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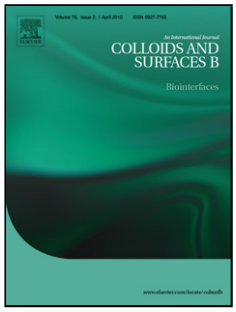

Title: Liposome-modified Titanium Surface: a Strategy to Locally Deliver Bioactive Molecules

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Liposome-modified Titanium Surface: a Strategy to Locally Deliver Bioactive Molecules†

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Highlights

- Two different liposome-based coatings on titanium surfaces were developed.
- Supported vesicular layers were obtained by liposome adhesion on passivated Ti.
- Covalently bonded vesicular layers were grafted on properly functionalized Ti.
- The effective anchoring of intact liposomes was proved in both systems.
- The response of adhering cells was evaluated by MG63 human osteoblast-like cells.

Abstract

Titanium and its alloys are widely employed materials for implants in orthopedic or dental surgery due to their mechanical properties, resistance to corrosion and osseointegration capability. However adverse reactions at the tissue/implant interface may occur, which limit the success of the osseointegration process. Therefore, different strategies have to be used to overcome these drawbacks. In this work, we developed two different liposome-based coatings on titanium surfaces as drug or bioactive molecule deposits for dental/orthopedic implant applications. The first one is a supported vesicular layer (SVL), obtained by liposome adhesion on passivated Ti surface, the second one is a covalently bonded vesicular layer (CBVL) grafted on properly functionalized Ti. Photoluminescence spectroscopy and atomic force microscopy investigations demonstrated the effective anchoring of intact liposomes in both systems. Cytotoxicity assays, performed after 48 h, showed a MG63 cell viability higher than 75 % and 70 % on SVLs and CBVLs, respectively. Scanning electron microscopy investigation revealed numerous and spread MG63 cells after 48 h on SVL modified Ti surface and a lower cell adhesion on samples coated with CBVL. The cellular uptake capability of liposome content was proved by fluorescence microscopy using carboxyfluorescein loaded SVLs and CBVLs. Finally, we demonstrated that these liposome-modified Ti surfaces were able to deliver a model bioactive molecule (phosphatidylserine) to adherent cells, confirming the potentiality of developed systems in bone related prosthetic applications.

Graphical abstract