

1 **Supplementary information**

2 Table of detailed comparison of existing conventional gelatin microneedles. pH vs. NaOH
3 titration curve of the UMG and MG-DMN for carboxylic group detection. FTIR spectra and
4 deconvoluted amide I region of stabilizing agents incorporated into unmodified and modified
5 gelatin microneedles. Optical image of the dissolution of MG-DMN after one month of storage.
6 SEM images of one-month stored UMG-DMN and MG-DMN. Mechanical properties (Force
7 vs displacement) of UMG-DMN with varying concentration of trehalose and its corresponding
8 bright field, fluorescence, and skin insertion study. Alamar assay of MG-DMN. *In-vitro*
9 bioactivity of PRP-MG-DMN stored at 4 °C for a month. Quantitative analysis of the vascular
10 area of the CAM assay and the wound closure rate. The standard curve of various HRP
11 concentrations was analysed using an HRP enzymatic assay.

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