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Supplementary Materials for

Fluorescent-based biodegradable microneedle sensor array for tether-free continuous glucose monitoring with smartphone application

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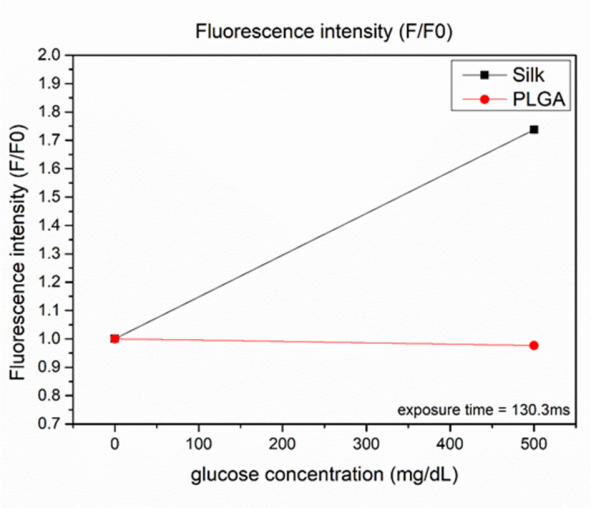
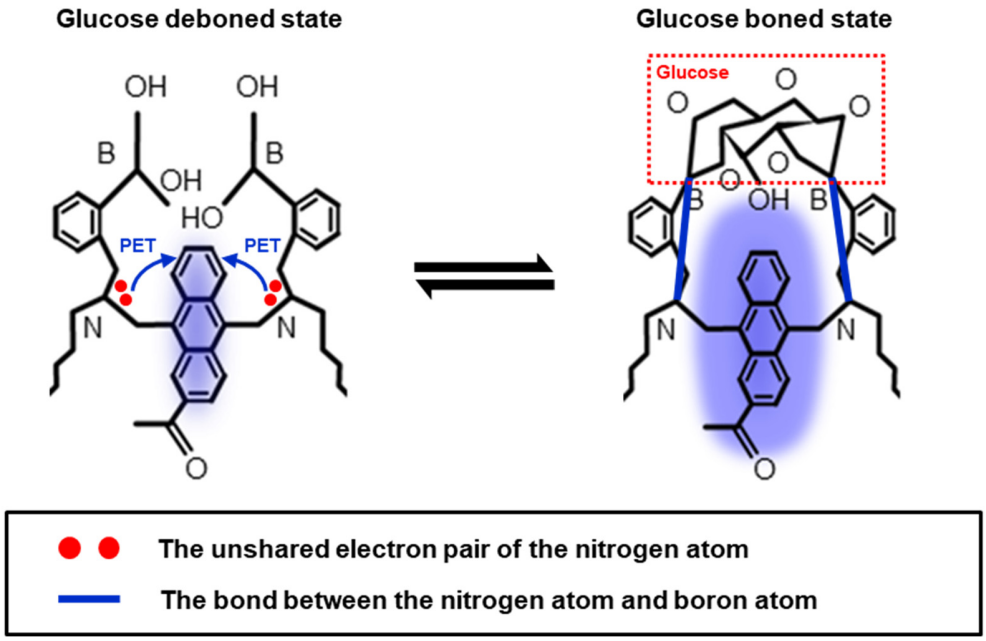
The PDF file includes:

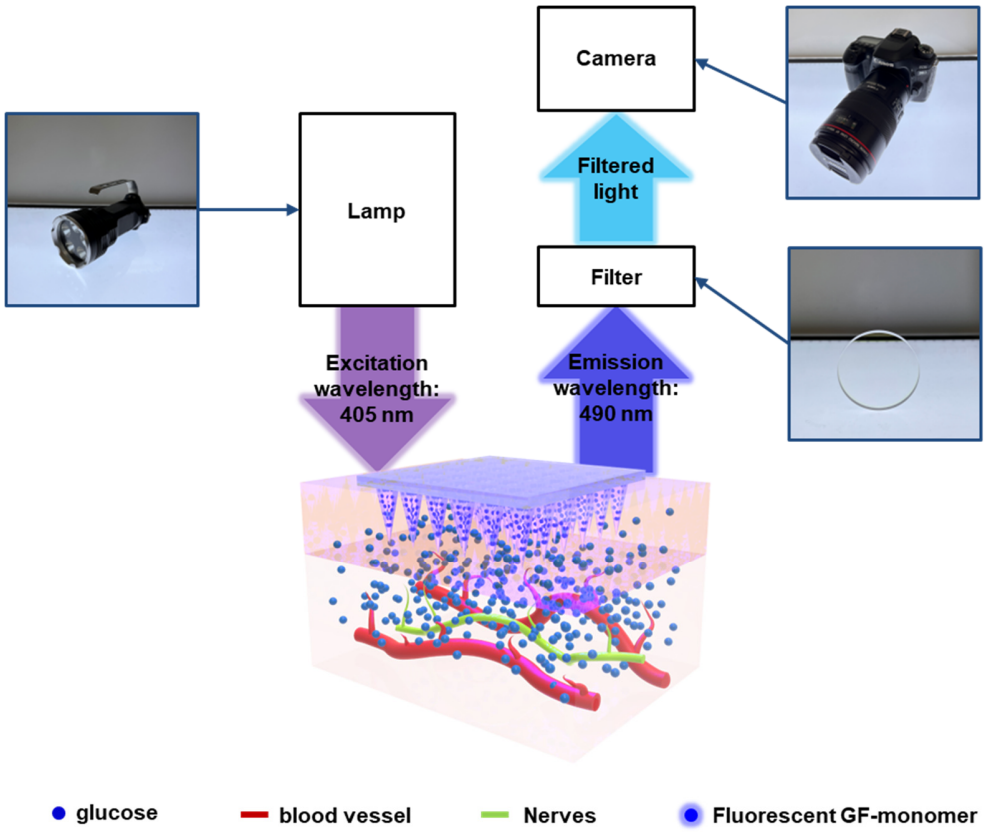
Other Supplementary Material for this manuscript includes the following:



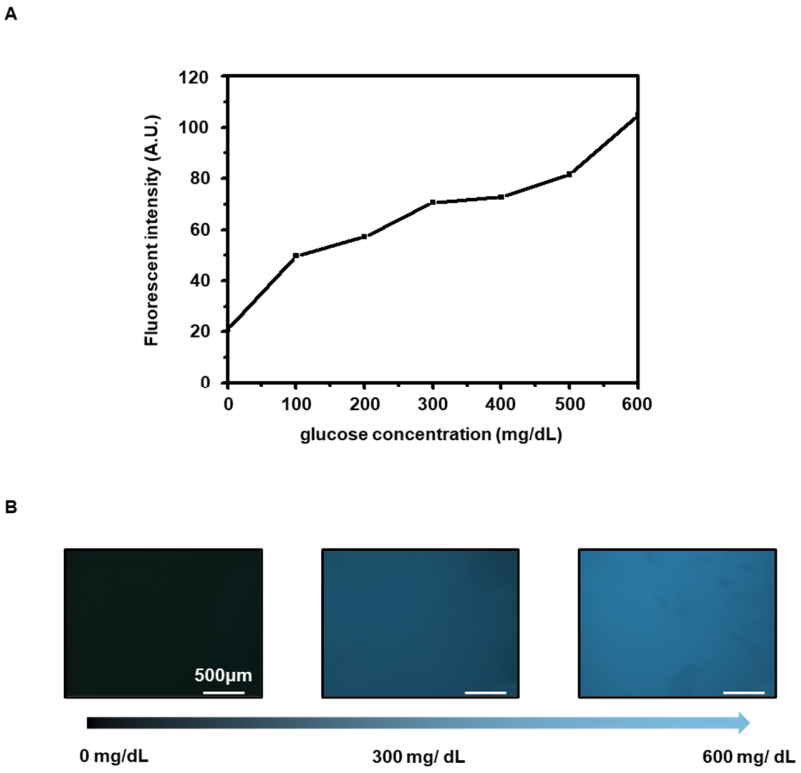
Supplementary Figure 1. Comparison of fluorescence responses to glucose of Silk and PLGA films combined with GF-monomer.



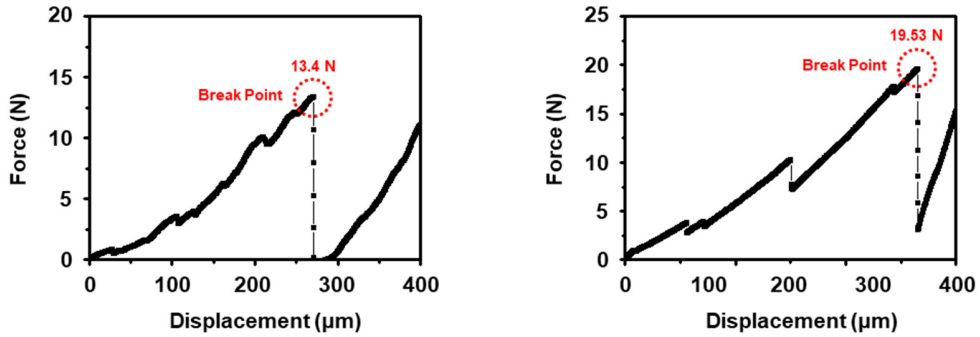
Supplementary Figure 2. Illustration of the fundamental mechanism underlying glucose detection using fluorescent boronic acid with photoinduced electron transfer (PET)



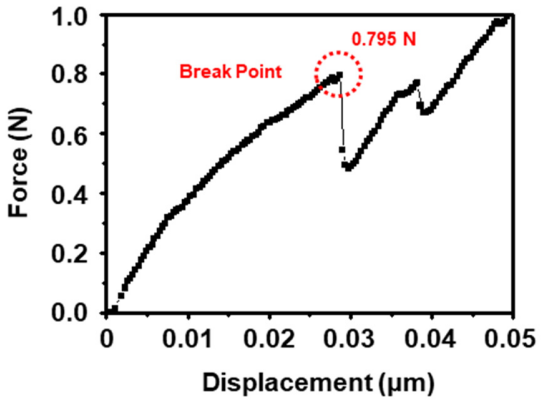
Supplementary Figure 3. Illustration of experimental setup for glucose monitoring using microneedle sensor with GF-monomer



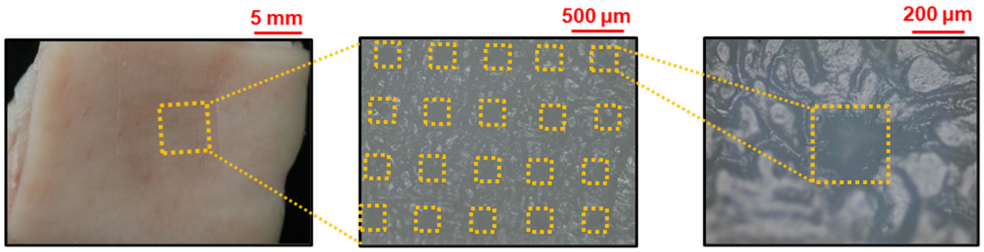
Supplementary Figure 4. In vitro experiment of silk film containing GF-monomer. **(A)** Graph and **(B)** images of fluorescence intensity results according to glucose concentration of silk film with GF-monomer



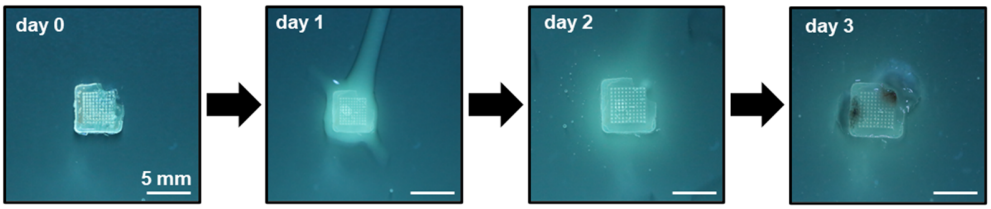
Supplementary Figure 5. Mechanical performance of the biodegradable microneedle sensor.



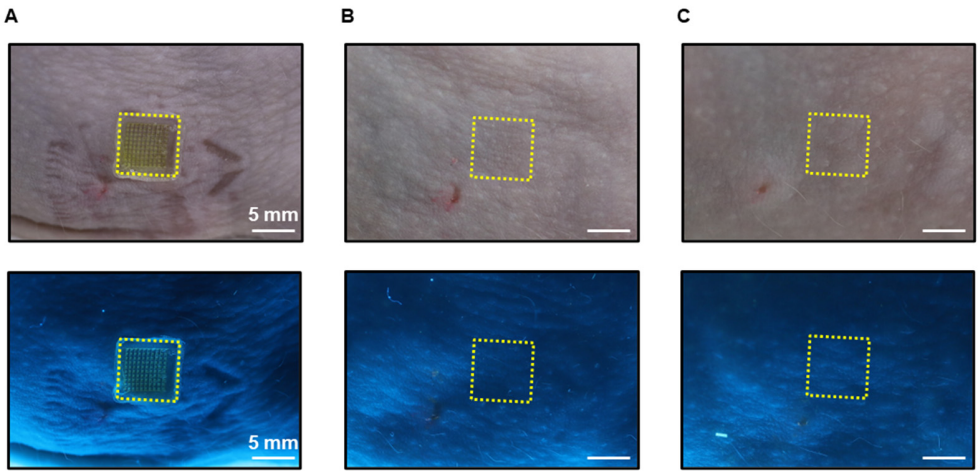
Supplementary Figure 6. The fracture force of a single microneedle



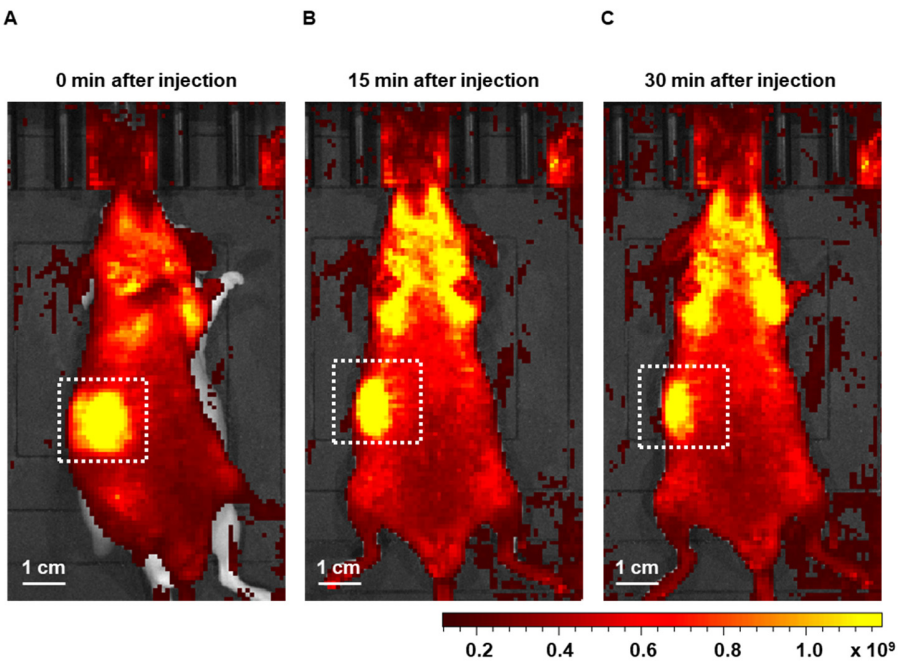
Supplementary Figure 7. Images of confirming the insertion via applicating the microneedle sensor to pig skin.



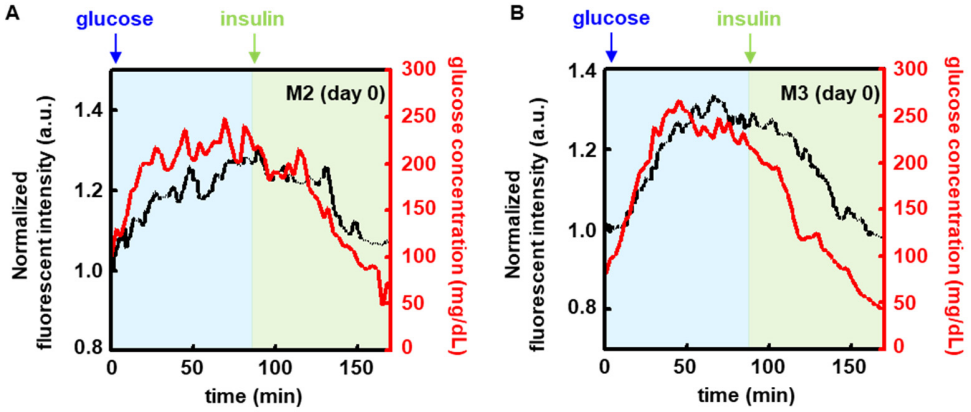
Supplementary Figure 8. Degradation process of biodegradable microneedle glucose sensor in gelatin skin model.



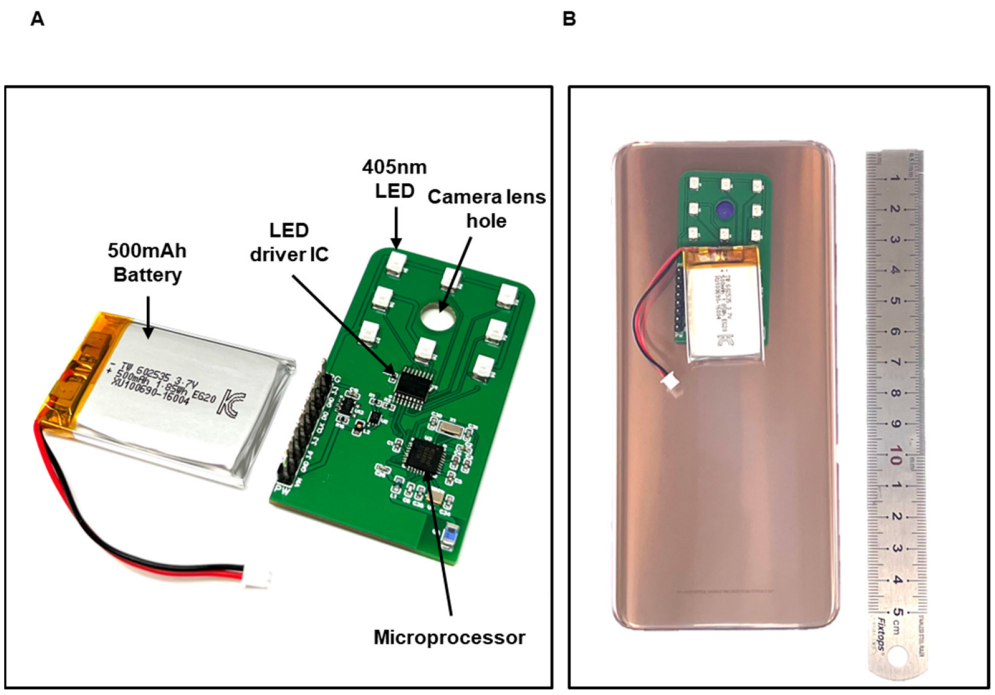
Supplementary Figure 9. Skin regeneration and recovery results for microneedle glucose sensor applied to rat skin. (A) Optical and Fluorescent images of minimally invasive microneedle glucose sensor on mouse skin, **(B)** immediately after removal and **(C)** 24 hours after removal



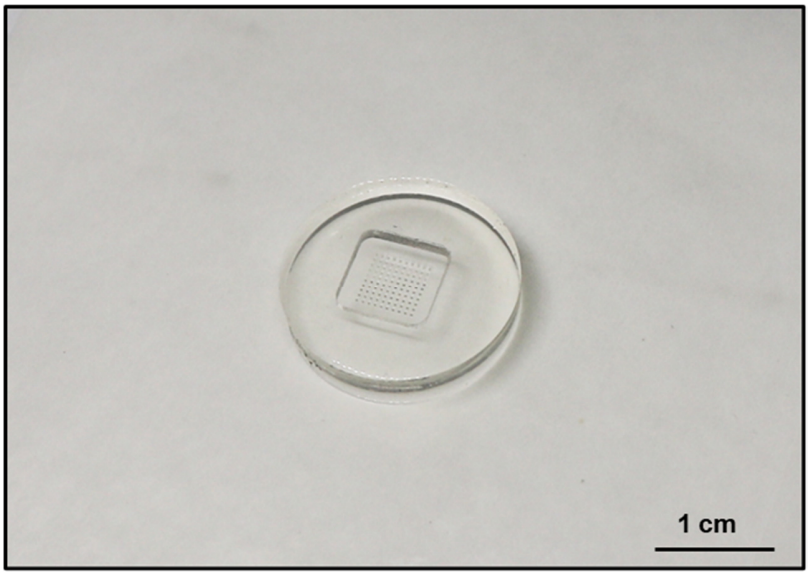
Supplementary Figure 10. Biodegradable Microneedle Array Sensor for Continuous Glucose Monitoring. (A) Image of the whole-body IVIS imaging of mouse for confirmation of IVIS applicability of GF monomer. Sequential imaging of injection spot (white box) with 490 nm expression after subcutaneous injection of GF monomer solution, after 0 minutes, **(B)** 15 minutes and **(C)** 30 minutes, respectively.



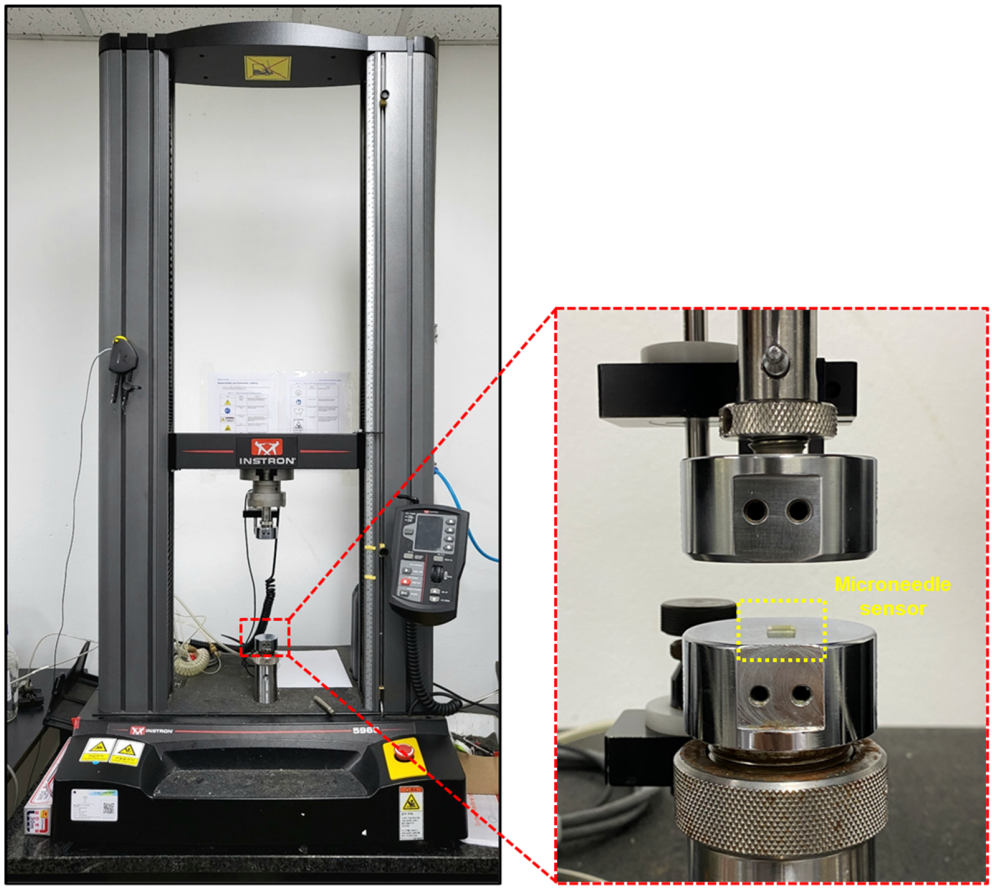
Supplementary Figure 11. In vivo Continuous Glucose Monitoring (CGM) using a Biodegradable Microneedle Sensor. (A) and **(B)** In vivo results obtained using a biodegradable microneedle glucose sensor and a glucometer on day 0 (Black: relative fluorescence intensity, red: glucose concentration measured by the glucometer)



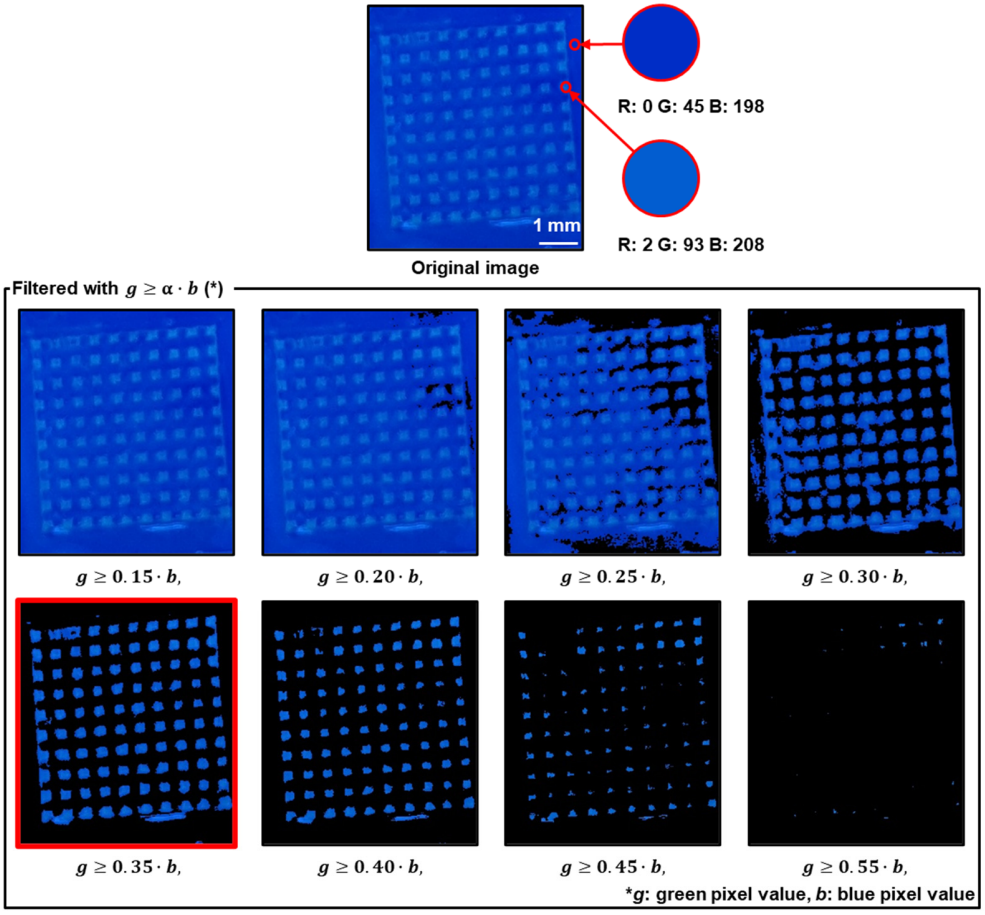
Supplementary Figure 12. Attachable printed circuit board (PCB) and a battery for providing 405nm UV. (A) Components of the UV delivering system employed in the home-diagnosis system, **(B)** Image of the device attached to the back of the smartphone.



Supplementary Figure 13. Image of microneedle mold. PDMS mold of microneedle with a height of 650 μm, base of 200 × 200 μm, and pitch of 500 μm in 10 × 10 arrays.



Supplementary Figure 14. Equipment and setup images for mechanical test of microneedle sensor.



Supplementary Figure 15. Fluorescence-filtered images according to filtering coefficients ranging from 0.15 to 0.55.

Movie S1 (separate file). Movie of the freely-moving mouse with the biodegradable microneedle glucose sensor attached

Movie S2 (separate file). Movie of continuous glucose monitoring in a high glucose level mouse with a home diagnosis system with a smart phone

Movie S3 (separate file). Movie of continuous glucose monitoring in a low glucose level mouse with a home diagnosis system with a smart phone

Movie S4 (separate file). Movie of continuous glucose monitoring in a normal glucose level mouse with a home diagnosis system with a smart phone