

RESEARCH ARTICLE

Three-dimensionally bioprinted skin-mimicking bilayer hydrogel dressing with compartmentalized antibacterial and pro-healing functions for diabetic wounds

Supplementary Files

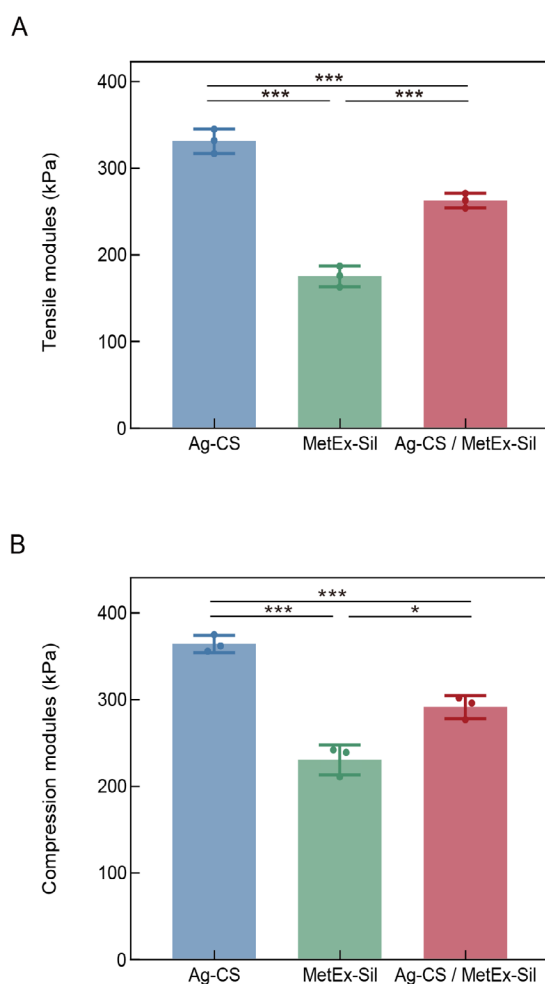


Figure S1. Mechanical properties of the hydrogel layers and bilayer construct. (A) Quantitative analysis of tensile modulus calculated from the linear region (10–30% strain). (B) Quantitative analysis of compression modulus determined from the 10–30% strain region. Tensile testing was performed at 10 mm/min and compression testing at 2 mm/min. Data are presented as mean \pm standard deviation. Statistical significance was determined by one-way ANOVA with Tukey's post-hoc test. Statistical significance is indicated as follows: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

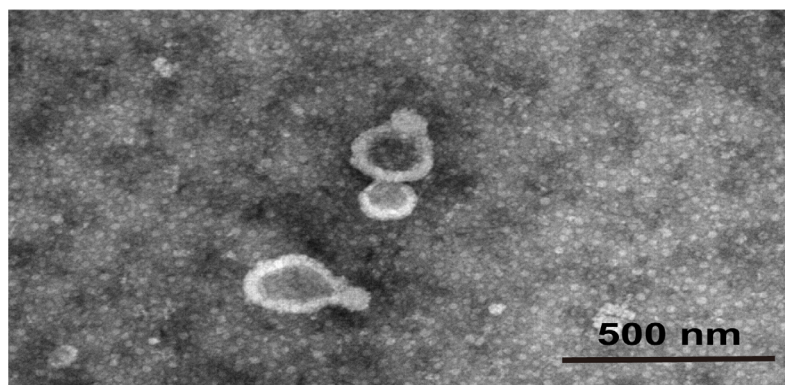


Figure S2. Representative transmission electron microscopy image of exosomes recovered from the release medium of the MetEx-Sil hydrogel at day 3. Scale bar: 500 nm; magnification: 20,000 \times .

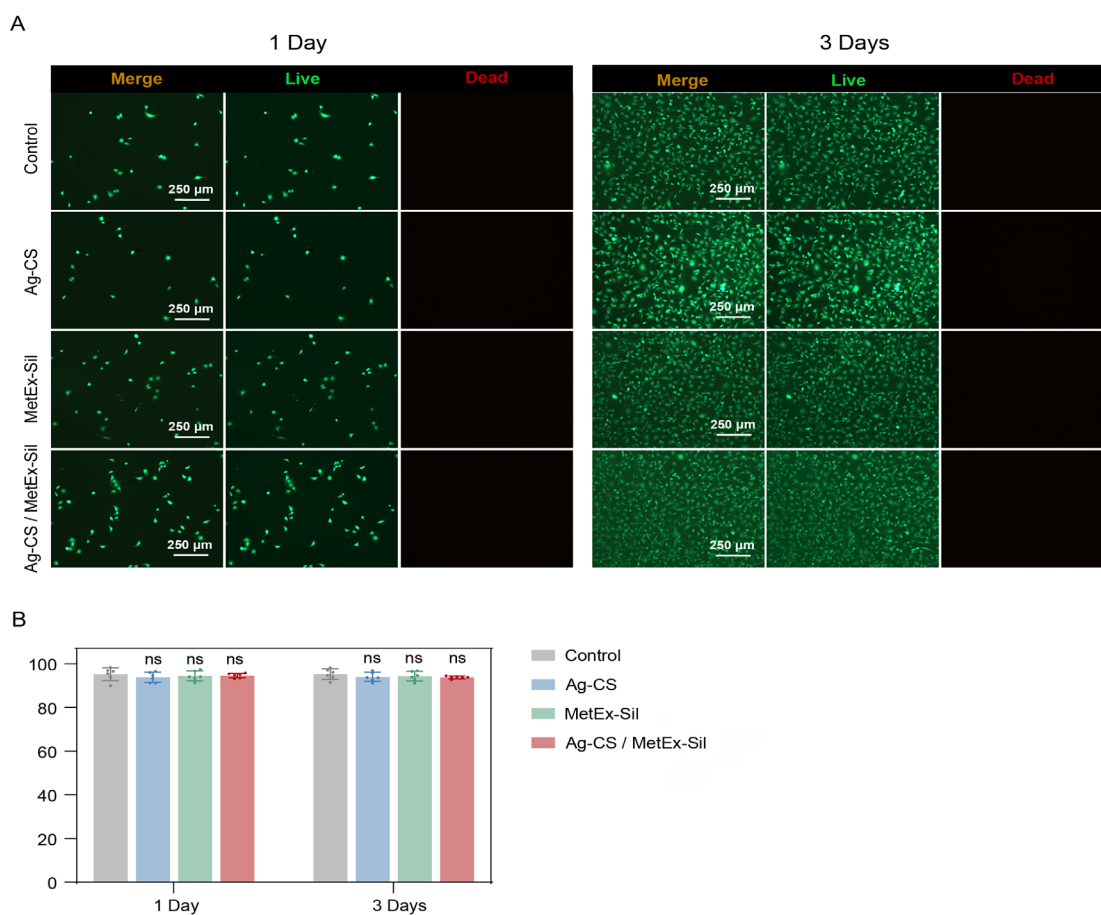


Figure S3. Representative calcein-AM/propidium iodide live/dead staining images of human umbilical vein endothelial cells treated with extracts from different hydrogel groups (Control, Ag-CS, MetEx-Sil, and Ag-CS/MetEx-Sil) at days 1 and 3. Scale bar: 650 μ m; magnification: 100 \times . Statistical comparisons were conducted between the control group and each experimental group at the respective time point. Statistical significance is indicated as follows: ns, not significant ($p > 0.05$).

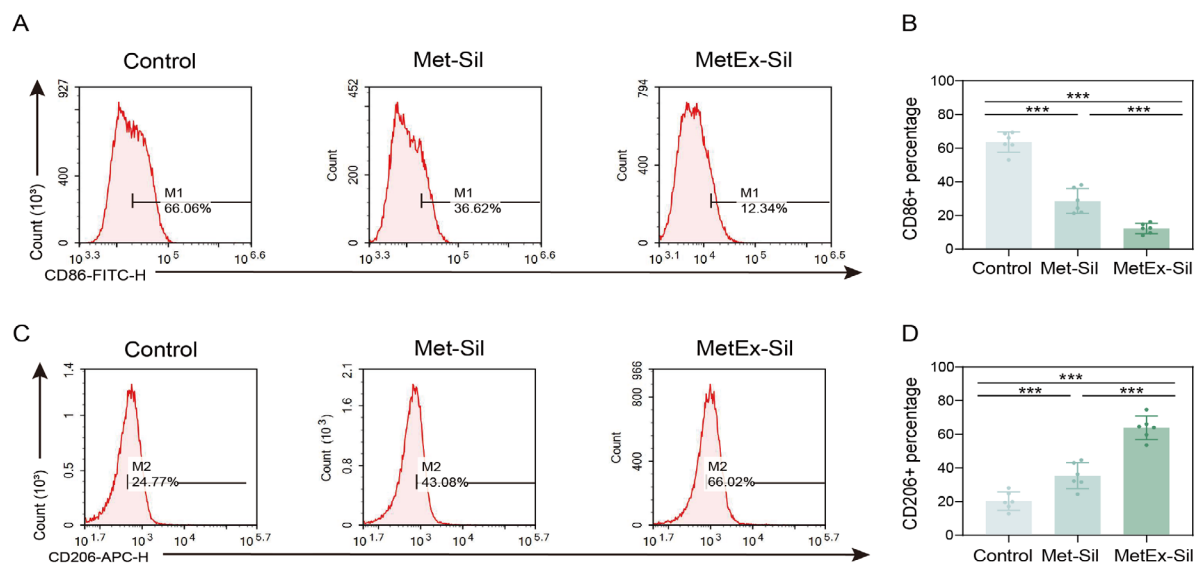


Figure S4. Flow cytometry analysis of macrophage M1/M2 polarization markers at day 7. (A, C) Representative flow cytometry histograms showing the expression of CD86 (M1 marker) (A) and CD206 (M2 marker) (C) at 7 days. (B, D) Percentages of CD86⁺ (B) and CD206⁺ (D) macrophage proportions. Data are presented as mean ± standard deviation. Statistical significance was determined by one-way ANOVA with Tukey's post-hoc test. Statistical significance is indicated by asterisks: **p* < 0.05, ***p* < 0.01, ****p* < 0.001.

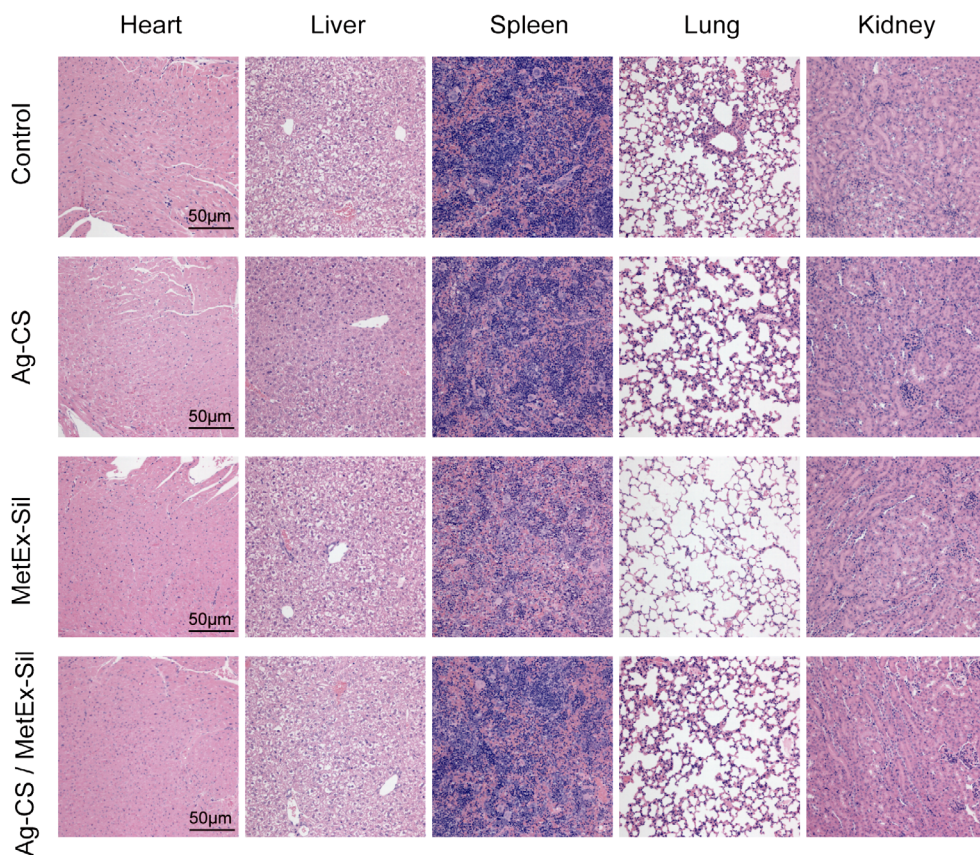


Figure S5. Representative hematoxylin and eosin-stained sections of the heart, liver, spleen, lung, and kidney were obtained from mice at day 15 post-treatment across four groups: Control (gauze), Ag-CS, MetEx-Sil, and Ag-CS/MetEx-Sil. Scale bar, 50 μm; magnification: 20×.

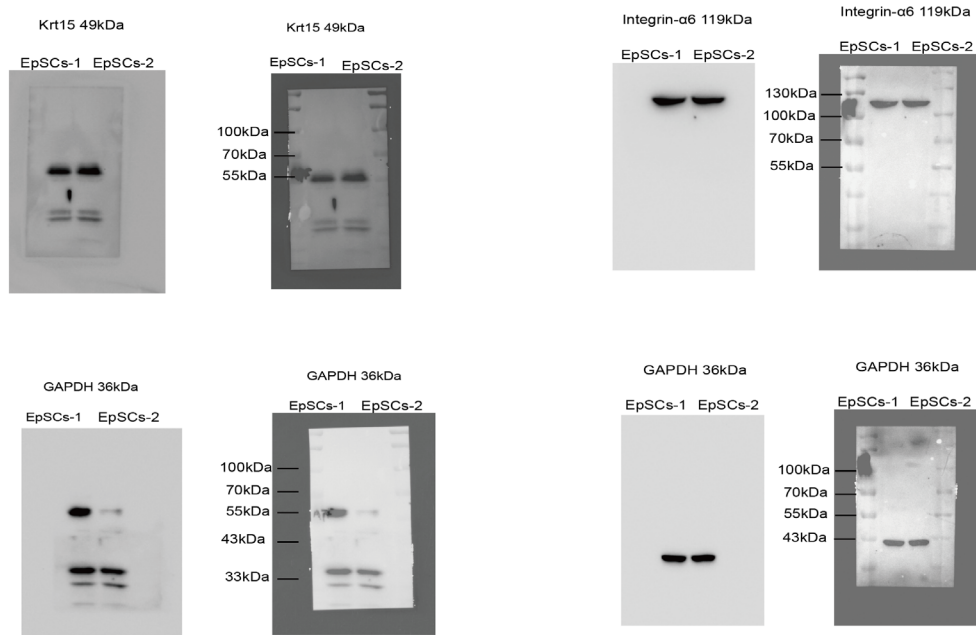


Figure S6. Original images for Western blotting for EpSCs-1 and EpSCs-2 in Figure 2C

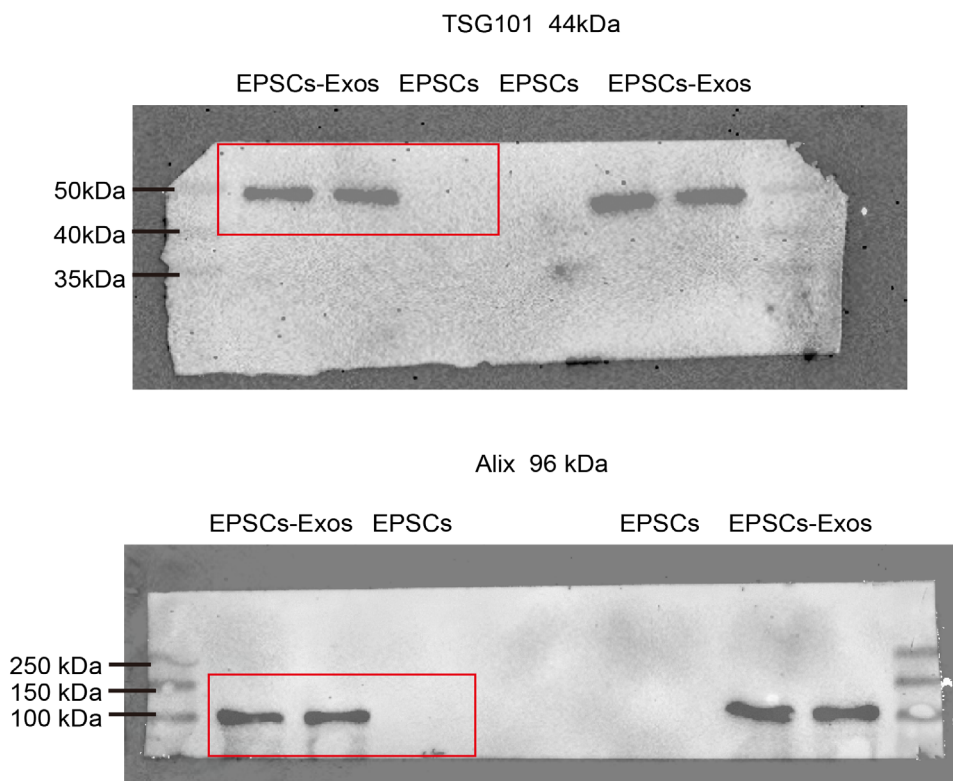


Figure S7. Original images for Western blotting for EpSCs-Exos and EpSCs in Figure 2F