

Long-term and room temperature operable bioactuator powered by insect heart tissue.

Supplementary information

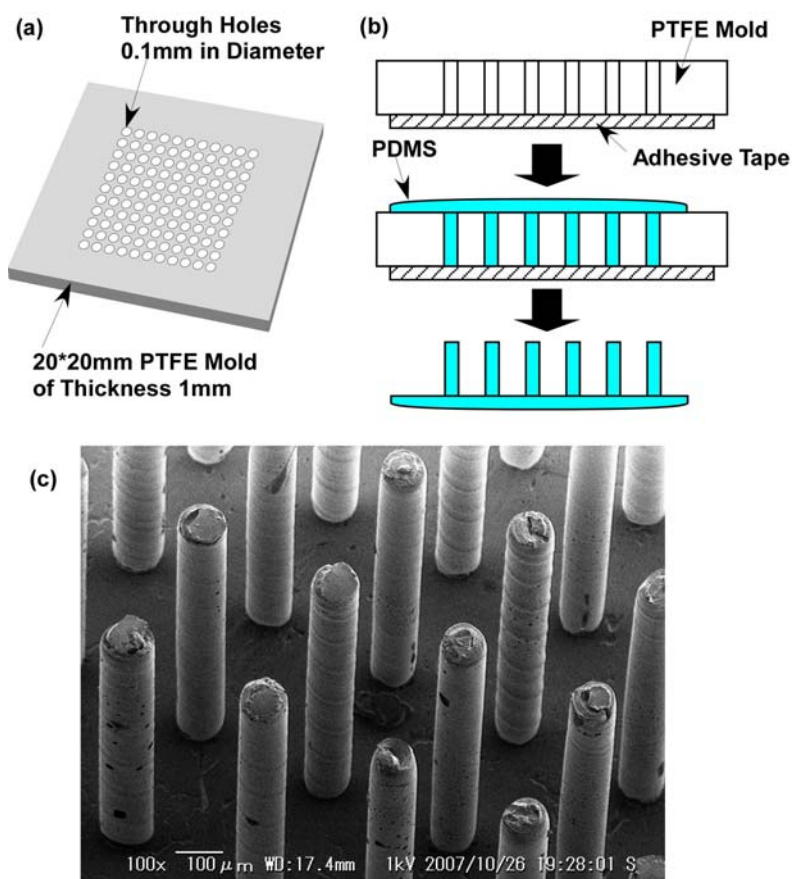


Fig. S1 Fabrication of the micropillars by molding polydimethylsiloxane PDMS. (a) The mold was fabricated by drilling through holes (diameter: 100 $\mu$ m) at intervals of 300 $\mu$ m through a 20-square-mm poly(tetrafluoroethylene) PTFE sheet (thickness: 1mm). (b) Adhesive tape was put on one side of the mold to prevent uncured PDMS from leaking out. Then uncured PDMS was poured onto the mold and the filled mold was baked at 90 °C for 30 min. After curing, the PDMS film was carefully peeled off so as not to tear the film. (c) Scanning electron microscope image of the micropillars (VE-8800, Keyence).

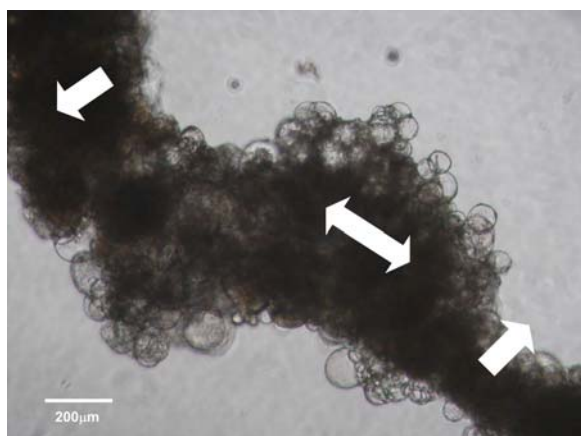


Fig. S2 Micrograph of DV tissue contracting spontaneously. The image was taken on the 10<sup>th</sup> day. The DV tissue was contracting spontaneously at 0.2 Hz (Supplementary Movie 1). The entire tissue did not contract simultaneously in the same direction and it could be divided into three sections which contracted independently as indicated by the arrows for contracting direction.

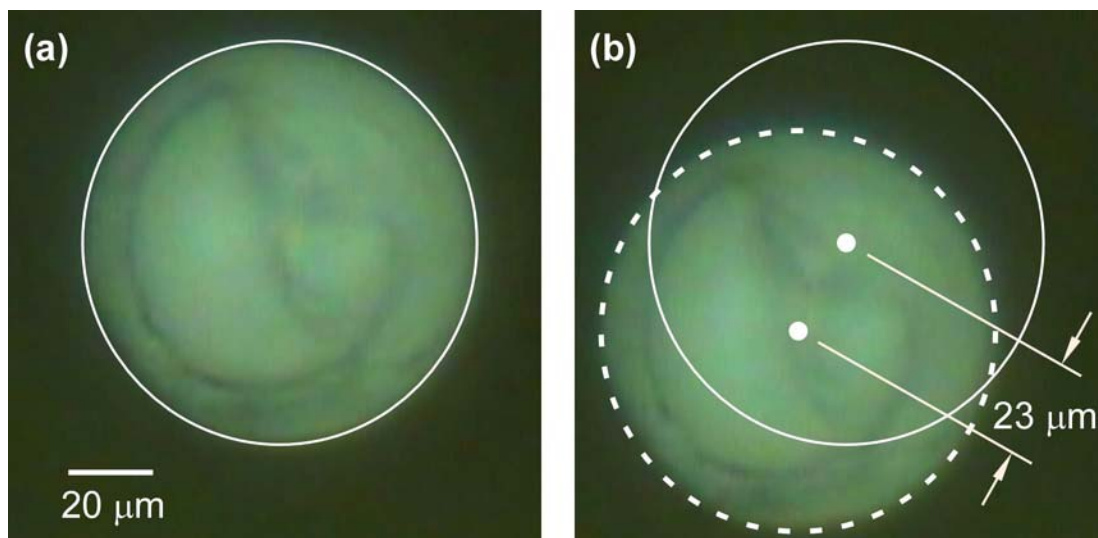


Fig. S2 Strongest displacement of the micropillar top. The strongest displacement was observed on the 42<sup>nd</sup> day. (a)The micropillar was not actuated. The continuous circle outlines the micropillar top. (b)The micropillar was actuated most strongly. The dotted circle outlines the micropillar top. The dots show the centers of gravity of the outlines. The displacement obtained by comparison of the still pictures was 23 μm which agreed with the result obtained by movie image analysis.

**Supplementary Movie S1.** DV tissue contracted spontaneously at around 0.2 Hz on the 10<sup>th</sup> day of culturing. In this case, the DV tissue could be divided into three sections which were contracting asynchronously at different frequencies.

**Supplementary Movie S2.** Actuation by a DV tissue of several micropillars on the 15<sup>th</sup> day. Eight micropillars were actuated in various directions. The micropillar enclosed by the dotted white circle was actuated most vigorously.

**Supplementary Movie S3.** The micropillar which was actuated most vigorously throughout the experiment. The micropillar which had been selected on the 2<sup>nd</sup> day was actuated most vigorously throughout the experiment. The image analysis results of this movie are shown in Fig. 4 for the 42<sup>nd</sup> day and the strongest displacement was 23  $\mu\text{m}$ .