Engineering Liposomes and Nanoparticles for Biological Targeting

Our ability to engineer nanomaterials for biological and medical applications is continuously increasing, and nanomaterial designs are becoming more and more complex. One very good example of this is the drug delivery field where nanoparticle systems can be used to deliver drugs specifically to diseased tissue. In the early days, the design of the nanoparticles was relatively simple, but today we can surface functionalize and manipulate material properties to target diseased tissue and build highly complex drug release mechanisms into our designs. One of the most promising strategies in drug delivery is to use ligands that target overexpressed or selectively expressed receptors on the surface of diseased cells. To utilize this approach, it is necessary to control the chemistry involved in surface functionalization of nanoparticles and construct highly specific functionalities that can be used as attachment points for a diverse range of targeting ligands such as antibodies, peptides, carbohydrates and vitamins. In this review we provide an overview and a critical evaluation of the many strategies that have been developed for surface functionalization of nanoparticles and furthermore provide an overview of how these methods have been used in drug delivery systems.