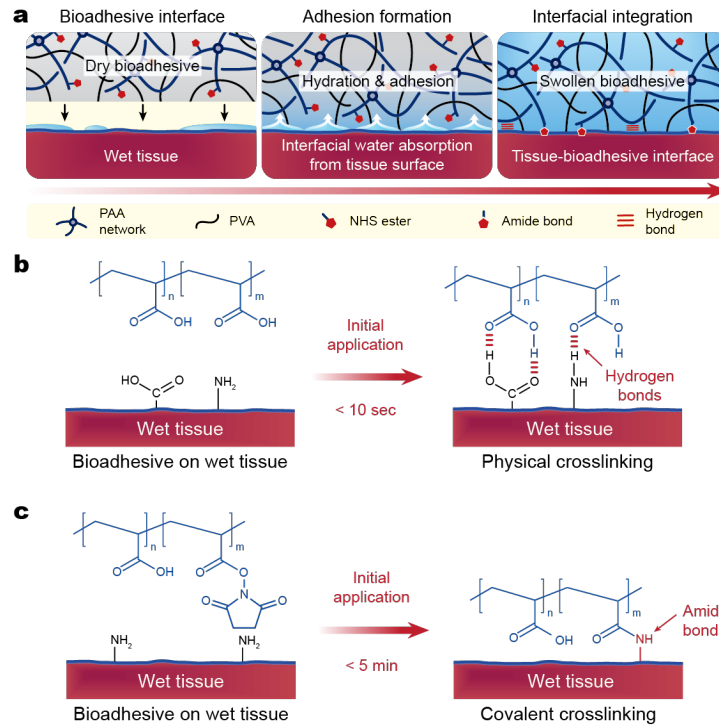
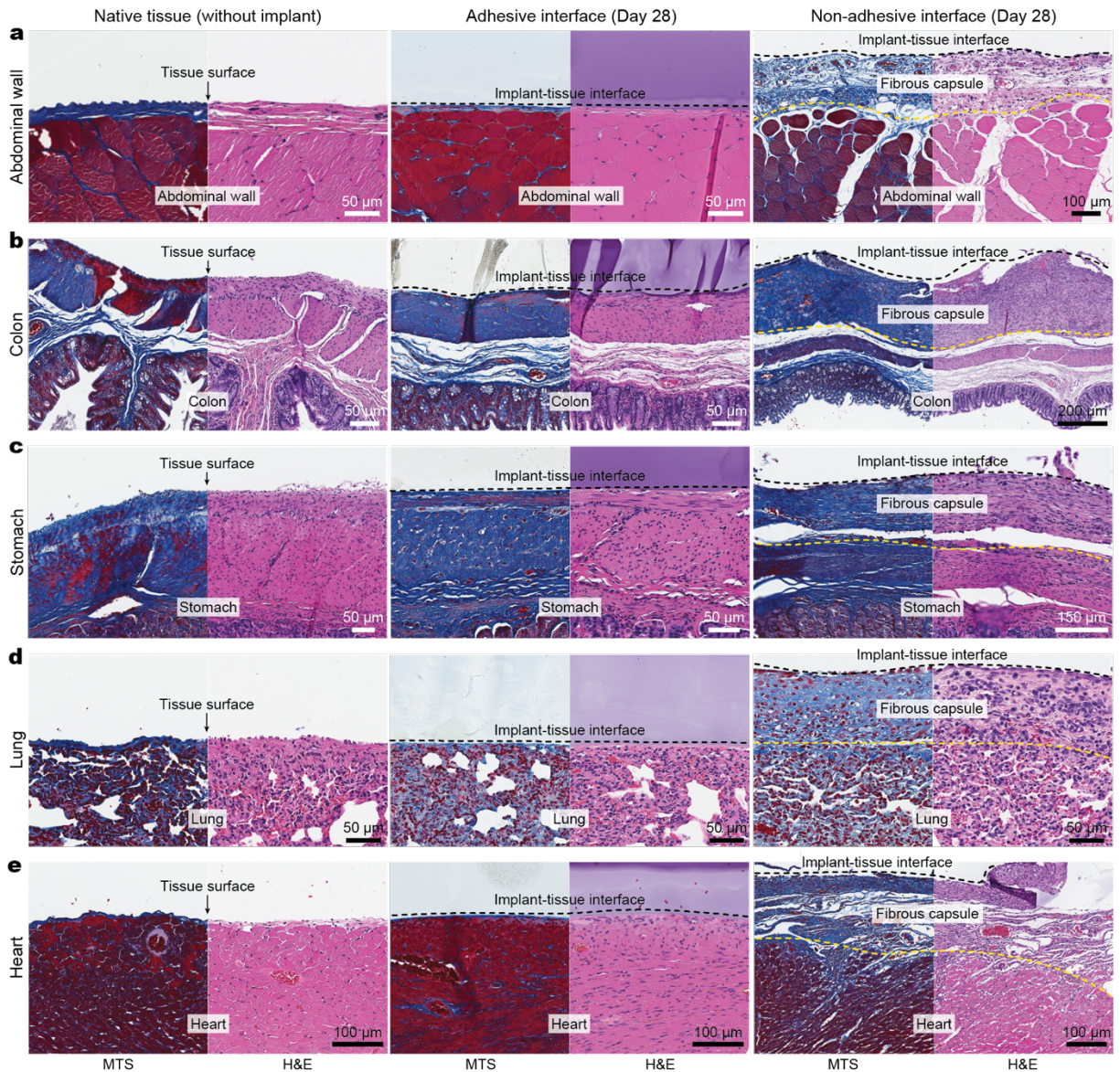

Supplementary information

Adhesive anti-fibrotic interfaces on diverse organs

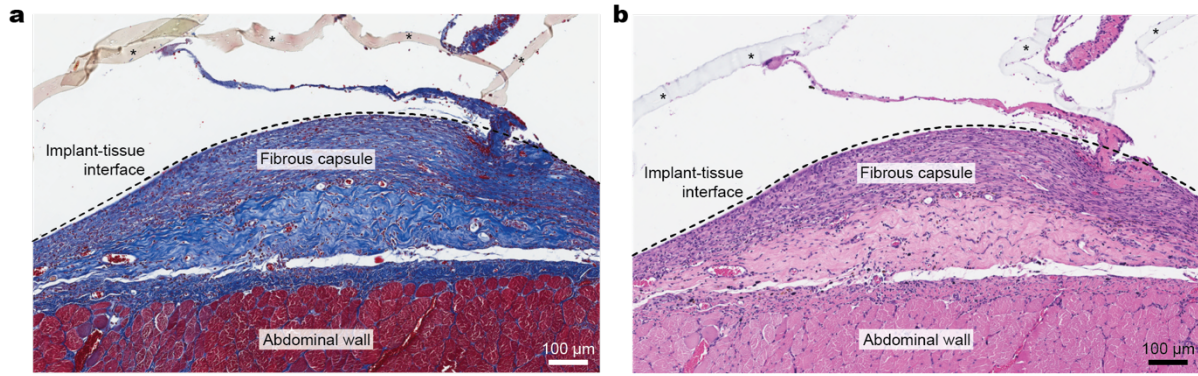
In the format provided by the
authors and unedited



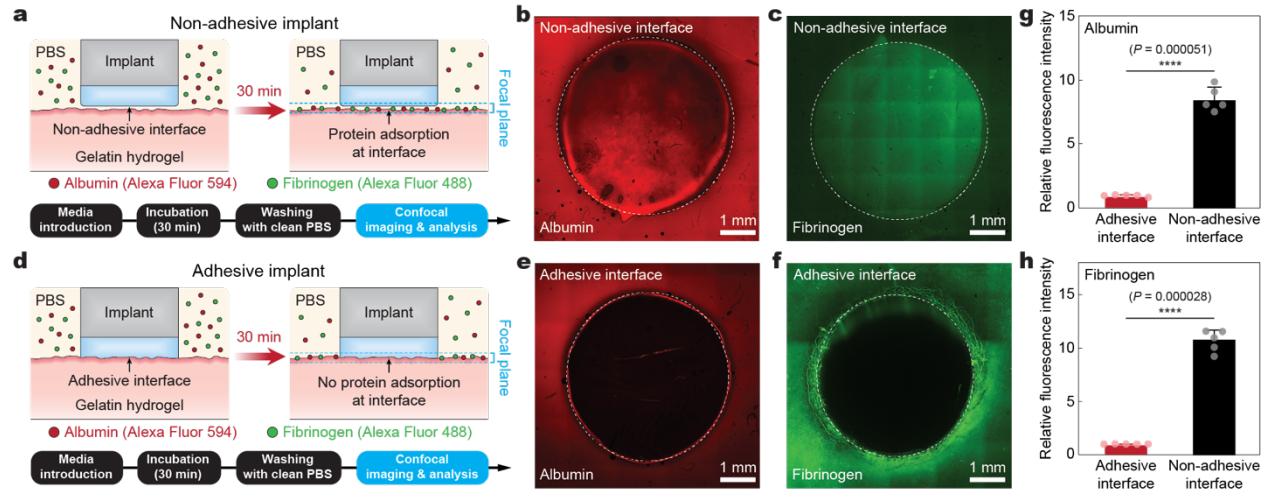
Supplementary Fig. 1 | Adhesion mechanism and chemistry of the adhesive implant. **a**, Schematic illustrations for adhesion of the adhesive implant to wet tissues. **b**, Schematic illustrations for physical crosslinking between the adhesive implant and the tissue by hydrogen bonds. **c**, Schematic illustrations for covalent crosslinking between the adhesive implant and the tissue by amide bonds.



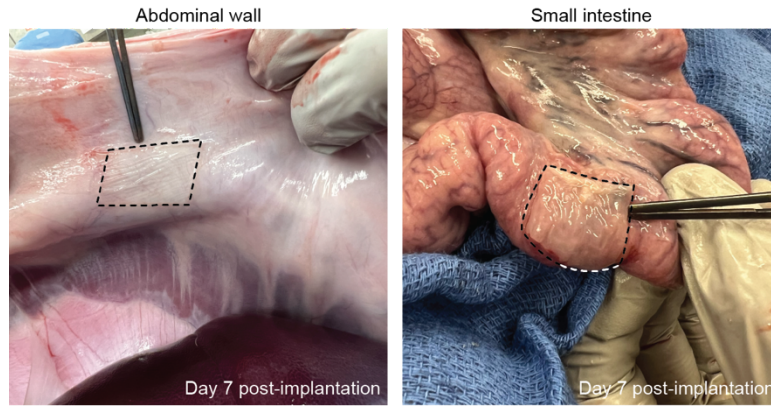
Supplementary Fig. 2 | Adhesive implant-tissue interface on diverse organs. a-e, Representative histology images stained with Masson's trichrome (MTS) and hematoxylin and eosin (H&E) for native tissue (left), adhesive implant (middle), and non-adhesive implant (right) collected on day 28 post-implantation to the abdominal wall (a), colon (b), stomach (c), lung (d), and heart (e). Black and yellow dotted lines in the images indicate the implant-tissue interface and the fibrous capsule-tissue interface, respectively. The experiment was repeated independently ($n = 4$ per group) with similar results.



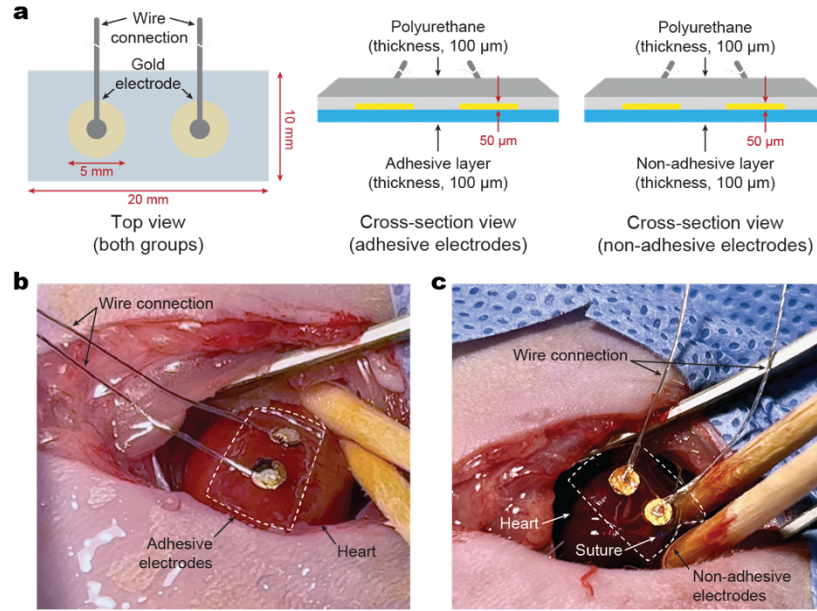
Supplementary Fig. 3 | Polyurethane mock device. a,b, Representative histology images stained with Masson's trichrome (a) and hematoxylin and eosin (b) of the polyurethane mock device collected on day 28 post-implantation to the abdominal wall. * in images indicates the implant; black dotted lines indicate the implant-tissue interface. The experiment was repeated independently ($n = 4$) with similar results.



Supplementary Fig. 4 | In vitro protein adsorption assay. **a-c**, Schematic illustration of the experimental setup (a) and representative confocal microscope images for in vitro albumin (b) and fibrinogen (c) adsorption assay for the non-adhesive implant. **d-f**, Schematic illustration of the experimental setup (d) and representative confocal microscope images for in vitro albumin (e) and fibrinogen (f) adsorption assay for the adhesive implant. **g,h**, Relative fluorescence intensity at the implant-substrate interface measured 30 min after co-culture for albumin (g) and fibrinogen (h). Values in **g,h** represent the mean and the standard deviation ($n = 5$; independent samples). Statistical significance and P values are determined by two-sided unpaired t -tests; **** $P < 0.0001$.



Supplementary Fig. 5 | In vivo implantation of the adhesive implants on porcine organs. Photographs of the porcine abdominal wall and small intestine on day 7 post-implantation for the adhesive implant. Black dotted lines in photographs indicate the boundary of implants.



Supplementary Fig. 6 | Electrodes with the adhesive and non-adhesive interfaces. **a**, Schematic illustrations for electrodes with the adhesive and the non-adhesive interfaces. **b,c**, Photographs of electrodes with the adhesive interface (**b**) and the non-adhesive interface (**c**) implanted to the rat epicardial surface. White dotted lines in photographs indicate the boundary of implants.

Supplementary Table 1 | Luminex multiplex assays for protein profiling of rat abdominal wall tissues. Data were normalized per total amount of proteins extracted and are represented as the mean $\pm$ standard deviation ($n = 3$ tissue lysates; independent biological replicates). Statistical significance and P values are determined by two-sided unpaired t -tests; $*P < 0.05$ (vs. non-adhesive interface for the same time point).

Molecule (pg mg ⁻¹ protein)	Non-adhesive interface		Adhesive interface	
	Day 3	Day 7	Day 3	Day 7
IL-1 α	6.87 $\pm$ 2.61	10.47 $\pm$ 5.38	3.87 $\pm$ 0.45	8.75 $\pm$ 5.08
IL-1 β	107.65 $\pm$ 129.51	125.97 $\pm$ 130.24	20.95 $\pm$ 4	26.77 $\pm$ 8.04
IL-6	31.48 $\pm$ 45.88	50.44 $\pm$ 60	15.31 $\pm$ 11.07	18.74 $\pm$ 6.33
IL-12P70	1.05 $\pm$ 0.23	1.18 $\pm$ 0.32	1.74 $\pm$ 0.28*	1.7 $\pm$ 0.35
IL-17	3.18 $\pm$ 0.34	4.04 $\pm$ 1.2	3.22 $\pm$ 0.47	3.74 $\pm$ 0.2
IL-18	394.21 $\pm$ 20.14	430.18 $\pm$ 111.11	192.43 $\pm$ 28.83*	145.5 $\pm$ 12.14*
TNF- α	0.58 $\pm$ 0.02	0.98 $\pm$ 0.4	0.69 $\pm$ 0.07	0.65 $\pm$ 0.11
MCP-1	53.77 $\pm$ 44.43	64.64 $\pm$ 28.67	47.47 $\pm$ 16.12	34.17 $\pm$ 2.23
G-CSF	0.2 $\pm$ 0.05	0.25 $\pm$ 0.03	0.36 $\pm$ 0.06*	0.34 $\pm$ 0.06
IL-4	12.62 $\pm$ 5.8	12.61 $\pm$ 1.71	17.41 $\pm$ 3.46	13.13 $\pm$ 1.61
IL-10	4.64 $\pm$ 2.63	9.93 $\pm$ 11.36	3.03 $\pm$ 0.35	2.31 $\pm$ 0.25
CCL3	17.34 $\pm$ 3.56	77.24 $\pm$ 73.93	9.21 $\pm$ 1.15*	20.74 $\pm$ 14.28
CCL5	10.15 $\pm$ 1.49	69.24 $\pm$ 31.03	5.88 $\pm$ 0.84*	38.57 $\pm$ 25.39

Supplementary Table 2 | Mechanical properties of the implants in this study

Implant	Young's modulus	Thickness
Polyurethane	2.1 MPa	100 μ m
Gold electrode	79 GPa	50 μ m