

miRaColl is a novel, miRNA-eluting collagen-based scaffold with applications in regenerative medicine. A proprietary process developed at RCSI enables the production of reliable, shelf-stable, biocompatible scaffolds containing miRNA adjuncts with the ability to target numerous pathways such as chondrogenesis, osteogenesis and inflammation.

VALUE PROPOSITION

Osteoarthritis (OA), affects 40 million people per annum in the US with associated healthcare costs of \$105 billion. OA generally develops from articular cartilage lesions. Current treatments for these lesions: microfracture, mosaicplasty and autologous chondrocyte implantation have limited long-term efficacy. OA patients often require arthroplasty, greatly reducing their quality of life. The miRaColl scaffold technology is designed for the optimal delivery of a range of microRNAs to enhance cartilage repair. miRaColl offers the potential to switch on or off genes associated with cartilage formation or degeneration and represents a new therapeutic option for the repair of large cartilage lesions.

THE TECHNOLOGY

The Tissue Engineering Research Group at RCSI has developed a novel range of microRNA-activated collagen-based (miRaColl) scaffolds offering a porous, biocompatible, cell-free product which is stable off-the-shelf and which can address clinically relevant large cartilage defects. The delivery of microRNAs to host stem cells is facilitated by non-viral vector complexes incorporated into the scaffold. Following implantation, the microRNAs instruct stem cells to form stable, non-hypertrophic cartilage on the scaffold thus providing the requisite stimuli to drive the repair of large defects.

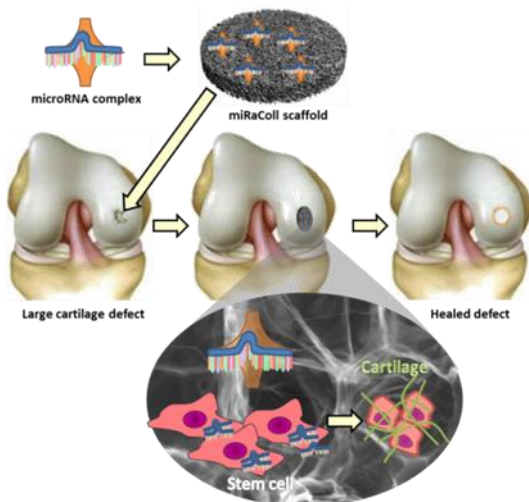


Fig 1: miRaColl microRNAs drive cells to repair large cartilage defects



Fig 2: Structure and biocompatibility: scanning electron micrographs of porous miRaColl & live/dead staining of stem cells (MSCs) after 1 week.

APPLICATIONS

The primary application of miRaColl is as a bioactive medical device to be implanted into cartilage lesions. However, miRaColl's versatility as a platform technology means that this product can be easily adapted, through tailoring the structural composition, vectors and the specific microRNA, for the repair of other soft and stiff tissues such as skin, nerve and bone. miRaColl also offers a platform for the localised delivery of RNA therapeutics.

FEATURES AND BENEFITS

miRaColl features	Benefits
Controlled freeze-drying manufacture	Ease of production and scale-up
	Off-the-shelf end product
	No specialised peri-operative work
Natural composition	Tissue-specific bioactive components
	Facilitates biocompatibility
	Facilitates biodegradability (progressive resorption in host body)
Tuneable structural properties	High porosity and permeability
	Facilitates handling and ease of use
	Improved cell retention in defect site
Controlled delivery of different microRNAs	Facilitates distribution of microRNAs to improve therapeutic effect
	Improved quality repair tissue
	Overcome problems of intranuclear delivery (vs. plasmid therapy)
	Reduced therapeutic dose: low cost and off-site effect (vs. growth factors)
	Ability to modulate pro-chondrogenic, anti-hypertrophic and anti-inflammatory pathways, with versatility to target numerous paths