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Nanoparticles to Enhance Antibiotic Delivery and Performance

Researchers at the University of South Florida have developed novel nanoparticles for the protection, rejuvenation, and delivery of antibiotic drugs. Potential applications include cosmetics, implant coatings, eye washes, and treatment of topical and systemic bacterial infections.

The delivery of antibacterial agents to infection sites within the human body is a challenge particularly for lipophilic drugs and for accessing deadly infections in fatty tissue and on the surface of surgically-implanted medical devices. The need to overcome this challenge is of high priority in the development of new antibacterial therapeutics for treatment of life-threatening infectious diseases and medical device implant technologies.

These nanoparticles specifically address this problem and demonstrate the means to enhance biological performance of both water insoluble and water soluble drugs, by targeting bacterial cells and avoiding rapid degradation of antibiotic compounds in the human body.

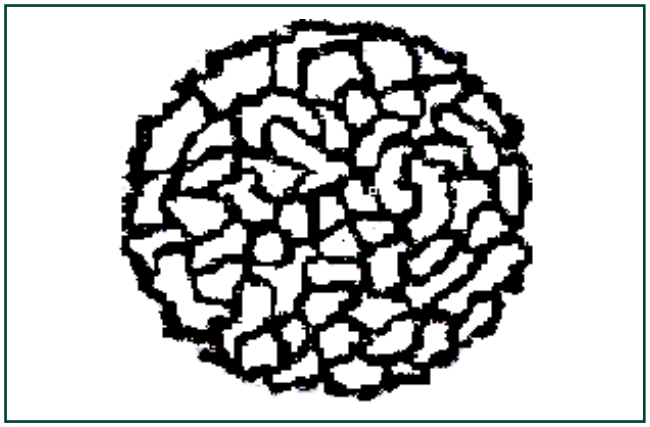
This methodology implements microemulsion polymerization as a means to easily prepare aqueous solutions of polyacrylate nanoparticles that contain antibacterial drugs either chemically bonded to the nanoparticle matrix or encapsulated within its protective core structure. The resulting nanoparticle antibiotics, or nanobiotics, are morphologically consistent and enhance the bioactivity of the antibiotics so that they are highly effective, even against drug-resistant bacteria such as methicillin-resistant Staphylococcus aureus (MRSA).

This methodology has been further utilized by the researchers to prepare "surfactant-free" nanoparticles as well as nanoparticle delivery vehicles for antimalarial drugs and drug-reversal agents.

Advantages:

- Enhances the bioactivity of water-soluble and water-insoluble antibiotics.
- Converts water-insoluble compounds into aqueous solutions of nanoparticles for easy administration.
- Effective against microbes such as MRSA that cause life threatening and drug resistant bacterial infections.
- Provides a delivery platform for a wide variety of drug classes, including anti-malarial drugs and drug-resistant reversal agents.
- Biocompatible with biological fluids and tissue.
- Nanoparticles target bacterial cells.

Delivery of Antibiotics



Nanobiotics: Nanoparticle-delivered antibiotics

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