Biomaterials for Targeted Drug Delivery

Suzie H Pun

University of Washington

Pharmaceutical drugs typically bind to a protein target in order to prevent or treat disease. However, drug binding to off-target areas can result in unwanted side effects. This is particularly noticeable in the use of chemotherapies to treat cancer, where the therapeutic window can be narrow and toxic side effects include nausea and vomiting, immunosuppression, and pain.

The goal of targeted drug delivery is to increase the relative concentration of a drug at the disease site compared to normal tissue. There are two major approaches in achieving drug targeting. In passive targeting, drugs or drug carriers preferentially accumulate at the disease site due to a combination of the physicochemical properties of the drug formulation and the physiology of the disease site. In active targeting, the drug or drug carrier recognizes target cells through a specific molecular interaction (such as a receptor/ligand binding event).

In this presentation, I will review some examples of drug carriers that have been developed for passive targeting, active targeting and a combination of both mechanisms. I will also provide two examples of tumor-targeted drug delivery formulations developed by our laboratory. The first example describes polymer nanoparticles that passively accumulate in solid tumor sites. In the second example, we used a library screening method to identify a peptide that preferentially binds to “anti-inflammatory” (M2) macrophage present in tumor environments. We further demonstrate that the peptide can be used for actively-targeted drug delivery to these cells to improve the responsiveness of the tumor to drug treatment.