Supplementary materials

Table S1. The grain size, and mechanical properties of pure Zn and Zn-Li-Sr alloy, n=3. Data are presented as mean ± standard deviation.

Materials	Grain size (μm)	UTS (MPa)	YS (MPa)	Ductility (%)	Vickers hardness (HV)
Pure Zn	14.38 ± 5.81	68.05 ± 5.58	48.38 ± 6.77	43.9 ±1.49	31.90 ± 0.50
Zn-Li-Sr	8.66 ± 4.20	452.15 ± 8.25	387.26 ± 5.55	18.23 ± 2.11	131.50 ± 6.30

Table S2. The mechanical properties, and weight loss (g) after 30 days of immersion of pure Zn and Zn-Li-Sr alloy, n=3. Data are presented as mean ± standard deviation.

Materials	UTS (MPa)	YS (MPa)	Ductility (%)	Weight loss (%)
Pure Zn	68.05 ± 5.58	48.38 ± 6.77	43.9 ±1.49	0.8 ± 0.08%
Zn-Li-Sr	452.15 ± 8.25	387.26 ± 5.55	18.23 ± 2.11	0.5 ± 0.04%

Table S3. Comparison of the properties of Zn-0.8Li, Zn-0.8Sr and Zn-0.8Li-0.8Sr alloys.

Performance	Zn-0.8Li[1]	Zn-0.8Sr[2]	Zn-0.8Li-0.8Sr
Mechanical properties	UTS: —— Microhardness: 200-240 HV	UTS: 150-200 MPa Microhardness: 45-50 HV	UTS：452.15 ± 8.25 MPa Microhardness: 131.50 ± 6.30 HV
Corrosion pattern	Small and uniform corrosion pits	Large corrosion pits	Small corrosion pits
Biocompatibility	In vitro: promote the proliferation of MC3T3-E1 cells. In vivo: ——	In vitro: promote the proliferation and osteogenic differentiation of MC3T3-E1 cells. In vivo: promoting the repair of femoral defects in rats.	In vitro: promote the proliferation and osteogenic differentiation of MC3T3-E1 cells. In vivo: promoting the repair of femoral defects in diabetic

	rats.

Table S4. Primer sequence of MC3T3-E1 cells.

Target gene	Direction	Primer sequence (5'-3')
ALP	Forward	GGAGATGGTATGGGCGTCTC
	Reverse	GGACCTGAGCGTTGGTGTTA
Col I	Forward	TTCTCCTGGCAAAGACGGAC
	Reverse	CTCAAGGTCACGGTCACGAA
OCN	Forward	CTGACCTCACAGATCCCAAGC
	Reverse	TGGTCTGATAGCTCGTCACAAG
RUNX-2	Forward	TCGGAGAGGTACCAGATGGG
	Reverse	AGGTGAAACTCTTGCCTCGT

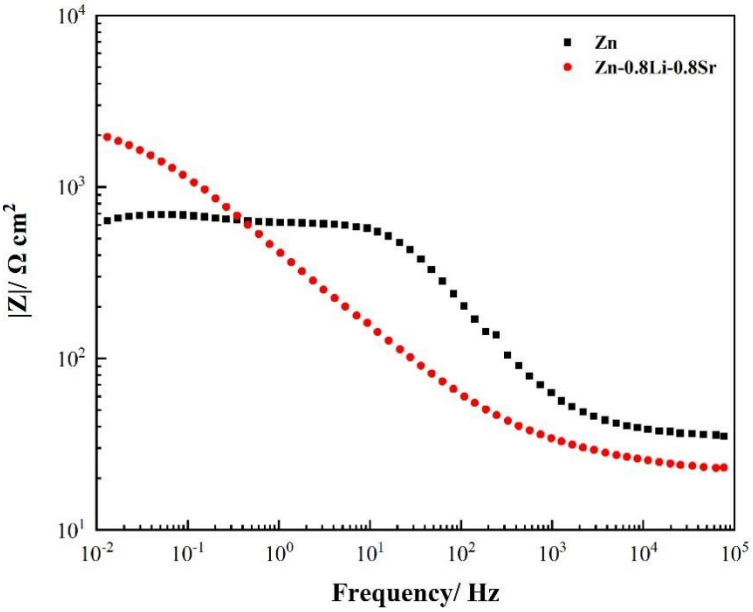

Fig S1. Bode plots of pure Zn and Zn-Li-Sr alloy (n = 3).

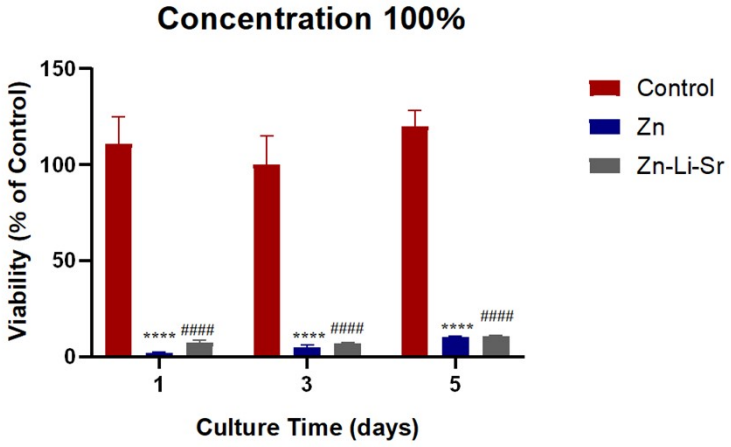

Fig S2. CCK8 results of 100%. Compared to the control group, statistical significance was set at: ****P ＜ 0.0001, ####P ＜ 0.0001. Data are presented as mean ± SD (n = 3).

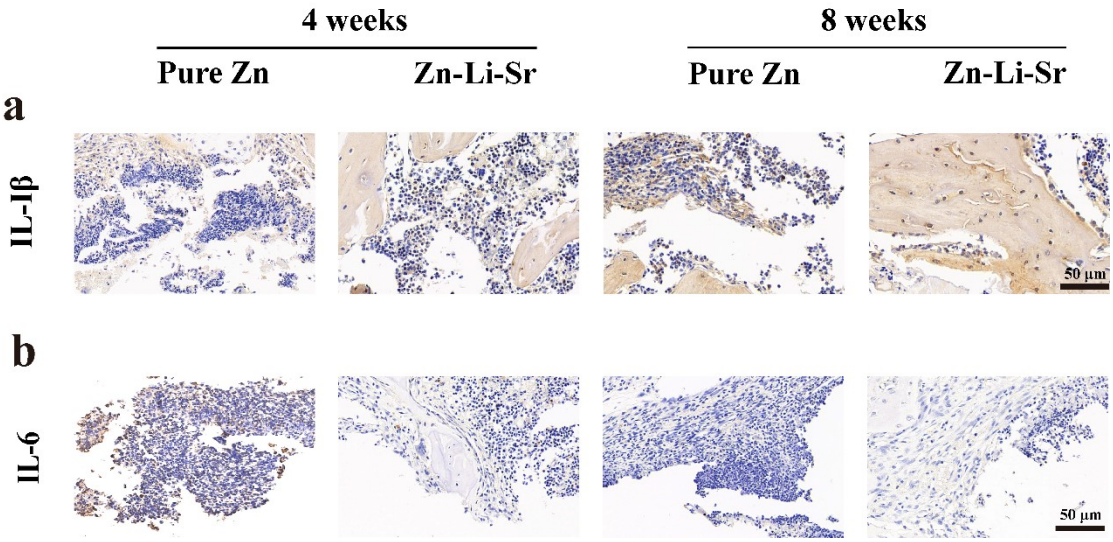

Fig S3. Immunohistochemical staining for inflammation. (a) Immunohistochemical staining of IL-1β. (b) Immunohistochemical staining of IL-6 (n = 3).

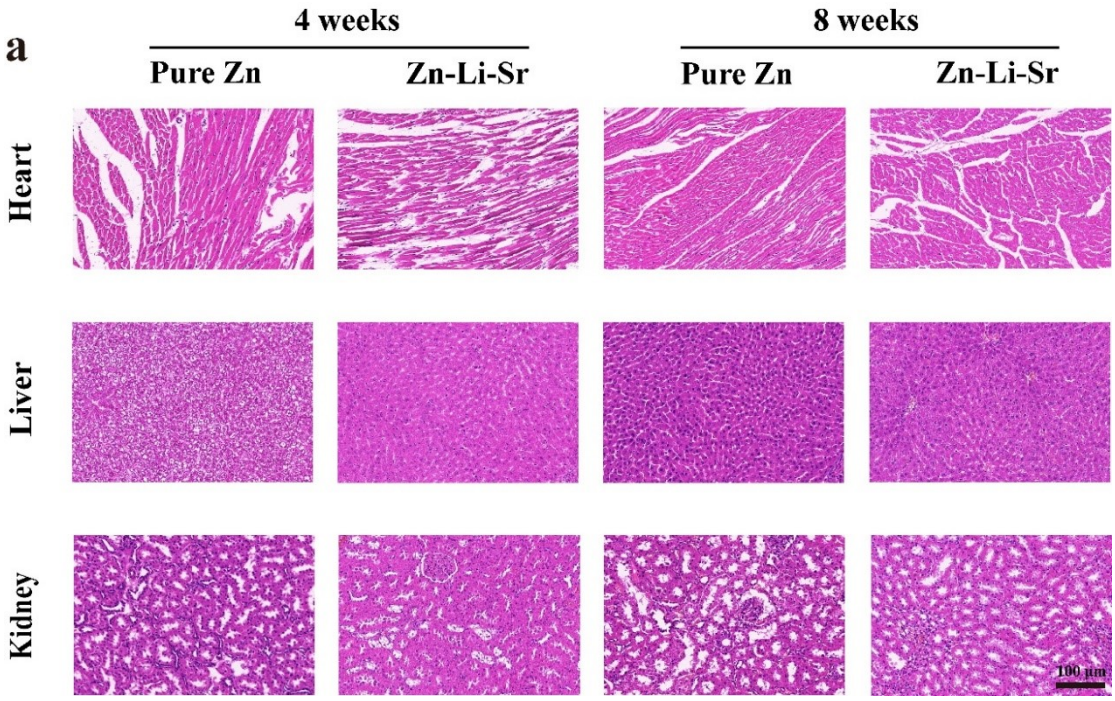

Fig S4. In vivo biosafety testing. (a) HE staining of heart, liver, and kidney (n = 3).

Reference

1. H. Yang, B. Jia, Z. Zhang, X. Qu, G. Li, W. Lin, D. Zhu, K. Dai and Y. Zheng, *Nat Commun*, 2020, **11**, 401.
2. B. Jia, H. Yang, Z. Zhang, X. Qu, X. Jia, Q. Wu, Y. Han, Y. Zheng and K. Dai, *Bioact Mater*, 2021, **6**, 1588-1604.