Priming the Tumor Microenvironment with Cyclophosphamide to Enhance Nanoparticle Delivery: An Imaging Study

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Nanoparticle research is an emerging field of medicine meant to tackle cancer using diverse constructs; however, nanoparticles suffer from improper and insufficient delivery, which has led to inadequate anticancer effects and intolerable systemic side effects. Altering the nanoparticle construct has been shown to readily affect its pharmacokinetics, yet, without an extensive understanding of the underlying mechanisms impacting nanoparticle delivery to the tumor, alterations to the nanoparticle construct are often ineffective. For this reason, we tested the use of a common FDA approved chemotherapeutic, cyclophosphamide, in a pre-dose regimen to improve nanoparticle delivery to the tumor. To assess cyclophosphamide's effects, we created three novel nanoparticle constructs. These constructs were based on polymeric backbones and used fluorescent dye, making them key candidates for an extensive imaging study using multiple distinct imaging techniques that range from evaluating whole body systemic uptake to cellular uptake. One construct in particular, Compound 2, stood out as potentially having great utility in future imaging studies and eventually clinical trials. Additionally, cyclophosphamide is found to significantly increase delivery of the nanoparticles to the tumor ($P<0.05$). These results indicate cyclophosphamide's potential as a universal tool in nanomedicine, affecting various cancer types and nanotherapeutics.

Awards Won:

Third Award of $1,000