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Repurposing Phenol & Phosphate Anticancer Drugs as Cationic Lipid Salts in Solid Lipid Nanoparticles Focused on Etoposide

A simple, generalizable method manufactures stable solid lipid nanoparticles for anionic anti-cancer and anti-infective drugs, offering improved drug delivery, high-shelf life, and potential for scalable production.

Researchers at Purdue have developed a method to improve the formulation of drugs by encapsulating an anionic drug (either an anti-cancer or anti-infective drug) with cationic lipids in a solid lipid nanoparticle (SLN). A common problem in pharmacology is the difficulty in delivering the drug of interest to the desired location. This depends on many properties such as the solubility of the drug in biological fluids, method of uptake by cells, and hydrophobicity of the drug. A method used to improve drug delivery is to encapsulate the drug with another substance to form a nanoparticle. This encapsulation could take the form of a polymer, protein, or what is becoming more common recently, a lipid nanoparticle. An important characteristic of modern SLN's is their stability. For example, the SLN-based Covid vaccines had to be stored at -80 â °C.

The researchers developed a simple, generalized method to manufacture SLN's with many types of anionic drugs, resulting in increased stability and a high-shelf life. To test the method's efficacy, they synthesized a dimethyldidodecylammonium - quercetin drug conjugate and found that the entrapment efficiency was as high as 85%, the SLN was stable up to 14 days at 1.7 - 3.3 Â°C, and that the SLN was thermally stable up to 46 Â± 3 Â°C

Advantages:

- Simple synthesis procedure

- Potential to scale production

- SLNs formulated with this method may have improved solubility, high drug payload, increased adsorption, slower metabolism and elimination, and enhanced activity or efficacy

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Pharmaceuticals/Drug Delivery & Formulations
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- Ability to make SLNs for controlled release

- SLNs can be prepared for any suitable route of drug administration such as oral, topical, etc.

- Generalizable, many different anionic drugs could be formulated into SLN

- Stable up to 14 days at 1.7 â€“ 3.3 Â°C

- Thermally stable up to 46 Â± 3 Â°C

- SLN may be less toxic compared to polymeric nanoparticles

- SLN may have higher efficacy compared to conventional drugs

Applications:

- Anti-cancer pharmaceuticals

- Anti-viral/bacterial pharmaceuticals

TRL: 2

Intellectual Property:

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