COMPARATIVE BIODISTRIBUTION OF EXOSOME, LIPID NANOPARTICLE, AND HYBRID FORMULATIONS FOR TARGETED GASTROINTESTINAL DELIVERY OF ANTI-TNF ALPHA

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Background: Drug delivery systems are crucial for enhancing the impact of medical treatments, particularly when focusing on tissues such as those of the gastrointestinal (GI) tract. Formulations like exosomes, lipid nanoparticles, and hybrids, have shown promising drug delivery vehicles for site-specific delivery of biologics such as anti-TNF alpha, a therapeutic agent that has been used to treat inflammatory diseases. Studying the bioavailability of these targeted drug delivery systems, could lead to remarkable improvement of medicinal outcomes including targeted treatment of the gastrointestinal tract (GI).

Aim: Our objective was to explore the GI biodistribution of three drug delivery systems-exosomes, LNP, and hybrids encapsulating the anti-TNF alpha factor.

Methods: Formulations of interest which include exosomes, LNP, and hybrids were administered to the mice. The biodistribution and intensity of bioavailability have been measured at time marks: 2h, 4h, 8h, and 24h post-administration using the Pearl LI-COR imaging system. At the 24-hour mark, the mice were dissected, and the intensity of the formulations was further measured in key organs of the gastrointestinal (GI) tract.

Results: The hybrid formulation showed the highest uptake and signal intensity, followed by LNP and exosomes. Each formulation showed a steady decline signal intensity from its peak two hours after dosage throughout the duration of 24 hours period. Compared to exosomes and LNPs, the hybrid system showed better biodistribution in the gastrointestinal (GI) tract.

Conclusion: The hybrid drug delivery system showed the most effective retention and distribution within the gastrointestinal tract, suggesting that it may be a superior formulation for the localized delivery of anti-TNF alpha in the treatment of inflammatory gut diseases. Further research is needed to optimize these formulations for clinical use.

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