A Novel In-Clinic Patient- and Cancer- Tailored Targeted Drug Delivery System

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Nanoparticle (NP) targeted drug delivery systems (TDDS) provide protection and enhanced uptake of therapeutics. Existing TDDS technology consists of pre-manufactured NPs with fixed targeting ligands. Therefore, if a patient does not exhibit proper characteristics recognized by a targeting ligand, that particular NP will be ineffective in treating the patient. Various cancers including ovarian, colorectal, and lung cancers overexpress receptors of high interest. One example is epidermal growth factor receptor (EGFR). Use of the complimentary ligand EGF can be used for targeting. Problems with its conjugation orientation make EGF targeted therapeutics complicated to achieve. This project developed novel in-clinic coatings of existing NPs with a desired ligand. The novelty is a patient-tailored, TDDS that is self-forming in the clinic. The patient can have their cells characterized for targeting receptors followed by the formulation mixing with the most appropriate, matching targeting ligand. Poly(lactic-co-glycolic acid)-paclitaxel NPs were fabricated and suspended into deionized water. To readily coat NPs with targeting ligand, Poly(lactide- co-glycolide)-poly(ethylene glycol-N-hydroxysuccinimide) (PLGA-PEG-NHS) linker was added. Characterization of NPs and NPs with PLGA-PEG-NHS was performed with DLS, SEM, and other methodologies. A coat is observed and all tests confirm PEG on the surface of NPs. Coating can be readily done in-clinic allowing attachment of targeting ligands and has great potential for multiple cancer sub-types, and numerous applications of personalized medicine, where TDDS would be advantageous. EGF ligand, for example, can be used for targeting avoiding the conjugation orientation making for a better-targeted in-clinic treatment.

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