

Hydrogel delivery of microRNA:nanoparticle complexes to modify cell fate and improve tissue repair

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MicroRNAs are small non-coding RNAs that regulate gene expression and which have powerful effects on cell proliferation, differentiation and migration. This makes them attractive candidates to improve the repair and restoration of damaged tissues but requires advances in the materials used for miRNA delivery and transfection to provide efficient and reliable outcomes.

This talk will explore the potential for hydrogel-mediated delivery of miRNA complexes to modulate cell fate and improve tissue repair. This includes overcoming the challenges of miRNA selection, delivery and transfection efficiency. Our results show that miRNAs can be complexed with porous silicon nanoparticles or cationic polymers to facilitate transfection and that it is possible to tailor the release of these from hydrogels to modify cell fate. Our data further indicate the ability of specific miRNAs to modulate mesenchymal stromal cell differentiation and keratinocyte proliferation and migration, leading to improved outcomes in bone tissue engineering and wound healing.