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Application of albumin-based nanoparticles integrated with thermo-responsive gel systems for enhanced nasal delivery of amoxicillin

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Amoxicillin is recommended as the first-line therapy for the treatment of Acute Bacterial Rhinosinusitis (ABR). However, orally administered amoxicillin is highly related to many systemic adverse effects and has poor bioavailability.
Therefore, this study aimed to prepare topical nasal formulation of amoxicillin utilizing albumin-based nanoparticle combined with thermo-responsive nanogel system to enhance the residence time in nasal cavity and prolong drug release.
Gelling temperature investigations revealed that all formulations (21 – 23% *w/w* Poloxamer 407) were suitable for nasal application (sol-gel transition at ~35°C). Particle size measurement revealed a nanosized preparation (< 200 nm) was obtained. Moreover, the mucoadhesive strength and drug release properties exhibited that the formulation with 21% *w/w* Poloxamer 407 could be considered optimal for effective nasal application. Antibacterial activity studies showed that the optimized *in situ* thermogelling nasal nanogels of amoxicillin preserved its effectiveness in terms to inhibit the growth of five common ABR pathogens in comparison to 1 mg/mL amoxicillin aqueous solution as positive control.
In conclusion, the preparation of Amoxicillin albumin-based nanoparticles incorporated into *in situ* thermo-responsive gel systems appeared as a potential candidate for local antibiotic therapy in the nasal cavity.

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