Technology Opportunity, Ref. No. UA-21/122

Fluorescent dyes in the near-infrared spectrum

Novel fluorescent dyes based on IR-780 dye have been invented. They can be easily tailored by polymer conjugation to enable different optical properties (e.g. spectrum) for imaging and tuning of hydrophilicity and lipophilicity. In conjunction with other dyes, they can enable FRET measurements. Importantly, the dyes can have multi-functional groups for further modification (e.g. targeting design with a specific ligand). The invention provides an opportunity for the design of novel imaging kits.

Keywords	imaging kits, near-infrared, IR-780, polymer conjugate, lipophilicity or hydrophilicity control, FRET (Förster resonance energy transfer), tracking of intactness of nanoparticles (loss of cargo)
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Reference	Biomacromolecules 2019 (currently being revised)
Background	Near infrared (NIR) dyes have been selected for numerous advantageous properties regarding imaging of biological specimens. They penetrate biological tissue more readily than UV-vis dyes due to reduced scattering and absorption. At present, commercially available NIR dyes are limited to phthalocyanine, cyanine, and squarain. However, they show shortcomings, such as aqueous insolubility and aggregate formation. Cyanine dyes (e.g. Cy 5.5, Cy7) show a high molar absorptivity, strong fluorescence, and good photostability, but are expensive, offer less solubility variations (e.g. hydrophobic, hydrophilic), are not biocompatible, and have less reaction functional groups for further modification.
Invention	Synthesis of polymer-dye conjugates to adjust the physicochemical characteristics of original cyanine dyes (i.e. IR-780), including their lipophilicity. With a functionalised linker between dyes and polymers, the final NIR spectrum offers a broad variability in fluorescence absorption / emission. Therefore these modified dyes can readily form FRET pairs with other dyes. For example, a poly-dimethyl-siloxane-IR-780 (PDMS-IR-780) conjugate can be used in a hydrophobic system. In addition, functionalization with polymers, such as poly-2-oxazoline (an alternative to polyethylene glycol [PEG]) offers many opportunities for attaching the dye to different bio-functional molecular segments, such as ligands for targeting, antibodies or drugs for precision medicine.
Fields of Use	Based on the invention, imaging kits can be designed for the research community providing the possibility for scientists to image *in vitro* and *in vivo*, e.g. to monitor the intactness of nanocarriers.
Patent Status	patent application filed (details available upon request)
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