Fe_3O_4@GO magnetic nanocomposites protect mesenchymal stem cells and promote osteogenic differentiation of rat bone marrow mesenchymal stem cells

He Zhang,[†a] Sirong Li,[†b] Yufeng Liu,[b] Yijun Yu,[c] Shichao Lin,[b] Quan Wang,[b] Leiying Miao,*[c] Hui Wei,*[b,d] and Weibin Sun*[a]

[a.] Department of Periodontology, Nanjing Stomatological Hospital, Medical School of Nanjing University, Nanjing, Jiangsu 210093, China.

[b.] Department of Biomedical Engineering, College of Engineering and Applied Sciences, Nanjing National Laboratory of Microstructures, Jiangsu Key Laboratory of Artificial Functional Materials, Nanjing University, Nanjing, Jiangsu 210093, China.

[c.] Department of Cariology and Endodontics, Nanjing Stomatological Hospital, Medical School of Nanjing University, Nanjing, Jiangsu 210093, China.

[d.] State Key Laboratory of Analytical Chemistry for Life Science and State Key Laboratory of Coordination Chemistry, School of Chemistry and Chemical Engineering, Chemistry and Biomedicine Innovation Center (ChemBIC), Nanjing University, Nanjing, Jiangsu 210023, China.

Table of Contents

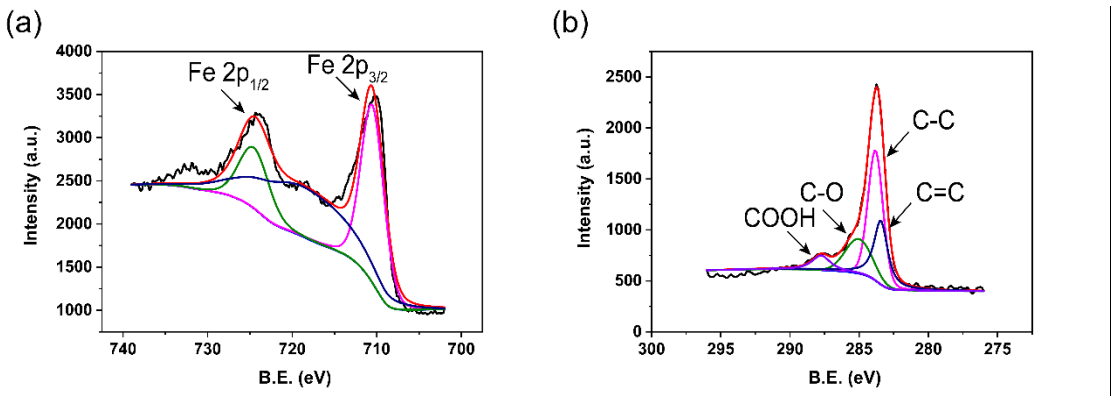

Figure S1. XPS spectra of Fe 2p (a) and C 1s (b) of Fe_3O_4@GO MNCs.

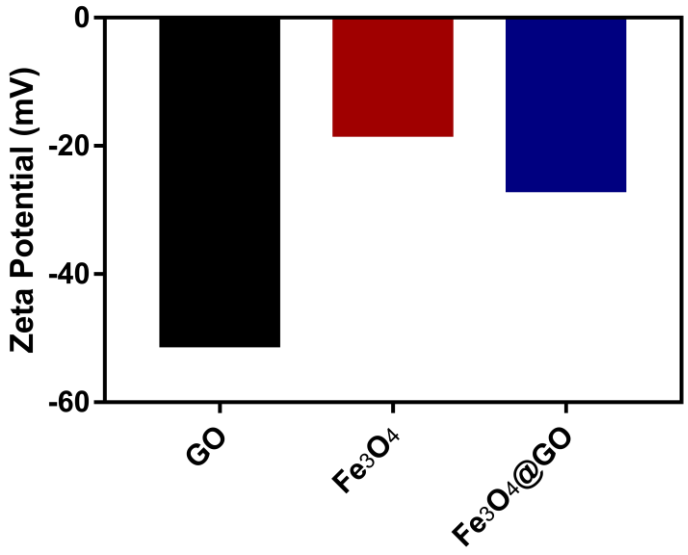

Figure S2. Zeta potentials of indicated NPs.

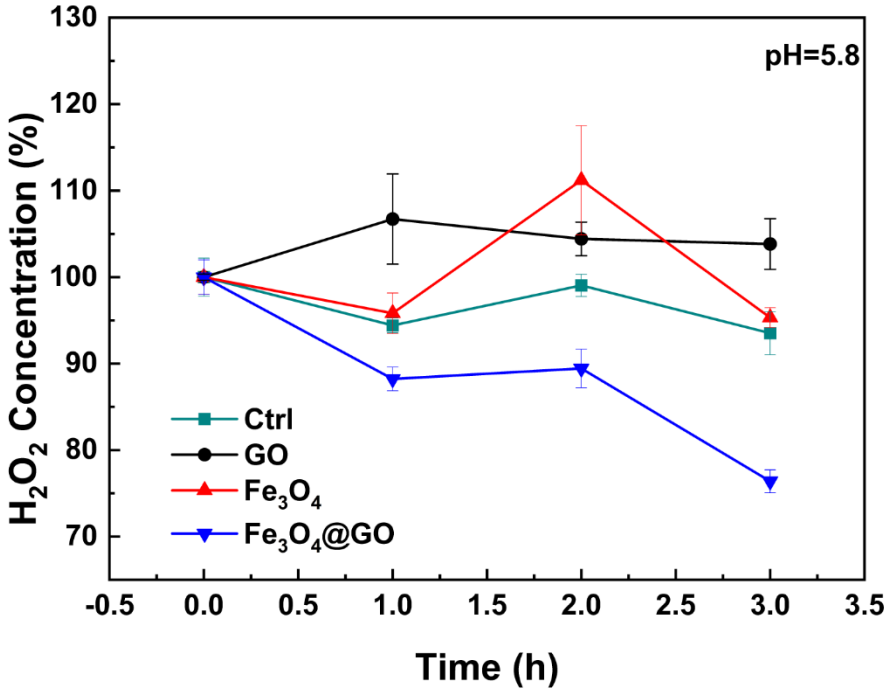

Figure S3. H_2O_2 scavenging activity of indicated NPs (pH 5.8). Each error bar shows the standard deviation of three independent measurements.

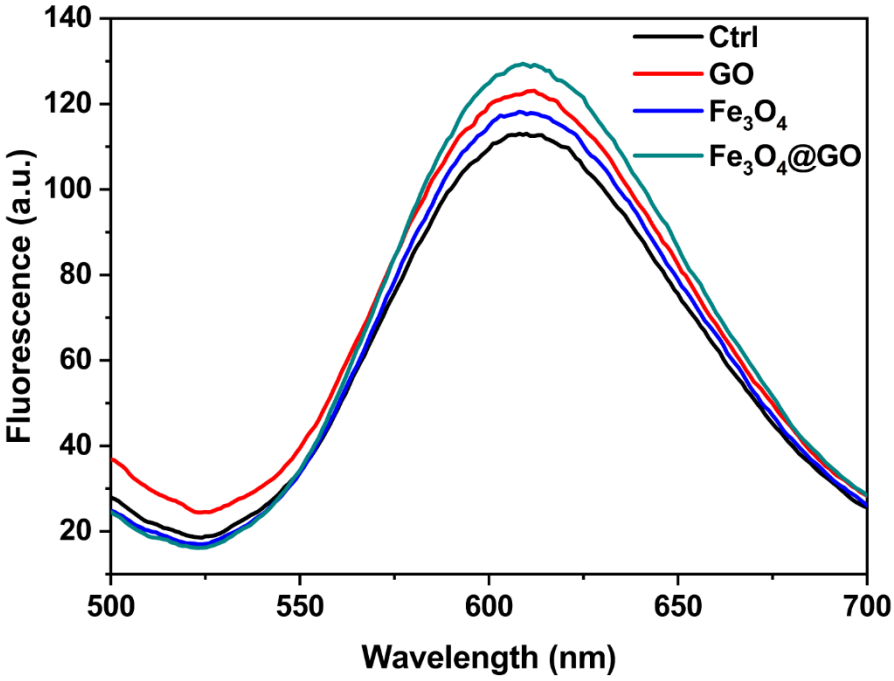

Figure S4. SOD-like activity of indicated NPs. Fluorescent spectra of dihydroethidine (HE) after reacting with xanthine (X) and xanthine oxidase (XO), in the absence and presence of GO, Fe_3O_4, and Fe_3O_4@GO MNCs, respectively.

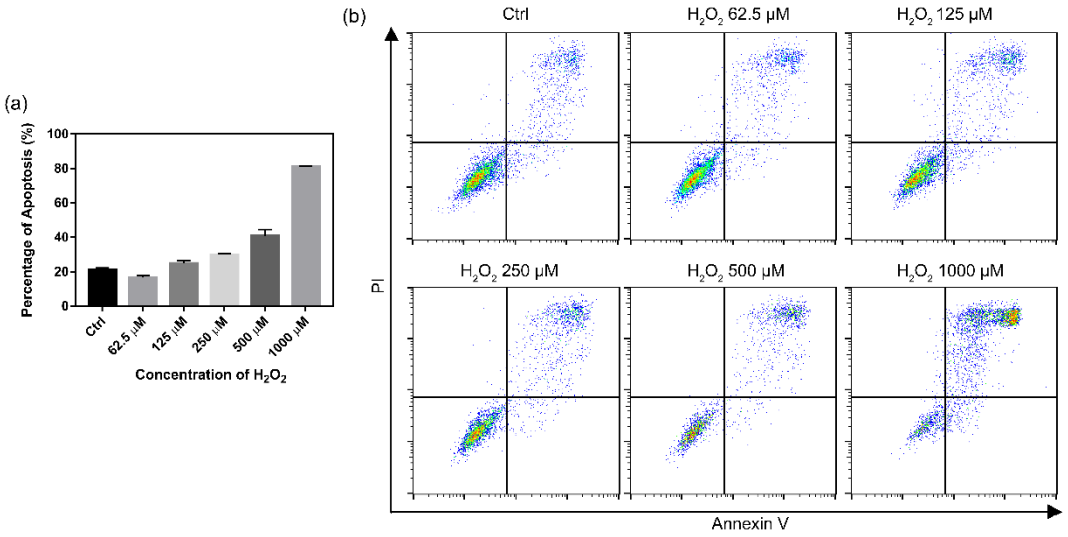

Figure S5. (a) Apoptosis level of MSCs incubated with different concentrations of H_2O_2. (b) Corresponding flow cytometry plots. Each error bar shows the standard deviation of three independent measurements.

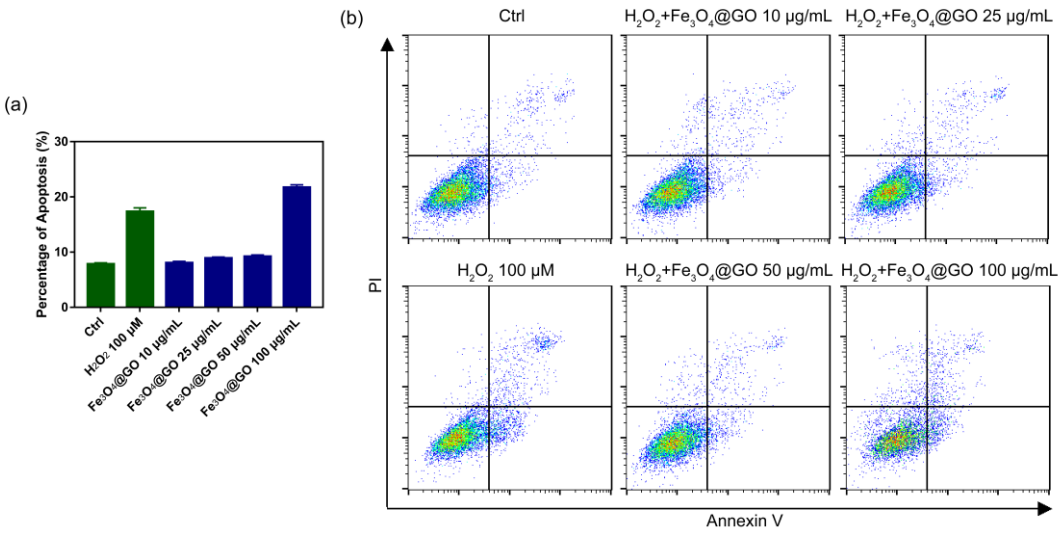

Figure S6. (a) Apoptosis level of MSCs incubated with different concentrations of Fe_3O_4@GO MNCs in the presence of 100 μM H_2O_2. (b) Corresponding flow cytometry plots. Each error bar shows the standard deviation of three independent measurements.

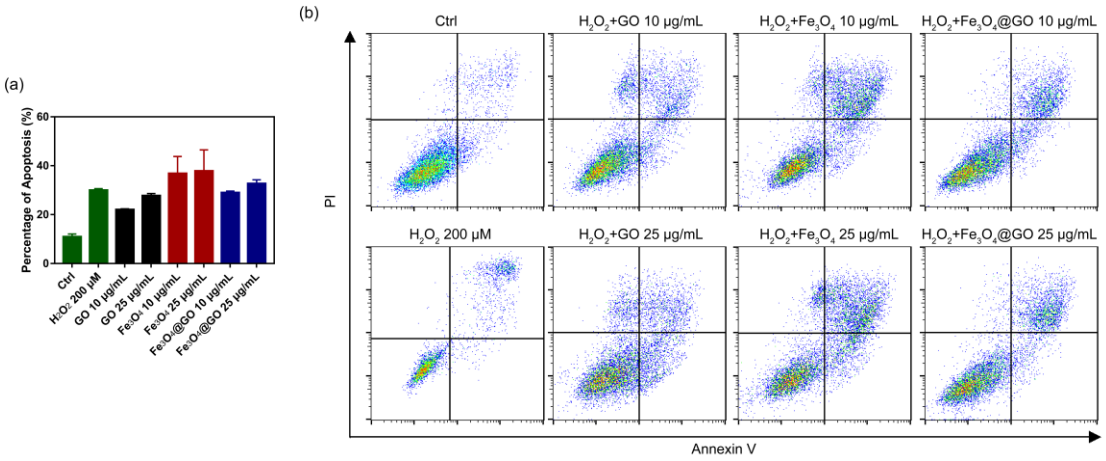

Figure S7. (a) Apoptosis level of MSCs incubated with different concentrations of NPs in the presence of 200 μM H_2O_2. (b) Corresponding flow cytometry plots. Each error bar shows the standard deviation of three independent measurements.

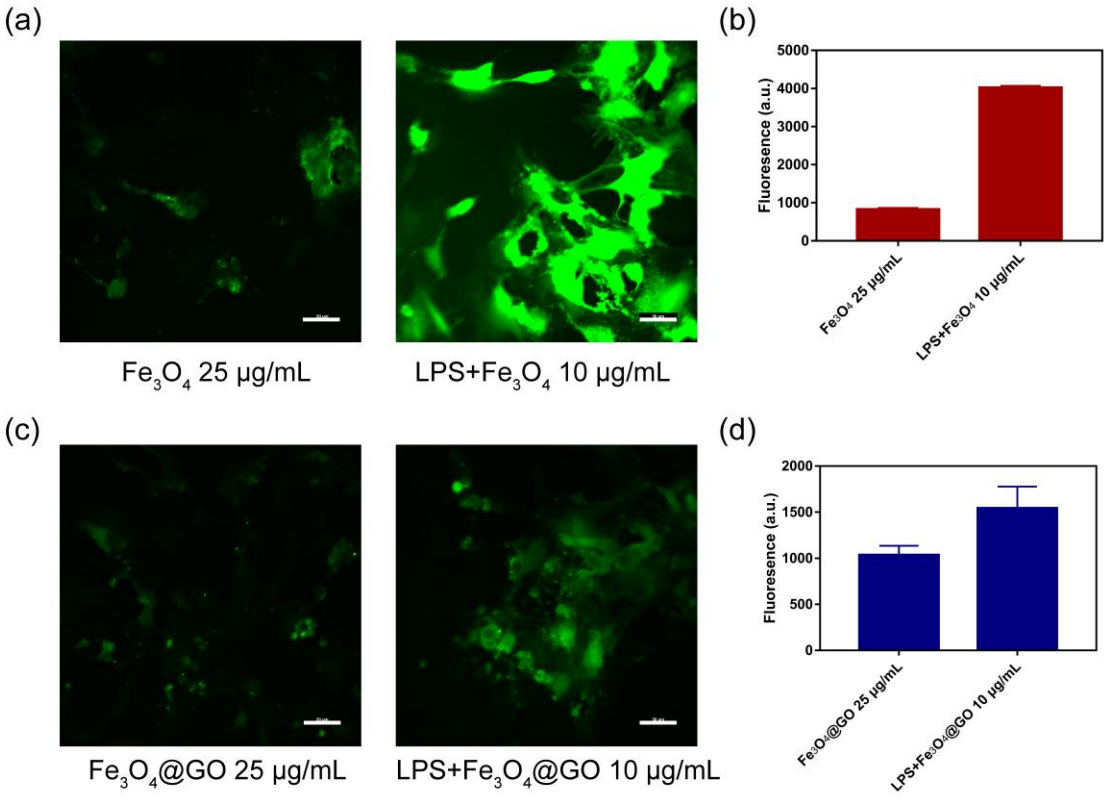

Figure S8. DCF fluorescent images and fluorescence intensity quantification of MSCs treated with LPS following pre-treatment with Fe_3O_4 (a, b) and Fe_3O_4@GO MNCs (c, d). The intracellular ROS levels were indicated by the green fluorescence of DCF. Scale bar: 50 μm.

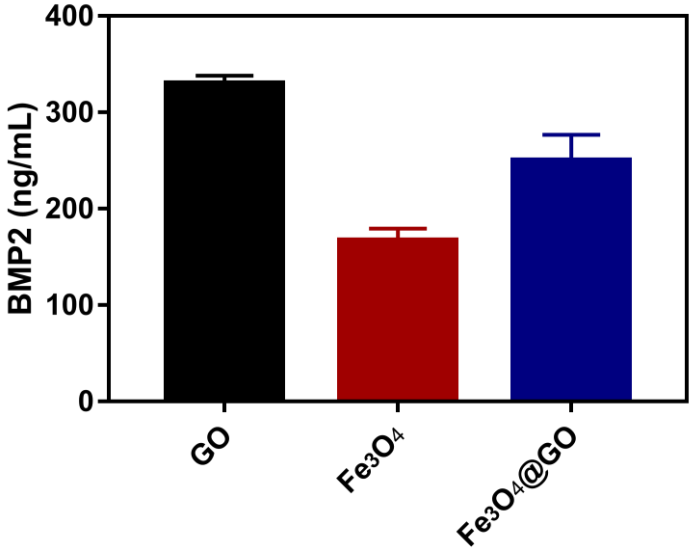

Figure S9. Concentrations of BMP2 loaded on 25 μg/mL of GO, Fe_3O_4, and Fe_3O_4@GO for MSCs cultures.