Sucrose Addition Improves Targeted ECO/siBeta3 Nanoparticle Stability

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The ability of siRNAs to regulate oncogenes through RNA interference makes them a promising target in cancer therapy. siRNAs are an especially beneficial treatment tactic for TNBC, a more aggressive breast cancer that currently lacks targeted treatment options. Previous studies have shown that siRNAs can treat tumor cells by regulating β3 integrin, a protein involved in metastasis. Previously developed ECO lipid nanoparticle carrier can target β3 integrin through successful encapsulation and cytosolic delivery of siβ3 in tumor cells. Current clinical application of ECO/siβ3 nanoparticles is tainted by the aggregation of the nanoparticles after lyophilization or freezing storage techniques. Inconsistencies in nanoparticle size result in less effective delivery of siβ3. To combat aggregation, the impact of sucrose addition on nanoparticle size was evaluated, since sucrose is used as a cryoprotectant in pharmaceuticals. Dynamic light scattering experiments show consistency of nanoparticle size after minus 80 freezing and after lyophilization, implicating sucrose's ability to maintain the stability of ECO/siβ3 nanoparticles. Furthermore, results show that nanoparticles with addition of sucrose maintained their ability to regulate β3-integrin compared to nanoparticles without sucrose, ensuring that the efficacy of the nanoparticle was sustained. Results suggest that sucrose addition in ECO/siβ3 nanoparticles is a simple method to significantly improve nanoparticle stability for clinical use. Looking forward, experiments involving different cryoprotectants on the nanoparticle and different targeted ECO/siRNA nanoparticles can be performed to determine the wide-ranging applications of targeted lipid nanoparticle stability.