



Office of Technology Management

Nanoparticles for Oral Delivery of Aminoglycosides

Technology Reference

CW026

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Field

Drug Delivery

Key Words

Oral drug delivery
Nanoparticles
Infectious diseases
Highly Hydrophilic, positively charged drugs
Aminoglycosides
Streptomycin

License Status

Seeking licensing partners

Patent Status

US & PCT application filed

Overview

Many drugs are limited in their route of administration. Recently, it has been shown that some drugs cannot be administered orally, mainly because they are substrates for the multi-drug efflux P-glycoprotein (Pgp) at the GI level. Pgp prevents the adsorption of its substrates across the apical brush membrane border of the intestine by mediation their active efflux. Moreover, if the drug is highly hydrophilic and/or positively charged (cationic), the absorption is impaired at the GI tract because the lipid nature of the cell membrane renders the GI tract highly permeable to lipid soluble (i.e., hydrophobic), but not hydrophilic, substances. Such drugs must be administered by an alternative route, such as parenteral injection.

Currently, no technology exists that can effectively deliver aminoglycosides, or other hydrophilic, cationic drugs, by oral route, which is the most preferred route for drug administration, especially for the treatment of chronic diseases having a long duration more efficient and less cumbersome methods of administering a highly hydrophilic, cationic drug to an individual in the treatment of a disease.

Technical Summary

The present invention is directed to a novel drug-delivery system, which utilizes a nanoparticle drug composition comprising a hydrophilic, cationic drug incorporated into a biodegradable nanoparticle prepared from a naturally occurring or synthetic polymer. The nanoparticle drug composition is incorporated into comprises a hydrophilic, cationic drug, which optionally has been complexed with a high molecular weight, naturally occurring polymer. The drug or drug complex is admixed with a biodegradable polymer, followed by the addition of an inorganic polyanion, like a condensed phosphate, to form the nanoparticles drug composition.

Animal data now available demonstrate that these nanoparticles, loaded with streptomycin and taken orally, reduce the bacterial load in a *M. tuberculosis* chronic infection-mouse model. The efficacy of such a formulation was equivalent to injected streptomycin, the current "standard of care." Besides tuberculosis, aminoglycosides have a large antibacterial spectrum and are particularly effective against diseases and conditions caused by *Pseudomonas*, *Pasteurella*, *Brucella*, *Haemophilus*, *Salmonella*, *Klebsiella*, and *Shigella* bacteria. In all these situations, an aminoglycosides oral carrier will be useful and attractive for clinical use.

Benefits

- Oral drug -delivery system for aminoglycosides, or other hydrophilic, cationic drugs

Areas of Application

- Infectious diseases
- Tuberculosis
- *Pseudomonas*

Stage of Development

- Animal data exists

