Supporting Information

Dynamic zwitterionic degradable hydrogel niche for efficient stem cell expansion and recovery

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1. Methods

1.1 Anti-protein adhesion property assay

Four proteins (BSA, lysozyme, fibrinogen and type I collagen) were selected to investigate protein resistance of the HC and HSC hydrogels. First, the hydrogels (10 mm in diameter and 0.5 mm in thickness) were immersed in a cell culture medium to reach a swelling equilibrium. Then, the hydrogels were incubated in 500 μL of protein solution (10 mg/mL, PBS buffer) at 37 °C for 2 h. The protein solution was removed, and the hydrogel was washed with PBS three times. Next, the hydrogel was soaked in 500 mL of sodium dodecyl sulfate solution (SDS, 1 wt%) for 1 h to desorb the adsorbed protein on the hydrogel surface. The protein adsorption behaviors were measured according to the manufacturer's protocol by a microplate reader at 562 nm by the BCA method.

1.2 Anti-bacterial adhesion property assay

A 300 μL hydrogel was formed in a 48-well plate, and then 500 μL of bacterial solution (1×10^5 colony-forming units mL^{-1}) was added. The hydrogel samples were incubated for 2 hours at 37 °C on a shaker at 200 rpm. At the end, the bacterial solution was aspirated and washed three times with PBS solution. The hydrogels were then transferred to new wells containing 500 μL of PBS solution and sonicated at intermittent intervals for 1 minute. Finally, 100 μL of the solution was added to the prepared solid agar medium and spread evenly. Incubate at 37 °C for 12 hours and count the colonies. TCPS without hydrogel was used as control.

1.3 Uniaxial compression test

Uniaxial compression test was performed using a universal electromechanical tester (WDW-05, China) equipped with a 50 N transducer. A column of hydrogel with a diameter of 6 mm and a height of 8 mm was

prepared, the termination strain was set at 80%, and the test was performed at a rate of 5 mm/min and the stress-strain curve was plotted. The compression modulus was calculated from the initial linear slope of the compressive stress-strain curve.

1.4 Surface zeta potential test

Hydrogels were lyophilized and ground into powder, and 0.10 g of hydrogel powder was dispersed in 10 mL of PBS (pH 7.4) and sonicated for 15 min. The zeta potential of the hydrogels was measured using a nanosize and zeta potential meter (Nano ZS, UK).

2. Figures

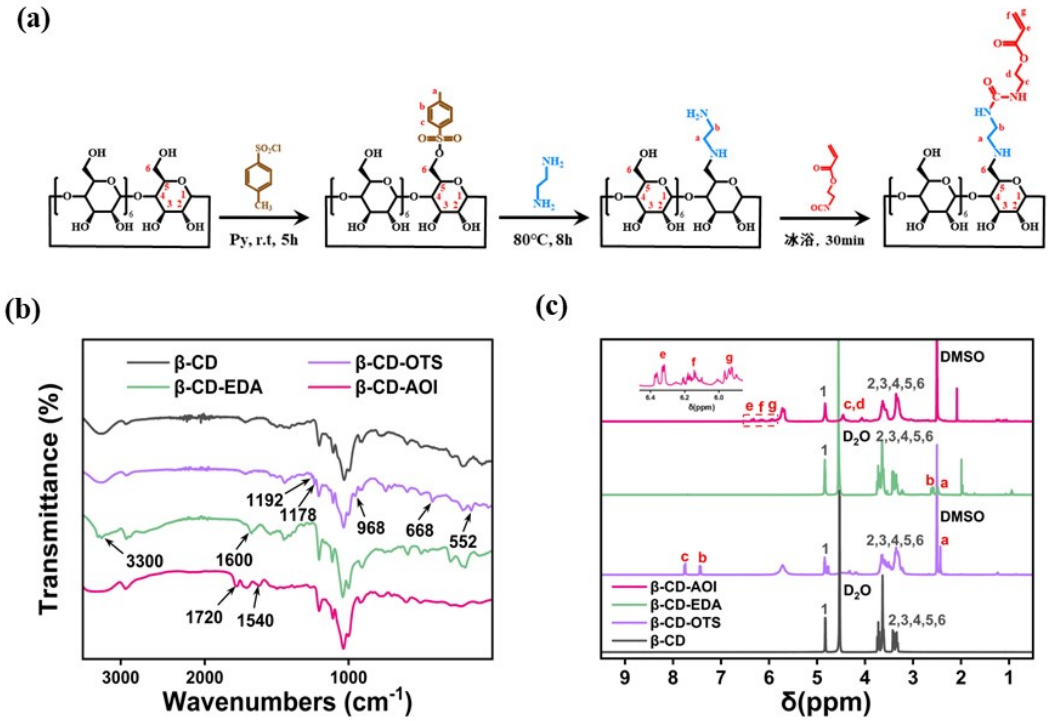

Fig. S1. Synthesis and characterization of β-cyclodextrin derivatives. (a) Schematic representation of the synthesis of β-cyclodextrin derivatives. (b) FTIR spectra and (c) ^{1}H NMR spectra of β-cyclodextrin derivatives.

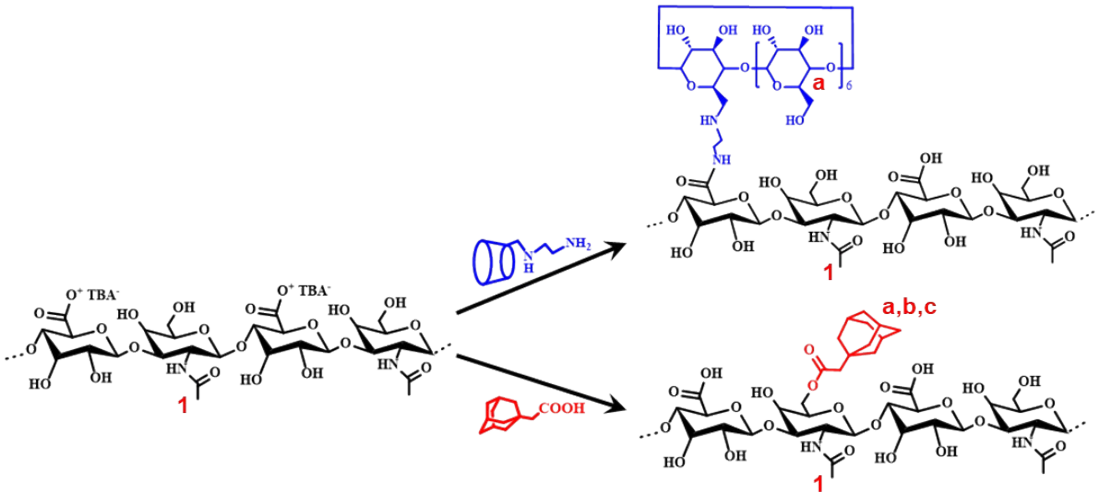

Fig. S2. Schematic representation of the preparation of HA-Ada and HA-CD.

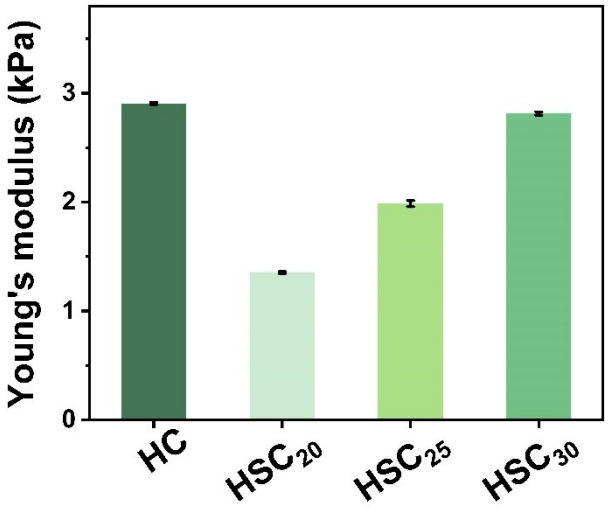

Fig. S3. Young's modulus of HC hydrogel and HSC hydrogels.

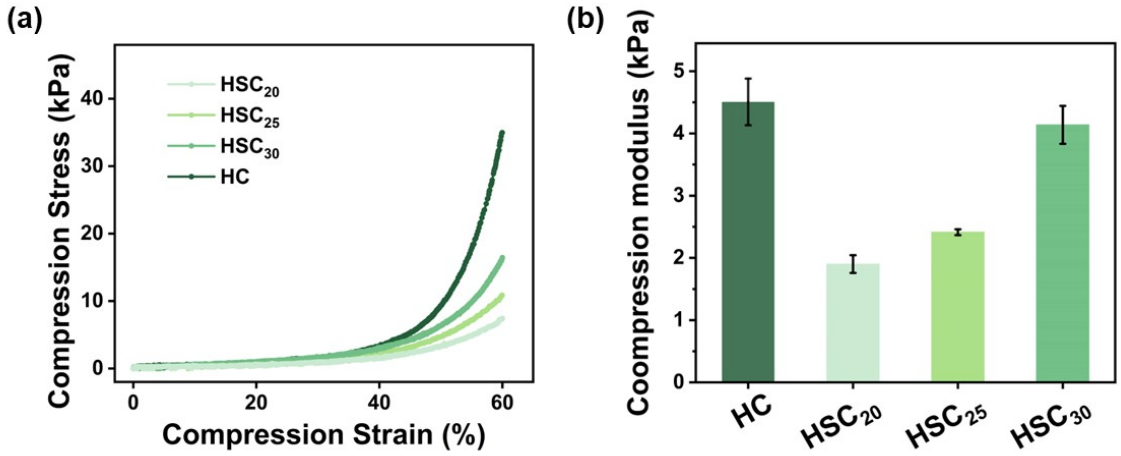

Fig. S4. (a) Compressive stress-strain curves and (b) compressive modulus of HC hydrogel and HSC hydrogels.

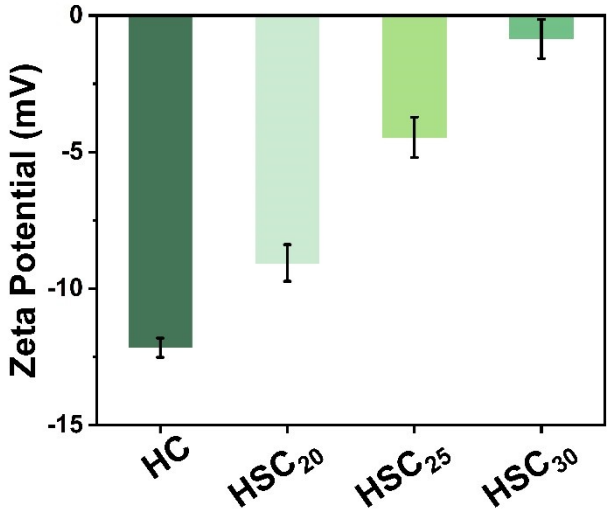

Fig. S5. Surface zeta potential of HC hydrogel and HSC hydrogels.

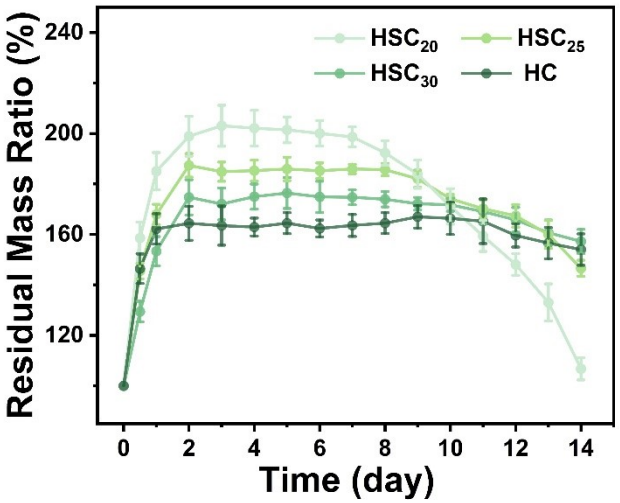

Fig. S6. Degradation curves of HC hydrogel and HSC hydrogels in PBS over 14d.

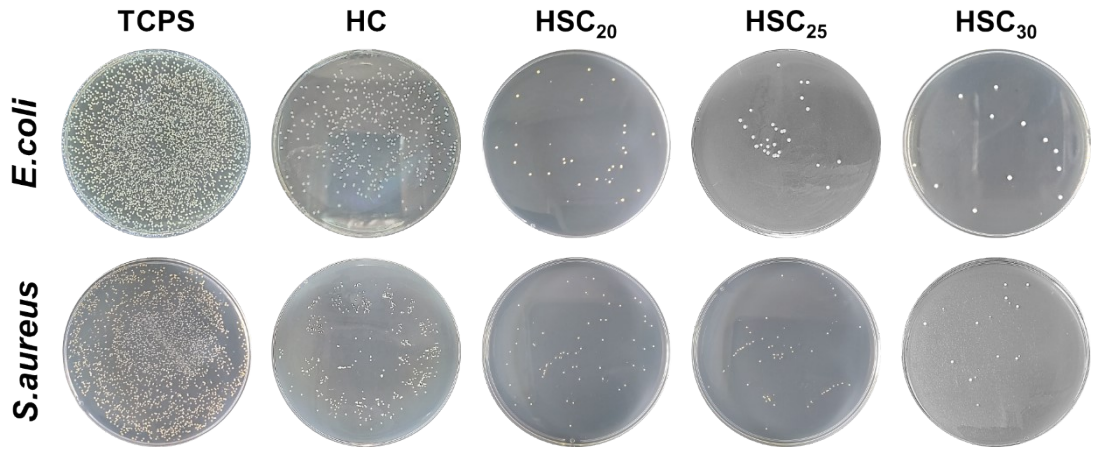

Fig. S7. Photo images of HC hydrogel and HSC hydrogels against E. coli and S. aureus adhesion.

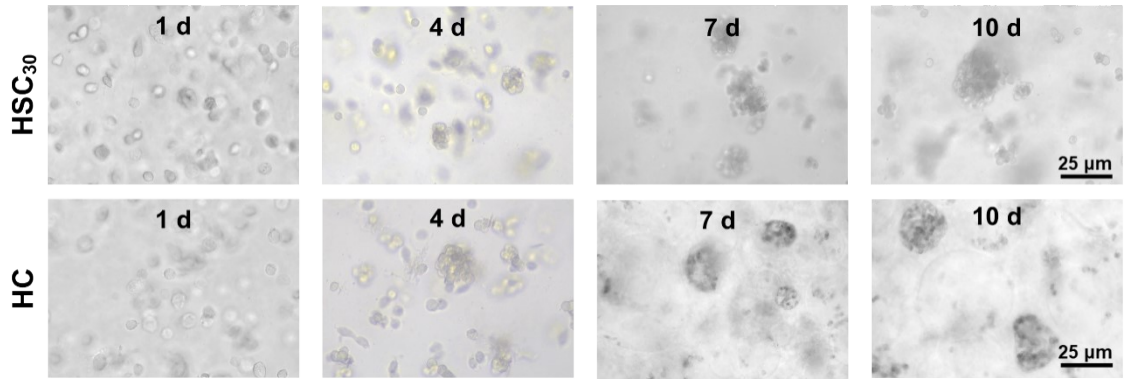

Fig. S8. Photo images of ADSCs cultured in the hydrogels at different days by bright field microscopy.

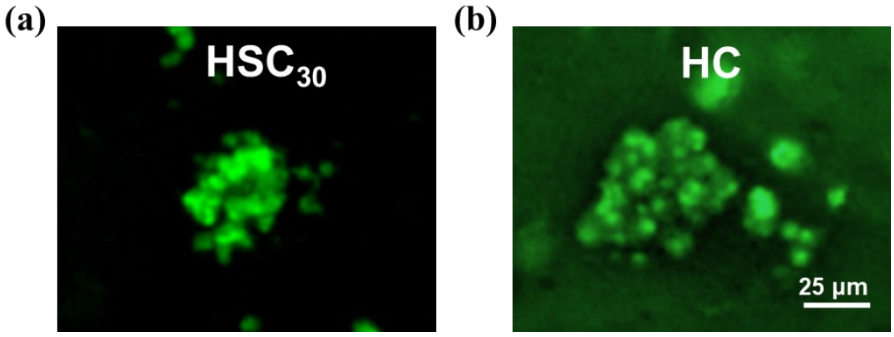

Fig. S9. AO fluorescence images of ADSCs cultured in (a) HSC_{30} hydrogel and (b) HC hydrogel after 10 d (at high magnification).

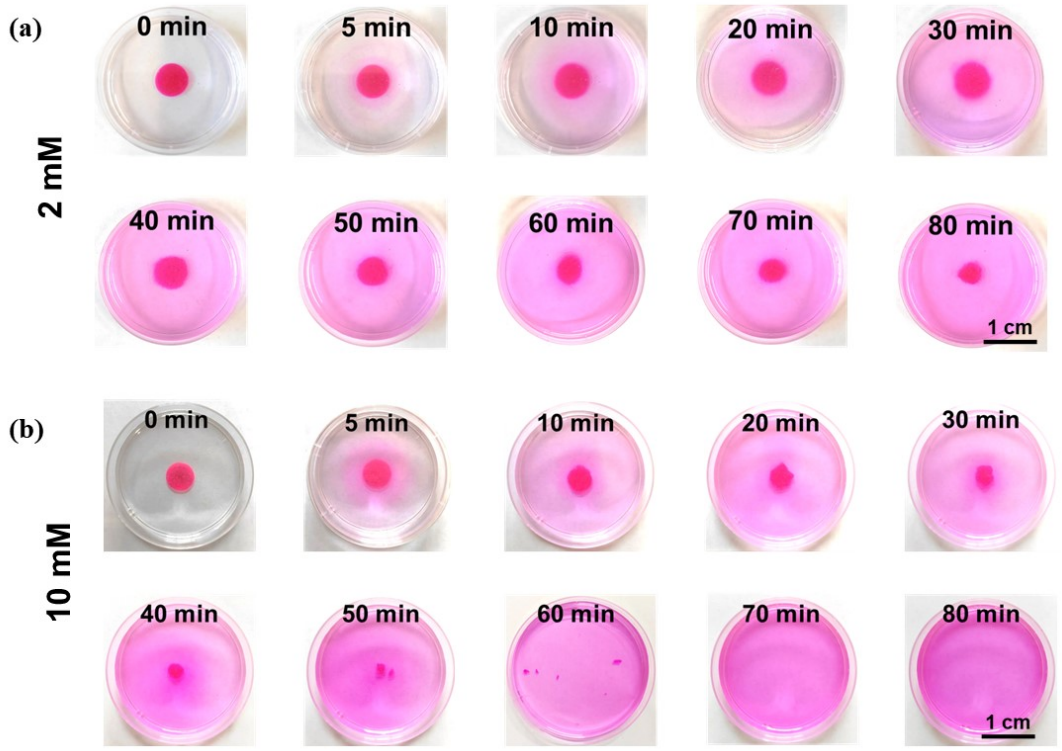

Fig. S10. Photo images of HSC_{30} hydrogel degraded in (a) 2 mM Ad-COONa solution and (b) 10 mM Ad-COONa solutions.

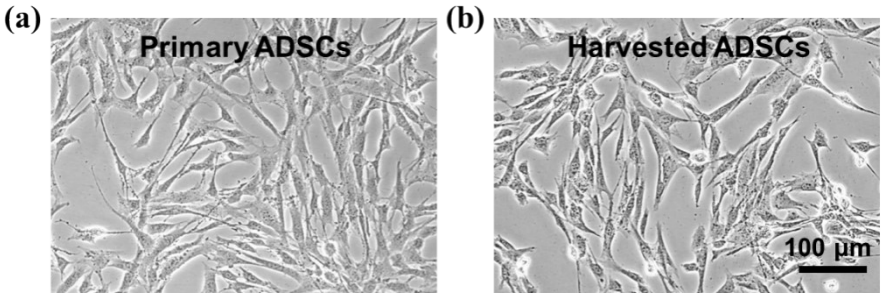

Fig. S11. Photo images of (a) Primary ADSCs and (b) ADSCs harvested from HSC_{30} hydrogel grown adherent on TCPS.

3. Tables

Table S1. Preparation parameters of different hydrogels.

Hydrogel	P(SBMA-co-CD) (wt%)	HA-Ada (wt%)	HA-CD (wt%)	v/v
HSC_{20}	20%	8%	---	1:1
HSC_{25}	25%	8%	---	1:1
HSC_{30}	30%	8%	---	1:1
HC	---	5%	5%	1:1