

Bone repair in challenging situations: Lessons from mesenchymal stem cells

Carl A. Gregory

Texas A&M Health Science Center, USA

In optimal conditions, damaged bone heals by a precisely regulated multi-stage process that takes a few weeks. Although the physiological mechanisms that govern the repair of different types of bone are somewhat variable, they all exhibit a highly anabolic repair phase of finite duration and capacity. If the extent of trauma is too great, or if healing potential is diminished by bone disease, the bone simply does not heal. This is a significant health concern given a current fracture non-union rate of 10%, a spinal fusion failure rate of up to 40%, at least 10 million osteoporosis sufferers in the United States, and about half of all cancer sufferers face destructive metastases to bone. Here, we discuss the lessons our group have learned from the presumptive progenitors of osteoblasts, the bone marrow mesenchymal stem cell (MSC). This work has led to the development of novel cytotherapeutic preparations and biologically complex matrices for unprecedented levels of stem cell retention and bone repair in experimental models. The study of malignant bone disease is also discussed, and how our work on MSCs has led to the characterization of bone degradation mechanisms caused by malignancy. Novel methods for the reversal of bone damage during malignancy are introduced.

Biography

Carl Gregory is an Assistant Professor of Molecular and Cellular Medicine at the Institute for Regenerative Medicine, Temple, Texas. He received his Ph.D. in Biochemistry from the University of Manchester in 1999 with Raymond Boot-Handford and Gillian Wallis on developmental disorders of collagen. Dr Gregory joined Tulane Health Science Center in 2001, working with Darwin Prockop on MSCs, osteogenesis and cancer. He joined Texas A&M University System Health Science Centre in 2008. During this time, he has published over 35 articles in peer-reviewed journals including Stem Cells, PNAS, Science TM and Blood. Dr. Gregory is also CSO of Blast Therapeutics Inc.

CGregory@medicine.tamhsc.edu