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Dual-triphic microfibrous scaffolds reshaping the lipidomic profile for enthesis healing of a rotator cuff model

Lang Bai[1,2], Ayiguli Kasimu[2,3], Jiankang He[2*], Zhanhai Yin[1*]

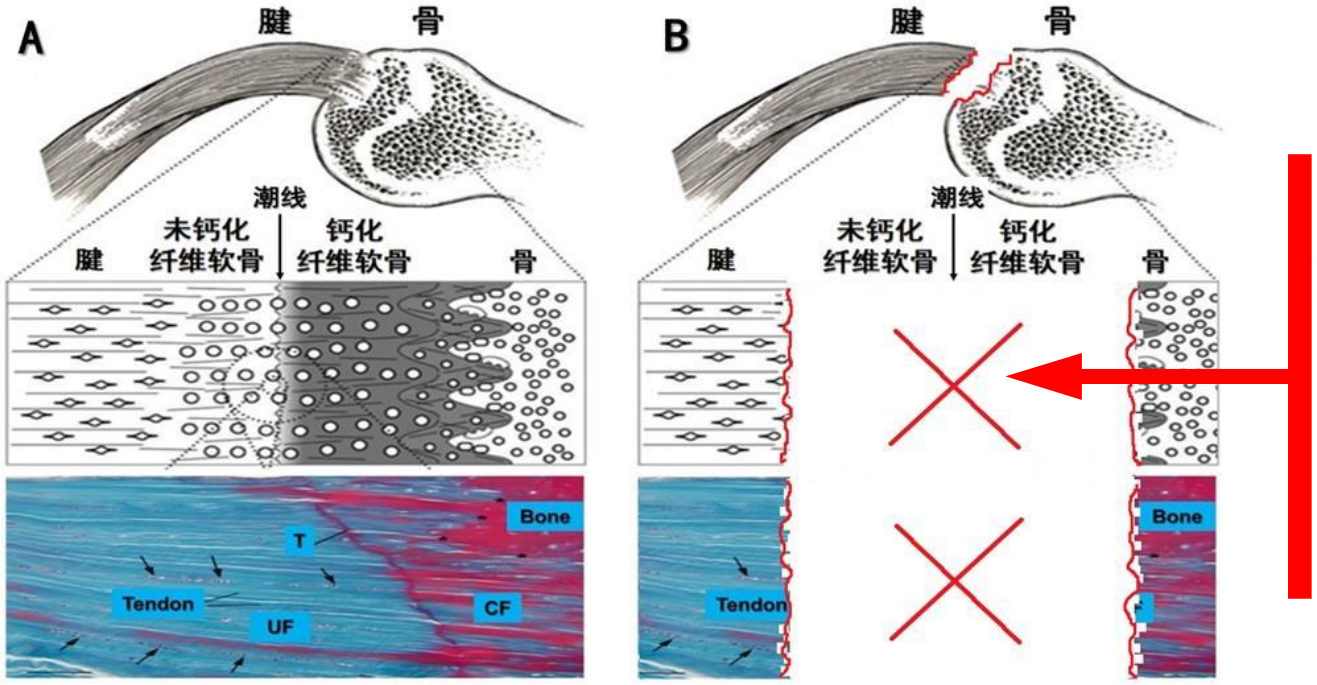
1. Department of Orthopaedics, The First Affiliated Hospital of Xi'an Jiaotong University, China
2. State Key Laboratory for Manufacturing Systems Engineering, Xi'an Jiaotong University, China
3. School of Mechanical Engineering, Xinjiang University, , China

Faculty Disclosure Information

- Nothing to disclosure

- **Rotator cuff injuries** are a major cause of shoulder pain
- **High re-tear rates** after surgery

----Difficulty in reconstructing the enthesis



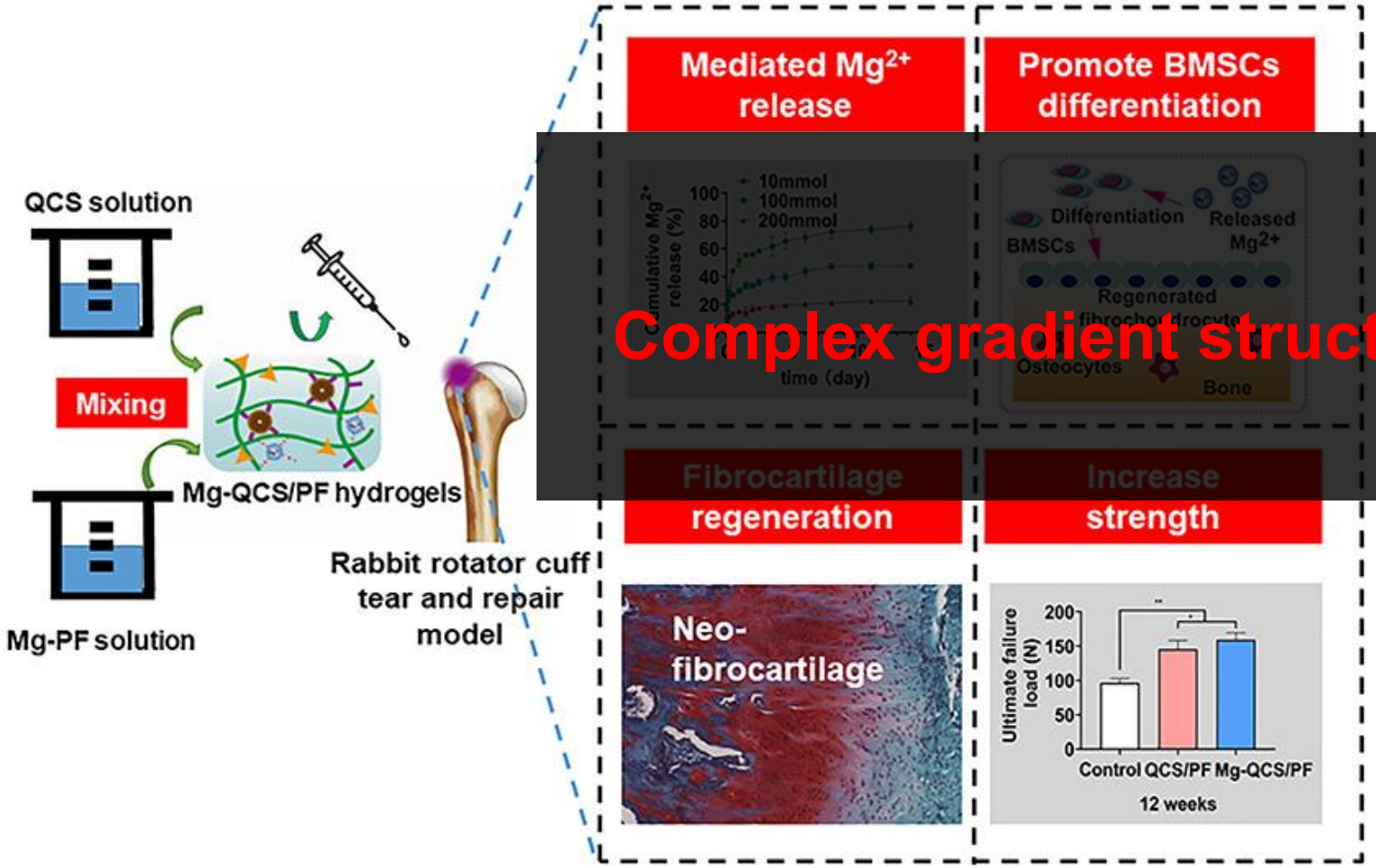
◆ **Gradient GFs**

◆ **Stem Cells**

Reasons: 1) Inability to provide sufficient endogenous or exogenous seed cells.
2) Inability to control specific differentiation factors based on the functional layering of the tendon–bone interface.

Our exploration：

Self-healing hydrogel with anti-inflammatory (curcumin) and pro-differentiation (magnesium ions) properties



Complex gradient structure?

Chemical Engineering Journal 396 (2020) 125335

Contents lists available at ScienceDirect

Chemical Engineering Journal

journal homepage: www.elsevier.com/locate/cej

Sustained release of magnesium ions mediated by injectable self-healing adhesive hydrogel promotes fibrocartilaginous interface regeneration in the rabbit rotator cuff tear model

Baojun Chen[a,1], Yongping Liang[b,1], Lang Bai[a,1], Meiguang Xu[a], Jing Zhang[c], Baolin Guo[b,*], Zhanhai Yin[a,*]

[a] Department of Orthopaedics, The First Affiliated Hospital of Xi'an Jiaotong University, Xi'an 710061, China
[b] Frontier Institute of Science and Technology, and State Key Laboratory for Mechanical Behavior of Materials, and Key Laboratory of Shaanxi Province for Craniofacial Precision Medicine Research, College of Stomatology, Xi'an Jiaotong University, Xi'an 710049, China
[c] Key Laboratory of Resource Biology and Biotechnology in Western China, Ministry of Education. School of Medicine, Northwest University, 229 Taibai North Road, Xi'an 710069, Ch

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Research Paper

Synergistic enhancement of tendon-to-bone healing via anti-inflammatory and pro-differentiation effects caused by sustained release of Mg^{2+}/curcumin from injectable self-healing hydrogels

Baojun Chen[1*], Yongping Liang[2*], Jing Zhang[3*], Lang Bai[1], Meiguang Xu[1], Qian Han[1], Xuezhe Han[1], Jintao Xiu[1], Meng Li[1], Xiaoling Zhou[1], Baolin Guo[2] and Zhanhai Yin[1]

1. Department of Orthopaedics, The First Affiliated Hospital of Xi'an Jiaotong University, Xi'an, 710061, China.
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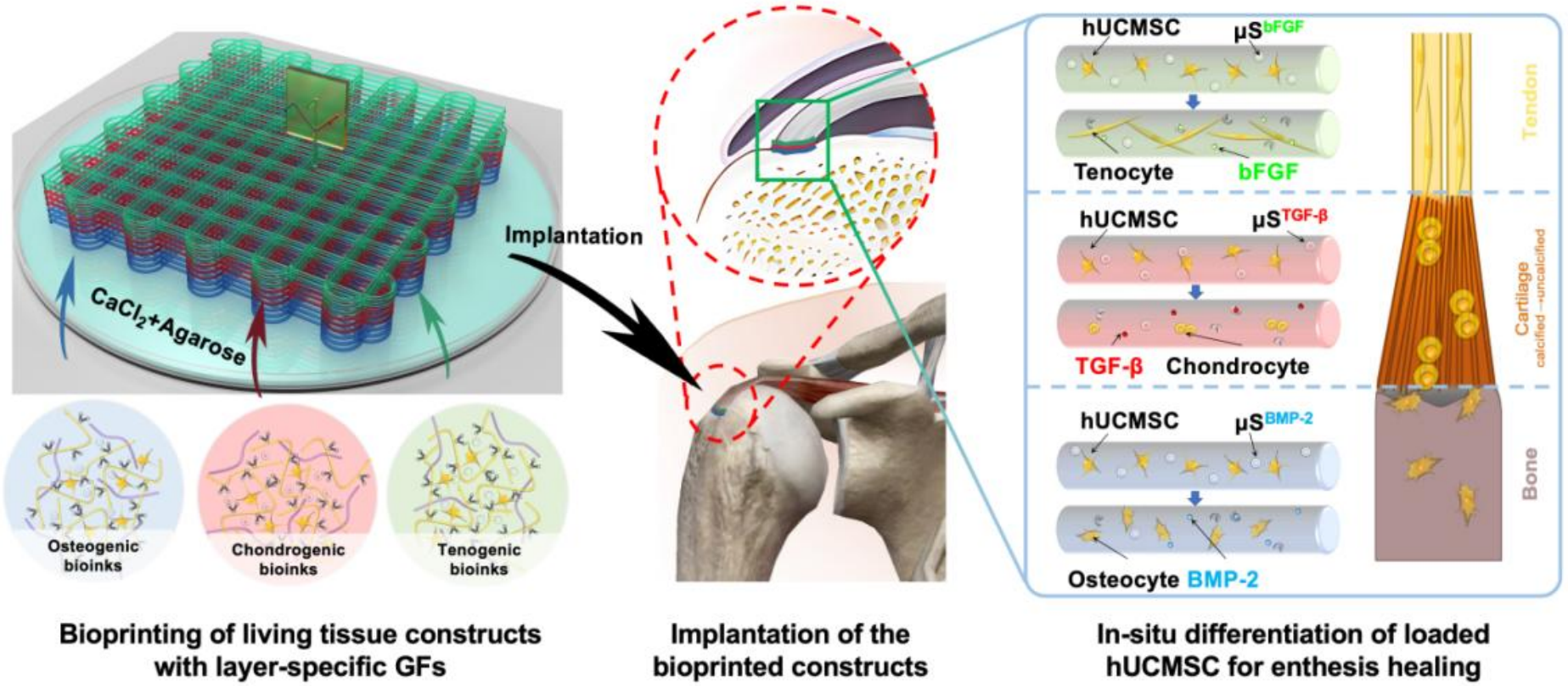
3. Key Laboratory of Resource Biology and Biotechnology in Western China, Ministry of Education. School of Medicine, Northwest University, 229 Taibai North, Xi'an 710069, China.

Bioprinted living tissue construct

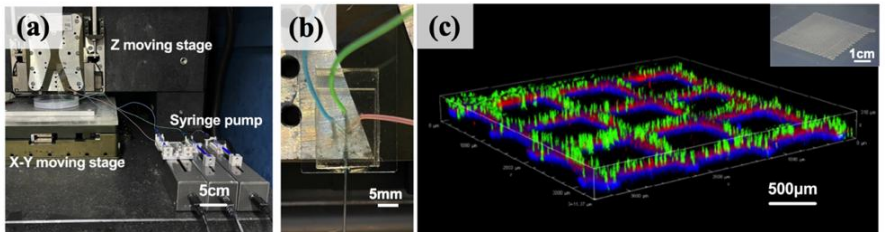


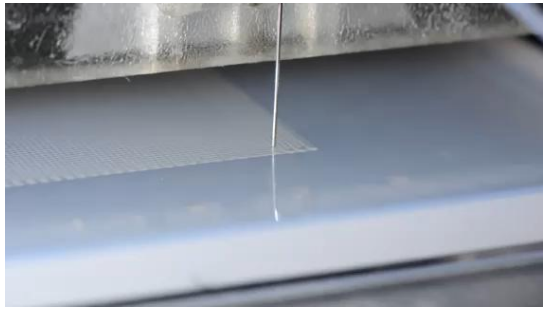
Bioprinting of living tissue constructs with layer-specific GFs

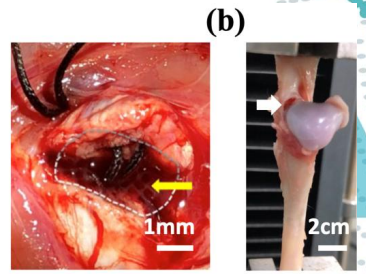
Implantation of the bioprinted constructs

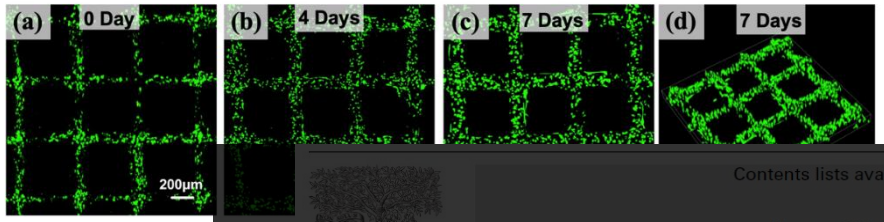
In-situ differentiation of loaded hUCMSC for enthesis healing

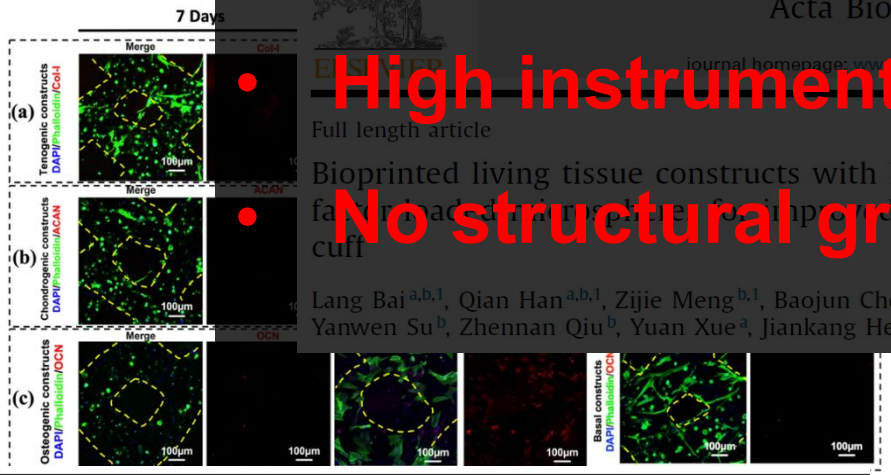
The hUCMSCs within the scaffold achieve layered differentiation under layer-specific growth factors, mimicking the natural enthesis and promoting tissue

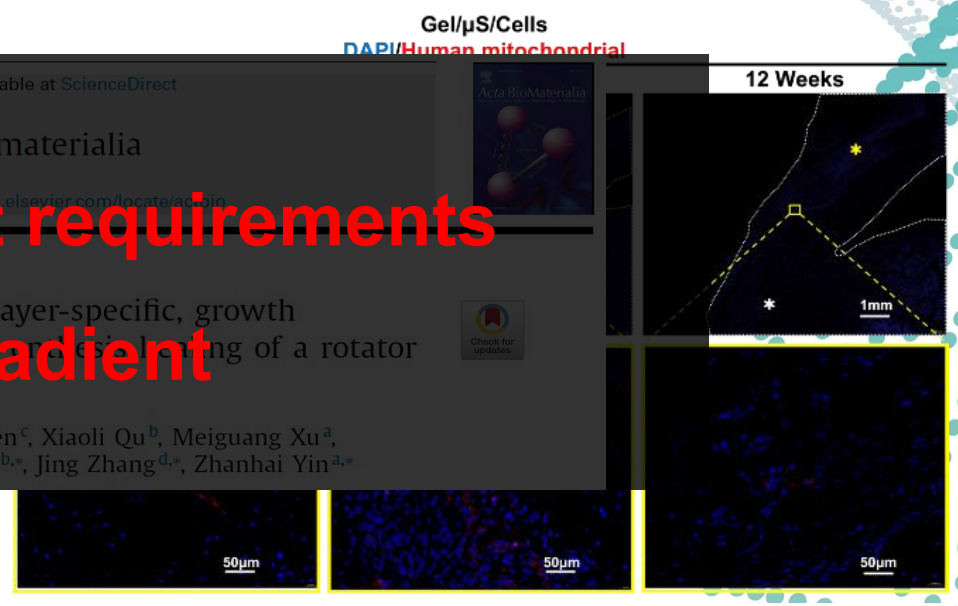


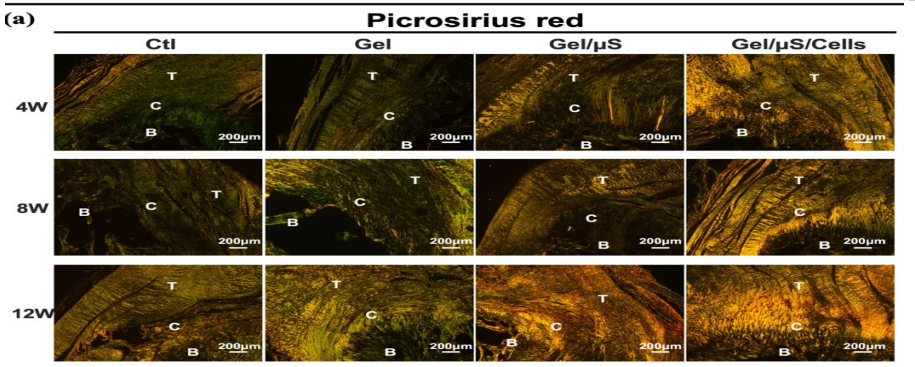


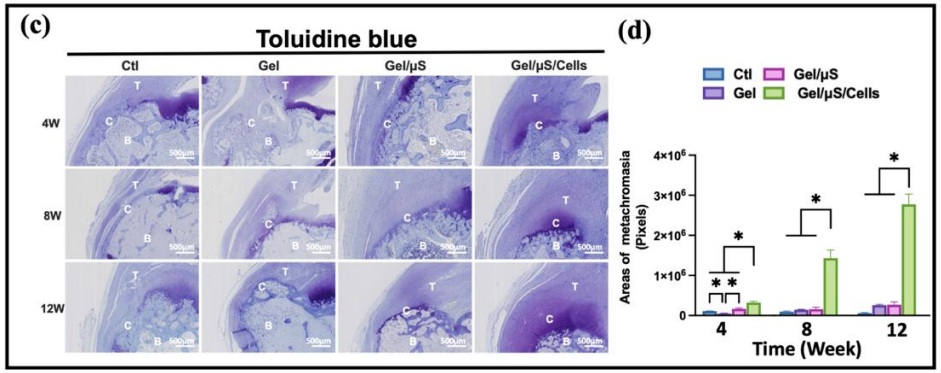












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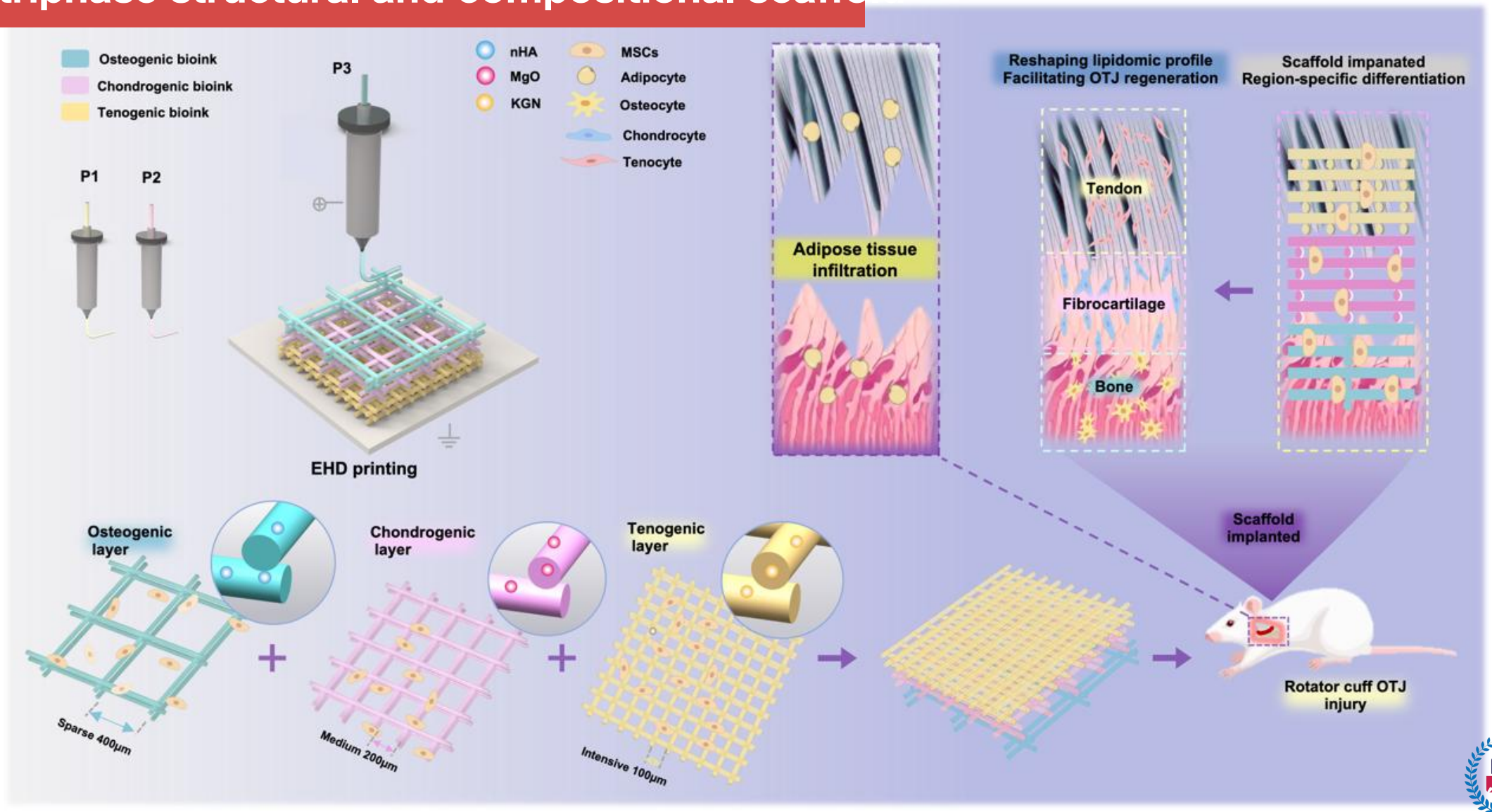
Full length article

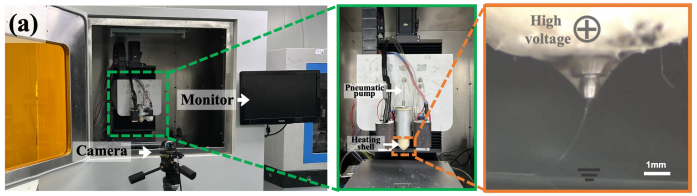
Bioprinted living tissue constructs with layer-specific, growth factor-loaded structure for zonal regeneration of a rotator cuff

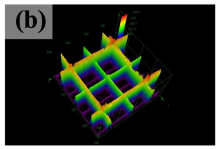
Lang Bai[a,b,1], Qian Han[a,b,1], Zijie Meng[b,1], Baojun Chen[c], Xiaoli Qu[b], Meiguang Xu[a], Yanwen Su[b], Zhennan Qiu[b], Yuan Xue[a], Jiankang He[b,*], Jing Zhang[d,*], Zhanhai Yin[a,*]

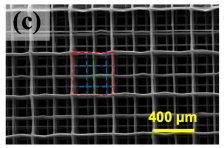
- **High instrument requirements**
- **No structural gradient**

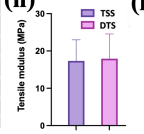
ual-triphase structural and compositional scaffo

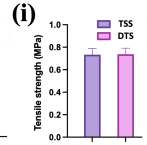


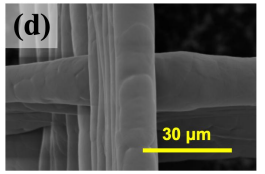

(a)
Monitor
Camera
Pneumatic pump
Heating shell
High voltage
1mm

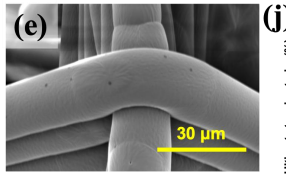

(b)

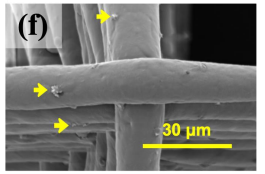

(c)
400 μm

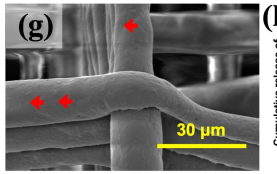

(h)
TSS
DTS
Tensile modulus (MPa)

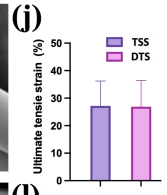

(i)
TSS
DTS
Tensile strength (MPa)

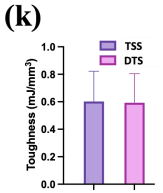

(d)
30 μm

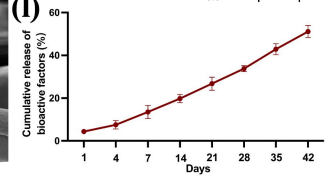

(e)
30 μm

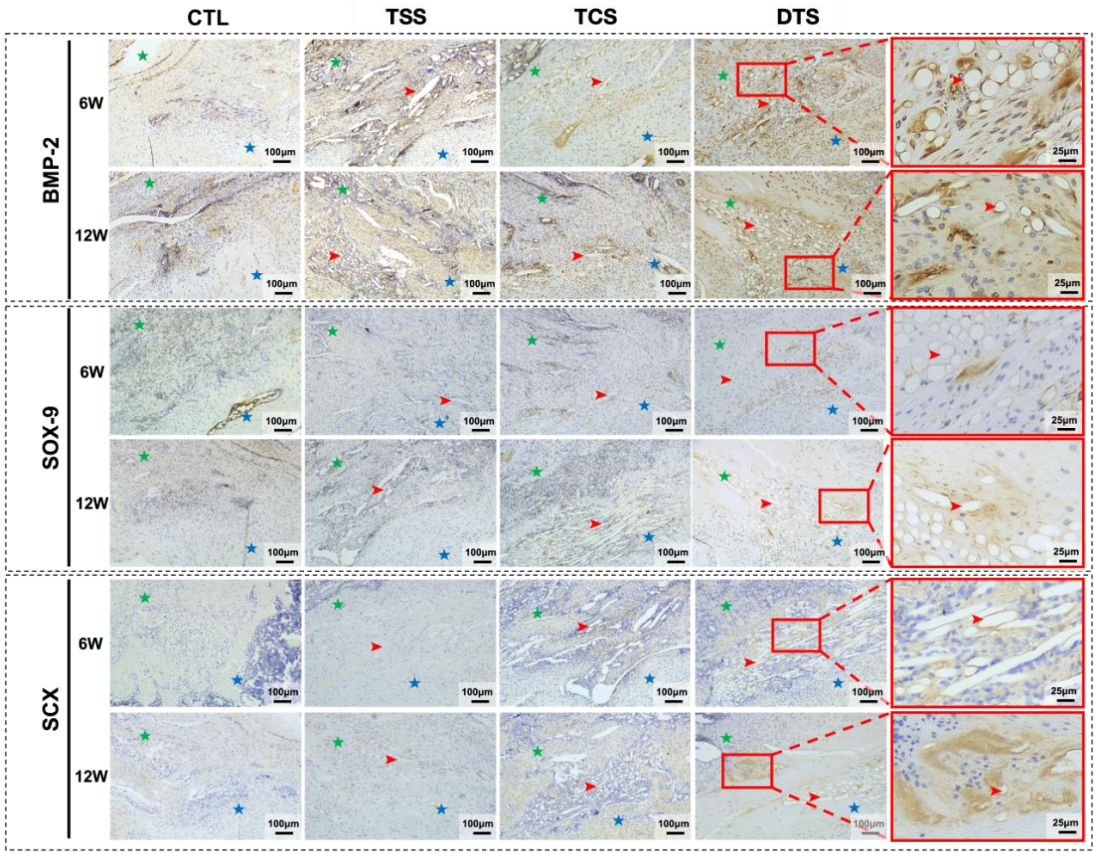

(f)
30 μm

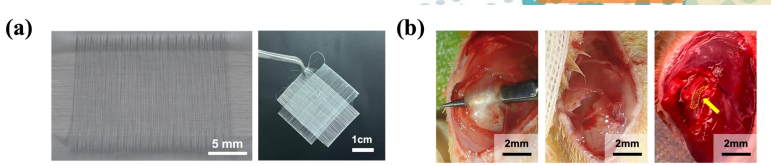

(g)
30 μm

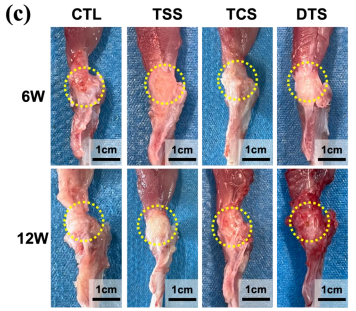

(j)
TSS
DTS
Ultimate tensile strain (%)

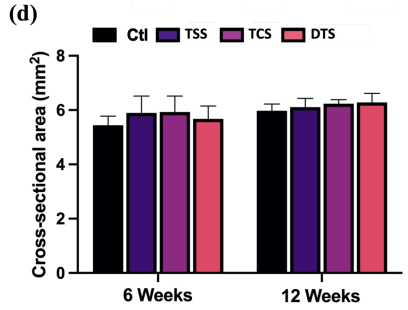

(k)
TSS
DTS
Toughness (mJ/mm³)

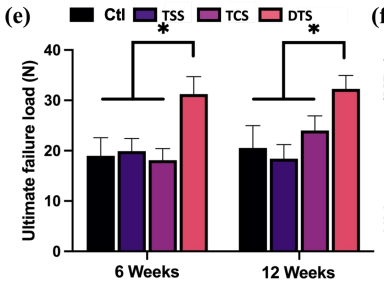

(l)
Cumulative release of bioactive factors (%)
Days

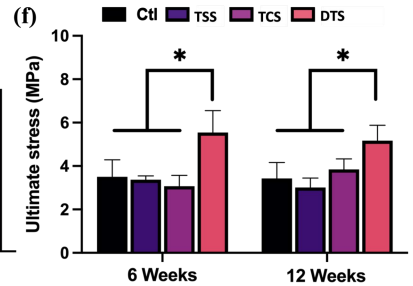

CTL
TSS
TCS
DTS
BMP-2
SOX-9
SCX
6W
12W
100μm
25μm

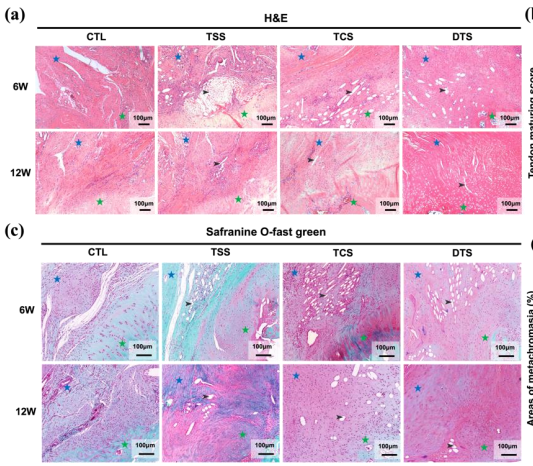

(a)
5 mm
1cm
(b)
2mm

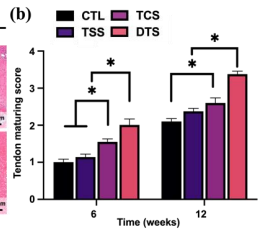

(c)
CTL
TSS
TCS
DTS
6W
12W
1cm

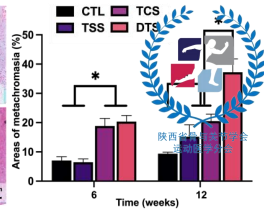

(d)
Ctl
TSS
TCS
DTS
Cross-sectional area (mm²)
6 Weeks
12 Weeks

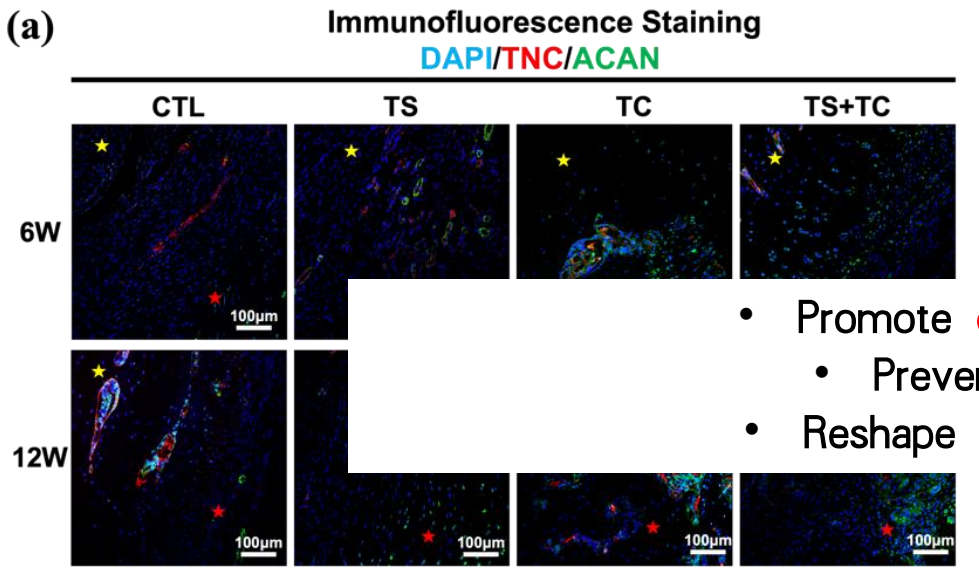

(e)
Ctl
TSS
TCS
DTS
Ultimate failure load (N)
6 Weeks
12 Weeks


(f)
Ctl
TSS
TCS
DTS
Ultimate stress (MPa)
6 Weeks
12 Weeks

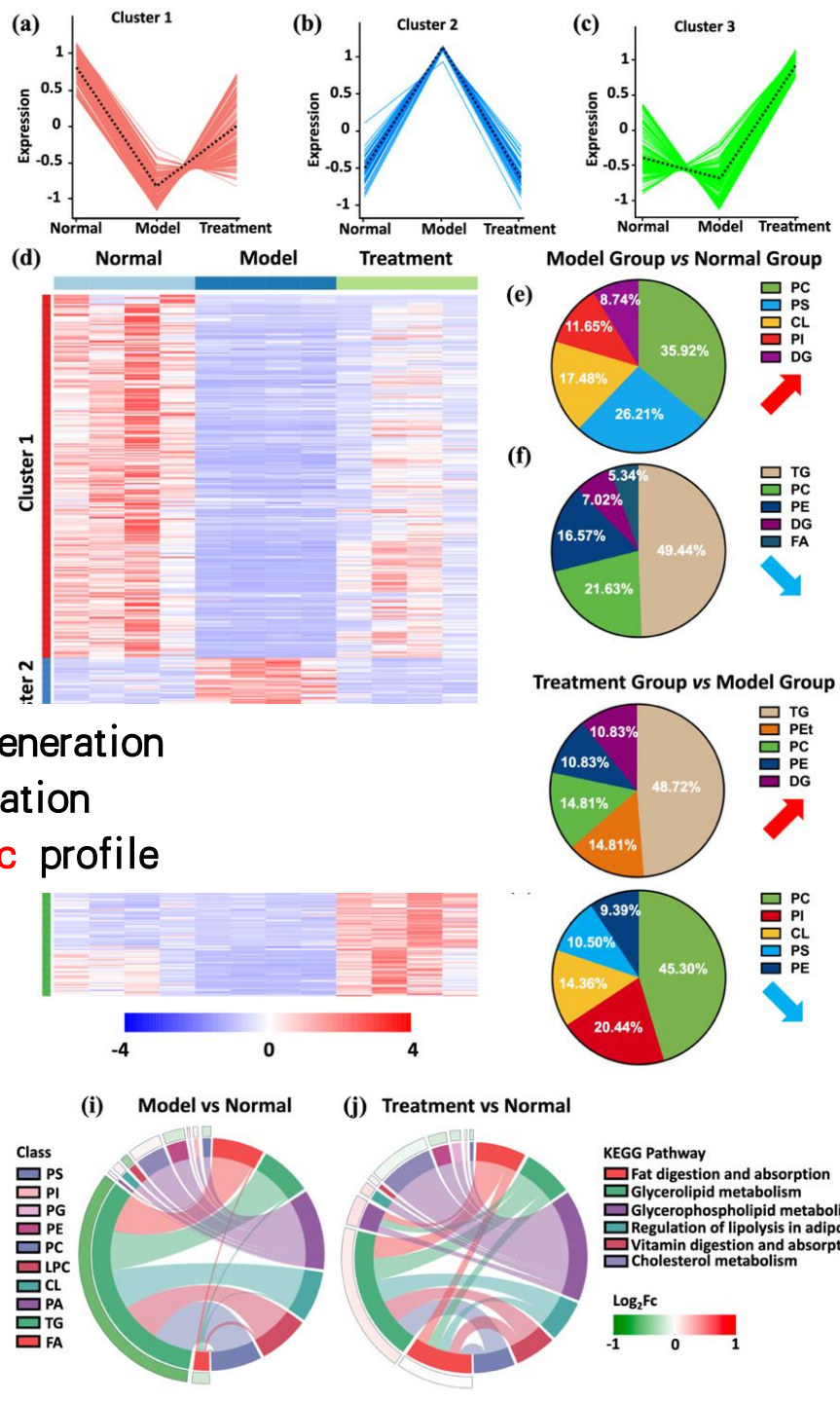

(a)
H&E
CTL
TSS
TCS
DTS
6W
12W
(c)
Safranine O-fast green


(b)
CTL
TSS
TCS
DTS
Tendon maturing score
Time (weeks)


(d)
CTL
TSS
TCS
DTS
Areas of metachromasia (%)
Time (weeks)



- Promote cartilage regeneration
  - Prevent scar formation
- Reshape the lipidomic profile



谢谢观看

— THANKS —

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