Supplementary Materials

pH-Triggered Antibiotic Release from Nanofiber-Hydrogel Hybrid Dressing for Infected Wound Healing

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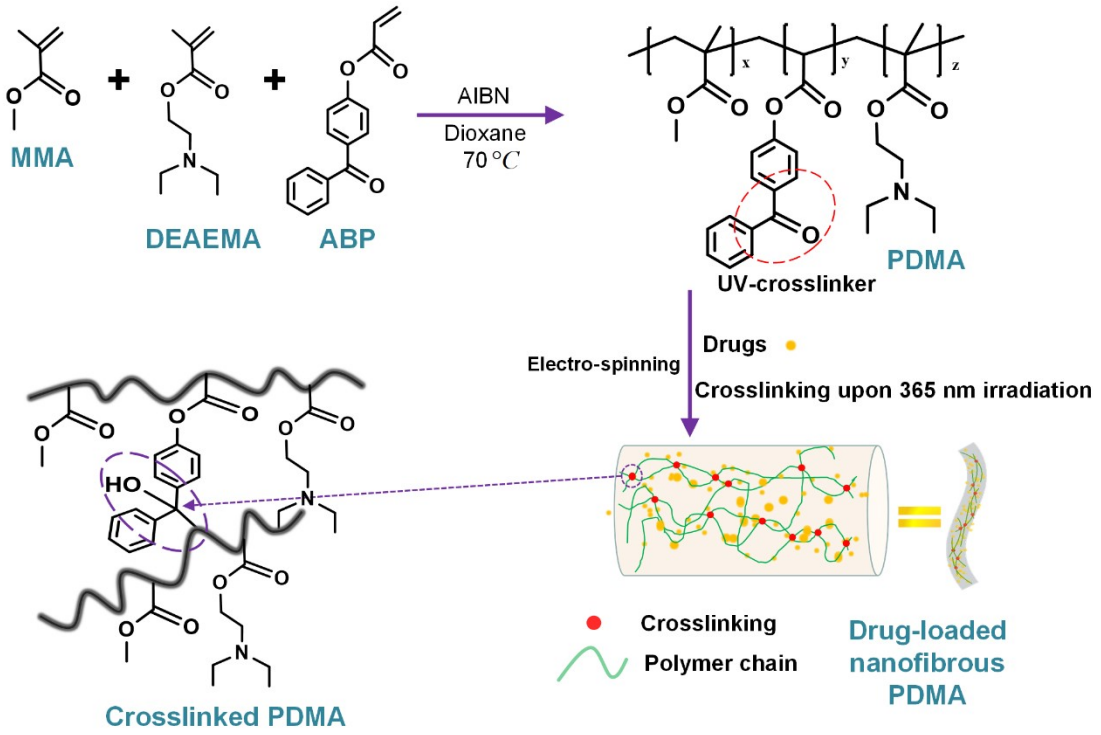

Fig. S1 Scheme of synthesizing P(DEAEMA-*co*-MMA-*co*-ABP) (denoted as PDMA). PDMA was synthesized via radical polymerization using DEAEMA and MMA as monomers, ABP as crosslinking agents, and AIBN as the thermal initiator. Firstly, DEAEMA, MMA, ABP, and AIBN dissolved in dioxane with designed molar ratios were filled in a round-bottom flask in dark. Then, nitrogen was bubbled into the reaction flask for 30 min before polymerization. Subsequently, the flask was wrapped in tin foil and put into the preheated oil bath at 70 °C overnight under a nitrogen atmosphere. The crude products, P(DEAEMA-*co*-MMA- *co*-ABP) with the monomer molar ratios of DEAEMA, MMA, and ABP at 87:10:3. After dialyzing with molecular mass cut-off (3000 kDa) in water for 2 days and drying in a freeze dryer under −75 ℃ for 2 days, the obtained copolymers were stored in a dry and dark environment for further analysis in the characterizations and application performances. The average conversion yield of PDMA was calculated to be 91.25%. Here, DEAEMA is expected to endow the synthesized PDMA with effective pH stimuli-responsive behavior, MMA with larger steric hindrance is conducive to improving the glass transition temperature of PDMA, and ABP with sensitive photoinitiated crosslinking groups contributes to the possible stability of nanofibrous PDMA.

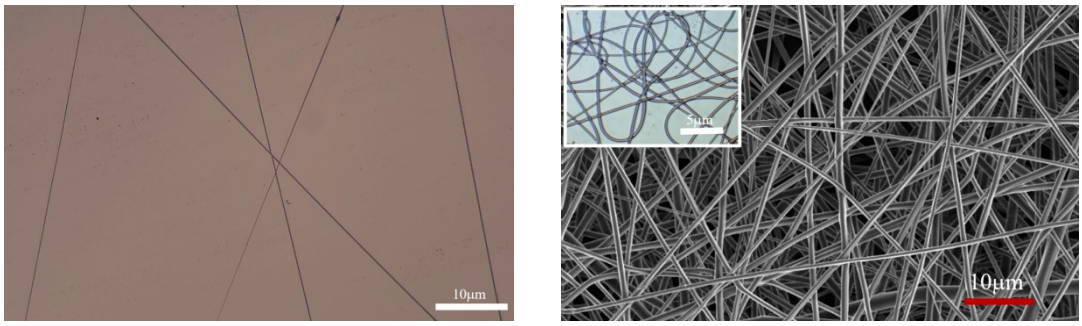

Fig. S2 The initial surface morphology of nano-spun fibers from optical microscope and SEM image. The voltage applied on a static needle (0.8 mm inside diameter and 10 cm length) for electrospinning was 20 kV and the flow rate of the syringe pump was set to 30 mm/min at 25 °C and 65% humidity throughout the spinning experiment. The distance between the needle tip and the grounded collector (the thickness and area are 0.2 cm and 400 cm^2, respectively) was 20 cm. The drug-loaded nanofibers were cross-linked under ultra-violet (UV) irradiation (365 nm, 1 W/cm^2) at a distance of 10 cm during the spinning and another 2 h was used to irradiate the spun nanofibers to completely crosslink so that the drug molecules were effectively encapsulated in crosslinked nanofiber and such nanofiber retained its shape in a strict environment. The spun nanofiber mats were dried in a vacuum oven at 40 °C overnight. The morphology of the nanofibers was initially observed by an optical microscope, and then the clear micro-scopic morphology was characterized by SEM.

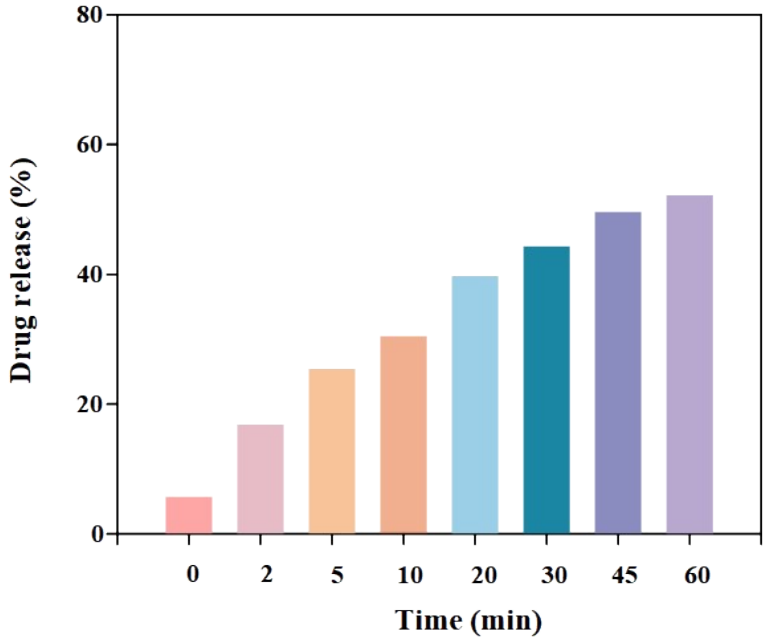

Fig. S3 Drug release from nanofibers after ultrasonic treatment for different durations at pH 7.4.

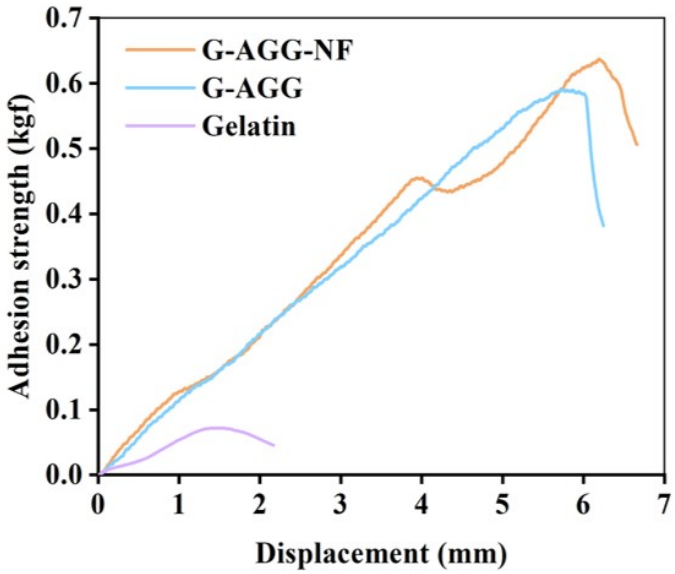

Fig. S4 Adhesive strengths of hydrogels on glass.

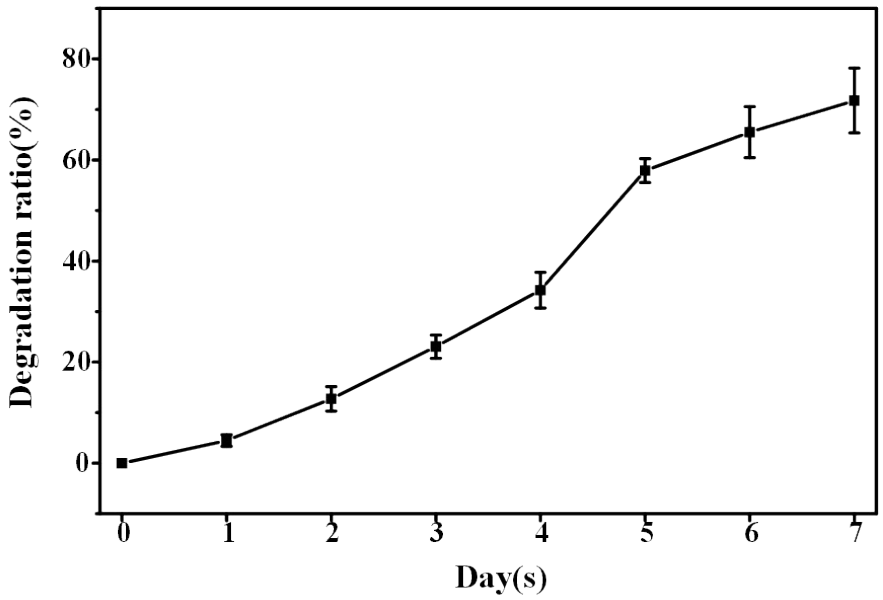

Fig. S5 Degradation of the gelatin hydrogel over 7 days (n = 3). The hydrogel degradation study was conducted in phosphate-buffered saline (PBS, pH 7.4, 0.01 M) over 7 days. Pre-weighed lyophilized hydrogel samples of uniform dimensions discs of 20 mm diameter were individually immersed in a sufficient volume of sterile PBS 30 mL per sample and incubated at 37°C under static conditions. At predetermined time points (Days 1, 2, 3, 5, and 7), samples were retrieved in triplicate, rinsed thoroughly with deionized water, and lyophilized to constant weight. The extent of degradation was quantified by measuring the remaining dry mass, expressed as a percentage of the initial dry weight. All experiments were performed with appropriate controls, and data are presented as mean ± standard deviation.

Table. S1. Primer sequences used for RT-qPCR analysis.

Gene	Forward (5'-3')	Reverse (5'-3')
TNF-α	AGACCCTCACACTCAGATCA	TCTTTGAGATCCATGCCGTTG
IL-6α	GTTCTCTGGGAAATCGTGGA	TGTACTCCAGGTAGCTA
IL-1β	TCCATGAGCTTTGTACAAGGA	AGCCCATACTTTAGGAAGACA
IL-4β	GGTCTCAACCCCCAGCTAGT	GCCGATGATCTCTCTCAAGTGAT
IL-10	GGACAACATACTGCTAACCGACTC	AAAATCACTCTTCACCTGCTCCAC
INF-α	GTTCAAGTCTCTGTCCCCAAAA	GTGGGAACTGCACCTCATGT
GAPDH	TGCACCACCAACTGCTTAG	GGATGCAGGGATGATGTTC

Table. S2. Determination of aldehydes in AGG

V_1	V_2	C
$350\mu L$	$3540\mu L$	$0.25\,\mathrm{mol}/L$

$$CHO\% = \frac{(3.54-0.35)\times 10^{-3}\times 0.25\times 161}{0.1}\times 100\% = 128.4\%$$

V_1---Volume of NaOH consumed by blank control, L;

V_2---The volume of NaOH consumed by the experimental group, L;

C---Concentration of NaOH standard solution, mol/L;

161---Average molecular weight at which half of the guar chains are converted into dialdehyde units.