Office of Technology Management

Biological Engineering of Articular Structures Containing Both Cartilage and Bone

Technology Reference

CW056

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Inventor

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Field

Dentistry

Orthopedics

Tissue Engineering

Key Words

Osteochondral

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Cartilage

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License Status

Seeking licensing partner

Patent Status

US Patent Application and International Patent Application pending

Overview

Currently 400,000 total joint replacement surgeries are performed annually in the United States. Arthritis effects 10% of the world population. Current orthopedic approaches for condylar repair including total joint replacement, such as auto grafts, allografts, and xenografts as well as synthetic materials. These approaches suffer from deficiencies such as donor site morbidity, immunorejection, limited tissue supply, potential transmission of pathogens, metal loosening, wear and tear. Tissue engineering of bone and cartilage has the potential to overcome these deficiencies and has been regarded as the next frontier in regenerative medicine.

Technical Summary

UIC Inventors propose an approach, which addresses several issues in this field. The method is based on engineered neogenesis of a human shaped condyle with stratified chondrogenic and osteogenic layers from a single population of adult bone marrow mesenchymal stem cells. Histological evaluation of recovered osteochondral constructs from in vivo implantation demonstrate layers of formation of cartilage and bone.

Benefits

- Ease of fabrication of tissue-engineered osteochondral construct in vitro
- No immunorejection issues (tissue-forming cells are from the patient's own bone marrow or fat tissue)
- Biological integration with the patient's bone tissue
- Possible to utilize the current orthopedic surgical approaches without separate approval process

Areas of Application

- Osteoarthritis
- Injuries
- Bone healing
- Cancer treatment
- Rheumatoid arthritis
- Congenital anomalies
- Implantation
- Joint replacements
- Tissue-engineered condyles may be used in replacement of large and small synovial joints whenever total joint replacement is indicated. Examples of these large and small synovial joints are the hip, knee, TMJ, finger and elbow joints in patients suffering from:

Publication

A. Alhadlaq and J.J. Mao; Tissue-engineered Neogenesis of Human-shaped Mandibular Condyle from Rat Mesenchymal Stem Cells; J Dent Res 82(12): 950-955, 2003

Stage of Development

- In vivo data in rats