

# Potential of Genipin-Crosslinked Collagen Yarns for Rotator Cuff Tendon Tissue Engineering

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## INTRODUCTION

### Rotator cuff tears

- 50% of people over 60 years old<sup>1</sup>
- Over 200,000 repairs/year in the US<sup>2</sup>
- \$ 474 billion/year health care costs in the US<sup>2</sup>

### Collagen

- Main component in dry tendon (60-85%)
- Excellent biological performance
- Erosion and degradation in body fluids with enzymes

### Genipin

- Natural crosslinker
- Compared to glutaraldehyde and EDC-NHS\*
  - Less cytotoxic<sup>3</sup>
  - Better biological performance<sup>4</sup>
  - Enhanced resistance to enzymatic degradation<sup>5,6</sup>

EDC-NHS\*: 1-ethyl-3-(3-dimethylaminopropyl) carbodiimide hydrochloride (EDC) and N-hydroxysuccinimide (NHS)

## OBJECTIVES

- To optimize genipin crosslinking conditions based on degree of crosslinking and changes in collagen yarn properties
- To evaluate degradation resistance of collagen yarns before and after crosslinking under the optimized condition
- To determine biocompatibility of genipin-crosslinked collagen yarns based on cell adhesion and proliferation

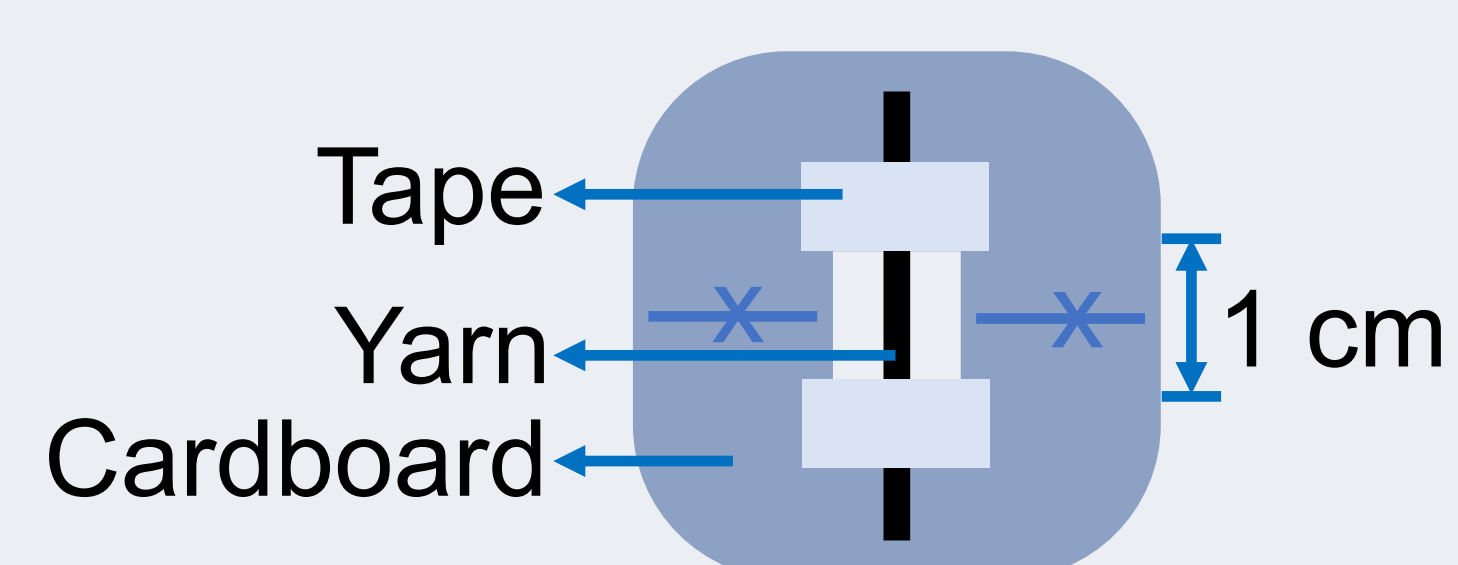
## MATERIALS & METHODS

### Optimization of Crosslinking Conditions

- Degree of crosslinking
- Tensile properties
- Swelling ratio

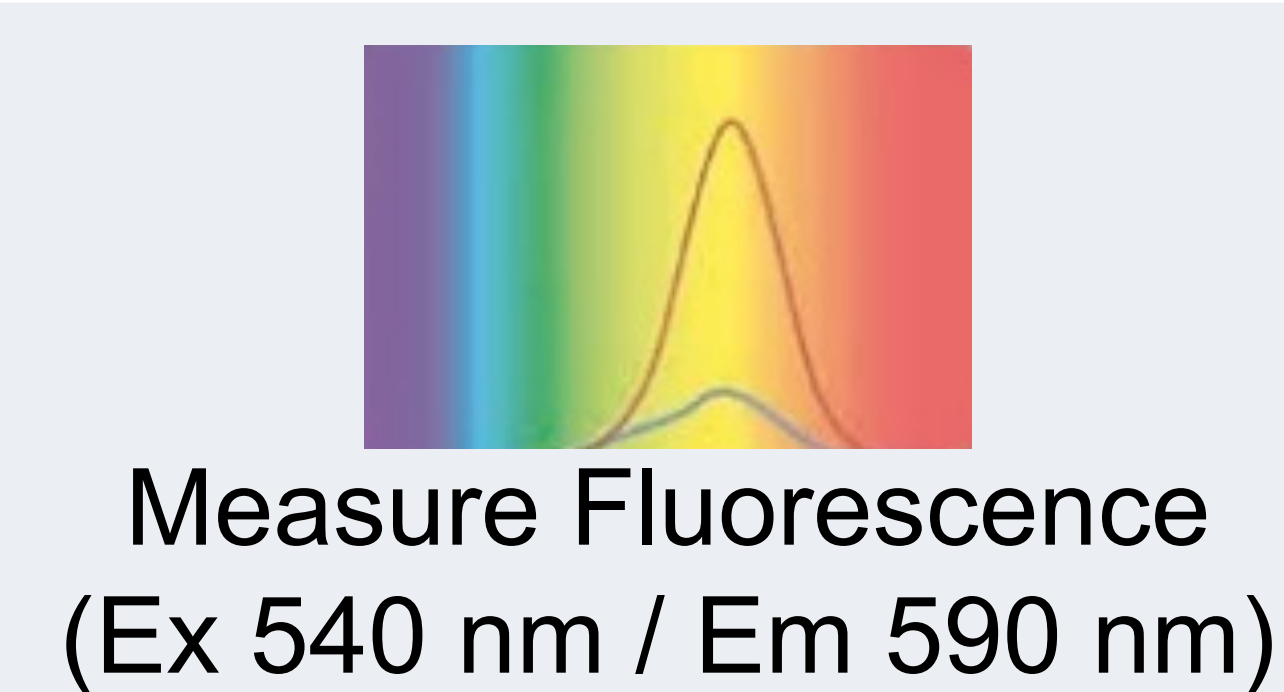
### Degradation Evaluation

- Enzyme activity level
- Tensile properties



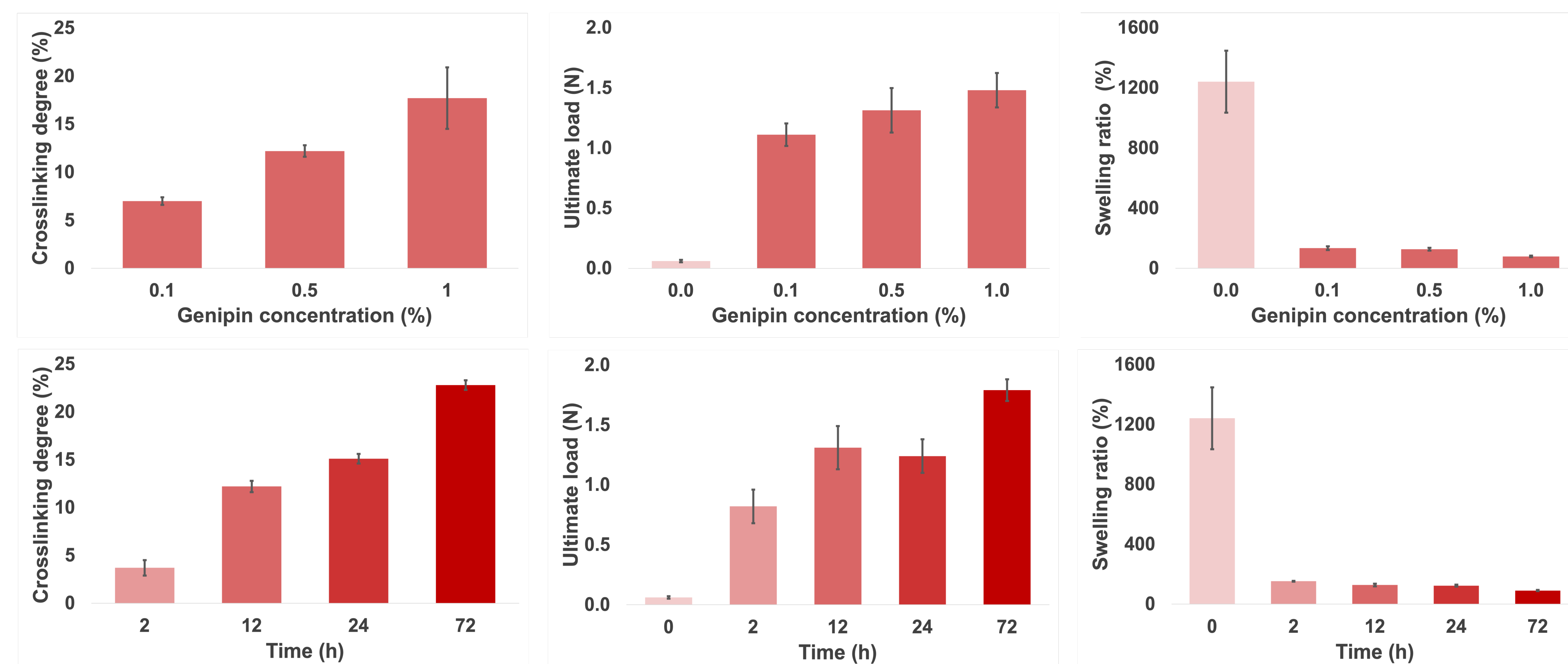
### Biocompatibility Tests

- *alarBlue* assay
- *Live/Dead* assay

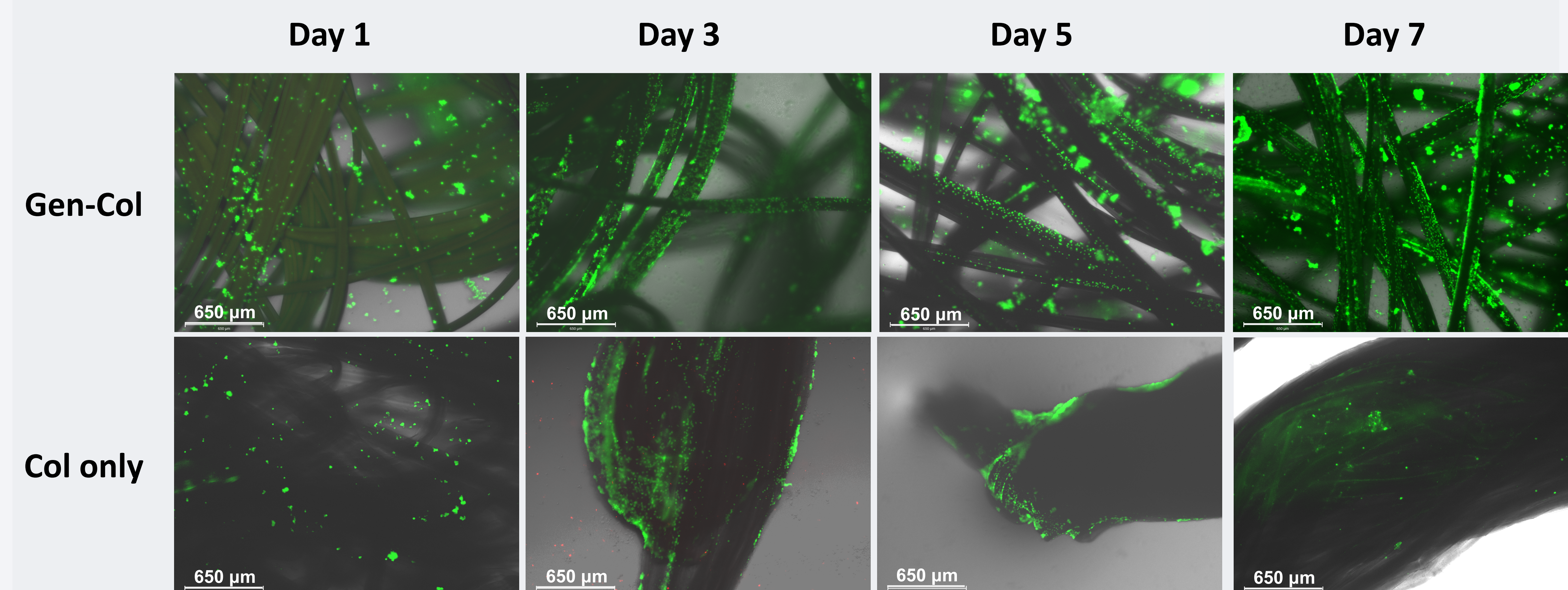


## RESULTS

### Optimization of Crosslinking Conditions



### Biocompatibility Tests



## CONCLUSIONS

- Crosslinking with genipin enhanced tensile properties and reduced swelling ratios of wet-spun collagen yarns
- Higher genipin concentrations and longer crosslinking times yielded higher degree of crosslinking, enhanced tensile properties, and lower swelling ratios
- Crosslinking with 1.0% genipin for 72 h at 37°C improved cell adhesion and proliferation on the wet-spun collagen yarns

## REFERENCES

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