Next Generation Intracellular Delivery: Optimization of Exosome Isolation and Novel Exosome-Mediated Delivery for Therapeutic Targeting of Cancer

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Next-generation intracellular delivery solutions are necessary and will provide essential roles in drug therapeutic applications as well as being critical components of genome editing approaches. Currently, advances in the fields of genome engineering push development of efficient nanocarriers. Many of these nanocarrier systems have limitations, in part because the cell rejects synthetic material regardless of whether or not it is disguised as a biological component. This project aims to use exosomes, being a biological entity, as a novel way to reach areas of the body that are resistant to nanoparticles and other bio-inspired systems. The primary problem that this project deals with is that isolation techniques have not yet been standardized. Thus it is necessary to standardize isolation and delivery techniques in order to use exosomes as efficient therapeutic nanocarriers. Utilizing the three most common isolation techniques: ultracentrifugation, ultrafiltration and an Invitrogen kit, a Multi Criteria Decision Analysis (MCDA) tool was utilized, specifically a Weighted Sum Model (WSM) to conclude that the ultracentrifugation technique was the most effective isolation technique for utilization of exosomes as nanocarriers. These exosomes were then stained with PKH26 dye and revealed to transfect HeLa cell line with great efficiency. Together, these findings demonstrate a clear way to isolate and utilize exosomes as drug delivery nanocarriers paving the way to next generation intracellular delivery.

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