MSC Differentiation across the Tendon-Bone Interface using CG Scaffolds

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Key Research Aims and Goals

To create a functionalized 3-D scaffold which promotes the regeneration of the tendon-bone interface, through both chemical and mechanical means.

Research Highlights and Results

- Our group has developed a method to produce 3-D, anisotropic collagen-GAG scaffolds.
- Recently, our group has shown that the combination of anisotropic Collagen-GAG scaffolds and growth factors (GF) influence tendon cell recruitment, alignment, and metabolic activity.[1]
- We are currently exploring the effect of interface geometries on mechanical strength

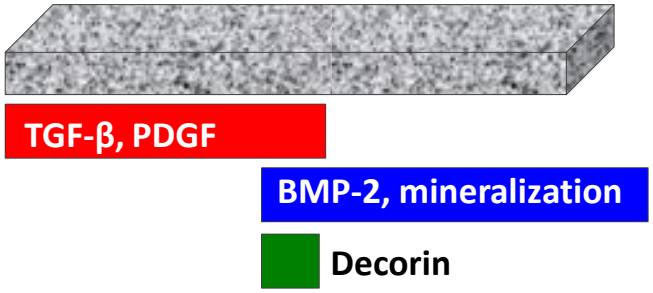

Fig 2: A sample pattern of combinations of growth factors and ECM proteins across the Tendon-Bone interface on a two dimensional collagen-GAG scaffold.

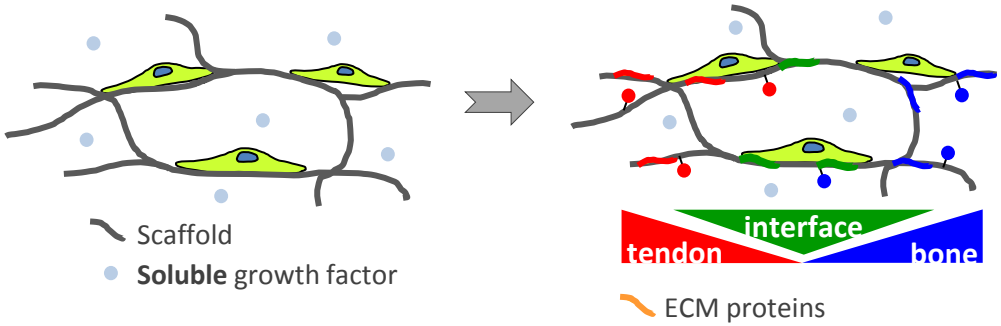

Fig 1: the addition of ECM proteins to a 3D scaffold to encourage cell differentiation across the Tendon-Bone Interface.

Future Research Plans

- Since growth factors and anisotropy have already encouraged good tendon-bone differentiation, a combination of ECM proteins should have an additive effect. The combination of ECM proteins and growth factors will further encourage cell differentiation across the tendon-bone interface.
- Increasing the surface area of the tendon-bone interface should increase the mechanical strength of the interface, which will lead to a stronger tendon-bone junction
- As ECM proteins, growth factors promote differentiation, and a structurally robust interface is explored, these two themes will be combined into one scaffold. Once these principals are shown to be successful on a two-dimensional collagen-GAG membrane, the same interface will be replicated in a 3D scaffold.

[1] Caliari, S., Harley, B. The effect of anisotropic collagen-GAG scaffolds and growth factor supplementation on tendon cell recruitment, alignment, and metabolic activity. Biomaterials. 2011;32:5330-40