Development of a Novel Near-Infrared Fluorescent Theranostic Anticancer Prodrug

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With the improvements of cancer treatment selectivity and real-time monitoring in mind, the goal of this project was to develop an anticancerous prodrug that could concurrently track and inhibit tumorigenic growth selectively. The formulated prodrug consists of a near-infrared (NIR) fluorophore and tubulin inhibitor Combretastatin A-4 (CA4), both conjugated and inactivated via disulfide linker, which in turn is reduced by intracellular glutathione (GSH), found in 40x greater concentrations in cancerous tissue. After GSH-mediated reduction and activation, the prodrug is designed to release both the NIR fluorophore, with fluorescence emission wavelength escaping the range of tissue autofluorescence, and CA4 simultaneously. The prodrug was successfully synthesized and characterized by NMR, mass spectroscopy, and fluorescence spectroscopy, with further follow-up procedures in vitro to be performed. The results of this study support the practical synthesis and characterization of a near-infrared, theranostic prodrug as a selective dual-purpose agent for inhibiting and monitoring cancer, and with further testing this platform may have applications for personalized medicine in the near future.

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