NOVEL STEROL DERIVATIVES FOR SUPERIOR LIPOSOME STABILITY

Tech ID: 18994 / UC Case 2008-036-0

BRIEF DESCRIPTION

BACKGROUND: Liposomes have been used in many drug, nutritional, and cosmetic delivery applications due to their unique properties that mimic the phospholipid bilayer of cell membranes. In all of their applications, liposome stability is crucial for efficient delivery stable liposomes mimimize leakage and loss of the payload. Sterols such as cholesterol have been proven to to greatly improve liposome stabilization. Consequently, cholesterol is widely used in liposome formulations. Sterols, as phytosterols, are also used in a variety of nutritional products to reduce cholesterol levels in humans.

UNMET NEED: When liposomes composed of free cholesterol and phospholipids are combined with biological fluids containing biological lipids and serum, cholesterol rapidly transfers out of the liposome into the biological lipids. This loss of cholesterol from the liposome results in decreased liposome stability and the subsequent leakage or loss of the encapsulated payload. Additionally, serum lipoproteins absorb free cholesterol, further increasing the rate of cholesterol loss from the liposome. Efforts to solve this problem have led to the development of water soluble sterol derivatives as well as hydrophobic sterols. However, neither have proven to be suitable for improving liposome stability. A new technology is needed that will allow liposomes with high amounts of sterols to remain stable when exposed to biological fluids.

SUMMARY: Scientists at UCSF have developed sterol derivatives that improve liposome stability both in vitro and in vivo. These derivatives can be incorporated into liposome formulations in the high amounts necessary to produce a stabilizing effect, and are resistant to transfer out of the liposome into biological fluid components. Cholesterol transfer out of a liposome in in a lipid laden environment typically occurs with a half-life of two hours, whereas the transfer of the UCSF sterol derivatives under the same conditions is undetectable after eight hours. Furthermore, liposomes containing UCSF sterol derivatives have demonstrated 80% less leakage in serum than liposomes containing free cholesterol. As an example of an oncology application, UCSF sterol-containing liposomes encapsulating doxorubicin showed equivalent therapeutic effect when compared to Doxil™ in a mouse cancer model. In an infectious disease application,

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OTHER INFORMATION

KEYWORDS

liposome, drug delivery, cosmeceutical, sterol, lipid, phospholipid

CATEGORIZED AS

- **Materials & Chemicals**
  - Biological
  - Chemicals
- **Medical**
  - Delivery Systems
  - Disease: Cancer
  - Therapeutics

RELATED CASES

2008-036-0

UCSF sterol-containing liposomes encapsulating amphotericin B showed lower toxicity and improved activity against a panel of fungi compared to AmBisome™.

FEATURES/BENEFITS

- Sterol derivatives are biocompatible
- Improved liposome stabilty results in decreased payload loss and improved efficacy
- Increased dispersibility for use in nutritional products

APPLICATIONS

- Liposome encapsulated drugs
- Nucleic acid delivery
- Stent coatings
- Stabilized emulsions
- Delivery of nutritional supplements in food
- Delivery of pesticides to plants
- Improved penetration and diffusion of active ingredients in cosmetics

OTHER INFORMATION

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