InSyTe FLECT/CT Application Spotlight

Drug Delivery

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Authors: Sun T et al.
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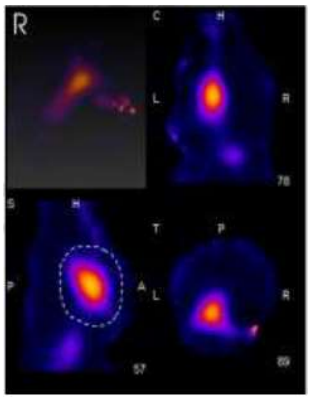
Summary: Drug delivery is a challenging aspect in the treatment of diseases. Factors such as low solubility, permeability, and stability of compounds affect the delivery of drugs. A common strategy to improve drug delivery is the use of prodrugs, which is where a drug is chemically modified to facilitate delivery and remain stable while in the bloodstream, and then converted by the body into an active drug upon arriving at the treatment site. In this application spotlight, a team of researchers in China report on an engineered drug-dye conjugate (DDC), consisting of a prodrug conjugated to a synthesized NIR fluorescent dye. The prodrug is designed such that both the dye and drug are conjugated to a chemical linker that quenches the fluorescence activity of the dye and acts as a carrier for the drug. The linker is then cleaved in the presence of glutathione, which has a higher concentration in the tumor microenvironment. The strategy reported is to use the conjugated NIR dye, which belongs to the Indocyanine Green (ICG) family of dyes, as a fluorescent label to 1) track the distribution of the prodrug and 2) utilize its properties as a photosensitive agent (produce heat when activated by light) to aid in tissue penetration of the drug. The researchers assessed the DDC distribution and accumulation in vivo in mice bearing MDA-MB-231 breast tumors using multiple imaging modalities, including the InSyTe FLECT/CT.



The authors used the InSyTe FLECT/CT to assess localization of the DDC in a preclinical model of breast cancer. The figure on the left, taken 12 hours after injection, demonstrates the InSyTe FLECT/CT capabilities of enabling 3D visualization of the DDC distribution and accumulation in the tumor. In addition to the tomographic image slices from different geometries seen in the figure at left, one of the supplemental materials in the publication is a projection video generated from FLECT data, showcasing the 3D visualization capability.

InSyTe FLECT Spotlight: Using the InSyTe FLECT/CT, the research team was able to visualize accumulation of the DDC *in vivo* 12 hours post intravenous injection. The research team also visually confirmed with the InSyTe FLECT/CT that the engineered DDC successfully delivered and released both the drug and fluorescent dye in the tumor. Furthermore, the research team touted the FLECT modality as a “really useful tool” that would allow them to “watch” the in vivo drug distribution and release over time in future studies.