

## (Equine) in vitro Tendinopathy Model

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## SCOPE OF THE METHOD

|                                  |  |
|----------------------------------|--|
| <b>The Method relates to</b>     | Animal health                                    |
| <b>The Method is situated in</b> | Basic Research, Translational - Applied Research |
| <b>Type of method</b>            | In vitro - Ex vivo                               |

## DESCRIPTION

### Method keywords

3D in vitro model  
Biofabrication  
mechanical stimulation  
tendon cells  
endothelial cells  
inflammation

### Scientific area keywords

Tendinopathy  
Equine  
mesenchymal stromal cells  
Regenerative treatments

### Method description

Overuse tendon injuries are a major cause of musculoskeletal morbidity in both human and equine athletes. Despite the big burden, there is no effective treatment to restore tendon's natural composition, due to a lack of understanding of fundamental cell biology.

Additionally, translation of novel regenerative therapies from basic research findings into clinical therapies has been hampered. In this *in vitro* tendinopathy model, primary isolated equine cells (tendon and endothelial cells), chemically modified gelatin, additive manufacturing techniques (such as 3D bioprinting and electrospinning), and mechanical stimulation are combined to generate new fundamental insights in tendon pathophysiology and to study novel therapies in a controlled and representative environment. Protocols for isolation of the cells and generation of gelatin derivatives are established and the best manufacturing technique is currently investigated. As the horse is recognized as animal model for orthopedic research, both human and equine veterinary medicine will benefit from the gained insights.

### **Lab equipment**

- Laminar air flow
- Centrifuge
- Incubator
- FACS Cell Sorter
- Freeze-dryer
- UVA-light source
- Spectrophotometer for polymer evaluation
- Rheometer for polymer evaluation
- 3D bioprinter or electrospinning set-up
- Mechanical stimulation bioreactor (e.g. TC3 EBERS)
- Inverted (fluorescence) microscope for evaluation

### **Method status**

Still in development

## **PROS, CONS & FUTURE POTENTIAL**

### **Advantages**

- Mimicking the hierarchical composition of tendon extracellular matrix with clear fibre alignment
- Incorporation of elongated tendon cells organized in a parallel fashion and endothelial cells as angiogenic cues
- Disease mimicking through mechanical (over-)stimulation (uniaxial stretching)
- Representative, reproducible and controllable

### **Challenges**

- Low throughput at this moment
- Still in optimization process
- Complex

### **Modifications**

Optimization of the model is still ongoing.

### **Future & Other applications**

As the horse is recognized as animal model for orthopedic research, both human and equine veterinary medicine will benefit from the gained insights. Moreover, the equine cells can be easily replaced by human cells. With further modifications, the model can be used to study other diseases such as enthesopathy.

## **REFERENCES, ASSOCIATED DOCUMENTS AND OTHER INFORMATION**

## References

Meeremans et al., Front. Cell Dev. Biol. 2021, 9. (2) (DOI: 10.3389/fcell.2021.651164)

Meeremans et al. Polymers. 2021, 13, 747. (DOI: 10.3390/polym13050747)

## Associated documents

[Meeremans et al.\(2021\) The Lack of a Representative Tendinopathy Model Hampers Fundamental Mesenchymal Stem Cell Research.pdf](#)

[Meeremans et al.\(2021\) Equine tenocyte seeding.pdf](#)

## Links

[Veterinary Stem Cell Research Unit](#)

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