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Surface modification of PLGA nanoparticles by low molecular weight chitosan to enhance mucoadhesion

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Statement of the Problem: Poly (lactic-co-glycolic acid) (PLGA) have been used in preparing polymeric nanocapsules due to its excellent biocompatibility, biodegradability and the ability to control drug release [1] [2]. Moreover, PLGA has been approved by the FDA for use in pharmaceutical preparations. However, PLGA has poor mucoadhesive properties, which limits its effectiveness in targeting nasal route. Chitosan has been reported as a mucoadhesive polymer due to its amine groups (NH_2) [3]. The current research intends to enhance the mucoadhesiveness of PLGA nanoparticles by coating with low molecular weight chitosan (LMWC). These nanoparticles were loaded with tobramycin as a model drug.

Methodology: PLGA and LMWC-PLGA nanoparticles were fabricated using emulsion-solvent evaporation techniques with polyvinyl alcohol (PVA) as a stabilizer. The nanoparticles were characterized in terms of their particle size and zeta potential (ζ) by DLS. The physical morphology was characterized using SEM [4]. The mucoadhesive properties of LMWC-PLGA nanoparticles were evaluated by the changes of ζ when the nanoparticles interact with mucin [5].

Findings: Spherical nanoparticles were prepared with a size range of 268-467 nm. The size increased as the LMWC concentration increases. Coated formulations were positively charged (ζ 34-50 mV). Noncoated NPs were negatively charged (ζ-2.8). The DE in all formulas was above 90%. Mucoadhession test showed that LMWC-PLGA were able to interact with mucin due to ionic interaction

Conclusion & Significance: A mucoadhesive nanoparticles loaded with tobramycin were prepared successfully. These preparations could be used to target bacterial infections caused by Pseudomonas aeruginosa. These nanoparticles are expected to extend drug action, improve patient compliance and minimize side effects.

Biography

Nusaiba Al-nemrawi earned her PhD degree in pharmaceutical sciences from Long Island University (LIU), New York, USA. Before that she earned the Master and Bachelor degrees in Pharmacy from Jordan University of Science and Technology (JUST), Irbid, Jordan. She received many awards and scholarships including Fulbright pre-doctoral scholarship (USA), NJPHAST award (USA) and graduate assistantship awards from both JUST and LIU. She is working now as assistant professor at JUST. She is focusing on the development of nanoparticles to sustain and control drug release, development of novel targeted nanoparticulate drug delivery systems to improve therapeutic outcomes of infectious diseases and design of novel polymeric nanoparticles for chemotherapy of cancers.

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