

Protein Interactions with Chemically-Designed Biomaterial Surfaces

Cell and Tissue Engineering Laboratory

Department of Biomedical Engineering

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An ideal orthopaedic implant could ultimately be designed to control macroscopic implant/bone integration by controlling cellular and subcellular events which occur at the bone-biomaterial interface. For this purpose, many biomedical engineers are developing methods to control fundamental cell-biomaterial interactions. Adsorption/desorption of proteins to a biomaterial creates a monolayer containing proteins in a variety of conformations, displaying specific sites (ligands) which can bind to cell membrane receptors. When receptors bind with appropriate ligands, signaling cascades are initiated which direct subsequent cellular functions (and, thus, the cellular response to the biomaterial). Many promising surface modification strategies have been identified to control cell/biomaterial interactions; however, the clinical utility of many of these strategies is limited, since nonspecific protein interactions with the surfaces are often not minimized or controlled by the modifications. The proposed research project will utilize model biomaterial surfaces designed to minimize nonspecific, background protein interactions, in a detailed study of protein interactions with immobilized bioactive ligands. Specifically, the student will use enzyme-linked immunosorbent assay (ELISA) and immunohistochemistry techniques to quantify the amounts and determine the orientations of selected proteins adsorbed to chemically-modified, model biomaterial surfaces. If time permits and the student is interested, the student may also perform short cell function assays to determine the biofunctionality of peptides on the biomaterial. The student who completes this project will become familiar with antibody handling and labeling, operation of a microplate reader, basic experimental design considerations and fundamental hands-on laboratory skills. These skills will be an asset to any student wishing to continue in the field of tissue engineering, but will also be an excellent laboratory experience for someone planning to attend medical school or to conduct biological or medical research in the future. To apply for this project, please send a resume and a cover letter, including your future educational/employment plans/goals, to Dr. Dee.