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Three-dimensional bioprinting of biomimetic bilayer hydrogels with engineered mechanical and cellular heterogeneity for wound healing

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Three-dimensional bioprinting of biomimetic bilayer hydrogels with engineered mechanical and cellular heterogeneity for wound healing

Running title: Heterogeneous bilayer hydrogel wound patches

Supplementary File

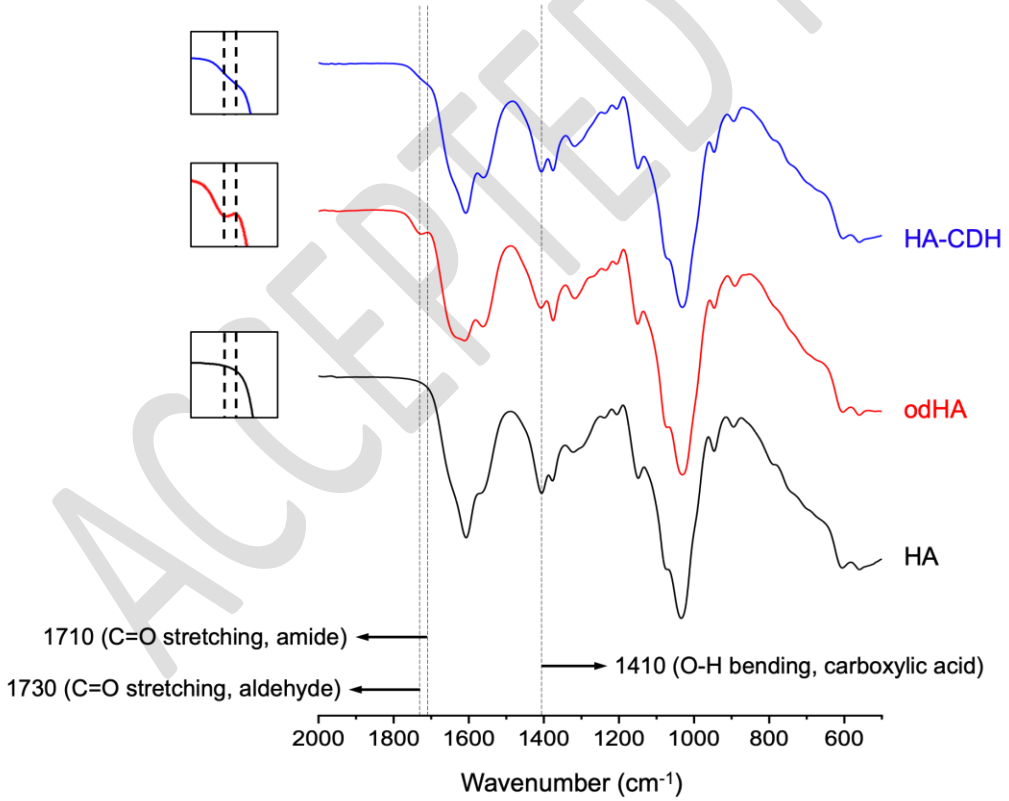

Figure S1. FT-IR spectra of HA, HA-CDH, and odHA.

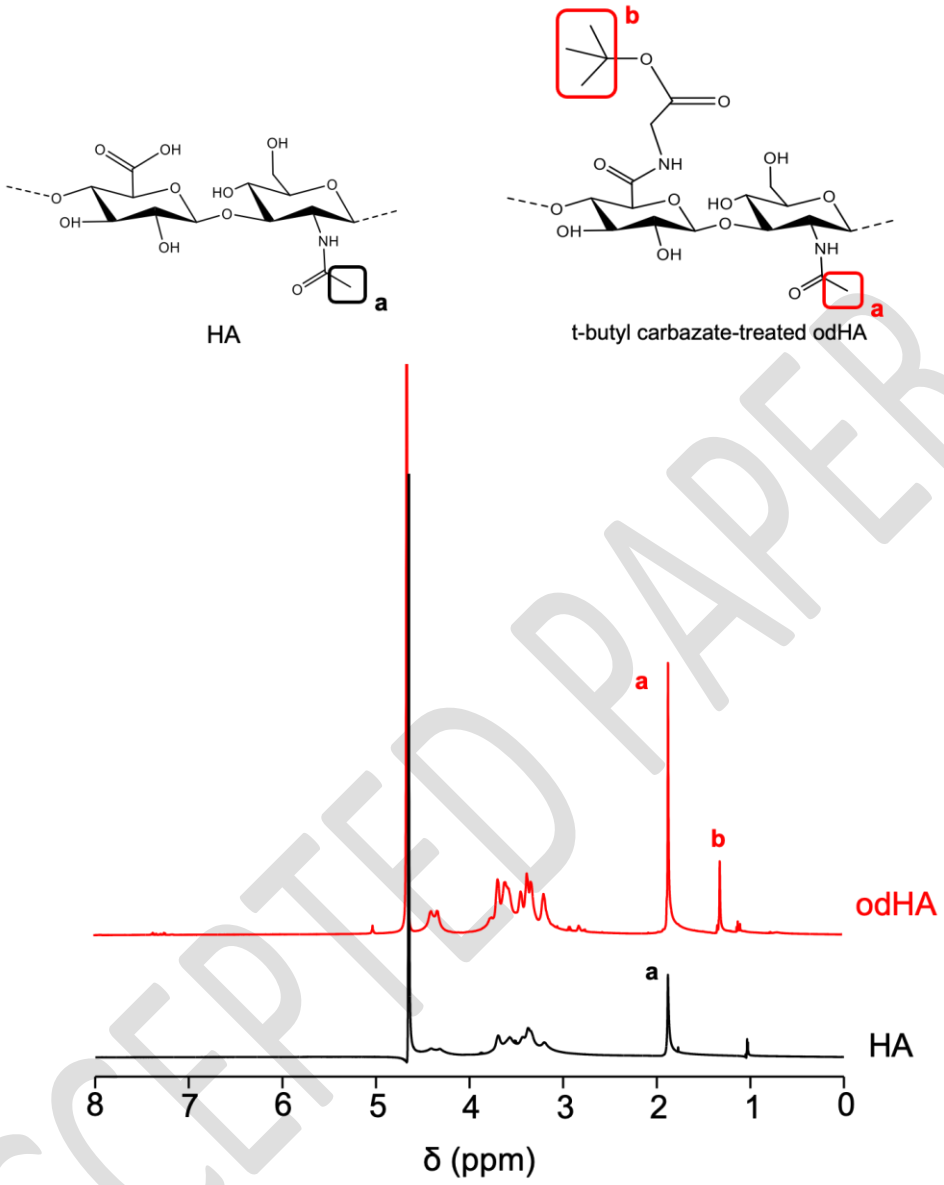

Figure S2. ^{1}H NMR spectra of HA and odHA.

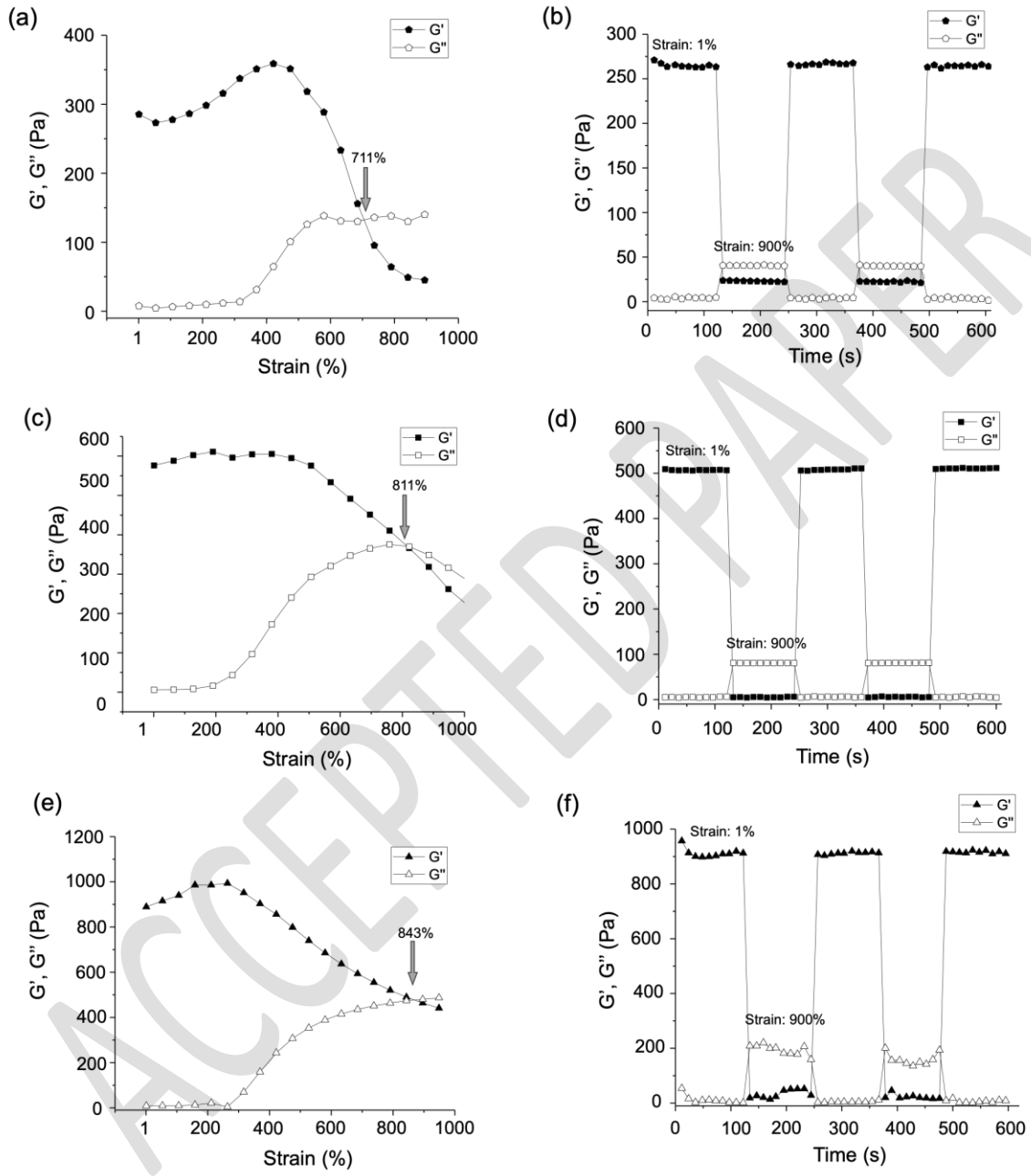

Figure S3. Amplitude sweep tests of (a) HA-CDH 0.5, (c) HA-CDH 1.0, and (e) HA-CDH 1.5 hydrogels. Repeated self-healing behavior of (b) HA-CDH 0.5, (d) HA-CDH 1.0, and (f) HA-CDH 1.5 hydrogels assessed using a rotational viscometer.

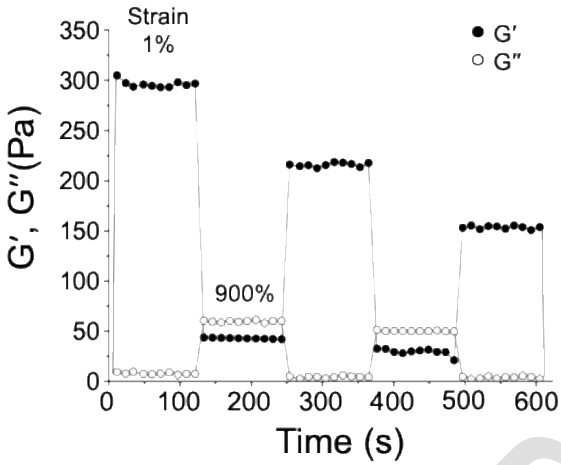

Figure S4. Repeated self-healing behavior of HA-CDH/odHA hydrogels (no ADH) assessed using a rotational viscometer.

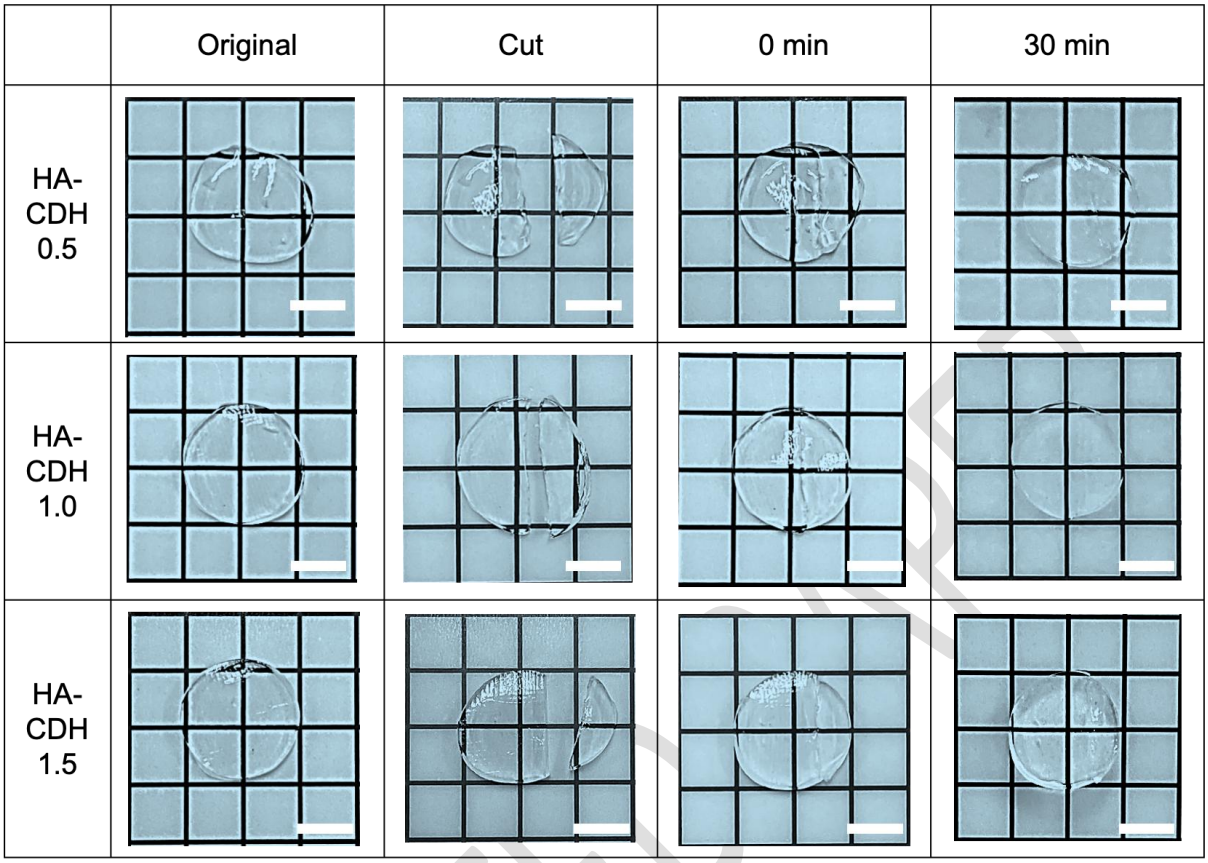

Figure S5. Self-healing behavior of HA-CDH 0.5, HA-CDH 1.0, and HA-CDH 1.5 hydrogels. The hydrogel disks were cut into two pieces and then reattached, forming fully integrated gel disks within 30 min at room temperature.

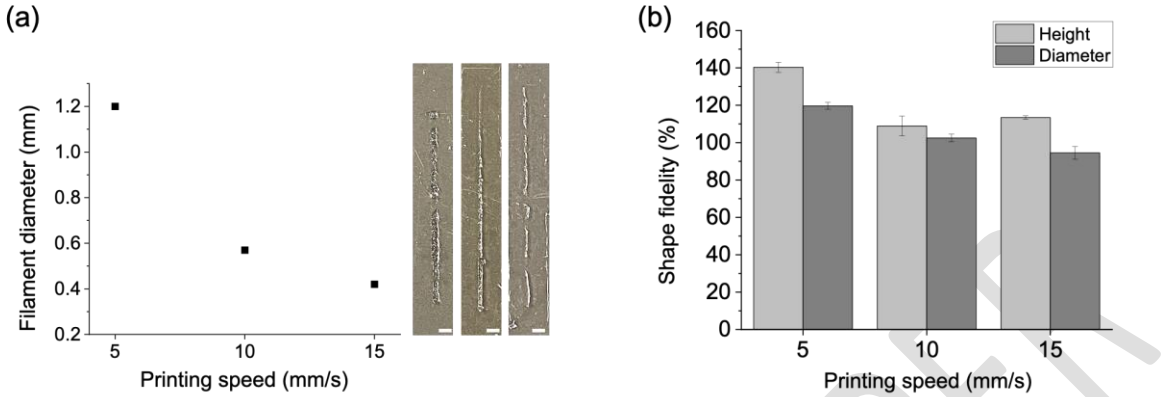

Figure S6. (a) Changes in filament diameters and images of the filaments of (a) HA-CDH 1.5 hydrogels printed at various printing speeds (scale bar, 2 mm). (b) Shape fidelity of HA-CDH 1.5 hydrogels at various printing speeds (n = 4).

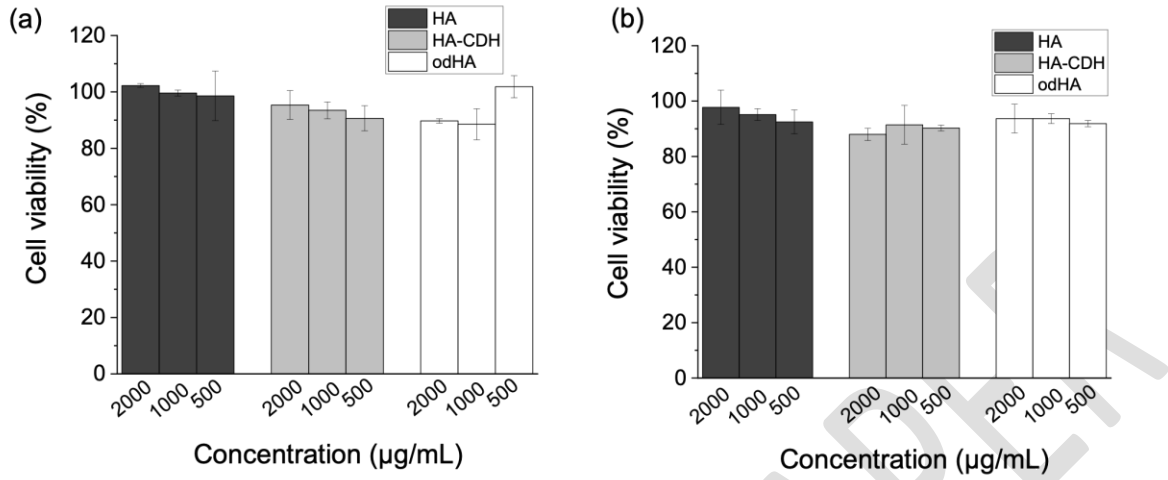

Figure S7. Relative viability of (a) HEKn and (b) HDFn cells treated with HA, HA-CDH, and odHA solutions at various concentrations (EZ-cytox, [cell] = 5.0×10^3 cells/well, n = 4).

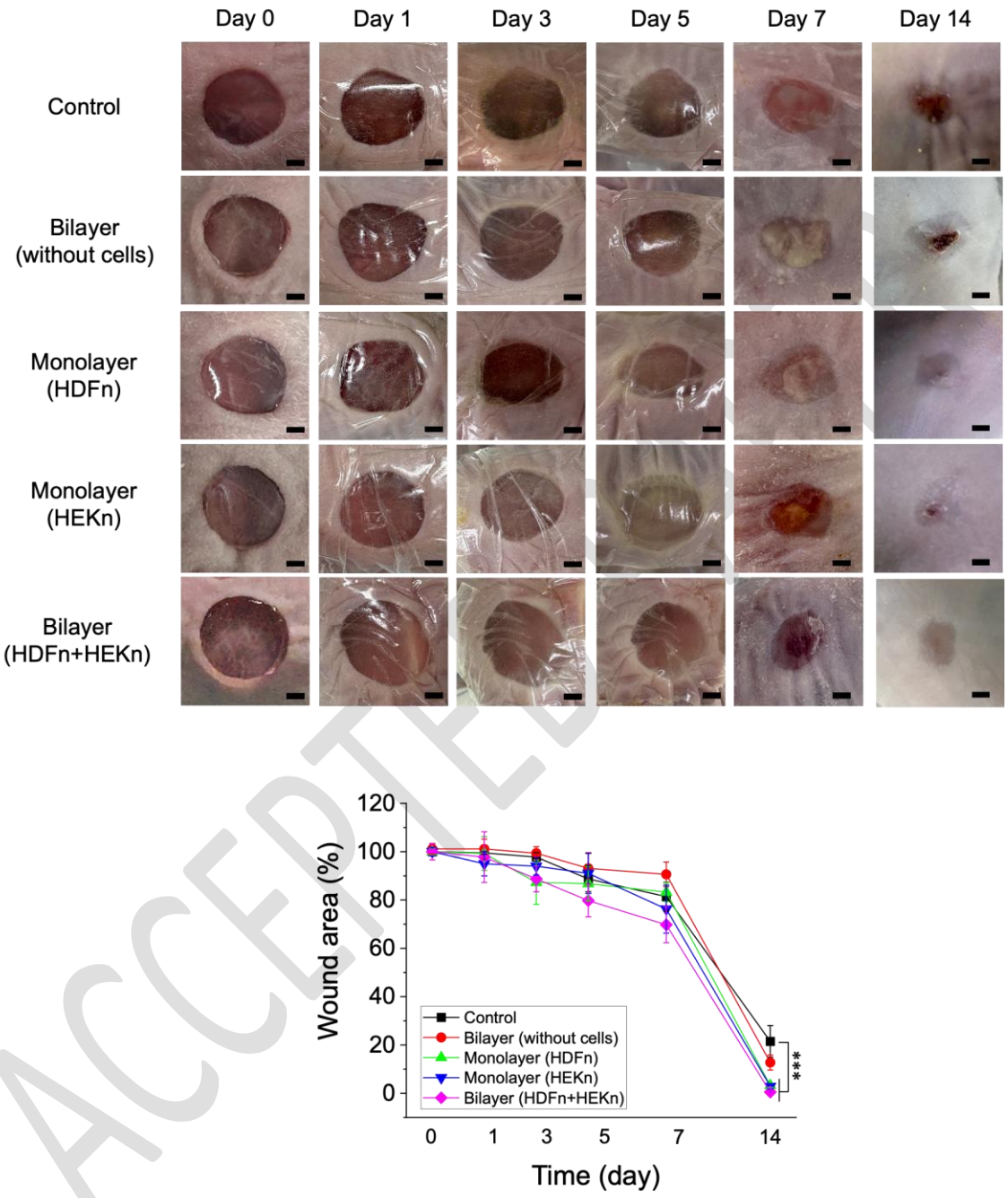

Figure S8. In vivo wound healing efficacy using various hydrogel patches containing primary human cells. Images of wound sites taken from Day 0 to Day 14 (scale bar, 2 mm). and their quantified wound area over time (***$P < 0.001$, n = 4).

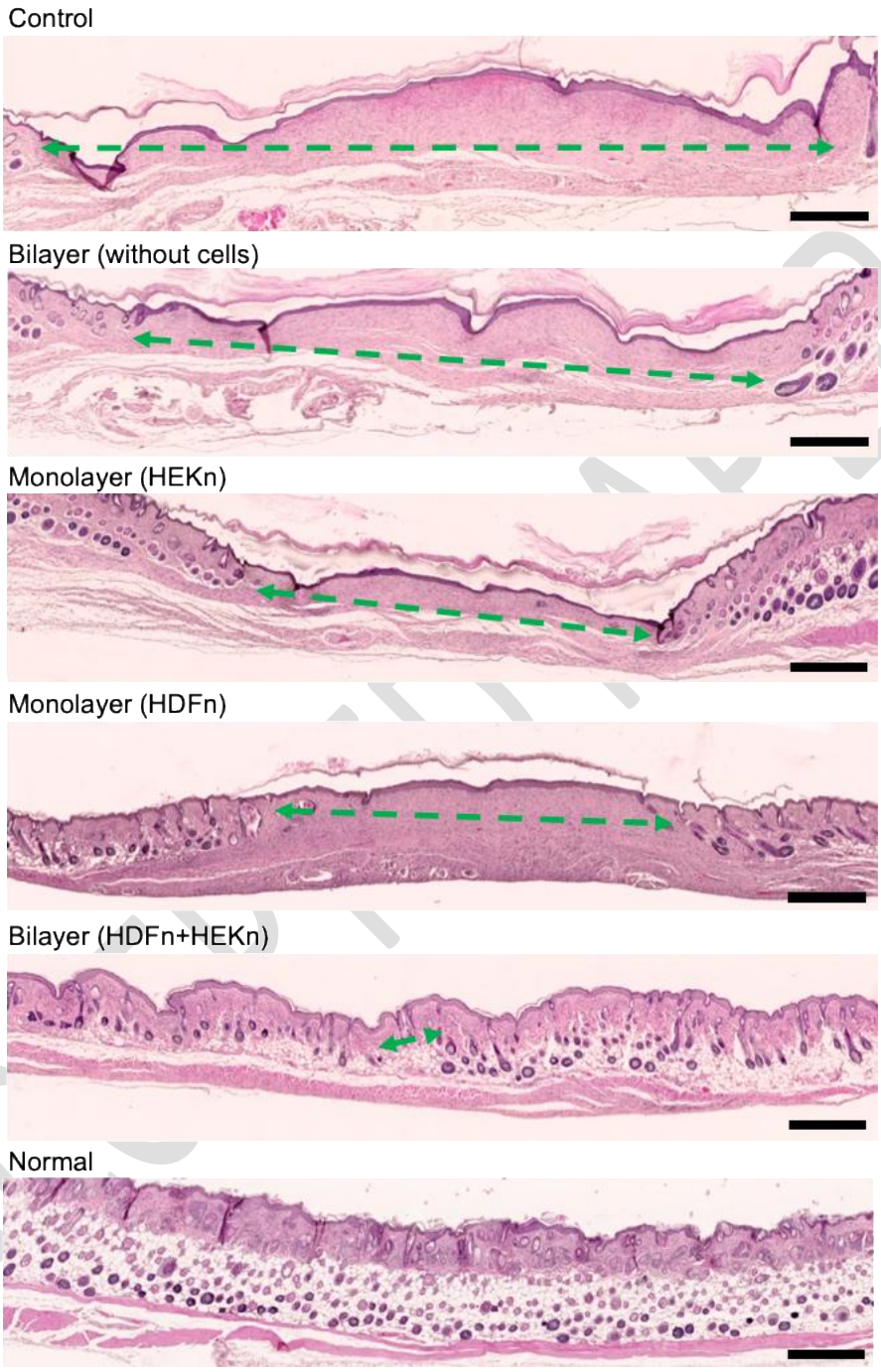

Figure S9. Representative H&E-stained images of skin tissue sections used for quantification of dermal gap (scale bar, 500 μm).