



Chondrogenic Differentiation of hMSCs on PCL Nanofibers

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Background

- ★ Human Mesenchymal Stem cells (hMSCs) can differentiate into many cell lineages
 - ★ Chondrogenesis -- cartilage repair therapy
- ★ Electrospun PCL nanofibrous scaffolds are biodegradable & mimic extracellular matrix

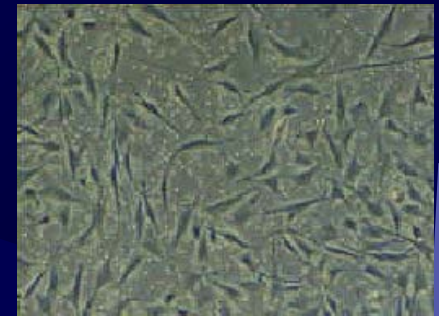


Figure 1. hMSCs in culture

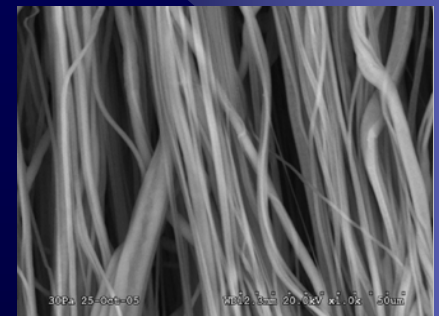
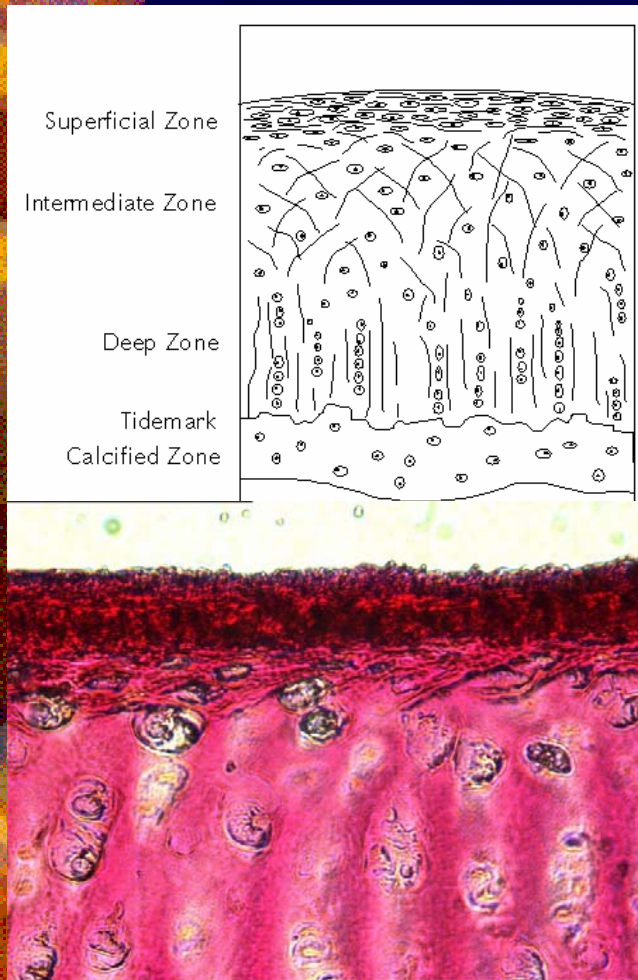


Figure 2. Oriented nanofibers

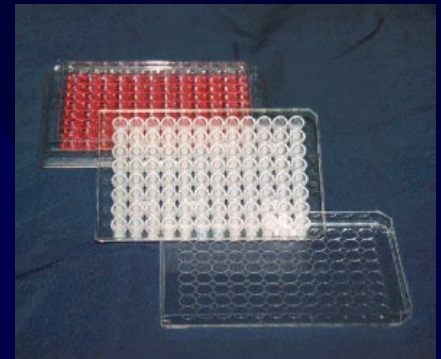
Goals



- ☀ Mimic thin superficial layer of articular (joint cartilage)
 - ☀ Attach & Differentiate hMSCs into cartilage cells on polymer nanofiber scaffolds
- ☀ Observe cell morphology & differentiation based on physical cues

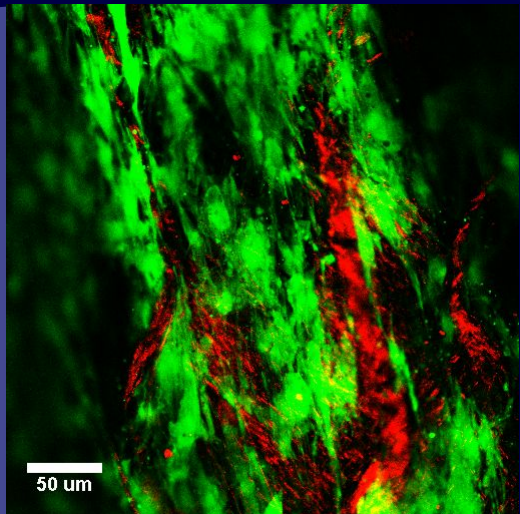
Figure 3. Articular cartilage
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Project Design

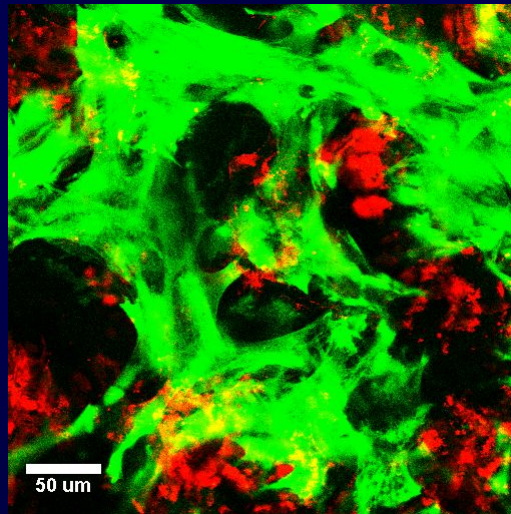


- ★ Seed hMSCs on nanofibrous scaffolds
 - ★ Cultured with chondrogenic media in 96-well plates (control with growth media)
- ★ Monitor cell proliferation & differentiation:
 - ★ Fluorescence imaging
 - ★ Total DNA count
 - ★ Sulfated Glycosaminoglycan (sGAG)

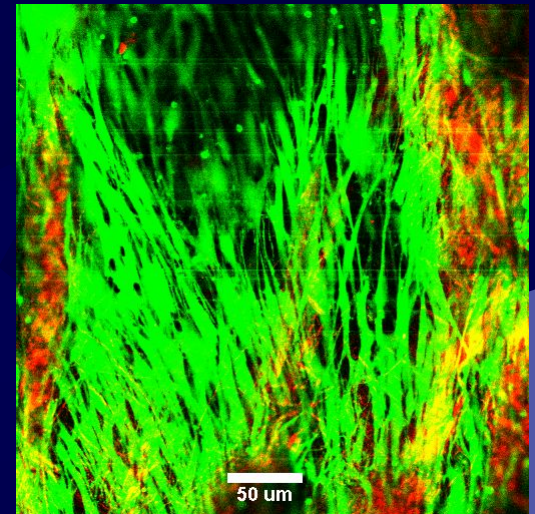
Cell Morphology



**Chondrogenic cells on
nanofiber scaffold**



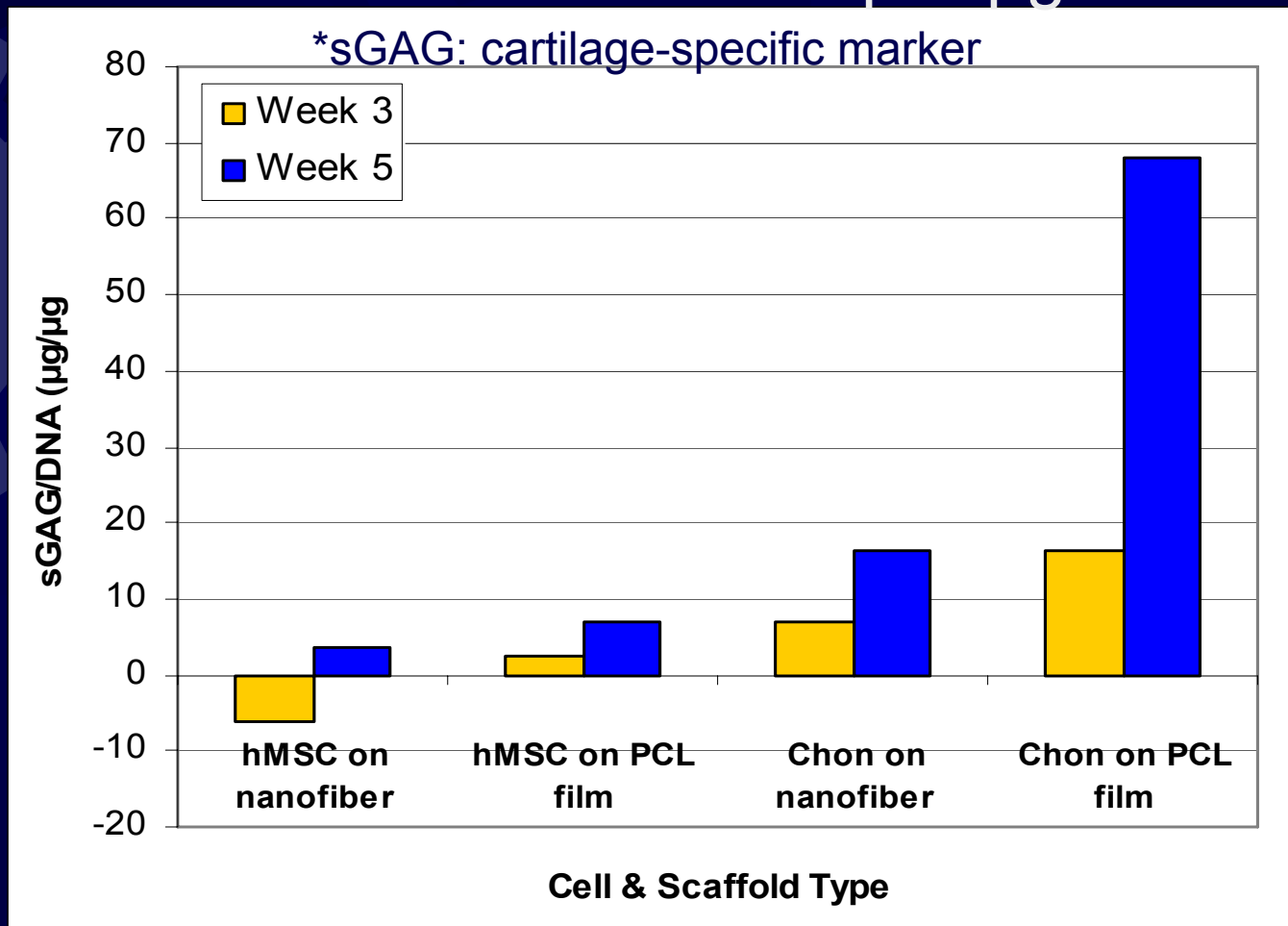
**Chondrogenic cells on
PCL film scaffold**



**Mes. stem cells on
nanofiber scaffold**

Tracking Differentiation

Amount of sGAG* detected per μg of DNA



Conclusions

- ★ Cells on nanofibers proliferate in an oriented manner
- ★ Chondrogenic media and fiber alignment induce chondrogenesis
 - ★ By 5th week, chondrogenic cells produced high amounts of sGAG
- ★ Oblong chondrogenic cell shape resembles superficial layer of articular cartilage

Future Directions

- ☀ hMSCs cultured on nanofibers as an alternative source of cartilage cells
 - ☀ Advantage: “renewable”
- ☀ Incorporate cartilage-inducing factors within nanofibers
 - ☀ Chemicals & proteins contained within fibers may mimic ECM better than mere suspension

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- ★ Joel Wise

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The background is a dark blue gradient with several large, semi-transparent gear shapes scattered across it. On the left side, there is a vertical strip of a colorful, textured image showing a close-up of interlocking gears in various colors like orange, yellow, and white.

Thank You!