

## Preparation and Characterization of Chitosan Nanoparticles for Delivery of Oligonucleotides

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**Abstract :** Purpose: The therapeutic potential of oligonucleotide (ODN) is primarily dependent upon its safe and efficient delivery to specific cells overcoming degradation and maximizing cellular uptake in vivo. The present study is focused to design low molecular weight chitosan nanoconstructs to meet the requirements of safe and effectual delivery of ODNs. LMW-chitosan is a biodegradable, water soluble, biocompatible polymer and is useful as a non-viral vector for gene delivery due to its better stability in water. Methods: LMW chitosan ODN nanoparticles (CHODN NPs) were formulated by self-assembled method using various N/P ratios (moles ratio of amine groups of CH to phosphate moieties of ODNs; 0.5:1, 1:1, 3:1, 5:1, and 7:1) of CH to ODN. The developed CHODN NPs were evaluated with respect to gel retardation assay, particle size, zeta potential and cytotoxicity and transfection efficiency. Results: Complete complexation of CH/ODN was achieved at the charge ratio of 0.5:1 or above and CHODN NPs displayed resistance against DNase I. On increasing the N/P ratio of CH/ODN, the particle size of the NPs decreased whereas zeta potential (ZV) value increased. No significant toxicity was observed at all CH concentrations. The transfection efficiency was increased on increasing N/P ratio from 1:1 to 3:1, whereas it was decreased with further increment in N/P ratio upto 7:1. Maximum transfection of CHODN NPs with both the cell lines (Raw 267.4 cells and Hela cells) was achieved at N/P ratio of 3:1. The results suggest that transfection efficiency of CHODN NPs is dependent on N/P ratio. Conclusion: Thus the present study states that LMW chitosan nanoparticulate carriers would be acceptable choice to improve transfection efficiency in vitro as well as in vivo delivery of oligonucleotide.

**Keywords :** LMW-chitosan, chitosan nanoparticles, biocompatibility, cytotoxicity study, transfection efficiency, oligonucleotide

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