InSyTe FLECT/CT Application Spotlight

Multifunctional nanoparticles for cancer imaging

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Title: Rational Design of Albumin Theranostic Conjugates for Gold Nanoparticles Anticancer Drugs: Where the Seed Meets the Soil?
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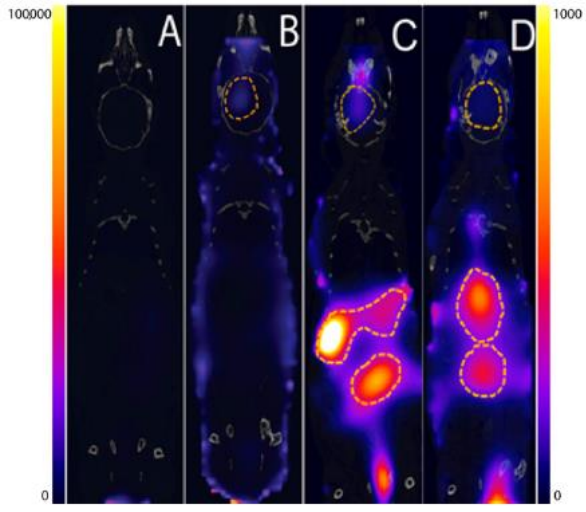
Summary: Multifunctional nanoparticles are custom designed reagents for disease detection intended for multiple purposes, such as diagnosis and treatment of disease (i.e. theranostics). Development of multifunctional nanoparticles is of particular interest in imaging and treatment of cancer. The general approach involves using a specific material as the basis for the multifunctional nanoparticle and the subsequent chemical conjugation of different materials or molecules that serve different purposes, including targeting of a specific molecular marker, image contrast for a specific imaging modality, or treatment of cancer. Previously, the research team had described a multifunctional agent comprised of a targeting molecule (albumin), therapeutic agent (trifluorothymidine), and different contrast agents for fluorescence (Cy7) and magnetic resonance (^{19}F) imaging. In this study, the authors built upon this work by developing two different gold nanoparticle (AuNP) based compounds; one where the multifunctional agent described above is conjugated to a standard AuNP for photothermal cancer therapy, and another where the multifunctional agent is conjugated to a boron-containing AuNP for boron neutron capture therapy, a form of radiation cancer therapy. The synthesis and in vitro characterization of both compounds is described, followed by in vivo imaging with the InSyTe FLECT/CT in a mouse model of glioblastoma (U87).



The authors used the InSyTe FLECT/CT to evaluate the in vivo distribution of the multifunctional AuNP agent. Figures A (1h) and B (72h) after tail vein injection of the previously developed multifunctional agent only. Figures C (1h) and D (72h) after tail vein injection of the AuNP based multifunctional agent. The AuNP based version of the compound shows accumulation in the glioblastoma after only 1h post-injection, as well as distribution in the liver. After 72h, the agent is no longer in the glioblastoma and is largely contained in the liver.

InSyTe FLECT/CT Spotlight: Using the InSyTe FLECT/CT, the research team obtained in vivo images of the multifunctional AuNP based agent in a mouse model of glioblastoma. The fluorescent dye conjugated to the AuNP agent provided fluorescence contrast and enabled the team to visualize the in vivo distribution of the agent. They concluded that the AuNP based agent uptake was largely in the liver and not in the glioblastoma. While they observed poor tumor accumulation, the in vivo imaging results enabled the research team to gain further understanding of the AuNP based nanoparticle and important information into how best to change and refine the design of the compound.