Impact of nanoparticles characteristics on siRNA-mediated gene silencing

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Small Interfering RNA (siRNA) are noncoding RNAs with important roles in gene regulation that can exert gene silencing effects at the post-transcriptional level by targeting messenger RNA (mRNA). This therapeutic tool can be used to silence inflammatory signals and reduce inflammation. After spinal cord injury (SCI), intense inflammation occurs resulting in further damage to the spinal cord, known as secondary injury. Although siRNA has a high silencing effect, it can be rapidly eliminated from the bloodstream and has poor transport across cell membranes. One approach to improving the delivery and efficacy of siRNA involves the use of nanoparticles (NPs). NPs work as a protective layer which helps to avoid clearance mechanisms and increase payload stability. We fabricated poly(lactic-co-glycolic acid) (PLGA) NPs to silence inflammatory signals to reduce inflammation and secondary injury. Encapsulation efficiency and the release profile of siRNA from the PLGA-NPs In vitro assay showed that PLGA-NPs encapsulation by double emulsion were found to be more efficient, had a low Polydispersity Index (PDI) and, if lyophilizing, the NPs could be stored for longer periods of time without affecting their size or PDI. PLGA-NPs showed a release profile of 70% in the time of 8hrs and 100% in a period of 192hrs. Together, these data suggest that the use of NPs to deliver siRNA is a promising next-generation drug delivery approach for the treatment of different injuries such as spinal cord injuries.