

# **Mechanotransduction and bone remodelling with growth factor-containing in-situ gels for regenerative bone tissue applications**

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The percentage of people over 50 years of age that are affected by bone diseases is expected to double by 2020<sup>1</sup>. This necessitates newer regenerative approaches to bone repair that serve facilitate cell adhesion, induction and regeneration.

The bone modulating cells, the osteoblast and osteoclast work together to actively remodell and maintain healthy bone consisting of a mineralised matrix consisting mainly of collagen, non-collagenous proteins and hydroxyapatite. Osteoclasts resorb bone matrix, leading to osteocyte apoptosis and a decrease in bone mass. The events of the osteoblast differentiation process that results in bone mineralisation and increased bone mass is not well understood. Circulating growth factors, cytokines, hormones and cell signals regulate osteoblast function and proliferation. Mechanical loading has also been shown to directly influence bone modelling<sup>2</sup>. The entry of calcium ions via voltage gated operated calcium channels is known to be crucial in osteoblast mechanotransduction and remodelling<sup>3</sup>.

This study proposes to fully explore bone remodelling of primary rat osteoblasts in the presence of loading and growth factors. In-situ imaging for mapping of calcium in the cytosol, membranes and organelles will be investigated. Microarray, PCR and western blot will be used to elucidate gene and protein regulation on loading and remodelling

## **References**

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2. Rubin CT et al, (1984), *J Bone Jt Surg Am.* **66**, 397
3. Jorgensen et al, (2004), *Current Opinion in Biotechnology*, **15:5**,406