

## Support Information

Microneedle patch realizes weight loss through photothermal induction  
of fat browning

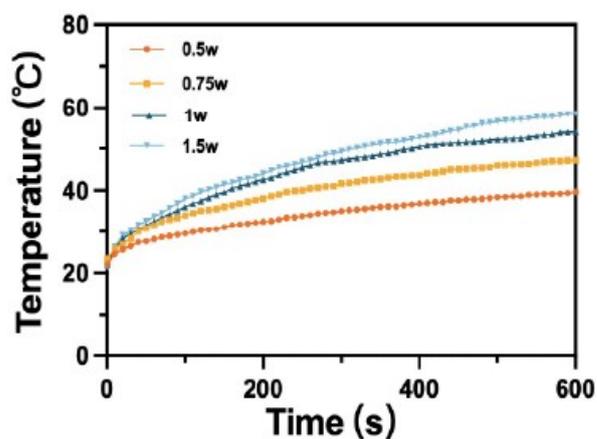


Figure S1 PDA-NPs photothermal profile with varying intensities(0.5, 0.75, 1 and 1.5  $W \cdot cm^{-2}$ ) of 808 nm laser irradiation.

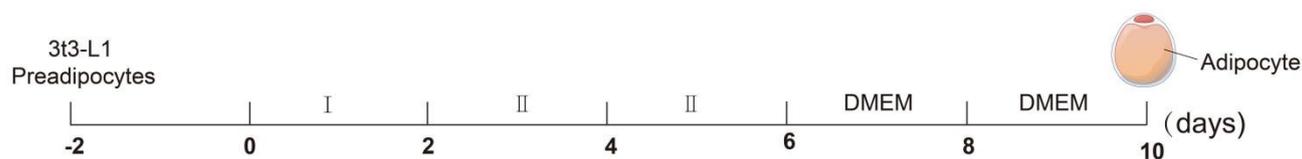


Figure S2 3T3-L1 cell differentiation process



Figure S3 Skin of mice after microneedle array action.

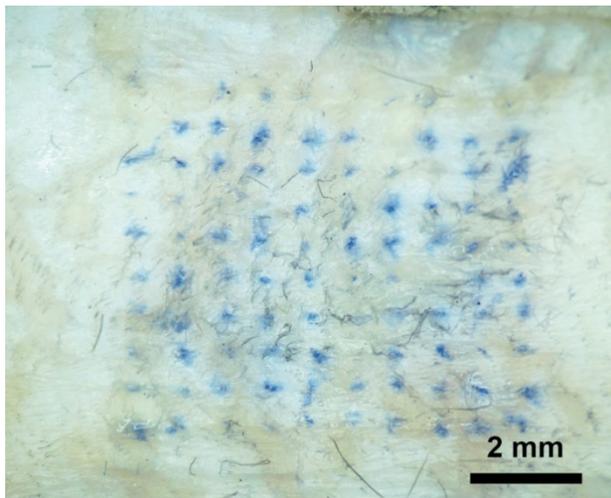


Figure S4 Mouse skin stained with trypan blue.

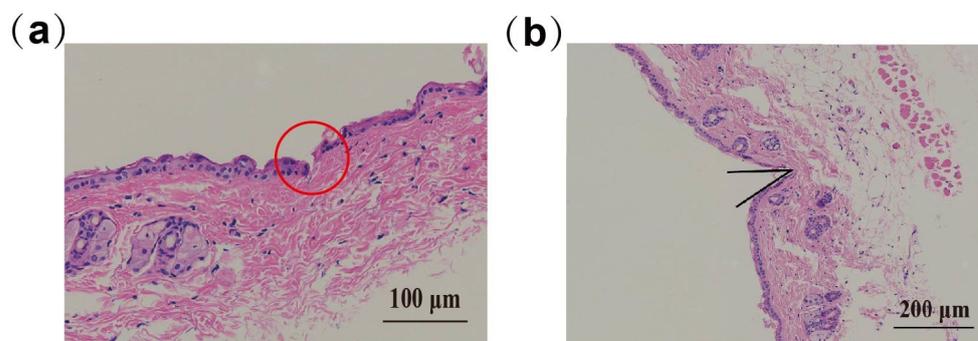


Figure S5 H&E staining of mouse skin. (a) The rupture of the skin stratum corneum under the action of MN. (b) MN invasion depth into the skin.

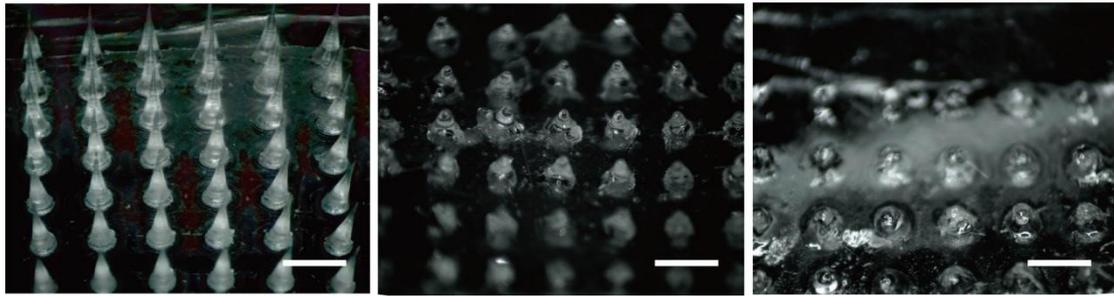


Figure S6 Microneedle tip dissolution process, scale bar = 1 mm

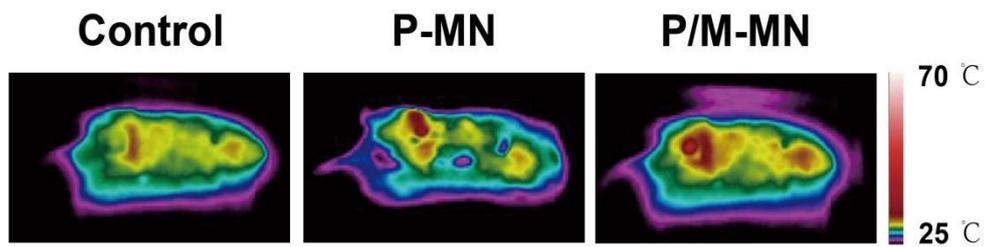


Figure S7 Thermographic images of mice in different treatment groups during treatment

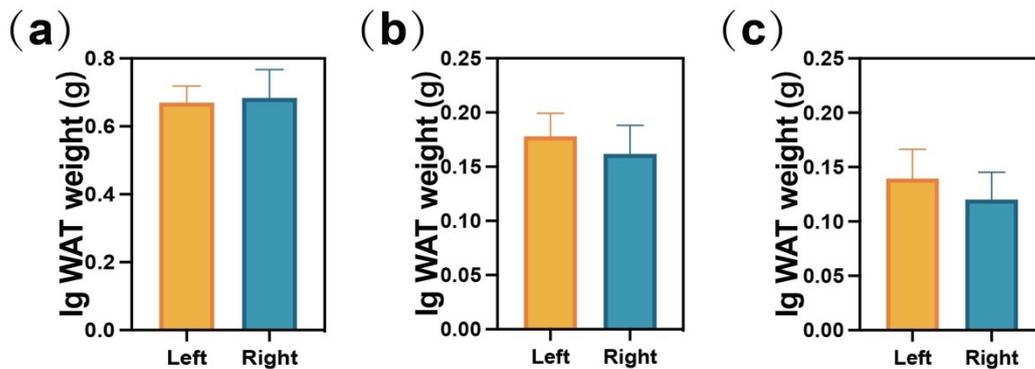


Figure S8 Comparison of weight between the treatment side (Right) and non treatment side (Left) of Ig WAT in mice, where (a) is the control group, (b) is the MN treatment group, and (c) is the MN synergistic mirabegron treatment group.