PhD seminar

Protein-based nanoparticles as drug delivery system for targeted cancer therapy: *In vitro* evidence

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Abstract

Chemotherapeutic drugs are highly effective for treating cancers, but serious side effects are unavoidable. Our goal is to develop the nanoparticle-based drug delivery systems that can target cancer cells selectively and kill them effectively with a minimal side effect to noncancerous cells. Hepatocellular carcinoma (HCC) and bladder cancer (BlCa) are our cancers of interest. HCC and BlCa cells highly expressed p32 and NRP-1, respectively, and we used them as target tumor receptors. Protein-based nanoparticles were highly biocompatible and widely investigated as anticancer drug nanocarriers. For HCC, we fabricated hemoglobin microparticles (HbMPs) loaded with doxorubicin (Dox) and coated with p32 antibodies (as tumor-targeting ligands) (p32Ab-Dox-HbMPs). For BlCa, we fabricated human serum albumin nanoparticles (HSA-NPs) loaded with doxorubicin (Dox) and conjugated with tumor-targeting peptides (APARPAR or iRGD) (APARPAR/iRGD-Dox-HSA-NPs). Uptake of our fabricated nanocarriers were selective to cancer cells, and they could kill cancer cells efficiently. In conclusion, this proof-of-concept in vitro evidence clearly demonstrated that protein particles loaded with anticancer drug and coated with tumor-targeting ligands could specifically target and kill cancer cells and leave the noncancerous cells unharmed. This nanoparticle-based drug delivery system could be an innovative tool for targeted cancer therapy.

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