

Human Tendon Nanogel Enhances Cellular Integration into Nano-Matrix Scaffolds

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Introduction

- Hydrogels act as a delivery system for cells and also as a scaffold for three-dimensional tissue specific guided regeneration.
- They have the potential to provide an augmented healing environment for improved repair strength after tendon repair or in chronic tendinopathy.
- The aim of this study was to create a nanogel by ultrasonication of human tendon hydrogel. We hypothesize that the decrease of collagen fibril dimensions would enhance cellular integration within the collagen network.

Methods

- A Sonifier Cell Disruptor was utilized to apply ultrasonication to human tendon hydrogel.
- Cell viability assays and SEM were examined.
- *In vivo* host cell repopulation and remodeling in a Sprague Dawley rat model (n=4) were analyzed.

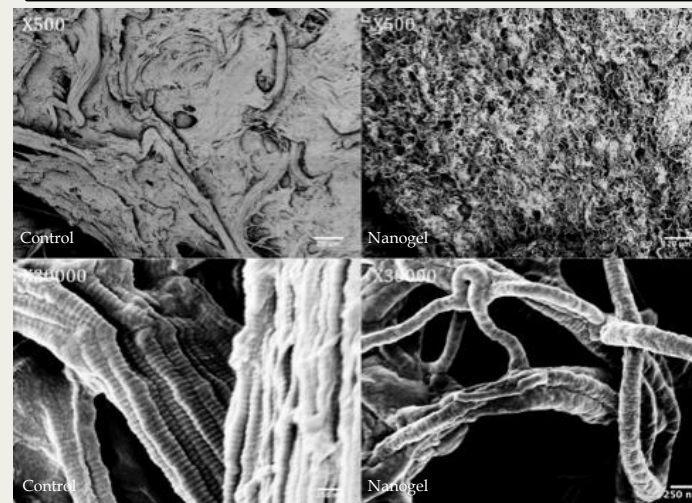


Figure 1: Scanning electron micrographs showing the collagen structure of the gels.

Results

- Increased cell proliferation was seen at day 7 in the nanogel compared to control (p=0.0002) and fluorescent cell assay confirmed viability *in vitro*.
- Scanning electron microscope demonstrated the creation of a porous network with an average collagen fibril diameter of 170±60 nm, confirming nano-hydrogel properties.
- Scanning electron and fluorescent cell viability assay demonstrated the presence of cell clusters one week post-reseeding in the nanogel with preserved hydrogel properties.

Conclusion

- The application of ultrasonication alters the hydrogel collagen network into nanoscaled fibers resulting in improved reseeding with retained hydrogel properties.
- The nanogel may be a more efficacious cell delivery system for augmenting healing.

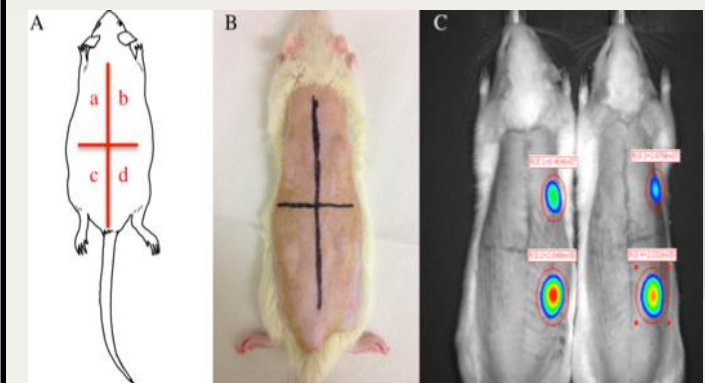


Figure 2: *In vivo* bioluminescent assay. 1 mL of gel was injected at 4 different places in each rat's dorsum. Picture A: a: non reseeded hydrogel; b: rat luciferase-firefly transfected fibroblasts reseeded hydrogel; c: non reseeded nanogel; d: rat luciferase-firefly transfected fibroblasts reseeded nanogel.