

Preparation of Polymer Nanocarriers for Targeted Delivery of Drugs

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Project 1: Transdermal Delivery

Amphiphilic nanoparticles offer a carrier that might enable the efficient transport of compounds through the stratum corneum of the skin. We are presently developing a modular approach to building amphiphilic macromolecule with control over size, shape, and surface properties in order to probe the utility of this approach for transdermal delivery of small molecular drugs, and transcutaneous delivery of antigens for vaccination.

Project 2: Cancer Therapy/Tumor Targeting

Recent studies have verified that the molecular weight and architecture of polymers can have a profound effect on their enhanced targeting to tumor tissue via the Enhanced Permeability and Retention (EPR) effect. With our development of efficient synthetic routes to complex molecular architectures, we plan on exploring in further detail the effect of molecular architecture on biodistribution and tumor targeting.

Research Objectives: The overall goal of our research group is to prepare material which will enable the improved transport, delivery, and effectiveness of drugs. Specific issues that will be addressed may include developing transdermal carriers, using targeting mechanisms to improve delivery to specific regions of the body, and providing a stable nano-environment for sensitive therapeutics (such as therapeutic genes or peptides). The bulk of the research at present focuses on the actual preparation of materials, though biological testing is planned in the near future.

Prerequisite/Experience: The proposed research will involve extensive synthesis of materials using traditional organic chemistry laboratory methods. As such, a strong understanding and academic performance in organic chemistry lectures and laboratories are critical to potential candidates.