

# Collagen remodeling as a marker for scoliosis curve progression: preliminary results in a micro-tissue system

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## Introduction

In scoliosis, most of the early deformity is in the disc. We hypothesize that all spines experience asymmetric loading during rapid adolescent growth resulting in temporary bending of the disc. The difference between individuals who develop persistent and progressive disc deformation, and those who spontaneously correct the same initial deformation of the disc, could be dependent on the individual's ability or lack thereof to alter their collagen network, in a faster and more permanent manner.

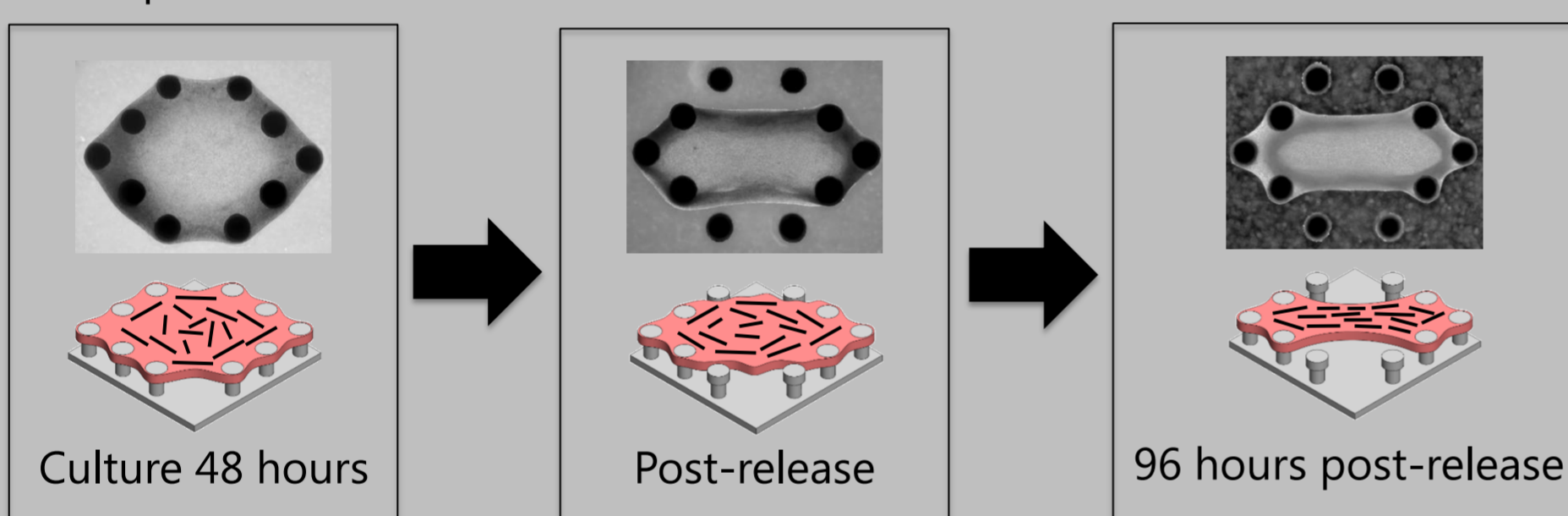
We hypothesize that we can distinguish between these groups by investigating collagen remodeling of the intervertebral disc. Recently, strains of mice have been identified with differences in their connective tissue healing capacity and their disc wedging characteristics, i.e. LG/J and C57BL/6J.

## Purpose

In this experiment, we determine whether an in-vitro micro-tissue assay can distinguish the differences in collagen remodeling rates of annulus fibrosus (AF) cells between LG/J and C57BL/6J mice strains.

## Methods

AF cells, harvested from 8-10 week-old LG/J and C57BL/6J mice were expanded in a hydrogel in a tissue remodeling platform and cultured for 48 hours. Hereafter the micro-tissues were released from one opposing set of posts and cultured for an extra 96 hours.

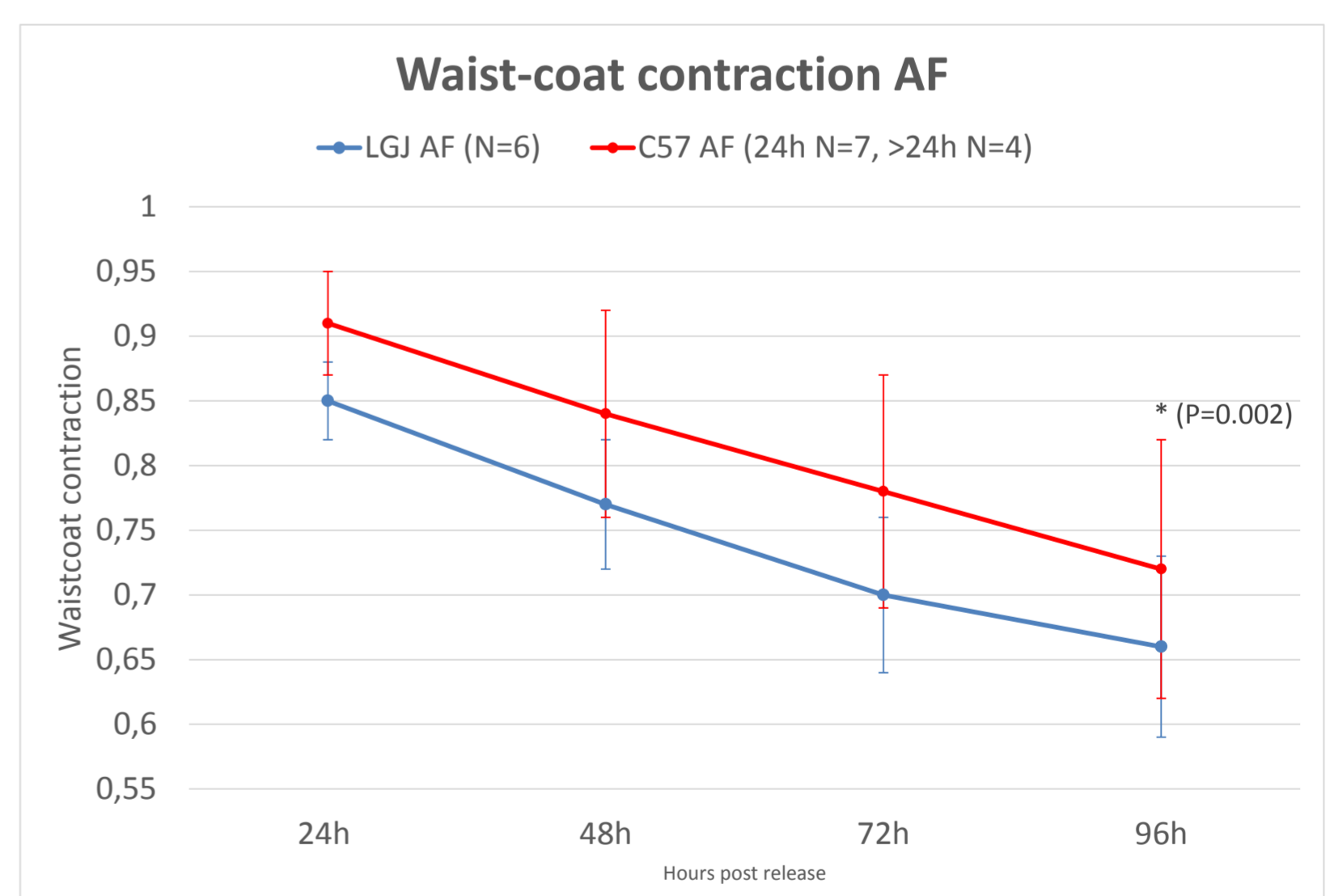
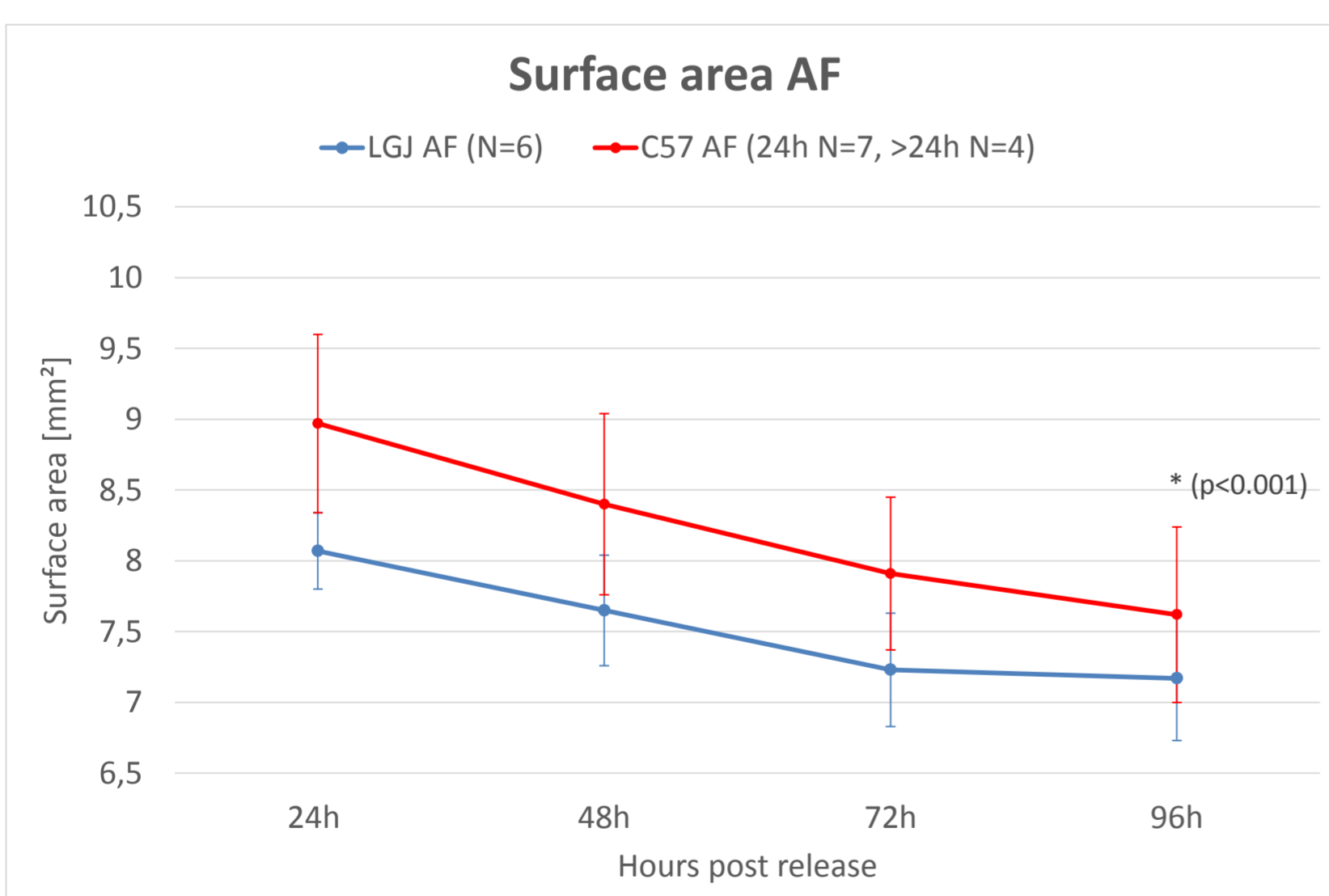


## Outcome measures

- Micro-tissue surface area
- waist-coat contraction
- Collagen orientation

## Results

There was more waist-coating ( $p=0.002$ ) and more surface area reduction ( $p<0.001$ ) in AF cells from LG/J than that from C57BL/6J mice. Order parameter analysis indicated no significant differences at 24h but at 96h, AF cells from LG/J mice were able to align the collagen better than those from C57BL/6J mice ( $p<0.001$ ).



## Conclusion

The micro-tissue remodeling assay system shows promising results in terms of distinguishing between the collagen network remodeling capability of AF cells of these different mice. The next step is to determine whether these differences are reproducible with skin fibroblasts which are more clinically accessible. This could pave the way towards a bioassay for the prediction of curve progression in human adolescent idiopathic scoliosis patients.

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