Electronic Supplementary Material (ESI) for Lab on a Chip.

A Flexible Electrode Array for Genetically Transfecting Different Layers of the Retina by Electroporation

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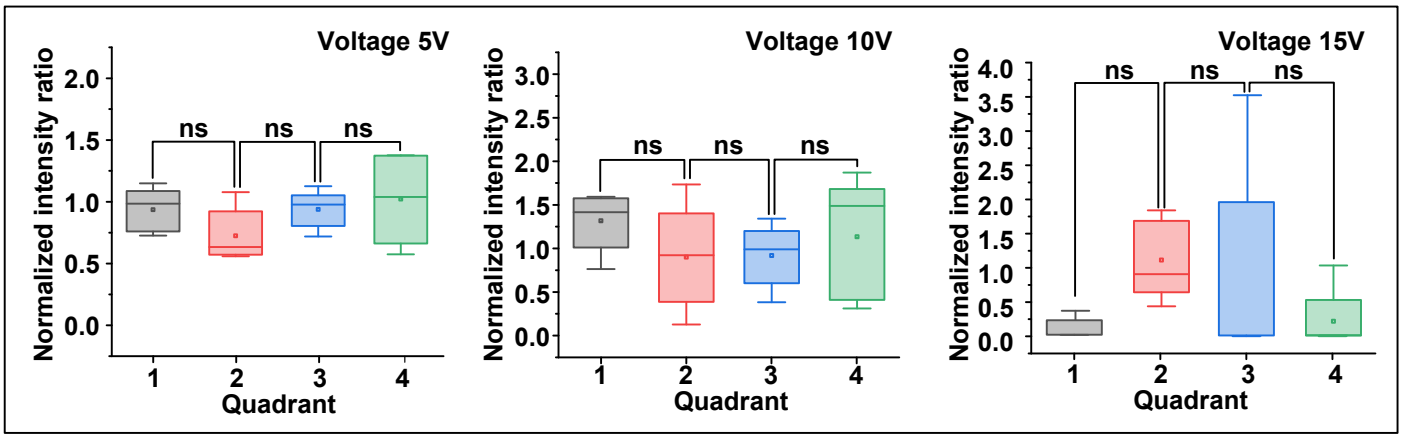
Supplementary Data S1

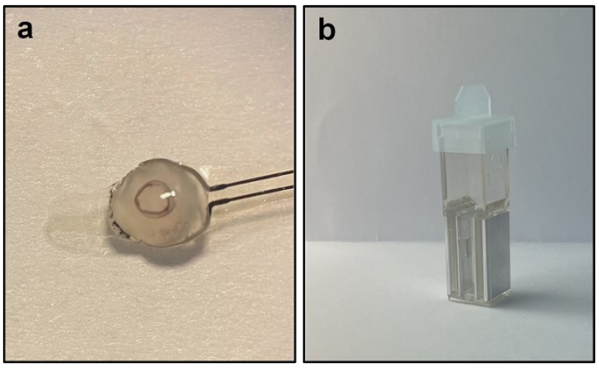
The uniformity of the electric field generated by the FERE.



24 hours after electroporation, the EGFP fluorescent images of the frozen sections were quantitatively analyzed. The normalized fluorescence intensity ratio was defined to describe the uniformity of the electric field generated by the flexible micro electrode array for retina electroporation (FERE). The results revealed that the normalized fluorescence intensity ratio in each quarter is not significantly different, demonstrating the uniformity of the electric field generated by the FERE is satisfactory. ns: no significance.

Supplementary Data S2

EX vivo electroporation of plasmid DNA by the FERE and the electroporation (EP) cuvette



(a) The photo of the retina/crystalline lens placed on the FERE.

Before the electroporation, the spherical retina/crystalline lens was transferred from the culture dish to the specially designed groove of the FERE. It was obvious that the FERE contacted well with the retina, which enabled the electric field to be applied evenly to the retinal tissue.

(b) The photo of the EP cuvette.

A 4 mm EP cuvette (Bio-rad Co. Ltd, America) was selected as the representative of distantly placed electrodes to differentiate the FERE and previous EP apparatuses. After the retina/crystalline lens was separated from the cornea, a sterile disposable pipette was used to transfer the dissected retina into an EP cuvette containing 200 μL of plasmid DNA. The retina/crystalline lens was held in place using forceps, ensuring that the lens side was facing the anode and the top surface of the retina was facing the node. 5 square wave pulses at 40 V each were applied by the pulse generator (ECM 830, BTX Co. Ltd, USA), with a pulse width of 50 ms and a pulse interval of 950 ms. After applying the voltage, the EP cuvette containing the retina/crystalline lens was placed in a cell culture incubator with a carbon dioxide concentration of 5% and a temperature of 37 °C. 20 minutes later, the retina/crystalline lens was transferred from the cuvette to a 12-well plate, using a sterile disposable pipette.