

# **Directing tissue regeneration (and stem cell differentiation) with ions released from materials.**

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## **Abstract**

Ions released (in a controlled manner) from materials can promote desirable cellular behavior and tissue regeneration. A range of materials have been designed to release different therapeutic ions (including Ag, B, Ca, Co, Cu, K, Li, Mg, P and Si), which have (either individually or in combination with other ions) been reported to promote tissue regeneration including; antimicrobial activity, angiogenesis, cell survival, desirable ECM production, stem cell recruitment and stem cell differentiation. The performance and application of these ion releasing materials could, however, be improved by gaining a greater understanding of the intracellular role of the ions in directing cell behavior (including stem cell differentiation), by understanding their effect on different stages on tissue regeneration, and by tailoring the ion release profile for patient-specific characteristics. Indeed, despite passing the 50th year anniversary since the creation of arguably the first ion releasing material in medicine, Bioglass® by Prof. L. Hench, there remains a lack of understanding of how these ions interact with cells, how they regulate gene expression and how they can be used to direct cellular differentiation.

## **Biography**

Gavin's research focusses on understanding material-biological interactions, to create improved biomaterials; materials that have reduced failure rates and increased functionality (e.g. promote tissue regeneration or improved nanoparticle targeting). He is an interdisciplinary scientist with over 60 publications in bone tissue engineering, soft and hard tissue implant failure, and nanomedicine. Among his successes is the invention of Co releasing of bioactive glasses in 2009 at Imperial College, which is (possibly) the first bioceramic to target a particular intracellular pathway, namely the HIF-1 $\alpha$  pathway. He's a Trustee for the British Society of Nanomedicine and a passionate educator. He has created a number of successful post-graduate and undergraduate courses and is currently the course director for MSc in Nanotechnology & Regenerative Medicine (with over 200 graduates), the iBSc in Surgical Science and a new cross faculty BSc in Medical Innovation and Enterprise. He currently supervises 9 PhD students and 2 postdoctoral researchers.

