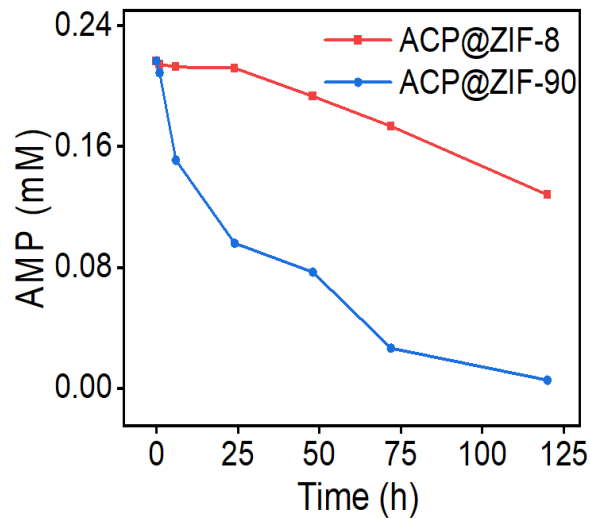
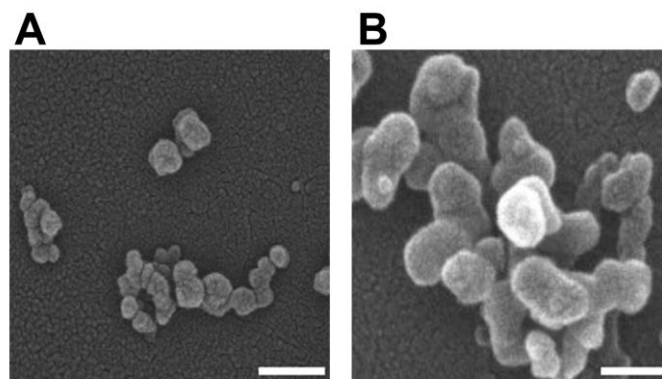


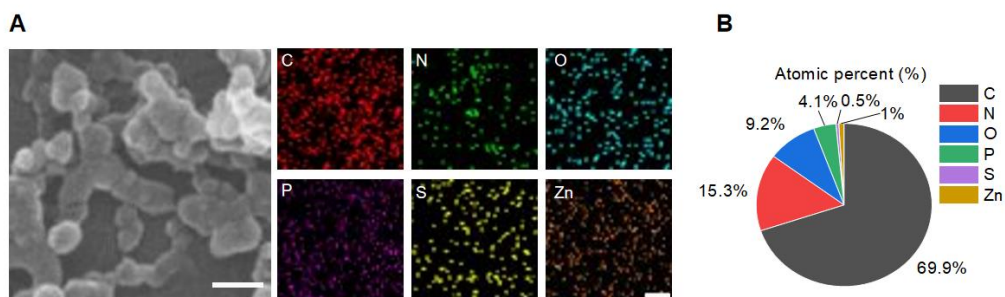
**Biomineralized in situ catalytic nanoreactor integrated microneedle patch for on demand immunomodulator supply to combat psoriasis**



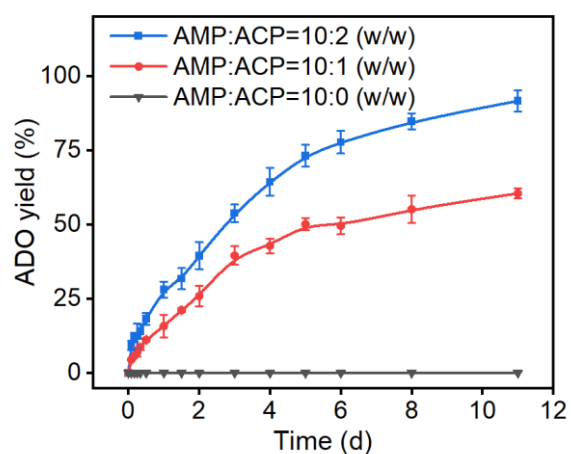
**Figure S1** The AMP concentration after immersing in ACP@ZIF-8 and ACP@ZIF-90 suspension, respectively.



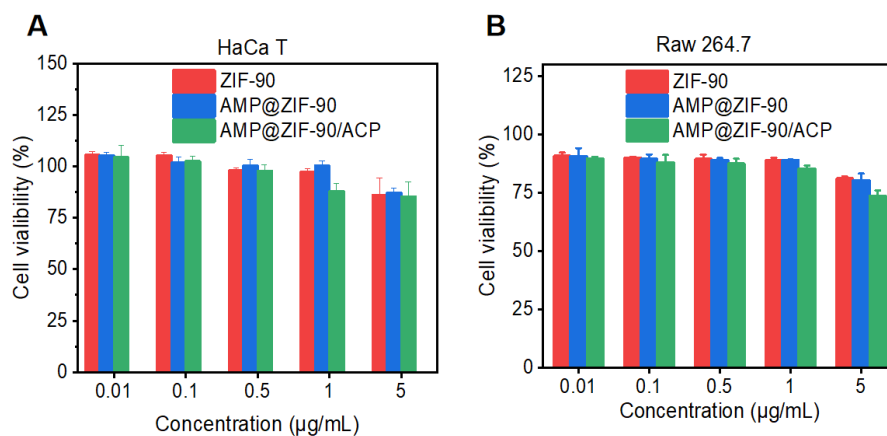
**Figure S2** SEM images of (A) AMP@ZIF-90 and (B) AMP@ZIF-90/ACP. Scale bar: 100 nm.



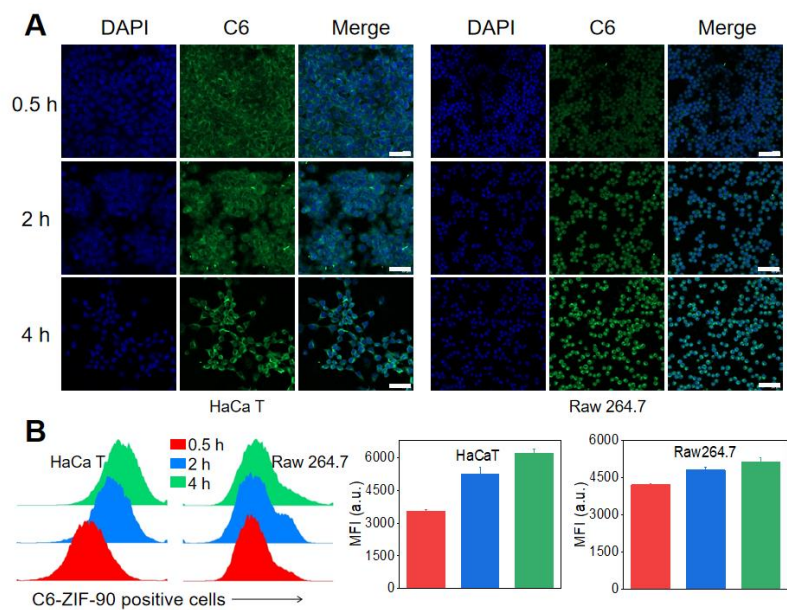
**Figure S3** (A) EDX analysis and (B) atomic percent of AMP@ZIF-90/ACP. Scale bar: 100 nm.



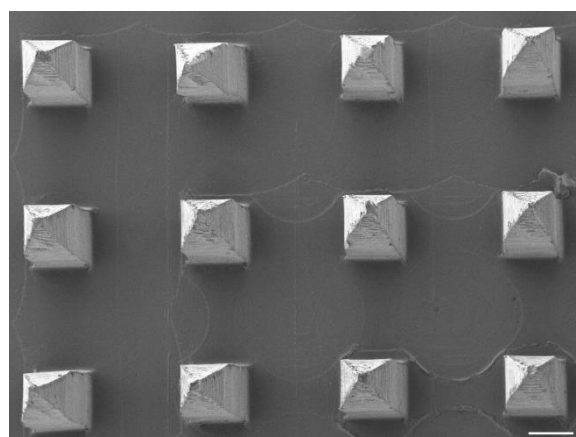
**Figure S4** The concentration of generated ADO after immersing AMP@ZIF-90/ACP with different ratio of AMP and ACP in pH 5.5 PBS (mean  $\pm$  S.D.,  $n=3$ ).



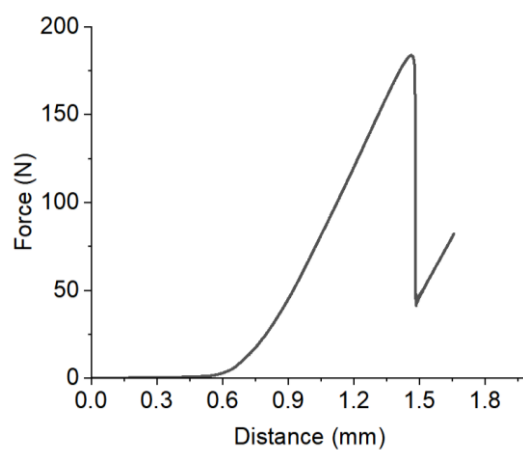
**Figure S5** Cell viability of (A) HaCa T and (B) Raw 264.7 cells after incubation with various samples for 24 h (mean  $\pm$  S.D.,  $n=6$ ).



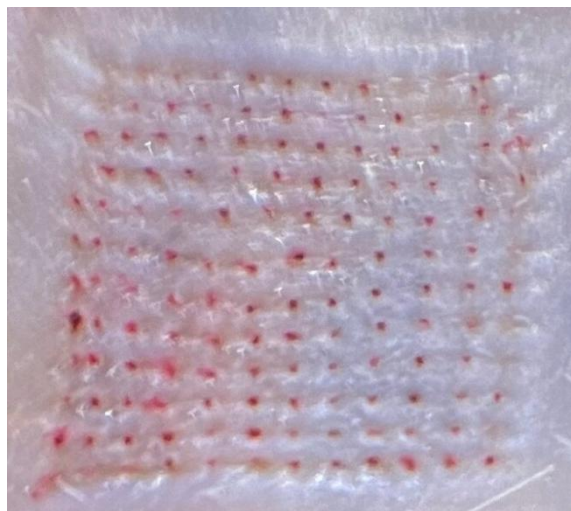
**Figure S6** Cellular uptake behavior evaluated by (A) CLSM and (B) flow cytometry, respectively (mean  $\pm$  S.D.,  $n=3$ ). Scale bar: 40  $\mu$ m.



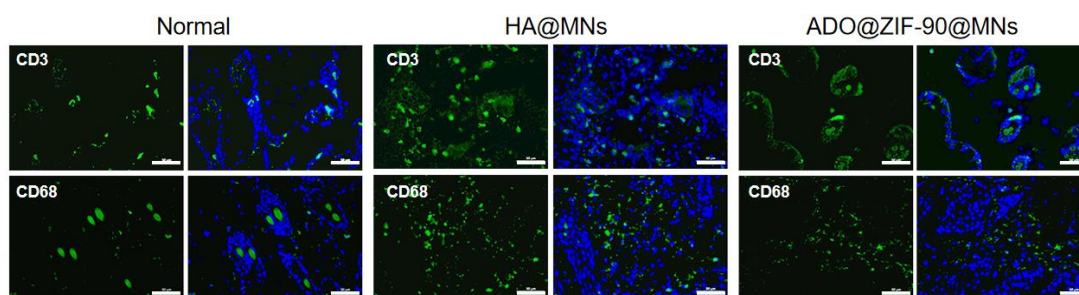
**Figure S7** SEM image of AMP@ZIF-90/ACP@MNs patch from top view. Scale bar: 200  $\mu$ m.



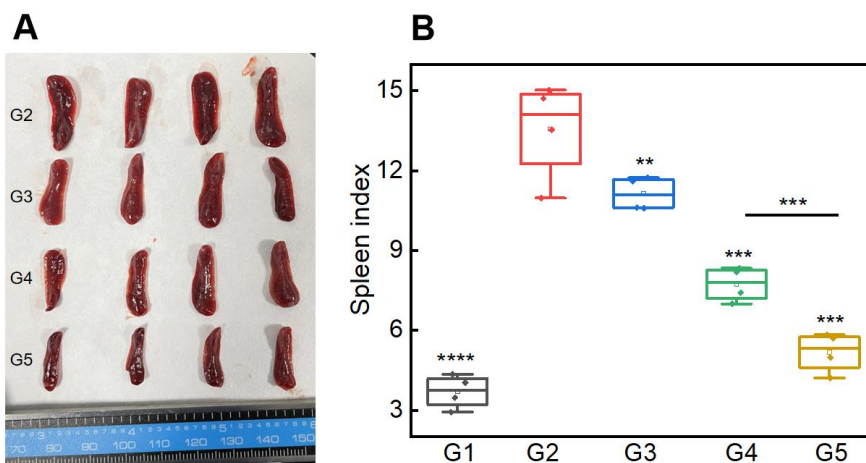
**Figure S8** The force displacement curve of AMP@ZIF-90/ACP@MNs.



**Figure S9** Photograph of mice dorsal skin after administration of C6@ZIF-90@MNs.

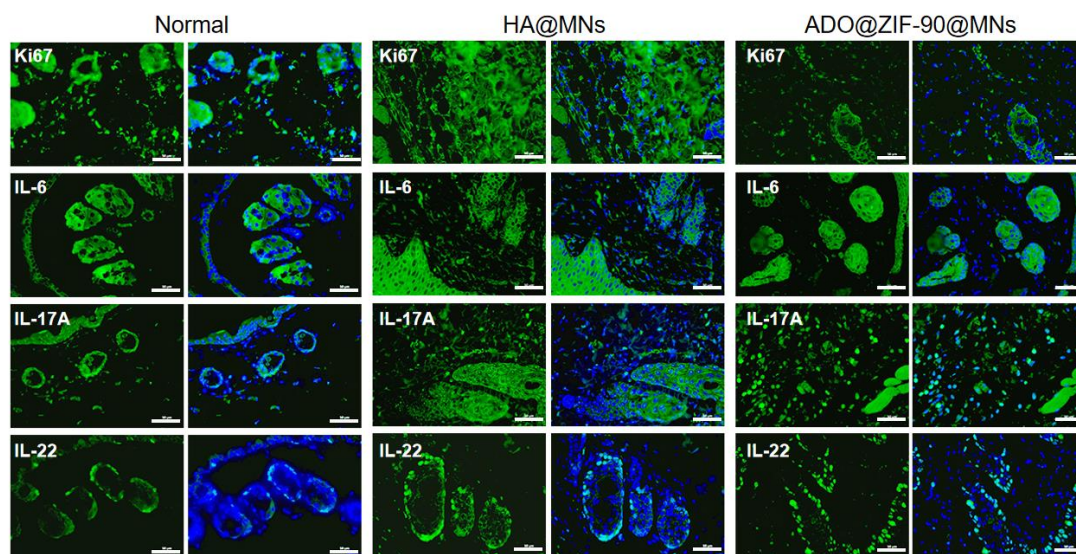


**Figure S10** Immunofluorescence staining of CD3 and CD68 in mice dorsal skin lesion sections of Normal, HA@MNs, and ADO@ZIF-90@MNs group. Scale bar: 50  $\mu\text{m}$ .

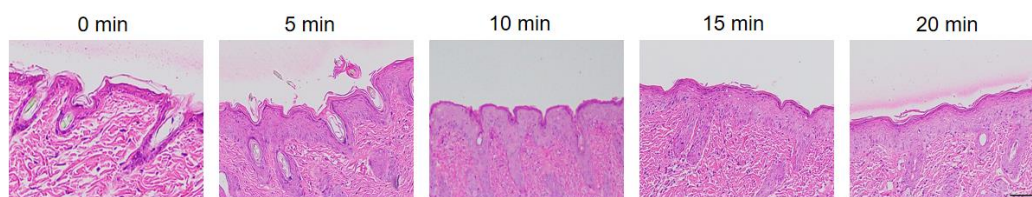


**Figure S11** Digital photograph of spleen (A) and (B) spleen index of various groups after treatment (mean  $\pm$  S.D.,  $n=3$ ). (\*\*  $P < 0.01$ , \*\*\*  $P < 0.001$ , \*\*\*\*  $P < 0.0001$  versus the control group).

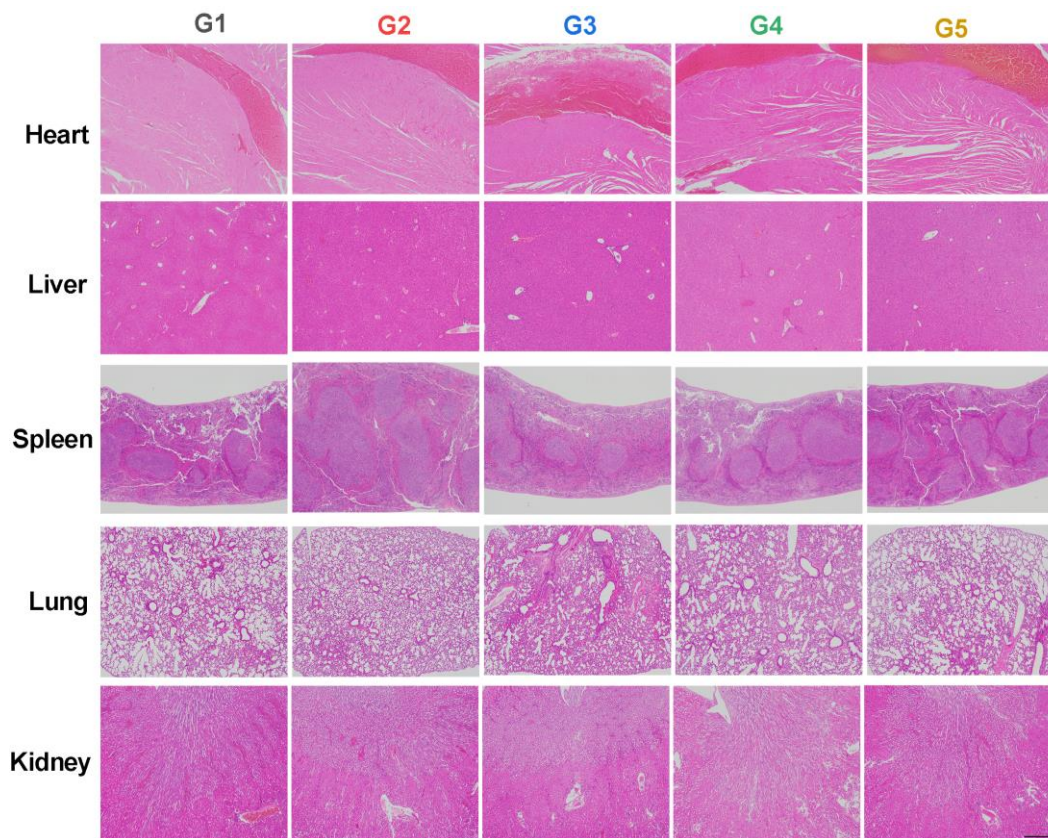




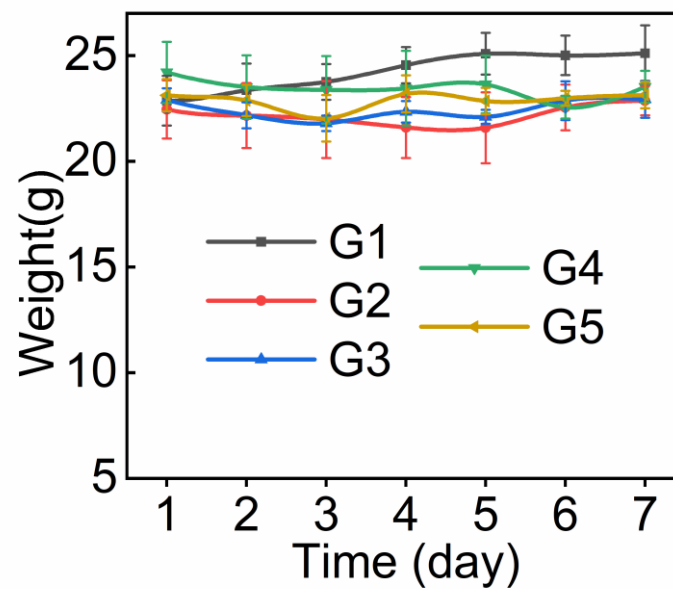
**Figure S12** Immunofluorescence staining of Ki67, IL-6, IL-17A, and IL-22 in mice dorsal skin lesion sections of Normal, HA@MNs, and ADO@ZIF-90@MNs group. Scale bar: 50  $\mu$ m.



**Figure S13** H&E staining of skin after AMP@ZIF-90/ACP@MNs administration at 0, 5, 10, 15, and 20 min. Scale bars: 200  $\mu$ m.



**Figure S14** H&E staining of heart, liver, spleen, lung, and kidney of various groups after treatment for histological examination. Scale bars: 200  $\mu$ m.



**Figure S15** Body weight recorded daily during the period of treatment (mean  $\pm$  S.D.,  $n=3$ ).