

## Supplementary Information

# Conformal Single Cell Hydrogel Coating with Electrically Induced Tip Streaming at an AC Cone

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### Keywords:

Hydrogels, Conformal coating, Single cell encapsulation, AC Spray.

### Conflict of interest:

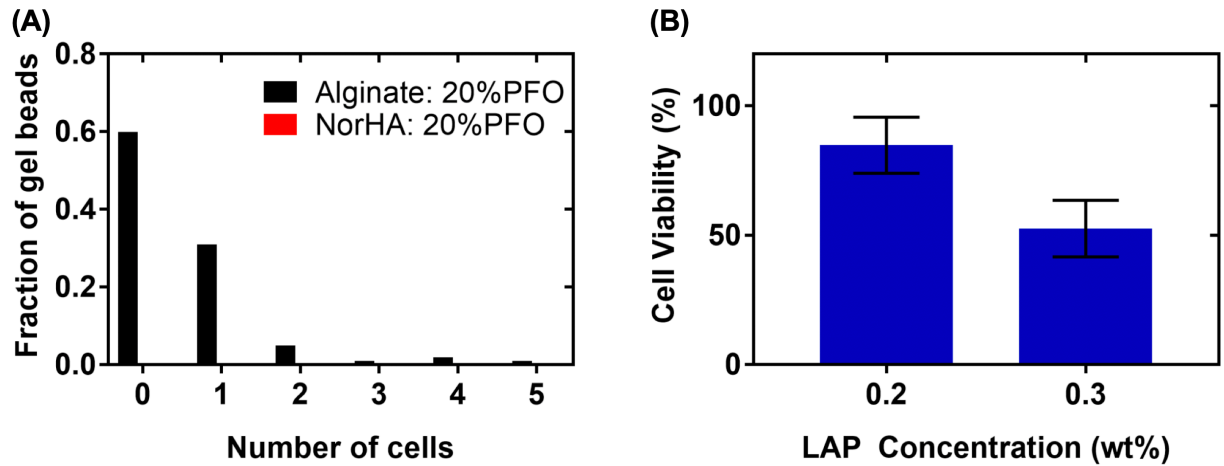
The authors have declared that no conflict interest exists

### Authorship notes:

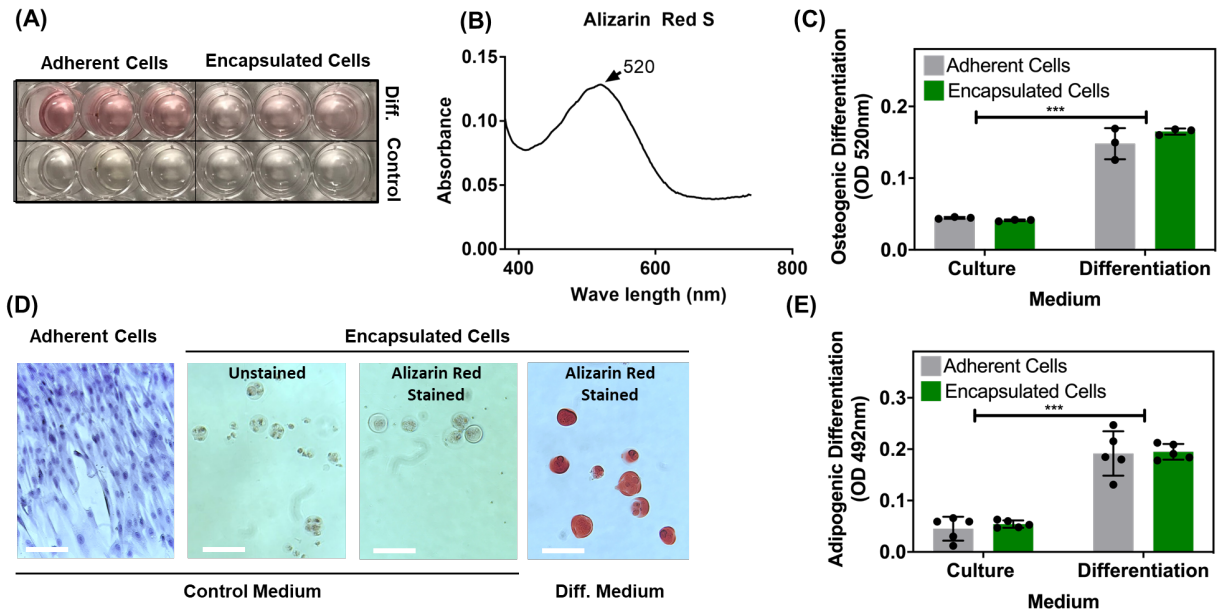
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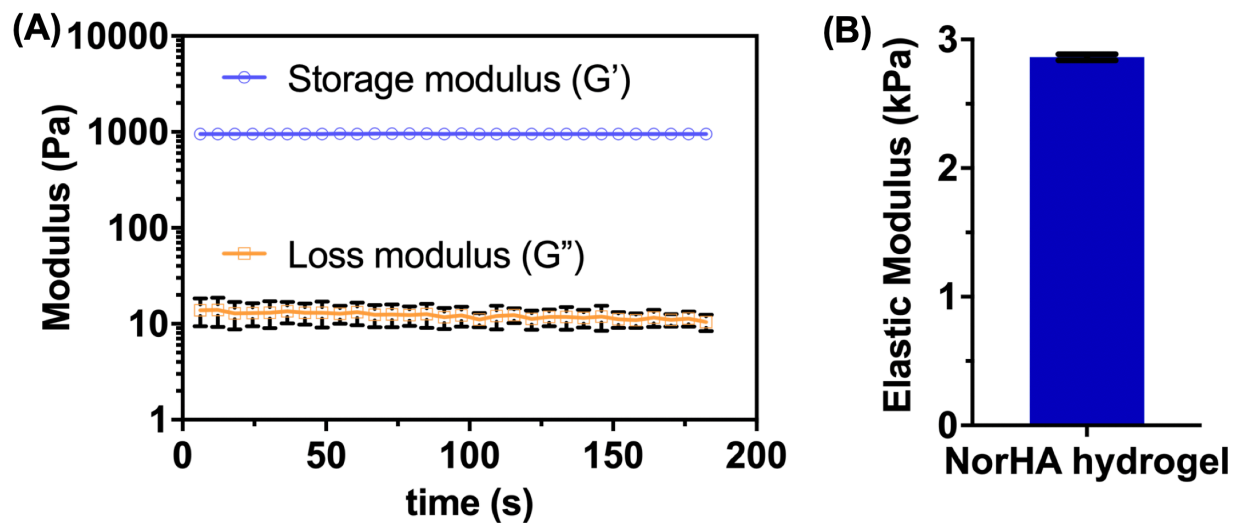
**Movie S1.** Tip streaming mode in AC electro spray at frequency higher than the charge relaxation time generates droplets containing single MDA-MB-231 cell. As a cell enters into the tip region, it blocks the streaming flow and gets ejected into the oil phase along with a small volume of the aqueous solution.



**Figure S1. (A)** Alginate gel particles extracted using 20% w/w PFO including both empty streaming droplets and encapsulated cells. For NorHA microgels, 20% w/w PFO proved ineffective to transfer any microgels from oil phase to liquid phase **(B)** Viability of cells immediately after cell encapsulation using 0.2% and 0.3% LAP concentration at the same UV exposure (10 mW/cm<sup>2</sup>, 365 nm, 5 seconds).



**Figure S2.** (A) Macroscopic appearance of osteogenic differentiated hMSCs cultured on well plates (Adherent Cells) and encapsulated within NorHA gel (Encapsulated Cells) after stained with Alizarin Red S Solution. To initiate differentiation, hMSCs were maintained in osteogenic differentiation medium for 7 days. Non-differentiated cells (Control) were maintained in control MSC Growth Medium. (B) Absorbance spectrum of Alizarin Red S solution as stained for calcium mineralization. Maximal absorbance was observed at 520nm. (C) Quantification of the extracted Alizarin Red S stain in each well was performed by measuring the absorbance at 520nm. \*\*P-value<0.005. (D) Representative images of adherent and encapsulated cells cultured in MSCs growth medium (Control Medium) and in osteogenic differentiation medium (Diff. Medium). Encapsulated cells were stained with Alizarin Red S Solution to visualize the calcium mineralization. Scale bars are 100µm. (E) Stain extracted in isopropanol and quantification of lipid content performed by measuring the absorbance of the resulting solution at 492nm. \*\*\*P-value<0.001.



**Figure S3.** (A) Storage modulus ( $G'$ ) and loss modulus ( $G''$ ) of NorHA hydrogels were measured at a constant 1 Hz frequency and 0.64% strain. (B) Elastic modulus of NorHA hydrogels was calculated following  $E=2G'(1+\nu)$ , assuming that the Poisson ratio's ( $\nu$ ) is 0.5 for polymeric hydrogels. Data represents mean  $\pm$  S.D. for three samples.