Multilayered Osteochondral Implant for Enhanced Bone Healing

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Technology description

This novel off-the-shelf osteochondral implant exhibits a highly similar microarchitecture to that of native bone and cartilage, allowing better integration and mechanical support to the damaged tissue after implantation. Approximately 2,000,000 surgical procedures were performed to repair chondral defects in the United States between 2004-2011, with a 5% annual incidence growth over that time period. Osteoarthritis presents a monumental societal burden. It was responsible for $185.5 Billion in aggregate annual expenditure in the United States alone in 2008. Symptomatically, approximately 27 million adults are affected in the United States alone and by the year 2020, over 25% of the US adult population is expected to suffer from OA. Current solutions consist of autograft or allograft tissue plugs. Unfortunately, autografts rely on host tissue availability and can cause further damage to the surgical site. Allografts have a limited availability and shelf-life and also pose the risk of rejection. Clemson University researchers have developed a readily available multilayered osteochondral implant that allows for better integration and mechanical support, decreasing the potential for rejection or revision surgery.

Technical Summary

Following the native microarchitecture of bone and cartilage, this construct consists of three distinct layers, each layer having a composition similar to that of its native counterpart. These layers, each having their own unique material and biochemical properties, are the cartilage analog, tidemark layer, and subchondral bone. The cartilage analog layer consists of decellularized xenogenic tissue that has been modified to improve its mechanical properties. The tidemark layer consists of a relevant combination of hydroxyapatite and poly(lactic-co-glycolic acid) (PLGA) and acts as the adhesive layer for the cartilage analog. The subchondral bone layer is a combination of hydroxyapatite and bioglass and serves as a scaffold-like material. All layers are treated to enhance mechanical properties.

Application area

Application	Stage of Development
Osteochondral repair, biomaterial implant	In Vitro Testing

Advantages

• Multilayered construct mimics native microarchitecture, promoting better tissue integration
• Construct possesses mechanical integrity, allowing for better mechanical performance in vivo
• Off-the-shelf readiness, decreasing problems with limited availability

Institution

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