InSyTe FLECT/CT Application Spotlight

Sentinel Lymph Node – Cancer imaging

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Title: Multifunctional Transferrin Encapsulated GdF_3 Nanoparticles for Sentinel Lymph Node and Tumor Imaging
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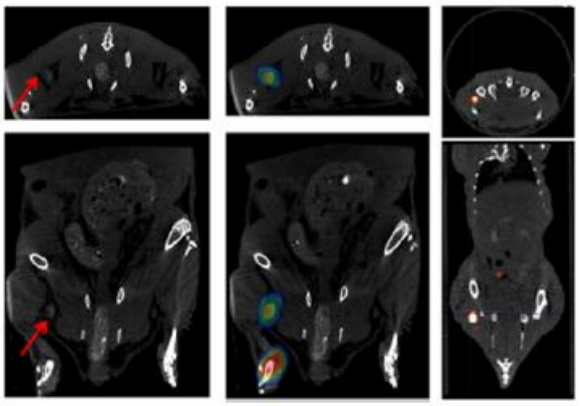
Keywords: Nanoparticles, sentinel lymph node, cancer imaging

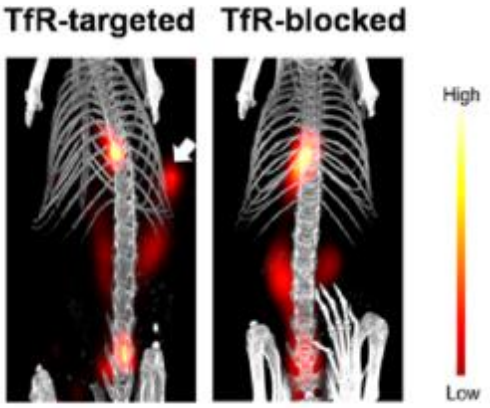
Summary: Endogenous proteins, including human serum albumin, bovine serum albumin, and transferrin, are ideal candidates to carry therapeutic drugs and dyes due to their high biocompatibility and low immunogenicity. Transferrin plays a key role in the construction of these types of nanoparticle-based carriers that can be applied to bioimaging and therapy. Transferrin transports iron ions across the cell membrane via endocytosis through binding on the cell surface transferrin receptor (TfR). In cancer cells, TfR expression is much higher compared to normal cells, which makes this an ideal biomarker for studying cancer. In this study, the authors synthesized a TfR targeting nanoplatform by conjugating a fluorescent dye (Cy7) and a radiotracer (^{64}Cu) to a gadolinium-based nanostructure encapsulated by transferrin. This multifunctional probe can then be used for MRI, PET, fluorescence and CT imaging modalities. The team then utilized the sentinel lymph node to act as a gateway for metastatic tumors that would be present in further downstream lymph nodes.



The authors used the InSyTe FLECT/CT to image the in vivo distribution of nanoparticles conjugated with Cy7 after injection into the foot pad and accumulation within the sentinel lymph node. In this example, the red arrows indicate the location of the sentinel lymph node in the CT, followed by the PET/CT image overlay. The FLECT/CT was then used to create the third column of images demonstrating the same accumulation in the sentinel lymph node of the nanoparticle construct.

InSyTe FLECT/CT Spotlight: Using the InSyTe FLECT/CT, the research team obtained in vivo images of the nanoparticle construct in a sentinel lymph node mouse model of SW480 colorectal xenograft tumors. By using a fluorescent dye labeled nanoparticle specific for the transferrin receptor, the research team was able to determine the in vivo distribution of the nanoparticle and confirm its delivery to the sentinel lymph node. They were also able to demonstrate accumulation of the nanoparticle in the primary colorectal tumor cell xenografts. The in vivo images in the paper complement the extensive multi-modality, biochemical, cellular, and histopathology work performed to confirm the delivery of nanoparticles to the

sentinel lymph node, as well as assess its efficiency for use as a multi-modality imaging agent for tumor imaging.



The authors also used the InSyTe FLECT/CT to image the in vivo distribution of nanoparticles conjugated with Cy7 three hours after intravenous injection into mice with colorectal tumor cell xenografts. In this example, the white arrow indicates the accumulation of the nanoparticle in the tumor in the targeted version of the nanoparticle. The FLECT/CT is also able to confirm hepatobiliary and renal metabolism with accumulation of the nanoparticles in the liver and kidney.