Theranostics
Session co-chairs: Rebekah Drezek, Rice University, and Darrell Irvine, Massachusetts Institute of Technology

Nanomaterials have been explored as reagents to deliver medicines to disease sites in vivo, detect the presence of disease, or as contrast agents to allow the imaging of target tissues for many years. Recently, a new class of multifunctional materials are emerging that combine elements of sensing, imaging, and/or drug delivery in a single system- theranostics, which can simultaneously diagnose/detect disease status while providing a means to treat the pathology, especially in metastatic cancer. This session will present perspectives on these concepts from three leaders in this emerging area and highlight some of the promising new approaches in preclinical development.

Speakers

1) Andrew Tsourkas, Univ. of Pennsylvania

The Challenges of Developing Targeted Theranostic Nanoparticles and Potential Solutions On the Horizon
Many nanoparticles being tested in pre-clinical studies include a targeting agent to confer additional specificity for a disease site, while minimizing off-target toxicity in normal, healthy tissues. However, these benefits are not always realized in practice. In the context of cancer, numerous studies have shown that targeting does not always result in a selective increase in the efficacy of therapeutic nanoparticles, yet it undoubtedly comes with hefty development costs. In this presentation, I will discuss some of the latest strategies that are being developed to improve the tissue penetration and targeting capabilities of theranostic nanoparticles as well as some of the non-receptor-mediated targeting approaches that are currently being explored.

2) Ester Kwon, Univ. of California, San Diego

Synthetic Biomarkers for Cancer Detection and Diagnosis
In our technology, diagnostic nanomaterials were engineered to target the tumor microenvironment and report pathogenic protease activity for the detection of cancer. These nanomaterial sensors can be tools for precision medicine to stratify patients for molecularly targeted therapies.

3) Evan Scott, Northwestern University

Immune Theranostics
Due to the complex responses generated by the stimulation of diverse immune cell populations during immunotherapy, it is critical to monitor which cells are targeted during treatment to understand the mechanisms behind elicited responses. I will present several short- and long-term controlled delivery systems that we have engineered to identify and quantify immune cells following intracellular delivery both in vitro and in vivo.