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Nanoliposome particle possessing protein based CRISPR/Cas9 system for the therapeutic applications

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Gene editing (CRISPR/Cas9) technology has been spotlighted as a superior therapeutic tool that is capable of treating the fundamental causes of disease induced by genetic abnormalities, which to date have been considered as incurable diseases. Thus many researchers have focusing establishment of gene editing moiety delivering, because efficient and safe delivery in the body remains one of the major challenges of biomedical and nano-pharmaceutical research. A plasmid based CRISPR/Cas9 system has shown several critical limitations such as off-targeting, integration of DNA segment and toxicity of transfection agent. To overcome these problem, protein based CRISPR/Cas9 system was recently co-opted to the therapeutic or gene editing method. However, the protein system has still remained the stability problems, especially in *in vivo* system as like degradation by enzymatic reaction or low efficiency. Herein, we elucidate novel method for the delivery system of protein based CRISPR/Cas9 with high efficient and biocompatibility. The CRISPR/Cas9 complex was successfully encapsulated into the nanometer sized liposome (nanoliposome), which was composited with bioapplicable phospholipid chemicals through metal coordination reaction. After chemical surface modification, the nanoliposome with gene editing materials was shown long term solution stability without agglomeration and penetrated well into the cell cytosol. We suggest optimization of preparation for the nanoliposomal protein based CRISPR/Cas9 system as a platform particle to the therapeutic application. As a proof of concept, the nanoliposome with CRISPR/Cas9 system was exploited to apply for the type-2 diabetes therapy and exhibited effectiveness of glucose control without off-targeting, acute toxicity and degradation. More importantly, our particle platform system was shown higher regulation effect than a clinical used chemical drug without various adverse reactions effect including renal disorder or allergic reaction.

Biography

Jee-Yeon Ryu is currently a PhD candidate at Ajou University College of Pharmacy. She is studying synthesis of nanomaterials aimed at biological applications.

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