

## Supplementary materials

### **Bi-directional regulation functions of lanthanum-substituted layered double hydroxide nanohybrid scaffolds *via* activating osteogenesis and inhibiting osteoclastogenesis for osteoporotic bone regeneration**

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**Table S1.** The mass amounts of chemical reagents for La-LDH nanoplates.

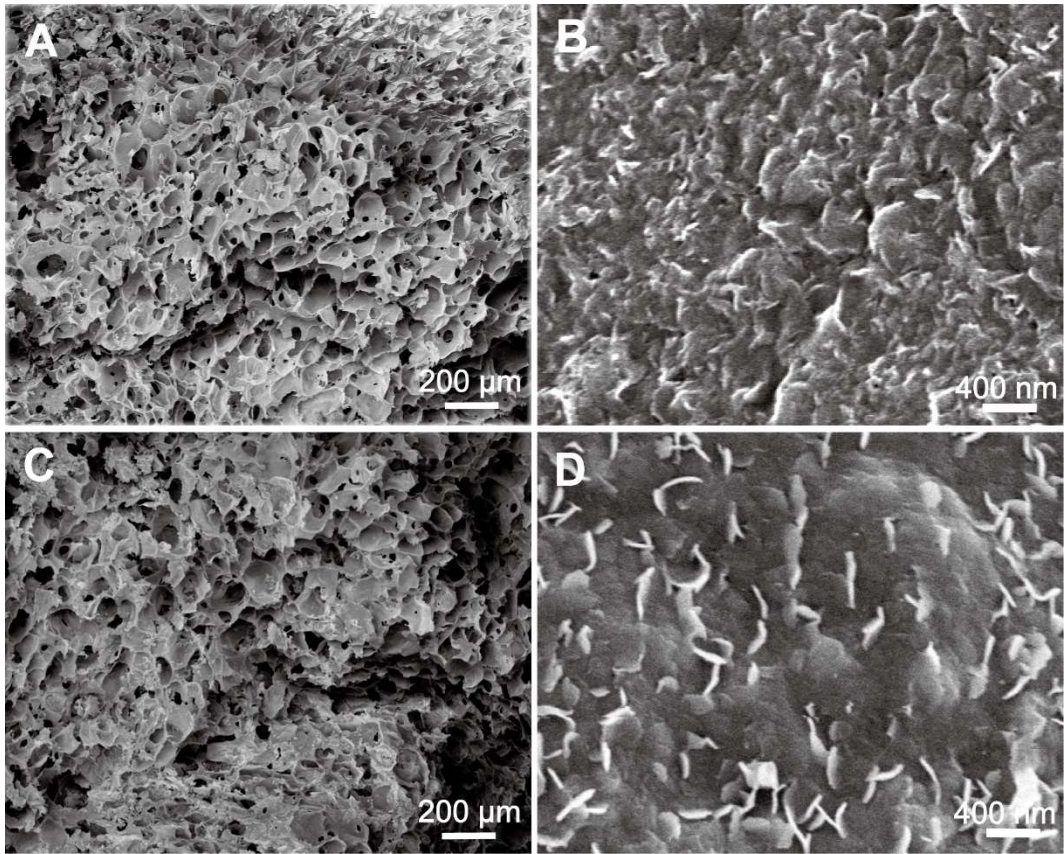
Chemical reagents	LDHs (g)	La1/7-LDHs (g)	La1/4-LDHs (g)
Mg(NO <sub>3</sub> ) <sub>2</sub> ·6H <sub>2</sub> O	23.0787	23.0787	23.0787
Al(NO <sub>3</sub> ) <sub>3</sub> ·9H <sub>2</sub> O	11.2540	9.8472	9.0032
La(NO <sub>3</sub> ) <sub>3</sub> ·6H <sub>2</sub> O	0	1.6237	2.5980

**Table S2.** Primer sequences for rat BMSCs-OVX.

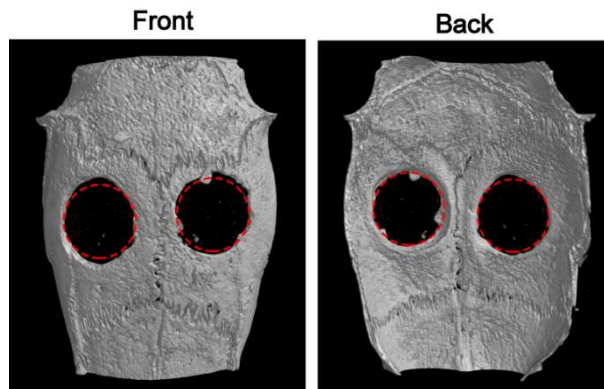
Gene	Primers (F=forward; R=reverse)
GAPDH	F: 5'-CCTGCACCACCAACTGCTTA-3'
	R: 5'-GGCCATCCACAGTCTTCTGAG-3'
ALP	F: 5'-CATCATCATGTTCTGGGAG-3'
	R: 5'-GACCTGAGCGTTGGTGTGT-3'
Runx-2	F: 5'-ATCCAGCCACCTTCACTTACACC-3'
	R: 5'-GGGACCATTGGGAAGTATAGG-3'
Col-1	F: 5'-CTGCCAGAAAGAATATGTATCACC-3'
	R: 5'-GAAGCAAAGTTTCTCCAAGACC-3'
OCN	F: 5'-CAGTAAGGTGGTGAATAGACTCCG-3'
	R: 5'-GGTGCCATAGATGCGCTTG-3'
OPG	F: 5'-GTCCCTTGCCCTGACTACTCT-3'
	R: 5'-GACATCTTTTGCAAACCGTGT-3'
RANKL	F: 5'-CCCATCGGGTTCCCATAAAGTC-3'
	R: 5'-GCCTGAAGCAAATGTTGGCGTA-3'

**Table S3.** Primer sequences for mouse osteoclasts.

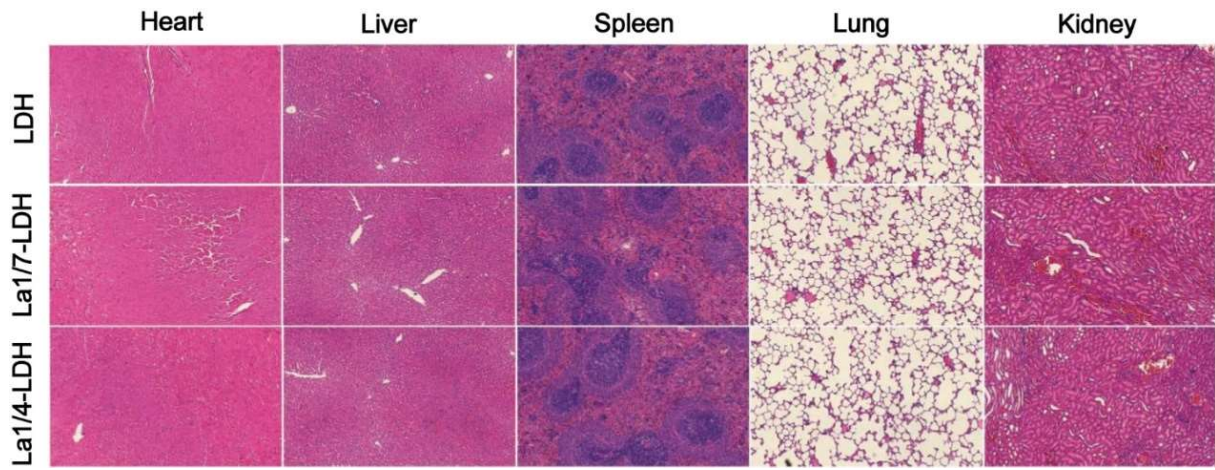
Gene	Primers (F=forward; R=reverse)
GAPDH	F: 5'-GGTGAAGGTCGGTGTGAACG-3'
	R: 5'-CTCGCTCCTGGAAGATGGTG-3'
NFATc1	F: 5'-TGCTCCTCCTCCTGCTGCTC-3'
	R: 5'-GCAGAAGGTGGAGGTGCAGC-3'
CTSK	F: 5'-GGGAGAAAAACCTGAAGC-3'
	R: 5'-ATTCTGGGGACTCAGAGC-3'
V-ATPase d2	F: 5'-AAGCCTTTGTTTGACGCTGT-3'
	R: 5'-TTCGATGCCTCTGTGAGATG-3'
TRAP	F: 5'-CTGGAGTGCACGATGCCAGCGACA-3'
	R: 5'-TCCGTGCTCGGCGATGGACCAGA-3'
DC-STAMP	F: 5'-AAAACCCTTGGGCTGTTCTT-3'
	R: 5'-AATCATGGACGACTCCTTGG-3'
c-Fos	F: 5'-CCAGTCAAGAGCATCAGCAA-3'
	R: 5'-AAGTAGTGCAGCCCGGAGTA-3'
CTR	F: 5'-TGCAGACAACTCTTGGTTGG-3'
	R: 5'-TCGGTTTCTTCTCCTCTGGA-3'



**Figure S1.** SEM images of samples: (A, B) LDH scaffolds; (C, D) La1/7-LDH scaffolds.



**Figure S2.** Micro-CT images of OVX-rat cranial defects without any scaffold materials at 12 weeks of post-implantation.



**Figure S3.** H&E staining images of rat heart, liver, spleen, lung and kidney after 12 weeks of implantation