domains of the peptides, were mediated by T cells, and could be directed towards both peptide epitopes and conjugated protein antigens. In addition to their demonstrated utility as scaffolds for regenerative medicine, peptide self-assemblies may also be useful as chemically defined adjuvants for vaccines and immunotherapies.

[1]This work was funded by NIH/NIDCR (1 R21 DE017703-03), NIH/NIBIB (1 R01 EB009701-01), and NSF (CHE-0802286)