Formulation and characterization of cationic nanoemulsions as carriers for microRNA

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Endogenously expressed microRNAs (miRNAs) act as post-transcriptional regulators of gene expression in various (patho)physiological processes. miRNA dysregulation is frequently linked to the onset and progression of numerous diseases, hence miRNA-based therapy could be an effective strategy for treating or preventing genetic, immune, or metabolic disorders. Even though miR-27a has been identified as a promising candidate for miRNA mimic therapy of obesity, its use is restricted due to enzymatic degradation and low membrane permeability [1].

To address these issues, we developed cationic lipid nanoemulsions (CNEs) as non-viral carriers for miR-27a. Miglyol® 812 was chosen as the liquid lipid, stearylamine (SA) as the cationic lipid, and Tween® 80 and Poloxamer 188 as surfactants to achieve dual electrostatic stabilization properties. Droplet size, polydispersity index, surface charge, viscosity, and pH value were determined as physicochemical parameters of CNEs. Furthermore, we studied how different mass ratios of CNE and miR-27a, as well as dilution in different media, affect the physicochemical features of the produced complex.

The CNE/miR-27a complex (5:1) was found to be the leading formulation after physicochemical characterization, stability, and cytotoxicity studies. The results revealed that reducing the SA concentration and maintaining the optimal droplet size are essential for the safety and efficacy of the formulations.

References

1.   Nam, H.Y, et al. Arch Pharm Res (2009) 32: 639–46.

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