New synthetic bone material could improve bone graft surgery

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Technology description

Summary

MARKETS ADDRESSED:
It is expected that half of Americans will need medical interventions during their lives to address bone fractures and the inability of bones to heal after being broken (that is, non-unions). Bone grafts could be used in these procedures to improve bone fusion and make recovery easier for patients undergoing surgical interventions. Bone grafts could also be used in spinal fusions, joint replacements, and by dentists for tooth implants to replace broken and missing teeth.
Currently, bone graft material is usually taken from the patient's own excess bone; a secondary source is bone donated from cadavers. Because of the complexities involved with both these bone sources, health professionals are seeking alternative sources to meet the need of the millions of bone repair procedures conducted each year. Synthetic bone material is of particular interest because it eliminates the problems associated with current bone sources.
Dr. Weitz's lab has developed a new process for producing synthetic bone material that could meet this growing demand. The new process develops material that is more uniform and more similar to natural bone than other existing synthetic bone materials available today.

Advantages

Currently, health professionals are forced to use bone material taken from the patient's own excess bone material or from cadavers. There are significant disadvantages with each of these sources: when using the patient's excess bone, patients must recover from two surgical procedures instead of the single repair to the bone; when using cadaver bone, it is always possible that the patient's body might reject it.
Hydroxyapatite (HAp) is a widely used material for orthopedic, dental, and other biorelated applications. Dr. Weitz's lab has developed a droplet-based microfluidic technology to formulate consistent, dense HAp nanoparticles that can effectively mimic the functions of bone material in their natural biological systems. This synthetic bone material exhibits unique microstructures with very high surface areas and mesoporosity. It also has better form, structure, and configuration for improved

bonding than existing synthetic bone materials. In addition, because the process is simpler than existing synthetic bone production processes, it can be produced at very high rates.

Institution

Harvard University

联系我们

叶先生

电 话：021-65679356

手 机：13414935137

邮 箱：yeyingsheng@zf-ym.com