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Strontium-doped mesoporous bioglass nanoparticles for enhanced wound healing with rapid vascularization

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1. Supplementary experimental section

1.1 Preparation of radial wrinkle mesoporous bioglass with different

A certain amount of CTAB and pure water (40 mL) was added to the flask, TEA was utilized to adjust the pH to alkaline. After stirring for 30 min, CaNO3 and TEP were added into the flask and stirred for 1 h. After that, TEOS was dissolved into an appropriate amount of cyclohexane solution, and mixed evenly by magnetic stirring. The TEOS/cyclohexane mixture was then added to the flask and reacted at 60 ℃ for different durations (24, 48 and 72 h). At the end of the reaction, the samples were centrifuged at 12000 r/min, washed with ethanol three times, and then freeze-dried. Then, the samples were calcined in a muffle furnace at 550 ℃ for 3 h to get target radial wrinkle mesoporous bioglass (rMBG). The products were named as dMBG-24 h, rMBG-48 h, and dMBG-72 h, respectively.

1.2 The element analysis of rMBG and rMBG/Sr

The chemical composition (C, N, O, Si, P, Ca, Sr) of the bioglass particles was determined by electron energy spectroscopy (EDS, attached to a scanning electron microscope (S-4800, Hitachi)) mapping of elements.

1.3 The chemical composition of bioactive sponge (SF/rMBG/Sr)

The chemical composition (C, N, O, Si, P, Ca, Sr) of SF/rMBG/Sr sponge was determined by electron energy spectroscopy (EDS, attached to a scanning electron microscope (S-4800, Hitachi)) mapping of elements to evaluate the loading of rMBG/Sr.

1.4 Cell cytoendocytosis of rMBG and rMBG/Sr

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As 100 μg/mL of bioglass nanoparticles exhibited excellent activity for NIH-3T3 and HUVECs, this concentration was used to prove cell cytoendocytosis the nanoparticles. Briefly, nanoparticles was labeled with FITC (green). Then, HUVECs were resuscitated and added into 24-well cell culture plates at a density of 1×10^4 per well. 500 μL particle/DMEM mixed medium (particle concentration 100 μg/mL) were added to each well, then the culture plates were placed in the cell incubator. After 48 h, the cells were fixed with 4% paraformaldehyde for 4 h. Rhodamine labeled phalloidine (red) and DAPI (blue) were utilized to stain cells after culture for 48 h and cells were observed with an inverted fluorescence microscope.

Supplementary figures

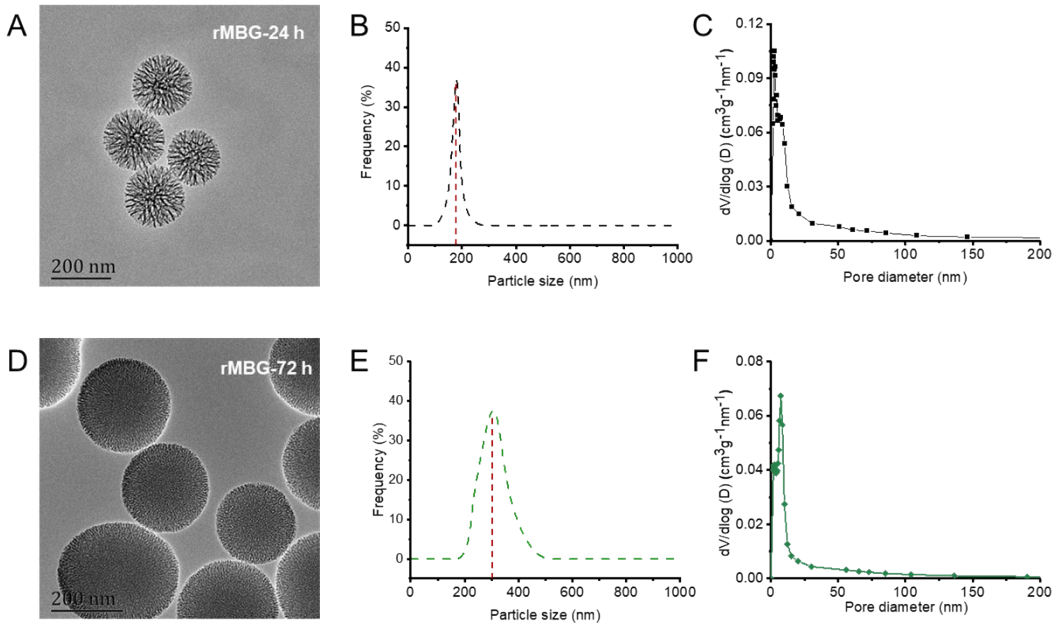

Figure S1 (A) TEM micrographs of rMBG-24 h, (B) pore size distribution of rMBG-24 h, (C) pore diameter distribution of rMBG-24 h, (D) TEM micrographs of rMBG-72 h, (E) pore size distribution of rMBG-72 h, (F) pore diameter distribution of rMBG-72 h.

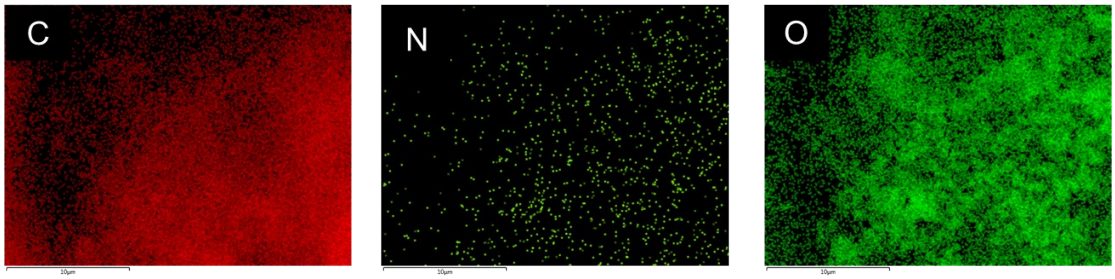

Figure S2 EDS mapping of rMBG/Sr about C, N and O.

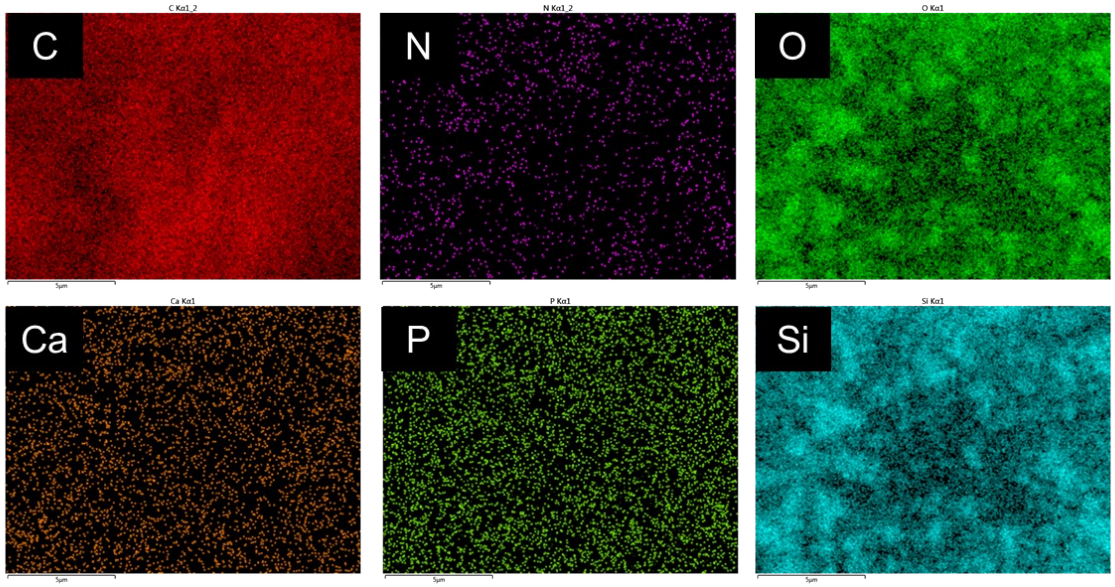

Figure S3 EDS mapping of rMBG about C, N, O, Ca, P and Si.

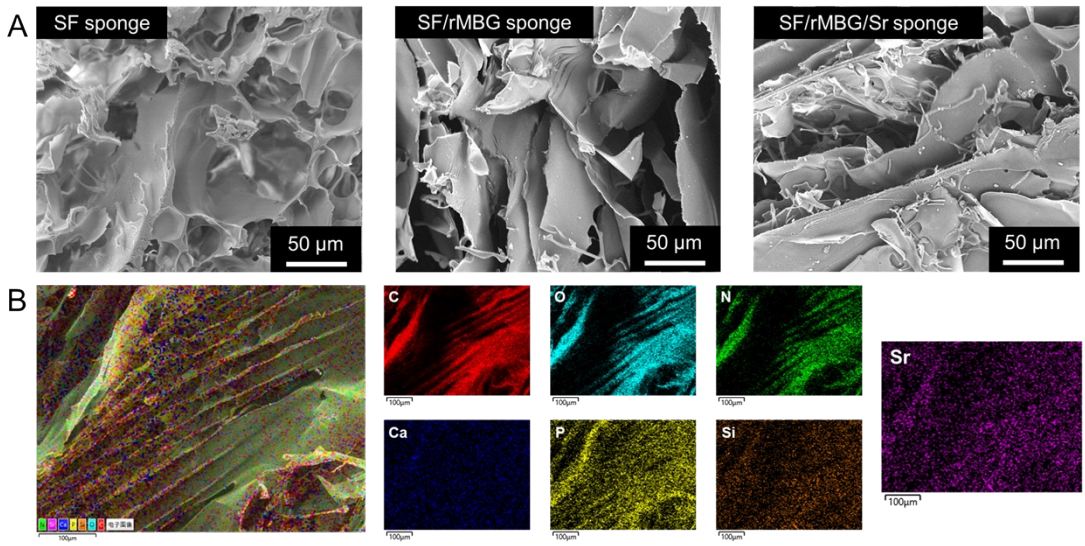

Figure S4 (A) Morphology of SF sponge, SF/rMBG sponge and SF/rMBG/Sr sponge. (B) Element distribution in SF/rMBG/Sr sponge.

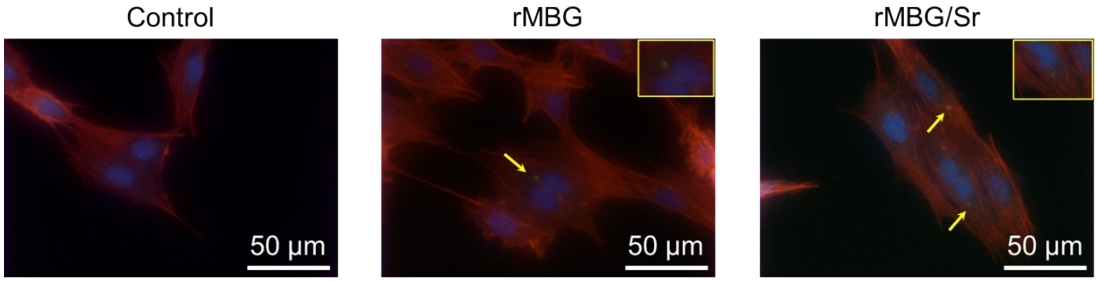

Figure S5 Cell cytoendocytosis of rMBG and rMBG/Sr. Red-cytoskeleton; Blue-cell nucleus; Green-FITC-labeled nanoparticles.

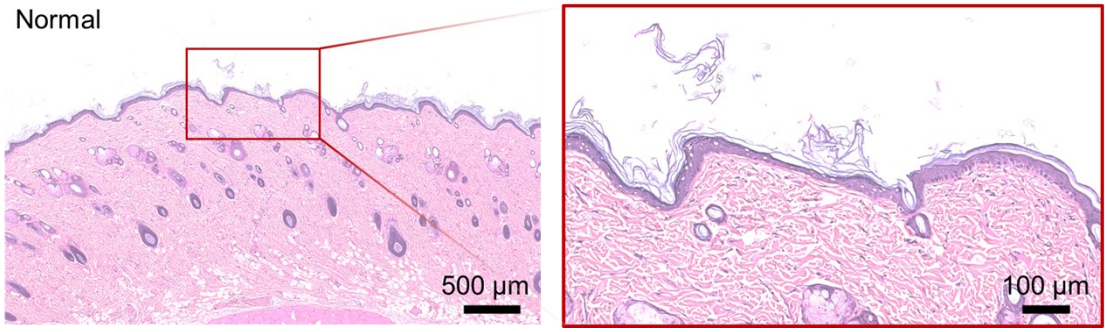

Figure S6 HE staining of normal tissue.

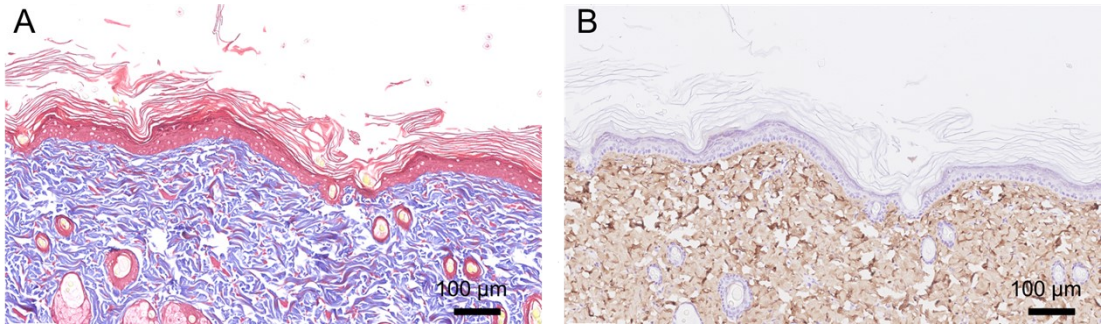

Figure S7 Masson staining (A) and Col I staining (B) of normal tissue.