

Growth factor encapsulation system and method for enhancing bone formation

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Technology description

Summary

This technology is a platelet concentration system comprised of platelet-rich plasma (PRP), a concentrated source of growth factors including platelet-derived growth factor (PDGF), transforming growth factor beta (TGF-beta), and vascular endothelial growth factor (VEGF), derived from the patient's own blood to induce bone growth in a surgical site. The technology provides a PRP-encapsulation system that is able to support a multi-staged, prolonged and controlled release of PRP-derived growth factors for bone regeneration. Growth factors are retained inside a biodegradable, biocompatible delivery vehicle, which increases PRP bioavailability, provides prolonged therapeutic release necessary for proper bone formation. This technology further provides a method for facilitating clot formation in PRP with thrombin receptor activator peptide-6 (TRAP-6) rather than thrombin. The use of TRAP-6 results in significantly less clot retraction than thrombin while providing excellent working time for the preparation of PRP.

Problem or Unmet Need:

Currently, one in every eight Americans is over the age of 65 and the incidence of bone and cartilage fractures in older people is increasing. Currently, the standard treatment for bone and cartilage repair is the use of autogenic or allogenic grafts. For an autogenic graft, the patient's own tissue must not only be able to be grafted, but the patient must also endure two painful surgeries. An allograft may transmit viral infections, be rejected by the patient's body, or not be available. Therefore, the need for effective bone repair is needed. Growth factors which can induce osteogenic responses in healing tissue present a less invasive and more reliable but a very expensive bone regeneration and treatment approach. Less costly alternatives for growth factor based therapies are needed and significant challenges to these methods lie in increasing bioavailability of the growth factors, modulating their release, and altering the kinetics to match the bone regeneration rate.

Application area

The technology comprises a more effective and less invasive method to enhance the formation of bone, which is applicable in oral/maxillofacial surgery, orthopedic surgery, veterinary medicine, and other surgeries necessitating bone and cartilage growth.

The system could be developed for therapies where formation of other types of tissue is necessary.

Advantages

The technology utilizes a biocompatible encapsulation system.

The method provides controlled, staged and prolonged release of growth factors.

The technology provides a less immunogenic and more economical alternative to thrombin.

The system minimizes the amount of clot retraction and the potentially rapid loss of critical bone regenerative growth factors at critical stages of the bone healing process.

The method eliminates the need for autogenic and allogenic grafts and multiple surgeries.

Institution

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