

Nanomedicine: New Opportunities in Targeted Cancer Therapy and Image-Guided Surgery

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Abstract

Nanomedicine is currently under intense development for applications in biomedical imaging, molecular diagnosis, and targeted therapy. The basic rationale is that nanometer-sized particles such as quantum dots, colloidal gold, and polymeric nanomicelles have functional and structural properties that are not available from either discrete molecules or bulk materials. When conjugated with targeting ligands such as monoclonal antibodies, peptides or small molecules, these nanoparticles can be used to target malignant tumor cells and the tumor microenvironment (such as tumor stroma and tumor vasculatures) with high specificity and affinity. In the “mesoscopic” size range of 10-100 nm, nanoparticles also have large surface areas for conjugating to multiple diagnostic and therapeutic agents, opening new possibilities in imaging, therapy, and surgery. At the present, however, there are several fundamental problems and technical barriers that must be understood and overcome. In this talk, I will discuss the major challenges and opportunities in the development of nanomedicine for targeted cancer therapy and image-guided surgery.