

Supporting Information

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SI Materials and Methods

S1. Fiber Injection Process. We injected the fluorescent hydrogel fiber using a modified indwelling needle assembly (SURFLO® Teflon I. V. Catheters, Terumo Co.). We flattened the inner needle of an indwelling needle. Thereby, the inner needle did not pierce a hole in the mouse ears. We also filled the inner needle with poly(dimethylsiloxane) (PDMS) (SILPOT 184, Dow Corning Toray Co., Ltd.) to effectively push the fibers. Surgical instruments including the inner needles were sterilized by autoclaving to reduce the risk of infection due to the injection process. We used presterilized outer needles. The fluorescent hydrogel

fibers were sterilized in 70% ethanol, and were then maintained in a physiological saline solution.

The injection process was as follows: First, the modified inner needle was inserted between the dermal layers of the mouse ear to create a gap for fiber implantation. Second, the outer needle containing the fibers was inserted into the gap. Third, the inner needle was inserted into the outer needle. Finally, the outer needle was removed from the gap, leaving the fibers in the mouse ear.

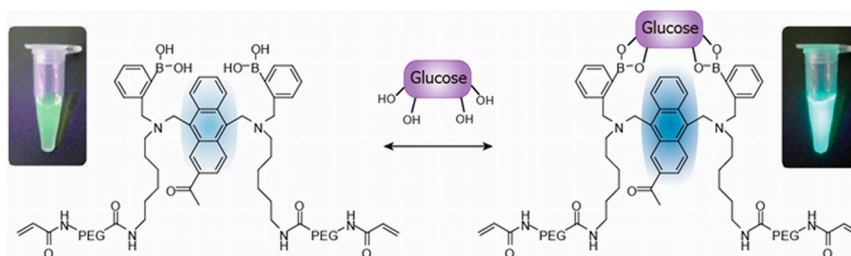


Fig. S1. Schematic illustration of the glucose-recognition principle of the glucose-responsive monomer. The glucose-responsive monomer is composed of diboronic acids, anthracene acid, PEG, and a vinyl group; these components act as glucose-recognition sites, a fluorogenic site, spacers, and polymerization sites for PAM, respectively. In the absence of glucose molecules, the fluorescence of the anthracene is quenched by a photo-induced electron transfer (PET) that occurs from the unshared electron pair of the nitrogen atom to the anthracene. When glucose molecules bind to diboronic acid, a strong reaction between the nitrogen atom and a boron atom inhibits PET. As a result, the fluorescence of anthracene is higher than under glucose-free conditions.



Fig. S2. Mouse ear with the implanted microbeads. Immediately after implantation, the microbeads remained at the implantation site. However, the microbeads dispersed from the implantation site after one month.

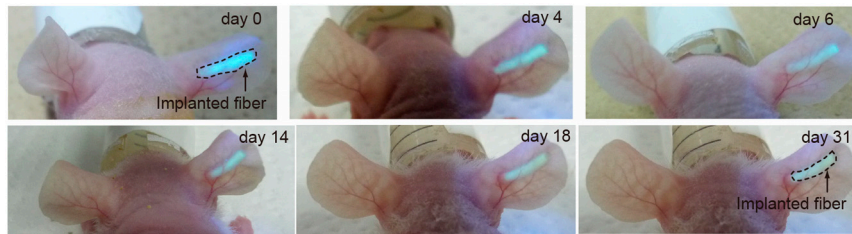


Fig. S3. Mouse ear with implanted fiber. The fiber remained at the implantation site for one month.

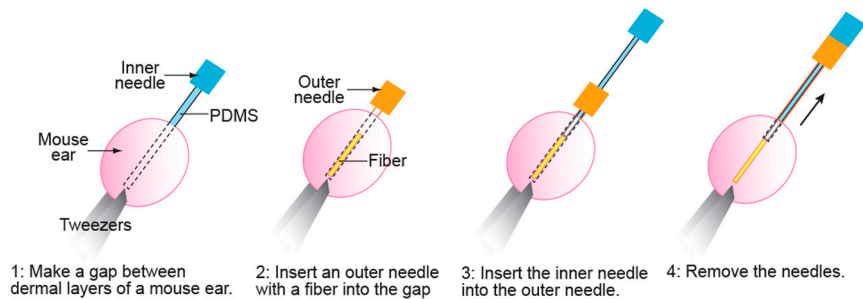


Fig. S4. Fiber injection process using a modified indwelling needle assembly.

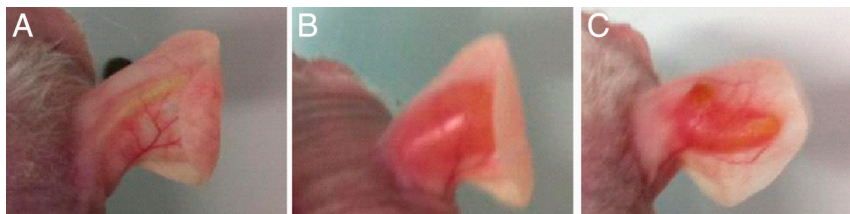


Fig. S5. Inflammation evaluation based on ear skin responses. (A) An inflammation index of 0; the ear skin shows no sign of inflammation and scab formation. (B) An inflammation index of 2; the ear skin shows reddening and swelling, but there is no scab. (C) An inflammation index of 3; the ear skin shows reddening, swelling, and a scab.

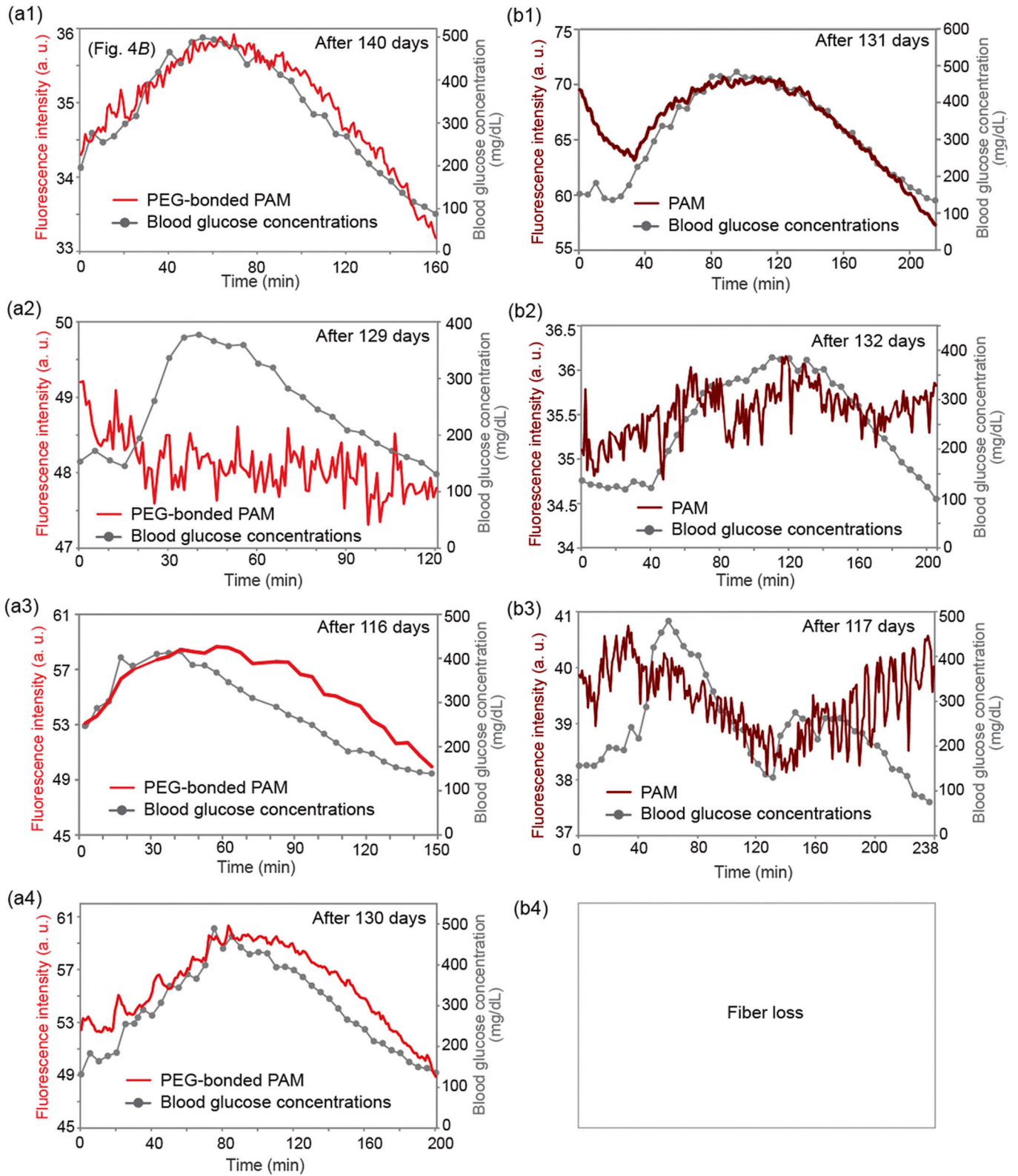


Fig. S7. Long-term in vivo glucose monitoring using the PAM hydrogel fibers (A) with PEG and (B) without PEG shown in Fig. S6. Overall, three out of four PEG-bonded samples responded to changing blood glucose concentrations, whereas only one out of four PAM samples responded to changing blood glucose concentrations. The PAM fiber of Fig. S6B4 came out from the implantation site after severe inflammation and wound healing process.

