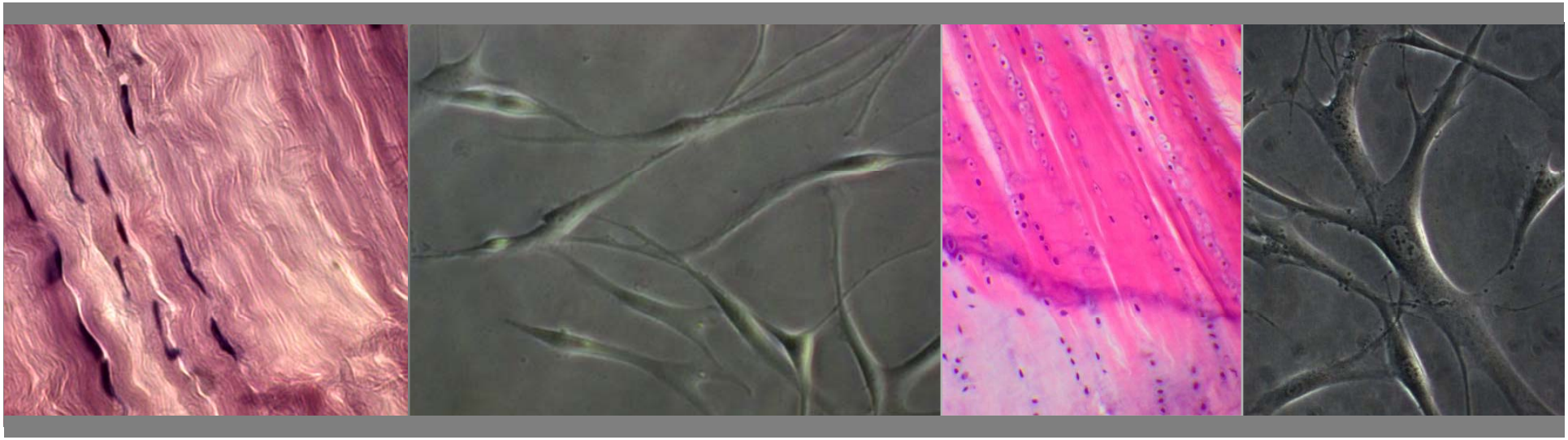
[1,2]Gundula Schulze-Tanzil, VMD

Research group „Bioreconstruction“



[1]*Institute of Anatomy, Paracelsus Medical University, Salzburg and Nuremberg, Germany*

[2]*Department of Orthopaedic, Trauma and Reconstructive Surgery, Charité-Universitätsmedizin Berlin, Campus Benjamin Franklin, Germany*

Education:

1990-1996	School of veterinary medicine, Freie Universität Berlin
1999	VMD Degree, Freie Universität Berlin
1999	Postdoctoral Fellow, Institute of Anatomy, Freie Universität Berlin
2005	Scientific assistant, Centrum of Anatomy, Charité University of Medicine, CCM, Berlin
2005-2008	Dep. of Trauma and Reconstructive Surgery, CBF/Centrum of Anatomy, CCM, Charité University of Medicine, Berlin
2007	Leader of the research laboratory of experimental surgery, AG Bioreconstruction
2008-2014	Dep. of Trauma and Reconstructive Surgery, CBF, Charité University of Medicine, Berlin
2009	Habilitation: Anatomy and Cell Biology
2015	Professorship at the Institute of Anatomy, Paracelsus Medical University, Salzburg and Nuremberg, Germany

Teaching Activities:

Dissection courses in gross anatomy, courses in histology, seminars and lessions in anatomy and cell biology

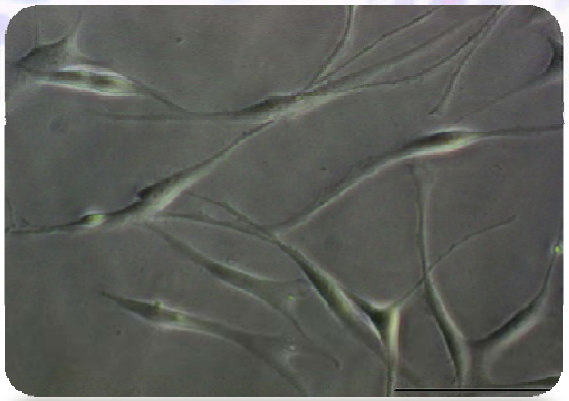
Scholarships:

1996-1999	Doctoral scholarship, Freie Universität Berlin
2005-2008	Rahel-Hirsch habilitation Scholarship, Charité Berlin

Ad hoc reviewer for

Acta Biomaterialia, Annals of Anatomy, Arthritis Rheumatism, Arthritis Research Therapy, Berliner Münchner Tierärztliche Wochenschrift, BMC Musculoskeletal Disorders, Biomaterials, Biotechnology Progress, Biotechnology Bioengineering, Bone, Cell Tissue Research, Cell Biology and Toxicology, Cells Tissues Organs, Clinical Medicine Insights: Arthritis Musculoskeletal Disorders, Clinical Experimental Immunology, Connective Tissue Research, Cytokine, Drug Dev reviews, European Cells Materials, European J Histochemistry, Experimental Biology and Medicine, Fibrogenesis and Tissue Repair, Folia Biologica, Gene Therapy, Histochemistry Cell Biology, Histology Histopathology, International J Molecular Science, J Biochips Tissue Chips, J Cellular Biochemistry, J Tissue Engineering Regenerative Medicine, J Biomedicine and Biotechnology, J Biomed Mater Res Part A, J Immunol Methods, J Orthop Surg Res, J Nanomedicine, Materials Letters, Medicinal Chemistry, Osteoarthritis Cartilage, Oxid Antioxid Med Sci, PLOSone, Review Material Letters, The Lancet, Tissue Engineering Part A.

Scientific interests



- cartilage and tendon/ligament biology
- osteoarthritis (in vitro and in vivo models)
- tendon injury and healing (in vitro and in vivo models)
- interplay of anti- and proinflammatory cytokines in tendon and cartilage, co-culture models
- cell- and biomaterial based cartilage and tendon repair: cartilage and tendon tissue engineering
- tendon/ligament ageing
- comparative anatomy/cell biology of tendons and cartilage subtypes

Techniques

Cell biology

- characterization of human and animal-derived primary cells: chondrocytes, tenocytes, ligament cells, synovial fibroblasts, PBMCs and neutrophils
- three-dimensional cultures (pellet, organoid, spheroids, hydrogel and scaffold cultures, statical and dynamical seeding of biomaterials and self prepared cell-freed extracellular matrices
- interaction of musculoskeletal cells in co-cultures
- immunohistochemistry/-cytochemistry, immunofluorescence microscopy
- confocal laser scanning microscopy
- flow cytometry
- histology/histopathology of musculoskeletal tissues
- transmission-/scanning electron microscopy
- ELISA, assays (cytokines, proliferation, DMMB-assay, cell vitality, cytotoxicity, caspase activity, TUNEL…)
- SDS-PAGE and Western Blot Analyses
- RT PCR and Real Time (RTD)-PCR
- transfection of primary cells: adenoviral, lipofection, Electroporation
- gene silencing using siRNA

Techniques

Animal models

● matrix assisted autologous chondrocytes transplantation in the minipig and rabbit (chondral vs. Osteochondral defects)
Lohan A et al., 2014
● partial Achilles tendon defect model in the rabbit (Stoll C et al., 2011, Biomaterials)
● nude mice xenograft model: *in vivo* Chondrogenesis and tendogenesis
Lohan A et al., 2011: Histochem Cell Biol
● osteoarthritis model in the rat (surgically induced: MMT)

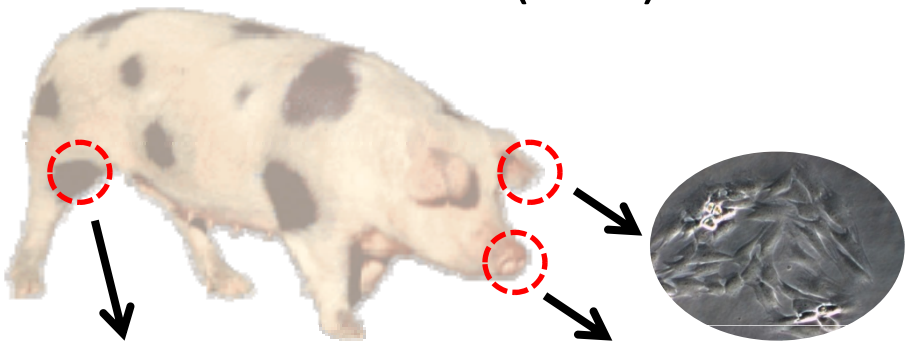
gross anatomical preparation techniques of human and animal-derived samples

Some recent publications (2014)

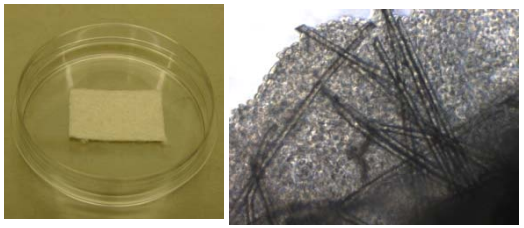
- Mrosewski I, Jork N, Gorte K, Conrad C, Wiegand E, Kohl B, Ertel W, John T, Oberholzer A, Kaps C, Schulze-Tanzil G (2014). Regulation of OA associated key mediators by TNFα and IL-10: Effects of IL-10 overexpression in human synovial fibroblasts and a synovial cell line. **Cell Tissue Res** 357(1):207-23.
- The Phantom 5 Consortium (2014). A promoter level mammalian expression atlas. **Nature** 27;507(7493):462-70.
- Gröger D, Kerschnitzki M, Weinhart M, Schneider T, Kohl B, Wagermaier W, Schulze-Tanzil G, Fratzl P, Haag R (2014)**.** Selectivity in Bone Targeting with Different Polyanionic Dendritic Dye Conjugates. **Advanced Healthcare Materials** 3(3):375-85.
- Lohan A, Marzahn U, El Sayed K, Haisch A, Müller RD, Kohl B, Stölzel K, Ertel W, John T, Schulze-Tanzil G (2014). Osteochondral cartilage defect repair using autologous orthotopic and heterotopic chondrocytes in the rabbit model. **Ann Anat.** 196(5):317-26.
- Girke G, Kohl B, Busch C, John T, Godkin O, Ertel W, Schulze-Tanzil G (2014). Tenocyte activation and regulation of complement factors in response to in vitro cell injury. **Mol Immunol**. 60(1):14-22.
- Stölzel K, Schulze-Tanzil G, Olze H, Schwarz S, Feldmann EM, Rotter N (2014). Immortalised human mesenchymal stem cells undergo chondrogenic differentiation in alginate and PGA/PLLA scaffolds. **Cell Tissue Bank**. 2014 May 16
- Hoyer M, Meier C, Breier A, Hahner J, Heinrich G, Drechsel N, Meyer M, Rentsch C, Garbe LA, Ertel W, Lohan A, **Schulze-Tanzil** G. In vitro characterization of self-assembled anterior cruciate ligament cell spheroids for ligament tissue engineering. **Histochem Cell Biol.** 2014 Sep 26.
- Jagielski M, Wolf J, Marzahn U, Völker A, Lemke M, Meier C, Ertel W, Godkin O, Arens S, **Schulze-Tanzil G (2014).** The influence of IL-10 and TNFα on chondrogenesis of human mesenchymal stromal cells in three-dimensional cultures. **Int J Mol Sci.** 15(9):15821-44.
- Hoyer M, Drechsel N, Meyer M, Meier C, Hinüber C, Breier A, Hahner J, Heinrich G, Rentsch C, Garbe LA, Ertel W, **Schulze-Tanzil G**, Lohan A. (2014). Embroidered polymer-collagen hybrid scaffold variants for ligament tissue engineering. **Mater Sci Eng C Mater Biol Appl**. 1;43:290-9.

Cartilage tissue engineering

to characterize /compare the quality of tissue engineered cartilage produced by heterotopic chondrocytes seeded on polyglycolic acid (PGA) scaffolds *in vitro* and *in vivo*

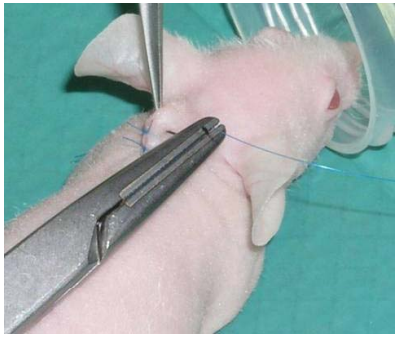


porcine
auricular,
nasoseptal
articular chondrocytes



seeded PGA

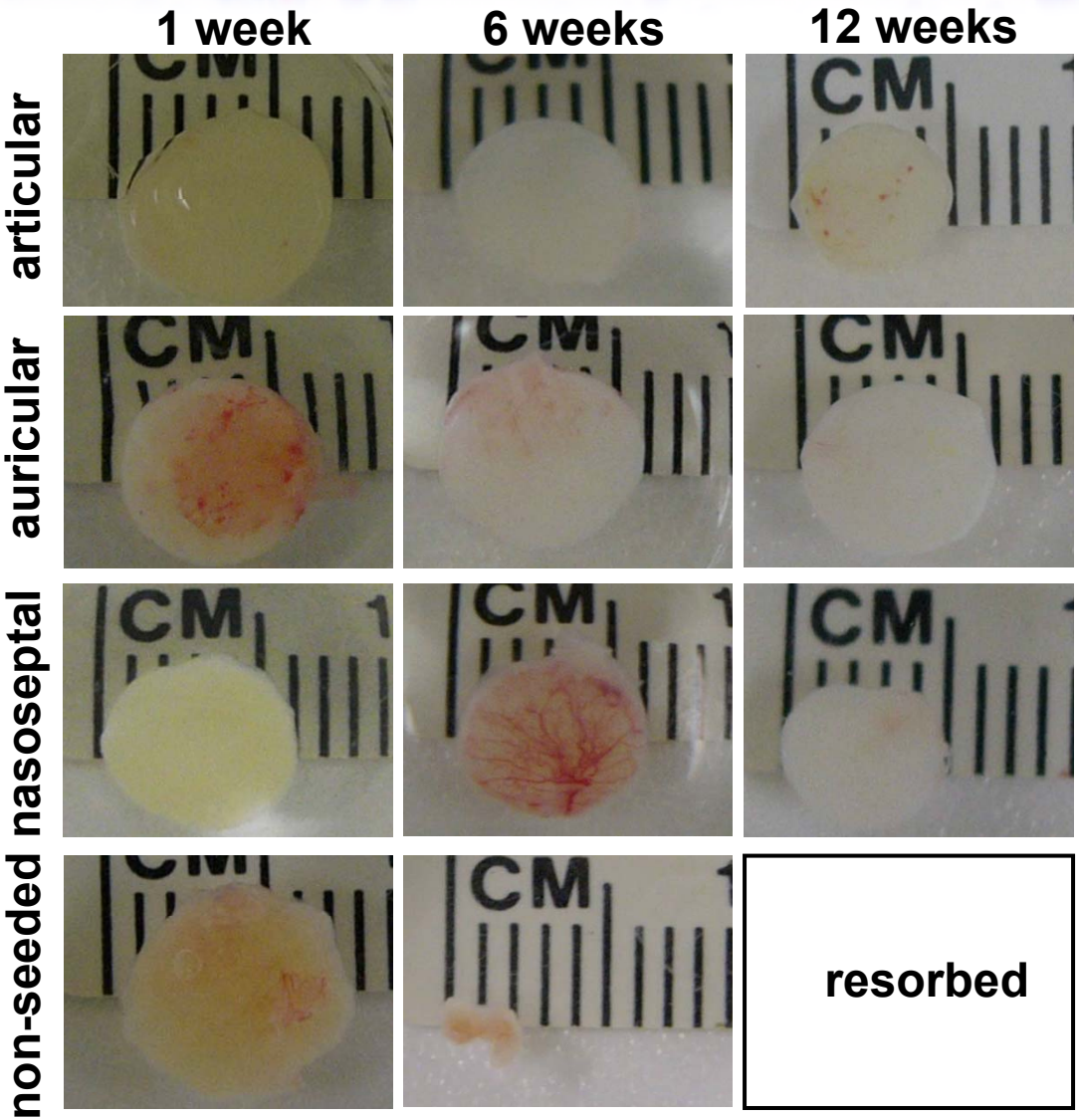
dynamic culture
3 weeks → analysis



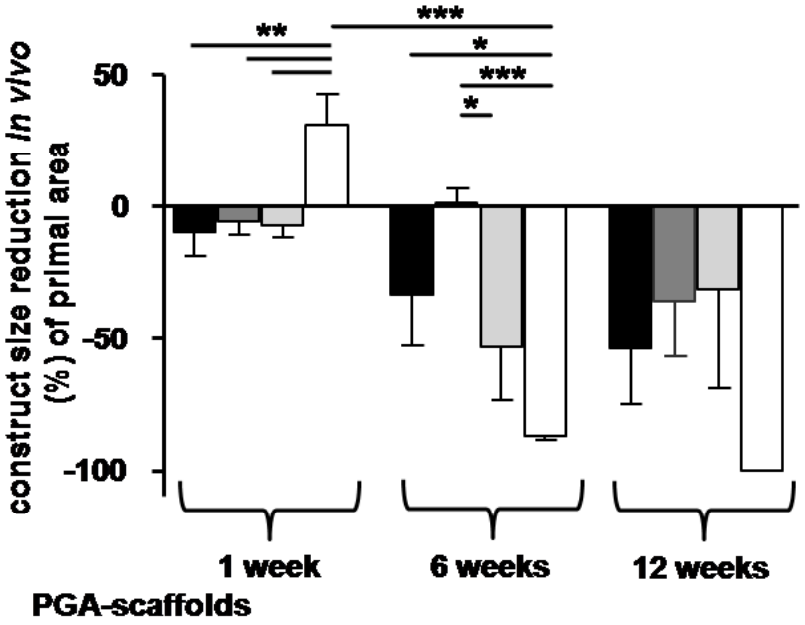
Implanted ino nude mice
1, 6, 12 weeks
→ analysis

Lohan A et al., 2011
Histochem Cell Biol. 136(1):57-69

Chondrogenesis by heterotopic chondrocytes *in vivo*

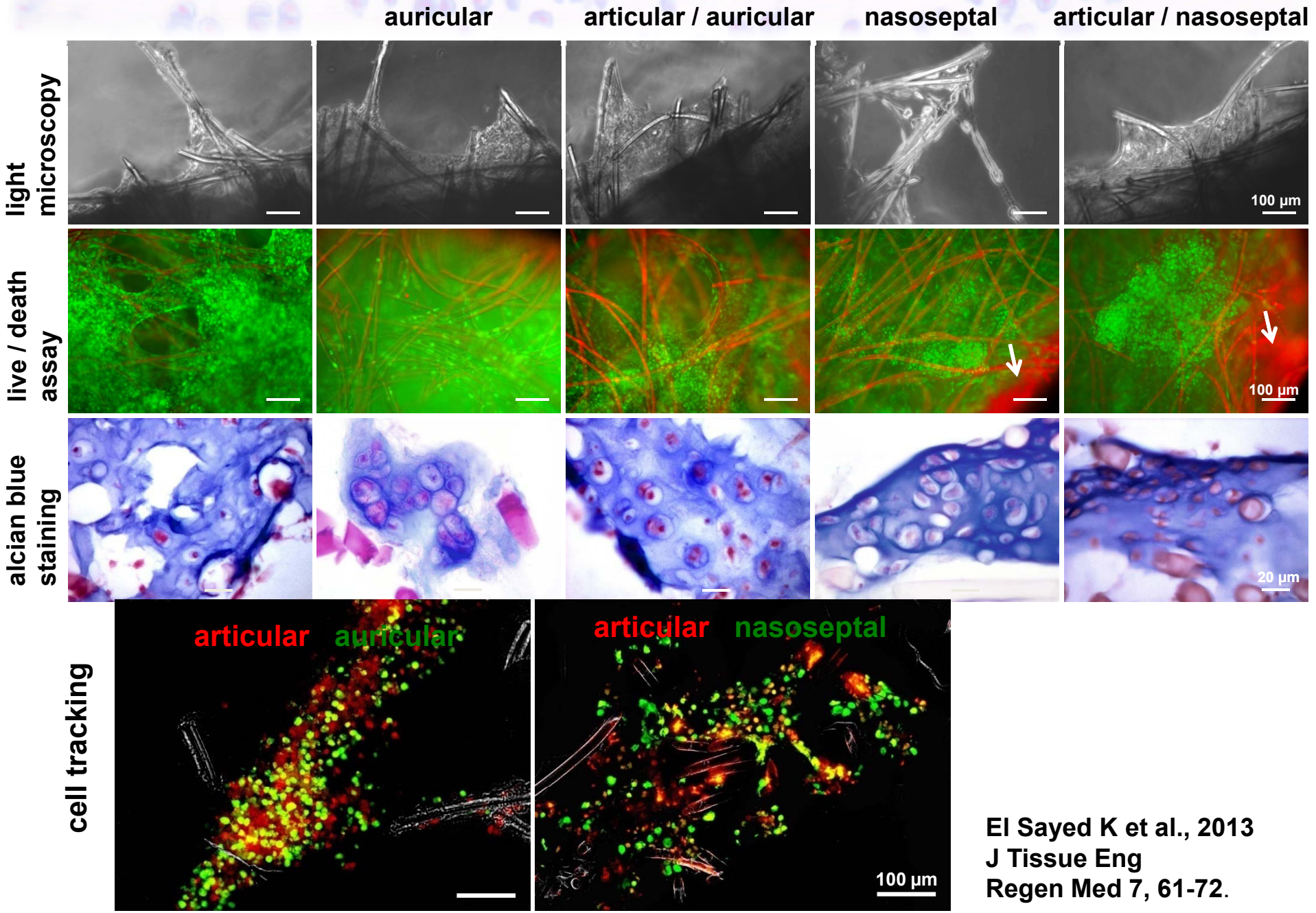


explantation



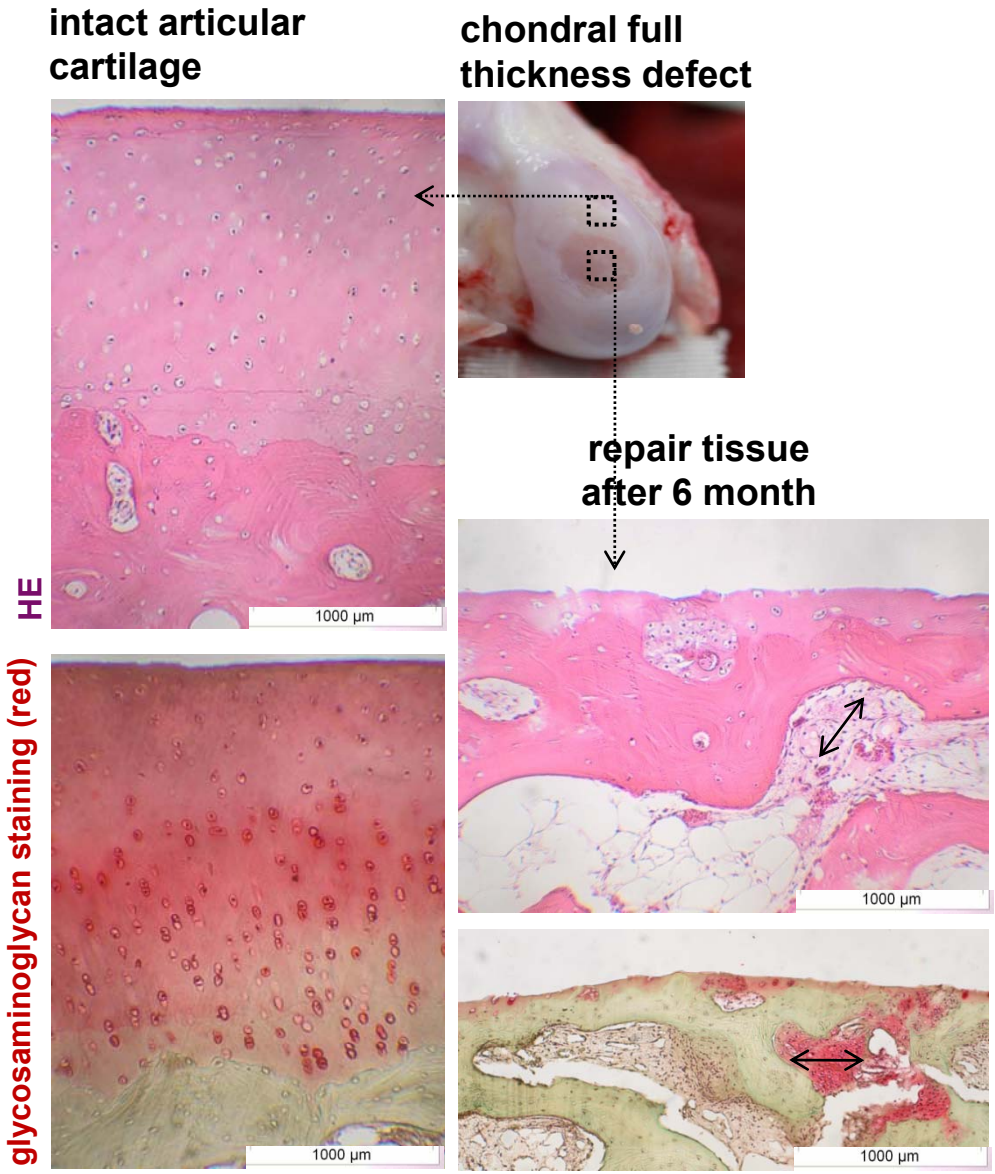
Lohan A et al., 2011
Histochem Cell Biol. 136(1):57-69

Chondrogenesis by heterotopic chondrocyte mono- and cocultures



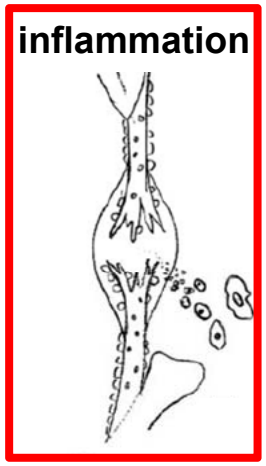
El Sayed K et al., 2013
J Tissue Eng
Regen Med 7, 61-72.

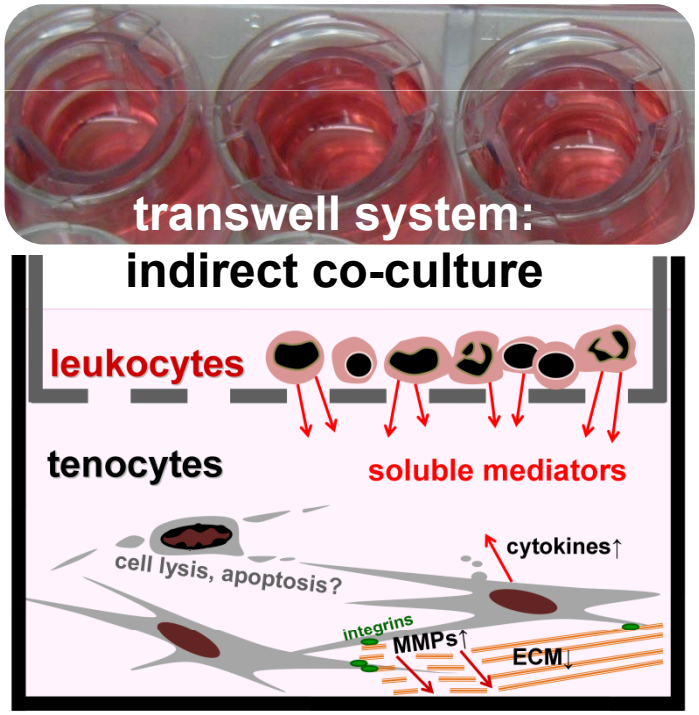
Cartilage repair *in vivo*

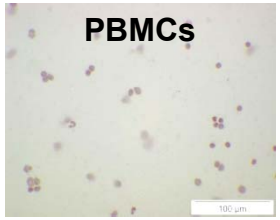


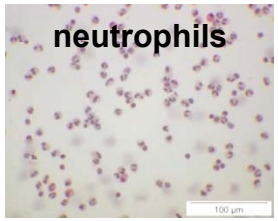
Lohan A et al., 2013, 195(5):488-97.

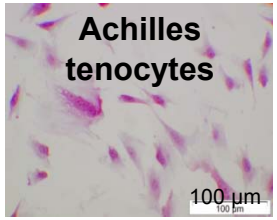
influence of autologous leukocytes on tenocytes?







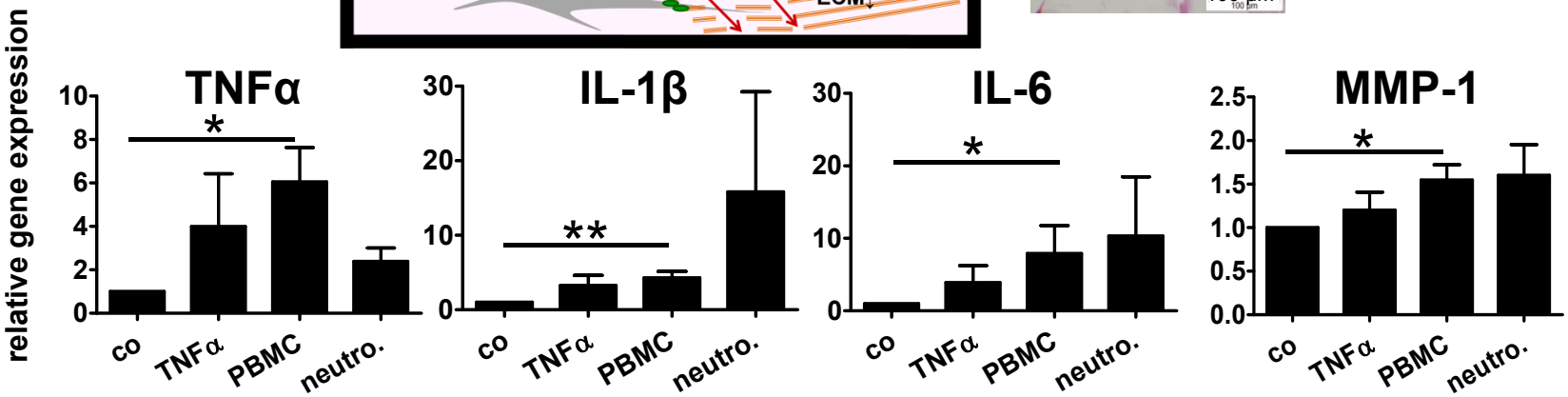




tenocyte response

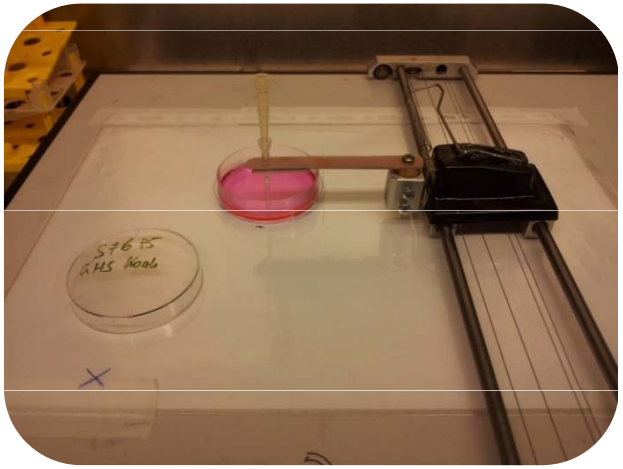
- to cytokines?
- **to leukocytes?**
- to complement activation?
- to cell injury?

10 ng/mL TNFα, 24 h
$4x10^6$ rabbit leukocytes
10^5 rabbit tenocytes



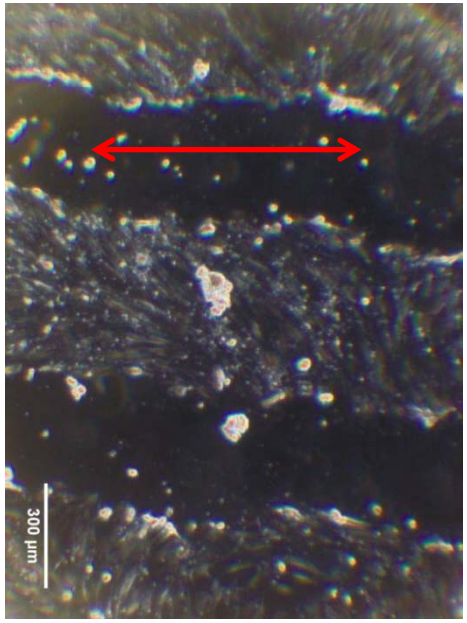
Al-Sadi O et al., 2012. Muscles Ligaments Tendons J. 2012 1(3):68-76.

tenocyte response to cell injury

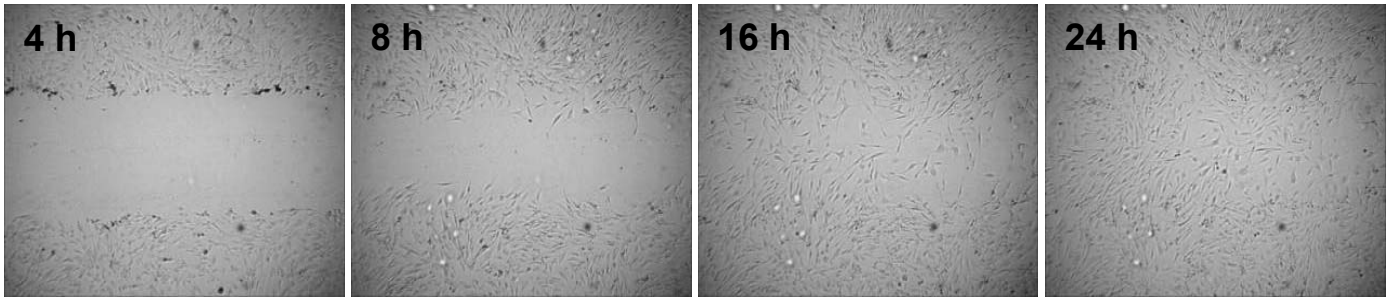


computer guided reproducible plotting system

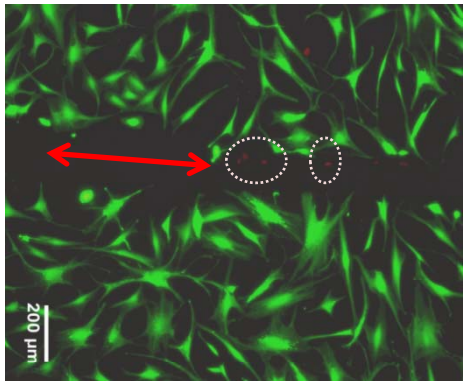
scratch assay



„healing“ after injury



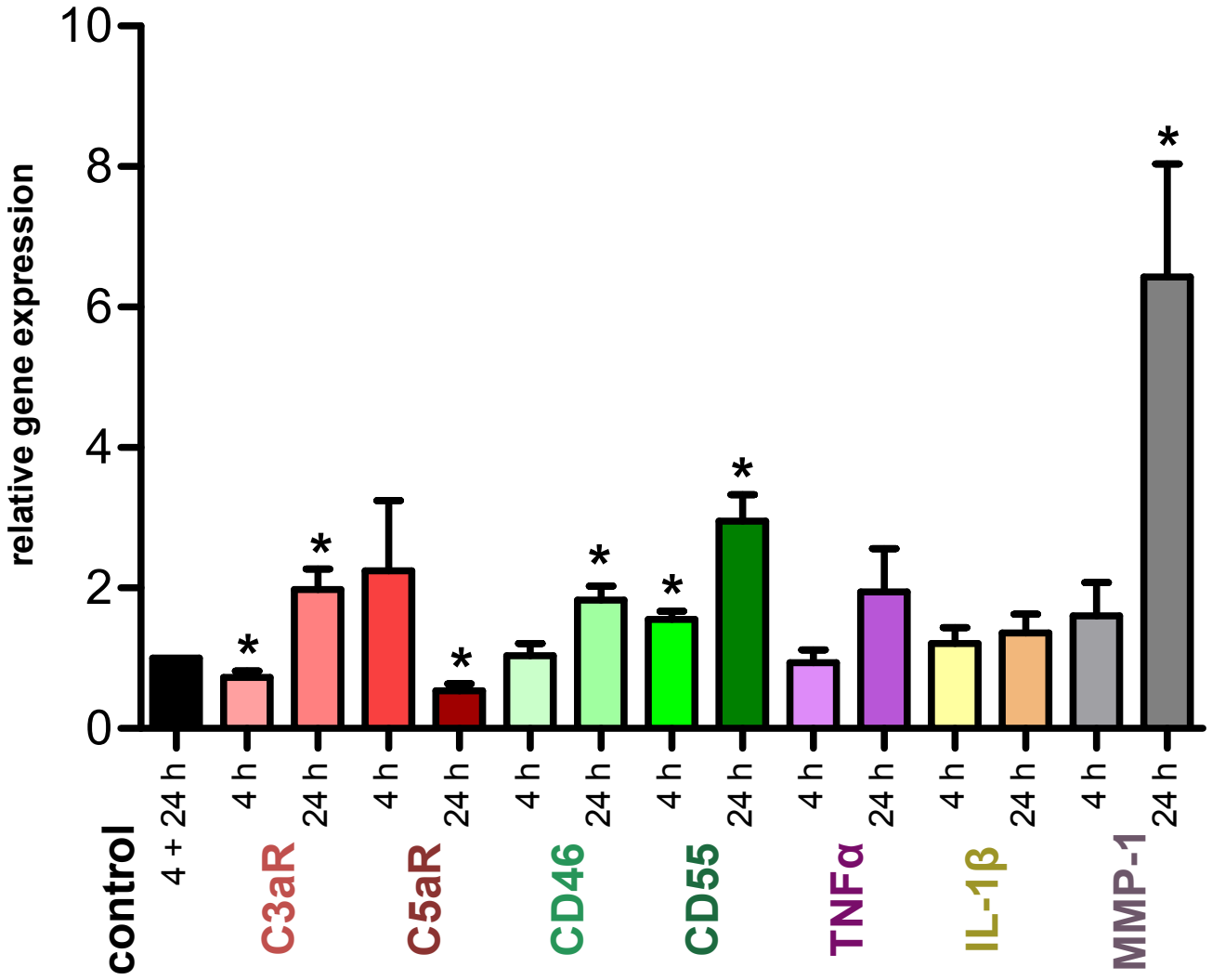
human Hamstring tenocytes



green: vital, red: dead cells

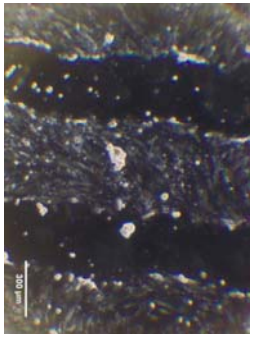
Girke G et al., 2014 Mol Immunol 60(1):14-22.

tenocyte response to cell injury



tenocyte response

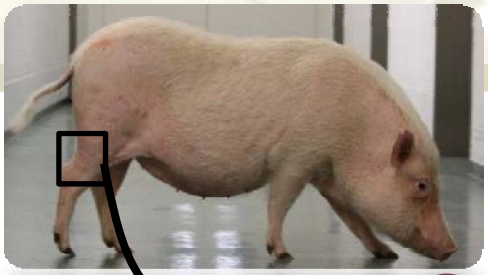
- **to cytokines?**
- **to leukocytes?**
- to complement activation?
- **to cell injury?**



human Hamstring tenocytes

Girke G et al., 2014 Mol Immunol

decellularized tendon ECM scaffolds



HE

Lohan et al., 2013, Schulze-Tanzil G et al., 2012
Connect Tissue Res. 54(4-5):305-12. Cells 1:1010.

tenocyte implantation in partial tendon defects (rabbit)

Achilles tenocytes

↓

expansion in monolayer

↓

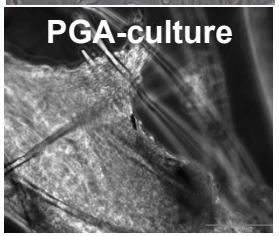
PGA-culture

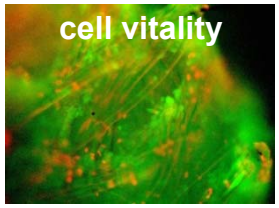
↓ **1 week**

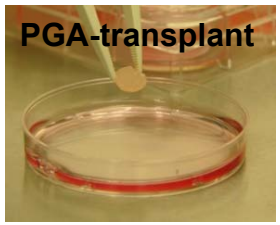
implantation in **tendon defect**

↓ **6 weeks**

healing?

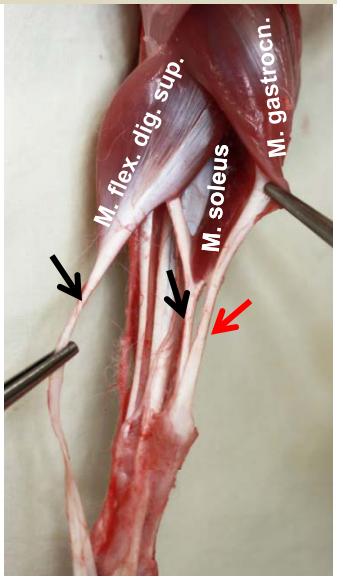




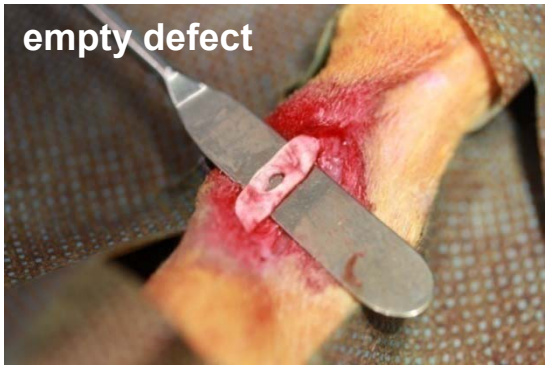


green = vital
red = dead

rabbit Achilles tendon



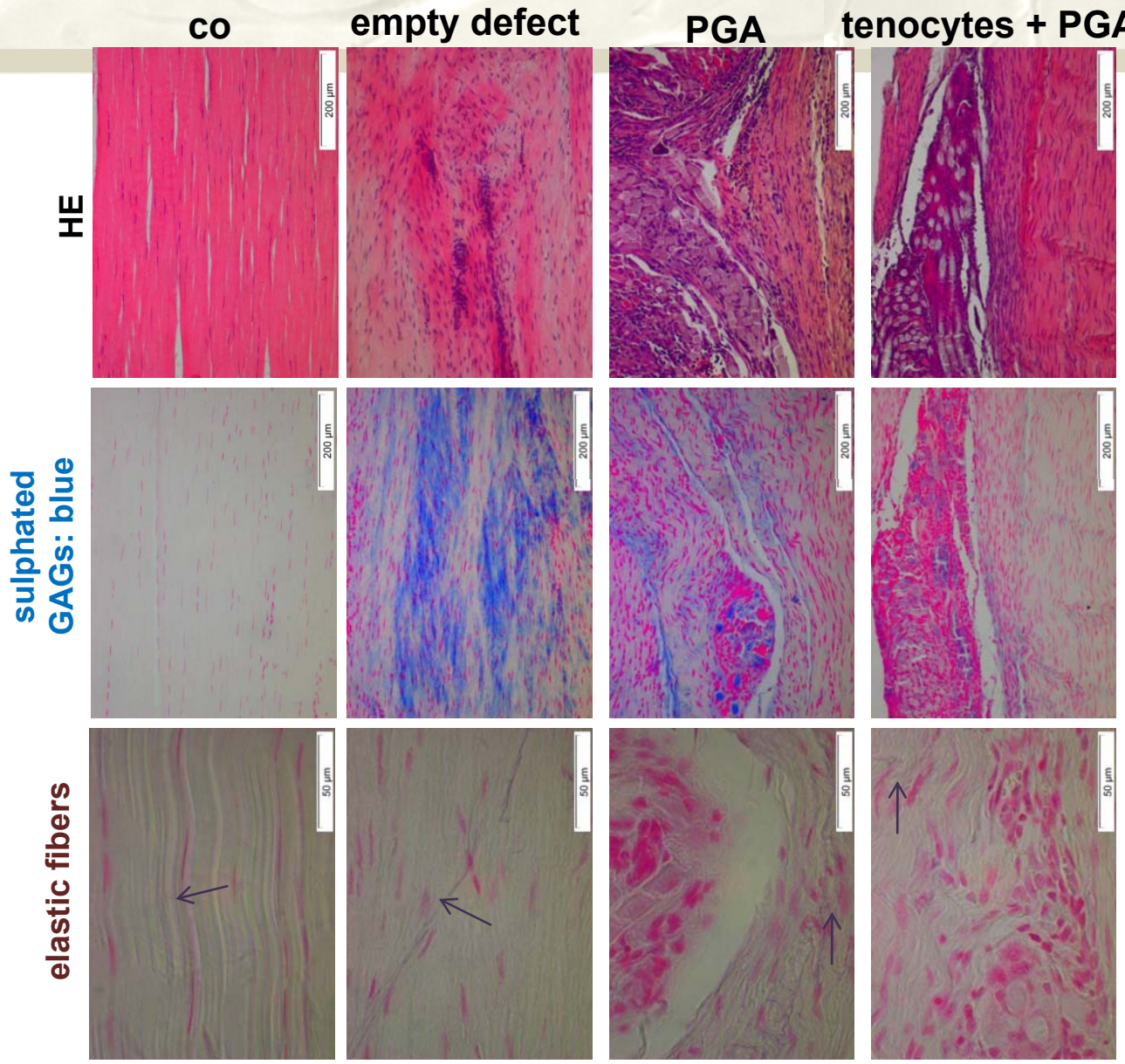
medial *M. gastrocnemius* tendon

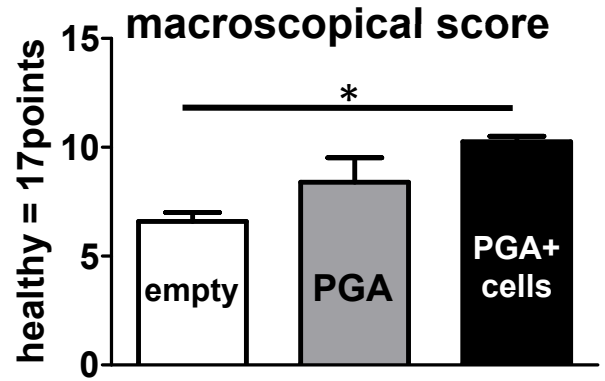


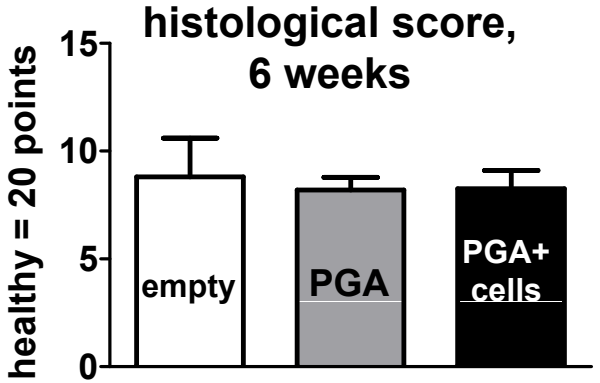
macroscopical and histological scoring

Stoll C et al., 2011
Biomaterials 32:4806

tenocyte implantation in partial tendon defects (rabbit)

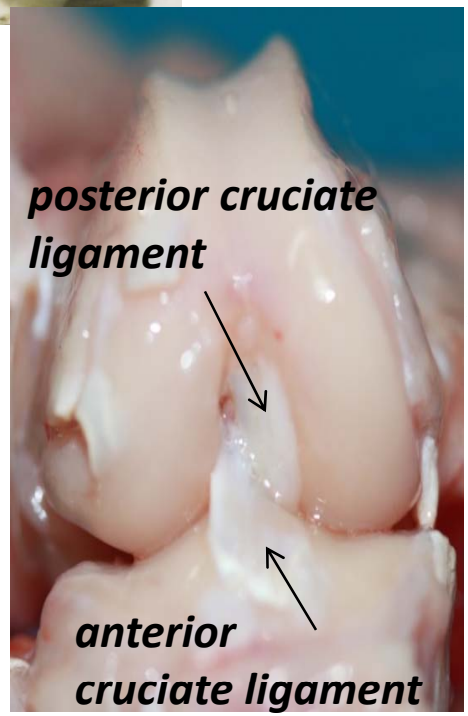


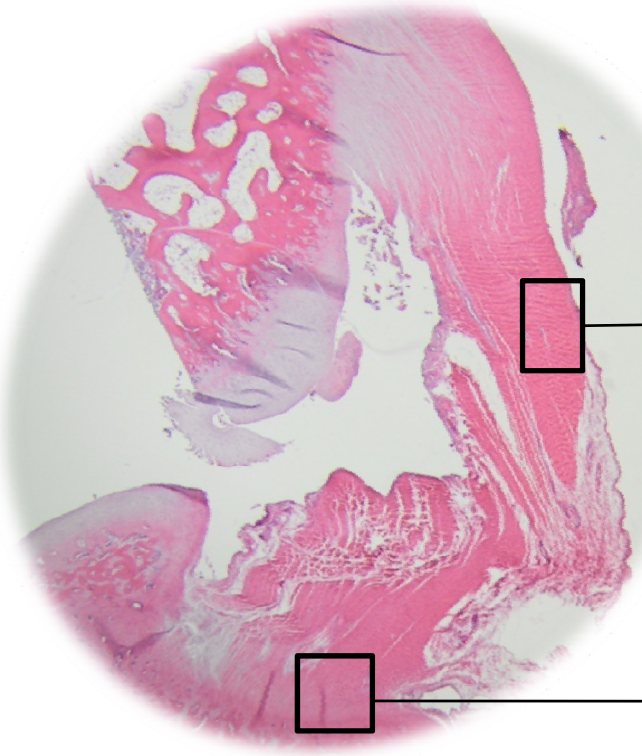




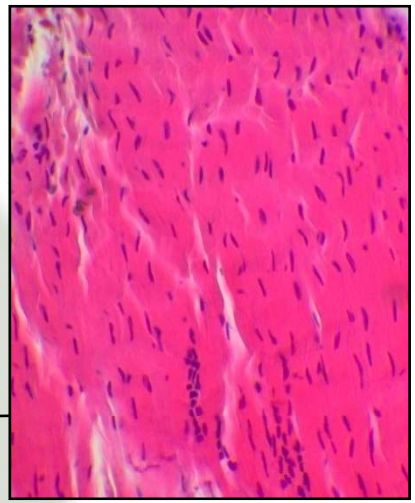
Stoll C et al., 2011
Biomaterials 32:4806

Lapine anterior cruciate ligament (ACL)

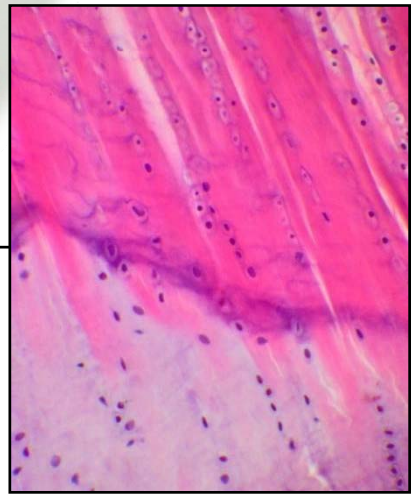




mean substance



enthesis

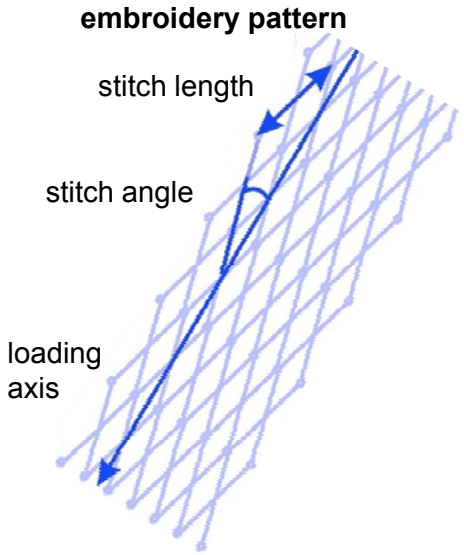


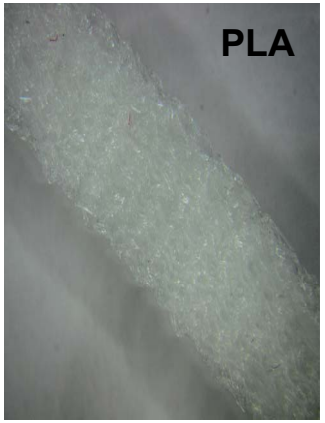
Dimensions:
15 mm x 3 mm x 4 mm

Hoyer et al., 2014. Materials Science and Engineering 1;43:290-9.

embroidered scaffolds with collagen

● **anterior cruciate ligament (ACL) tissue engineering using embroidered scaffolds supplemented with collagen**



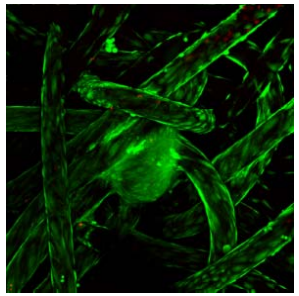


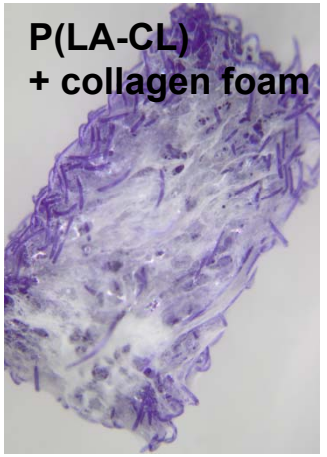
- Poly(lactic-co-ε-caprolacton) = PLA-CL, monofilament
- Poly-L-lactic acid = PLA, multifilament
- both materials combined

Dimensions of the lapine ACL (15 mm x 3 mm x 4 mm)

spheroid-based seeding

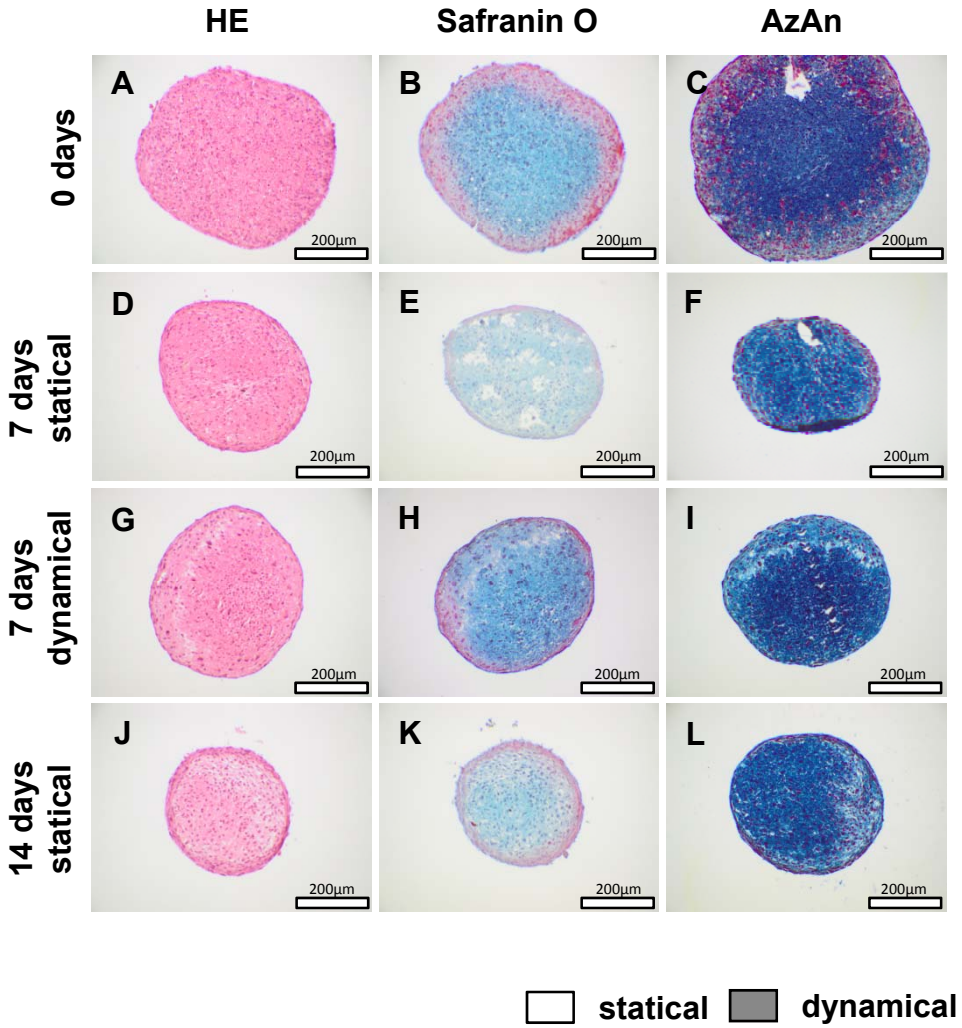
vitality

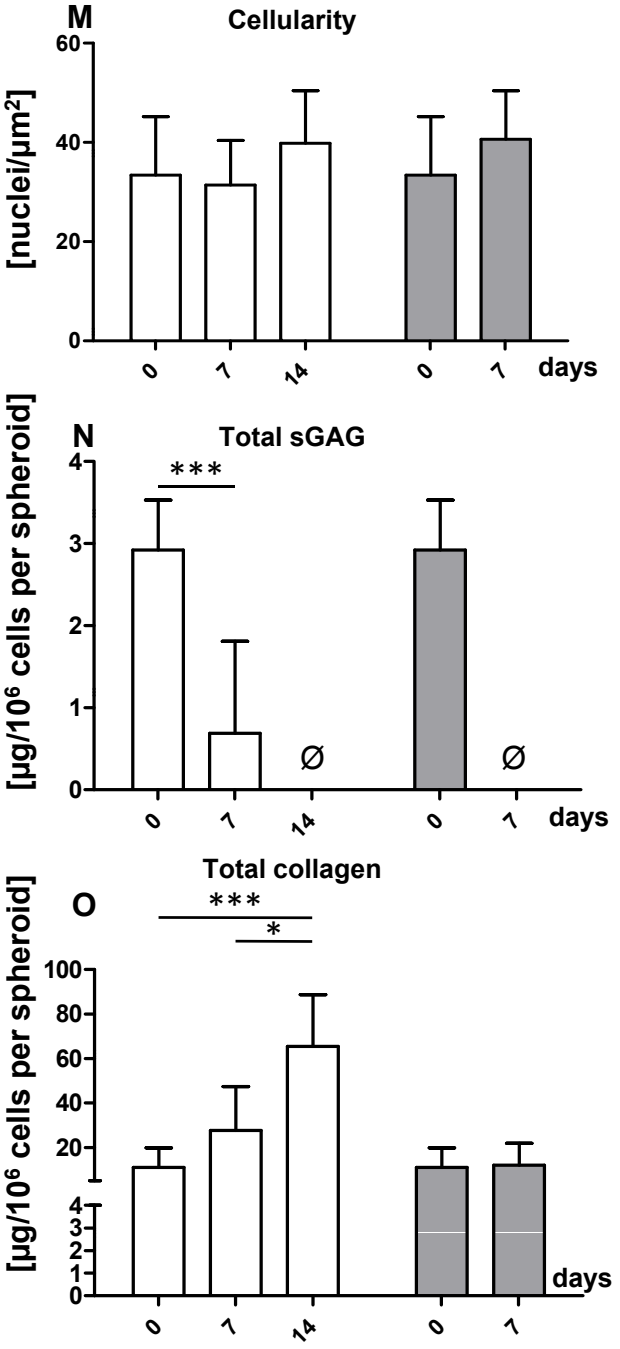




Hoyer et al., 2014. Materials Science and Engineering 1;43:290-9.

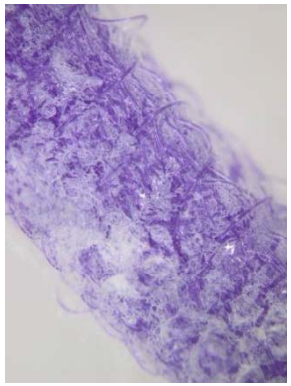
ACL spheroid characterization

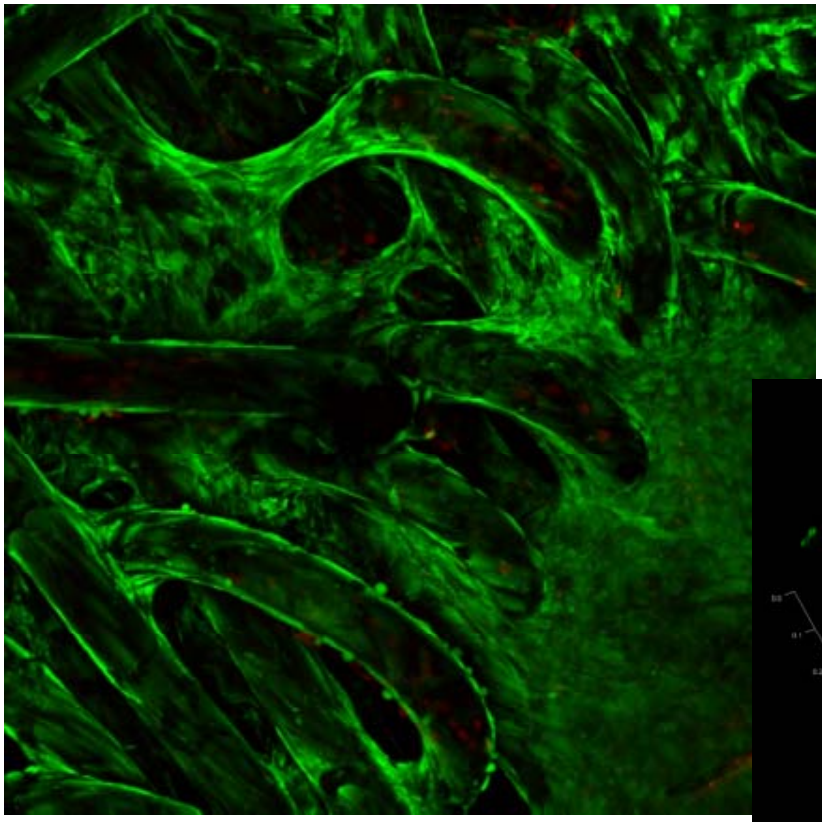




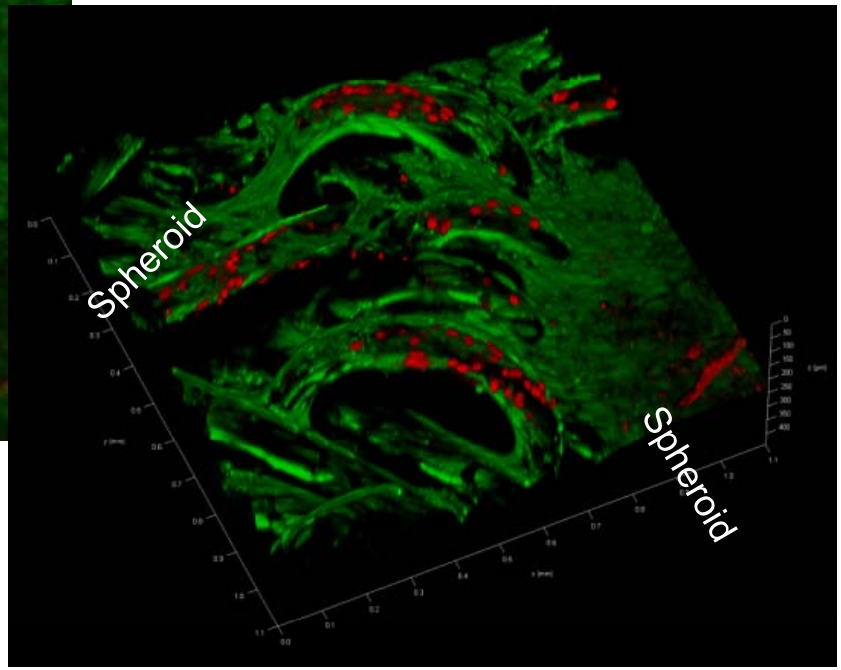
Hoyer et al., 2014. Histochem Cell Biol. *In press*

Collagen scaffolds seeded with ligament cells





7 d



green: vital, red: dead cells

Hoyer et al., 2014. Materials Science and Engineering 1;43:290-9.