Skeletal stem cell for the regeneration of cartilage and bone and treatment of osteoarthritis: the osteochondroreticular stem cell

Published date: July 20, 2016

Technology description

Summary

This technology describes the identification of a skeletal stem cell and the means to isolate and expand it, for use in the regeneration of cartilage and bone due to skeletal disorders such as osteoarthritis, osteoporosis, and bone fracture. Osteoarthritis is a chronic, debilitating condition affecting more than 250 million people worldwide. Current approaches for the treatment of osteoarthritis are arthroscopic inspection and clearing of joint debris, eventually followed by a total joint replacement. The envisioned clinical application for these cells is delivery at the time of arthroscopy, where the cells could provide enormous therapeutic benefit, minimizing patient pain and delaying or obviating the need for a total joint replacement. The ability to identify and separate out these cartilage-making cells is a powerful tool that may change the standard of care for the treatment of joint pain and other skeletal disorders.

Osteochondroreticular stem cells are chief producers of cartilage and bone, out-performing mesenchymal stem cells in the production of cartilage tissue.

Current cellular therapies in bone and cartilage regeneration and repair have utilized pooled mesenchymal stem cells (MSCs). Osteochondroreticular stem cells (OCRs) demonstrate significantly enhanced ability to generate cartilage when compared to MSCs, indicating that these cells may be more beneficial as a therapy for osteoarthritis. Cellular therapies using MSCs are currently in clinical trials to treat knee osteoarthritis, but, with stronger chondrogenic potential, OCRs potentially have an even greater opportunity for clinical success. These cells were identified and isolated by expression of the gene Gremlin 1 and other cell markers, which were identified via microarray screen and flow cytometry experiments. This stem cell population may also have yet undiscovered roles in skeletal development and may provide insight into various other skeletal disorders and treatments.

In vitro and in vivo experiments have demonstrated that OCRs from mice easily propagate in culture, behave with a stronger chondrogenic potential than traditional MSCs, and can be easily transplanted into fracture.

Publications

Worthley D. et al. "Gremlin 1 Identifies a Skeletal Stem Cell with Bone, Cartilage, and Reticular Stromal Potential" Cell. 2015 Jan 15;160:269-84.

Advantages

The cells described in this technology have improved chondrogenic potential

The cells described in this technology have fewer descendant cell types (i.e. cannot differentiate into adipocytes)

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