Precisely Size Controlled Drug-silica Nanoconjugate for Cancer Therapy

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Objective

Drug delivery nanomedicines, in the size range of 1-200 nm, have attracted much interest in the past 2-3 decades as alternative modalities for cancer treatment. The size of these drug delivery vehicles has been strongly correlated with their in vivo biodistribution, penetration in tumor tissue, and intracellular trafficking. It potentially has significant impact on their antitumor efficacy. We aim for developing a clinic relevant, size-controlled drug delivery system to study and understand the size effect of nanomedicine in biological systems.

Research Highlights

- We studied the size effect on *in vivo* anticancer efficacy and identify the optimal nanoparticle (NP) size (50 nm) for the most efficient tumor reduction in xenograft MCF-7 tumor model (Figure 1a, b).
- We also studied the size effect on *in vivo* biodistribution using athymic nude mice bearing MCF-7 tumor and found enhanced tumor accumulation were observed when the size of NP was ≤50 nm (Figure 1c, d).

Future Research

- We will evaluate the efficacy of preventing tumor metastasis using the size-controlled drug-silica nanoconjugates in murine 4T1 tumor model and study the size effect.
- Study the toxicity of silica NP as a systemic drug delivery system and investigate the long term clearance of the silica NP from the treated mice using radio labeling method.

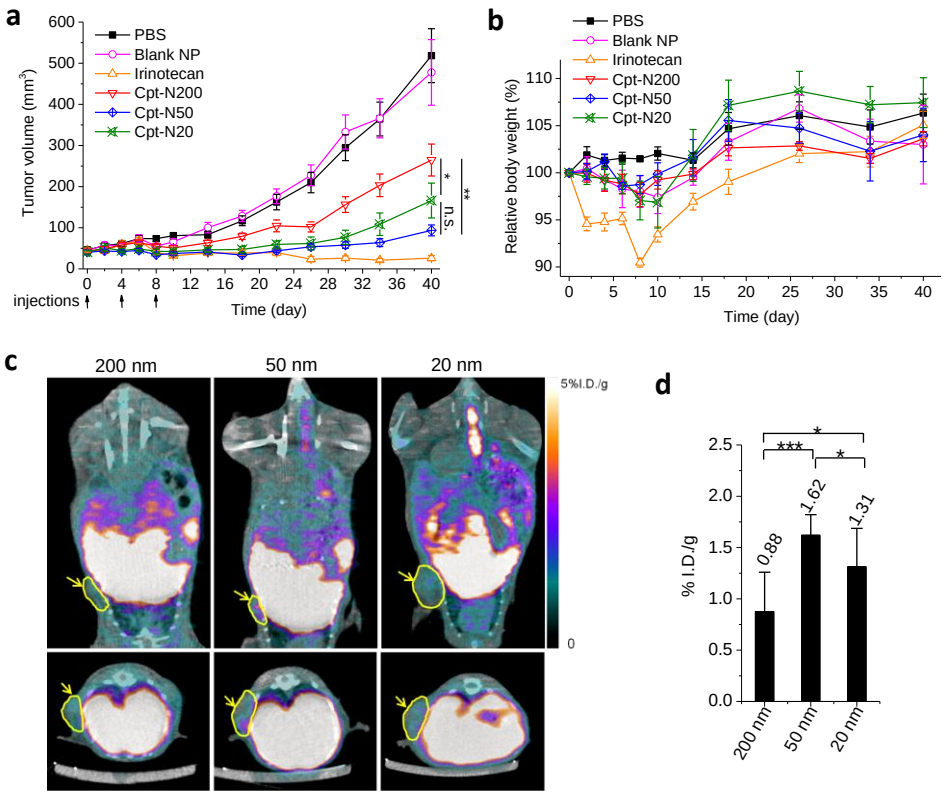

Figure 1. a, *In vivo* antitumor efficacy study in athymic nude mice bearing xenograft MCF-7 tumors; **b**, The body weight of mice were monitored during the whole study to evaluate if any acute toxicity caused by the treatments; **c**, *In vivo* biodistribution studies in athymic nude mice bearing xenograft MCF-7 tumors; **d**, Mice were euthanized 24 hours post injection. Tumors were collected and measured for radioactivity by γ-counter to determine the accumulation of silica NPs.