Supporting Information

The effect of RGD peptide on 2D and miniaturized 3D culture of HEPM cells, MSCs, and ADSCs with alginate hydrogel

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Figure S1. A schematic illustration of the microfluidic device used for producing the cell-laden core-shell microcapsules with the inset showing the design of the flow-focusing junction. After the core solution containing cells, shell solution containing sodium alginate, and mineral oil emulsified with aqueous solution of calcium chloride flow into the flow-focusing junction, the oil emulsion shears the core and shell solutions to generate core-shell structured droplets at the flow-focusing junction. The alginate solution in the droplets is cross-linked by Ca^{2+} in the oil emulsion into hydrogel at and after the flow-focusing junction. The extraction channel at the end of the microfluidic device helps to extract/transfer the microcapsules from the oil to aqueous solution of carboxymethyl cellulose for efficient collection of the cell-laden core-shell microcapsules. The oil channel was 400 μm x 400 μm, the shell channel was 300 μm x 300 μm, and the core channel was 200 μm x 200 μm.[44]

Figure S2. Schematic designs showing how mechanical properties including storage (G′) and loss (G′′) moduli were measured using rheometry. (A) Alginate solution was pipetted onto a circular PDMS mold, then cross-linked with $CaCl_2$. The gel disk was then transferred to the parallel-plate platform of the rheometer. (B) The core solution, which was 2% carboxymethyl cellulose, was pipetted directly onto the cone-plate platform for measurements.

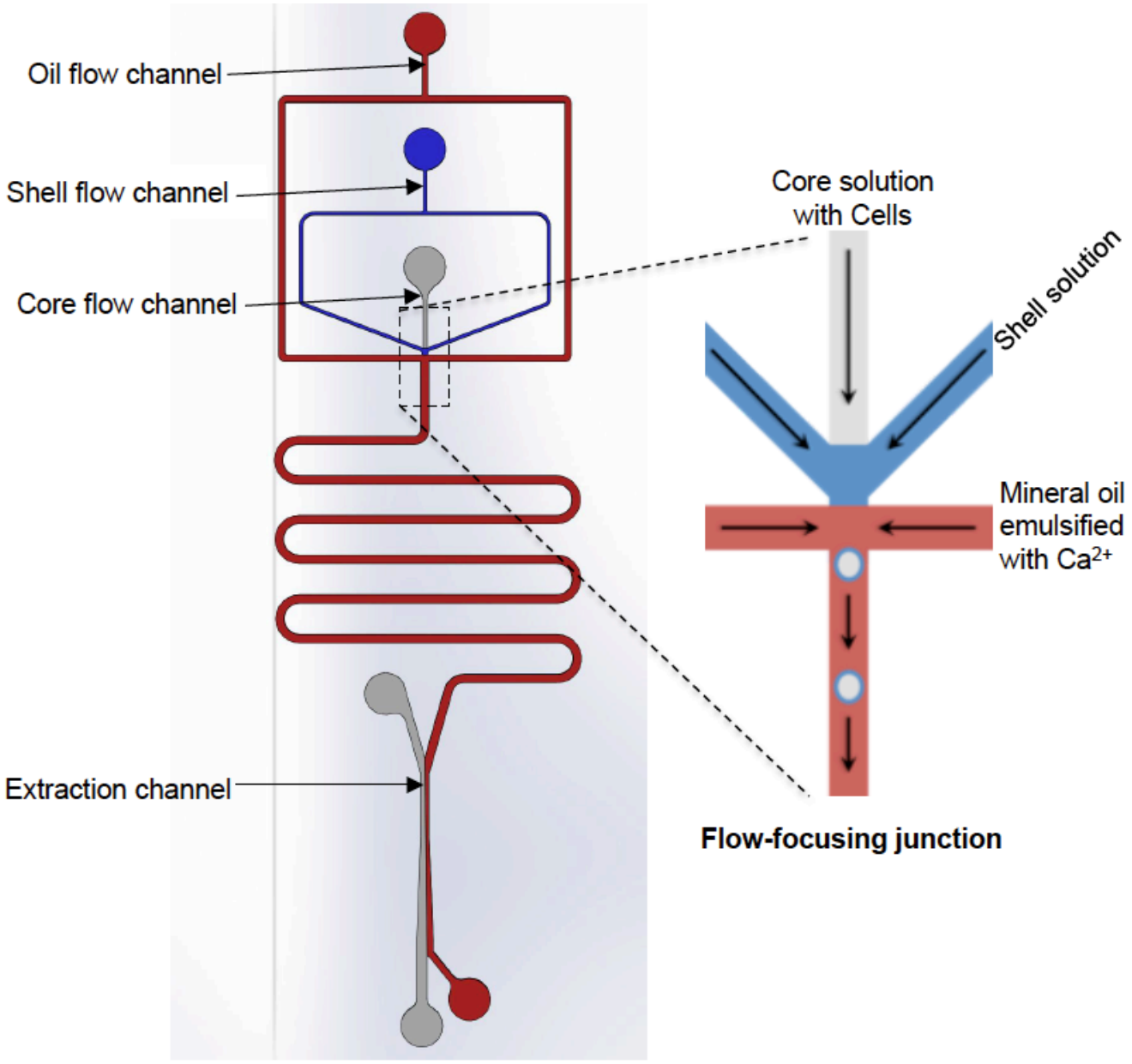
Figure S3. Human embryonic palatal mesenchyme (HEPM) cells, mesenchymal stem cells (MSCs), and adipose derived stem cells (ADSCs) cultured on flat hydrogels of 0.5% alginate-RGD, 2% alginate-RGD, and 2% unmodified alginate on days 0 and 4. The initial cell density was $5x10^4$ cells per well. Scale bar is 100 μm.

Figure S4. Typical images showing the morphology of HEPM cells cultured in the core of microcapsules with an alginate or alginate-RGD shell on days 0 and 4. Three different cores were studied: liquid core (0% alginate-RGD), hydrogel core of 0.5% alginate-RGD, and hydrogel core of 2% alginate-RGD. Scale bar is 100 μm.

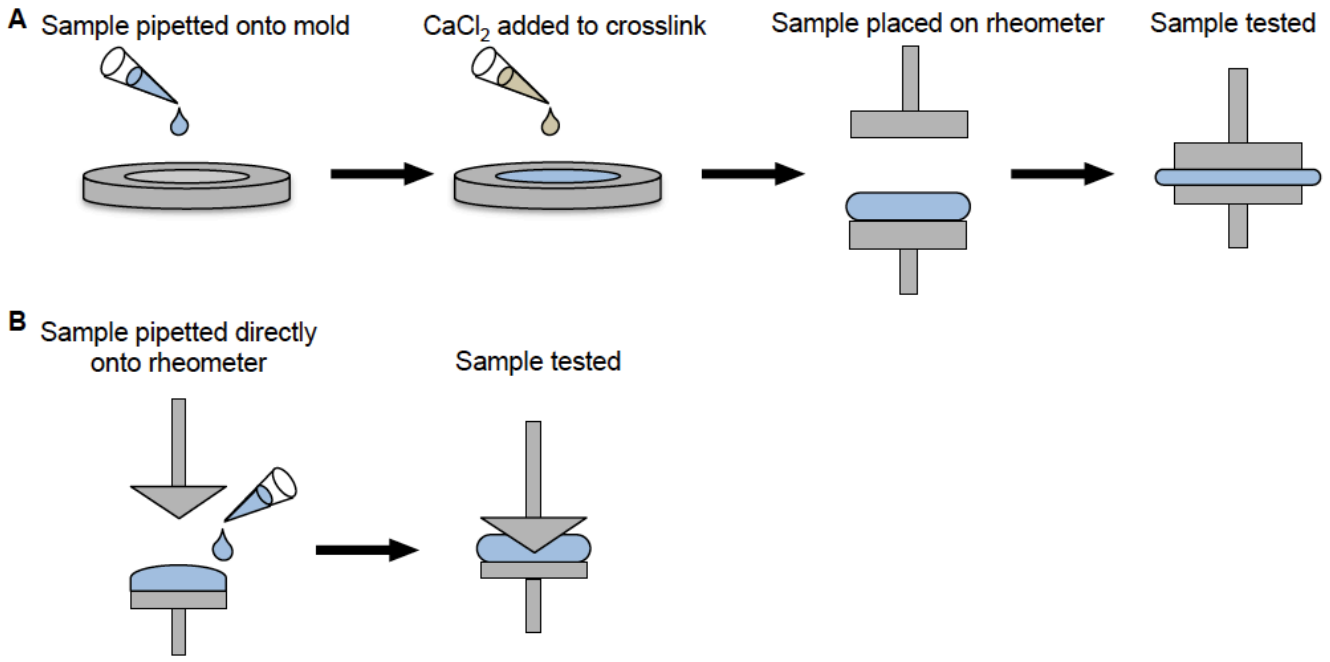
Figure S5. Typical images showing the morphology of MSCs cultured in the core of microcapsules with an alginate or alginate-RGD shell on days 0 and 4. Three different cores were studied: liquid core (0% alginate-RGD), hydrogel core of 0.5% alginate-RGD, and hydrogel core of 2% alginate-RGD. Scale bar is 100 μm.

Figure S6. Typical images showing the morphology of ADSCs cultured in the core of microcapsules with an alginate or alginate-RGD shell on days 0 and 4. Three different cores were studied: liquid core (0% alginate-RGD), hydrogel core of 0.5% alginate-RGD, and hydrogel core of 2% alginate-RGD. Scale bar is 100 μm.

Figure S7. Human embryonic palatal mesenchyme (HEPM) cells, mesenchymal stem cells (MSCs), and adipose derived stem cells (ADSCs) cultured on flat hydrogels of 0.5% alginate-RGD, 2% alginate-RGD, and 2% unmodified alginate on days 6 with live/dead staining showing viability of all cells whether spread on the alginate-RGD hydrogels or aggregated on the alginate hydrogels. Scale bar is 100 μm.



Dumbleton_Figure S1



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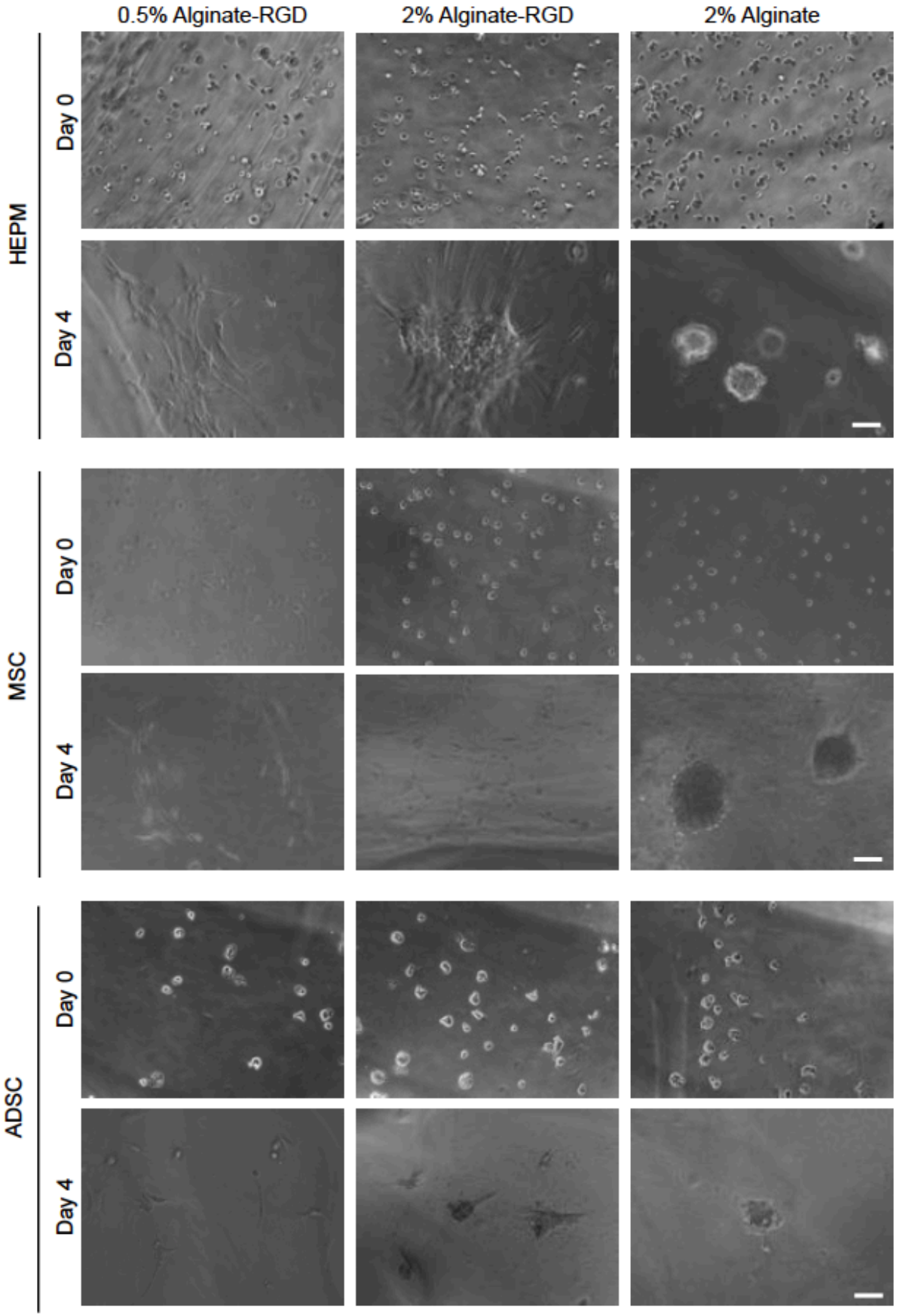

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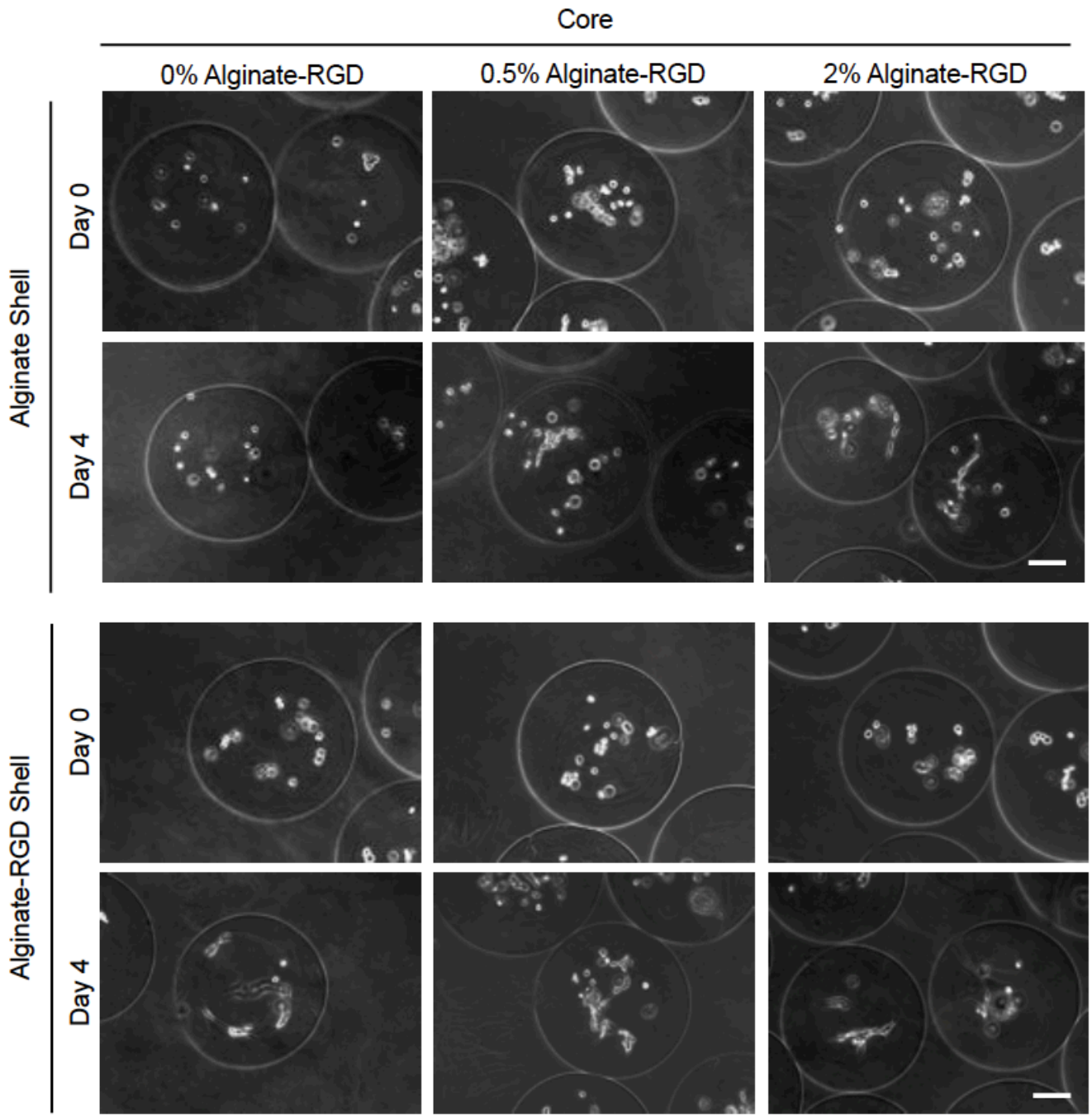

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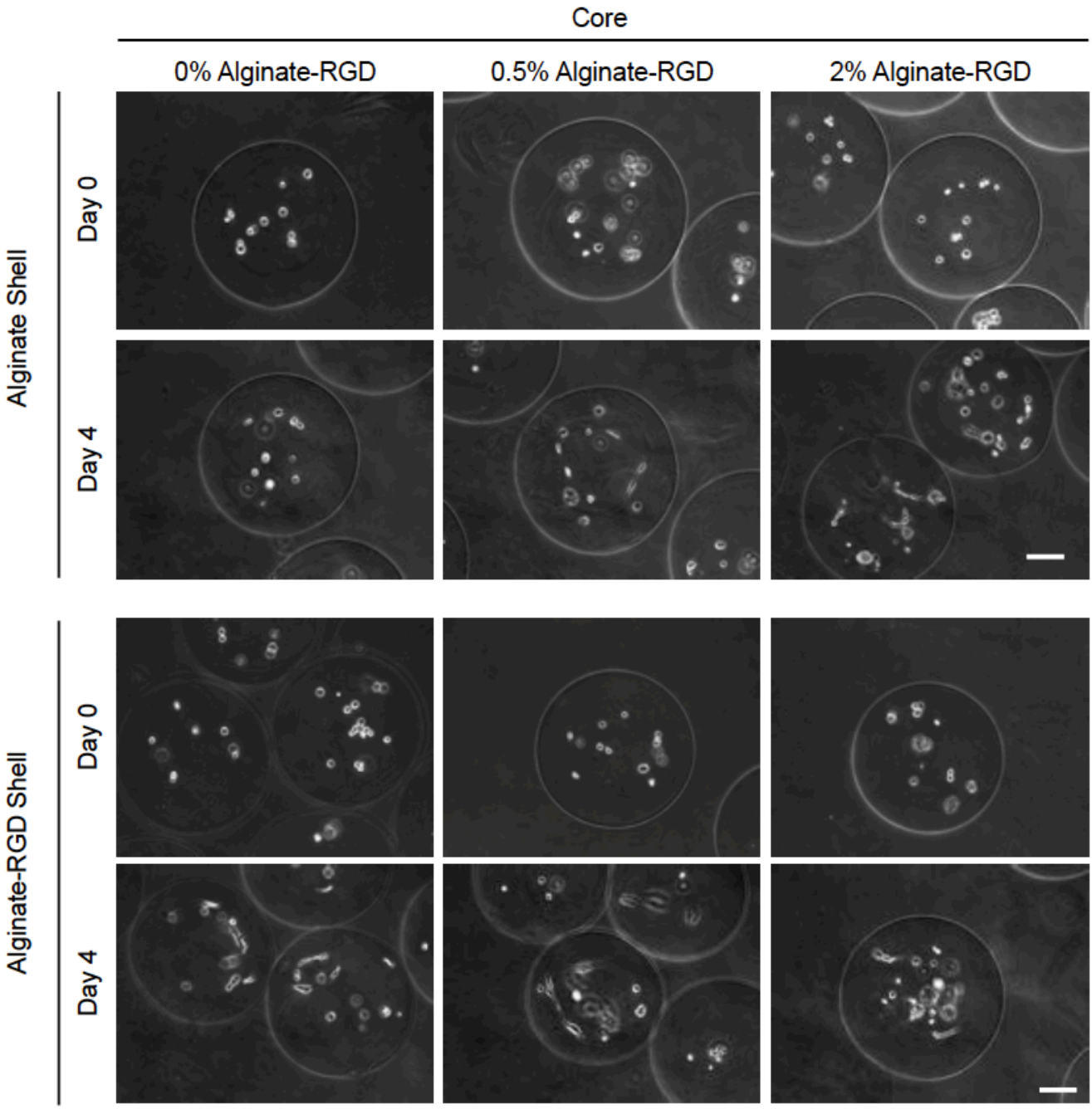

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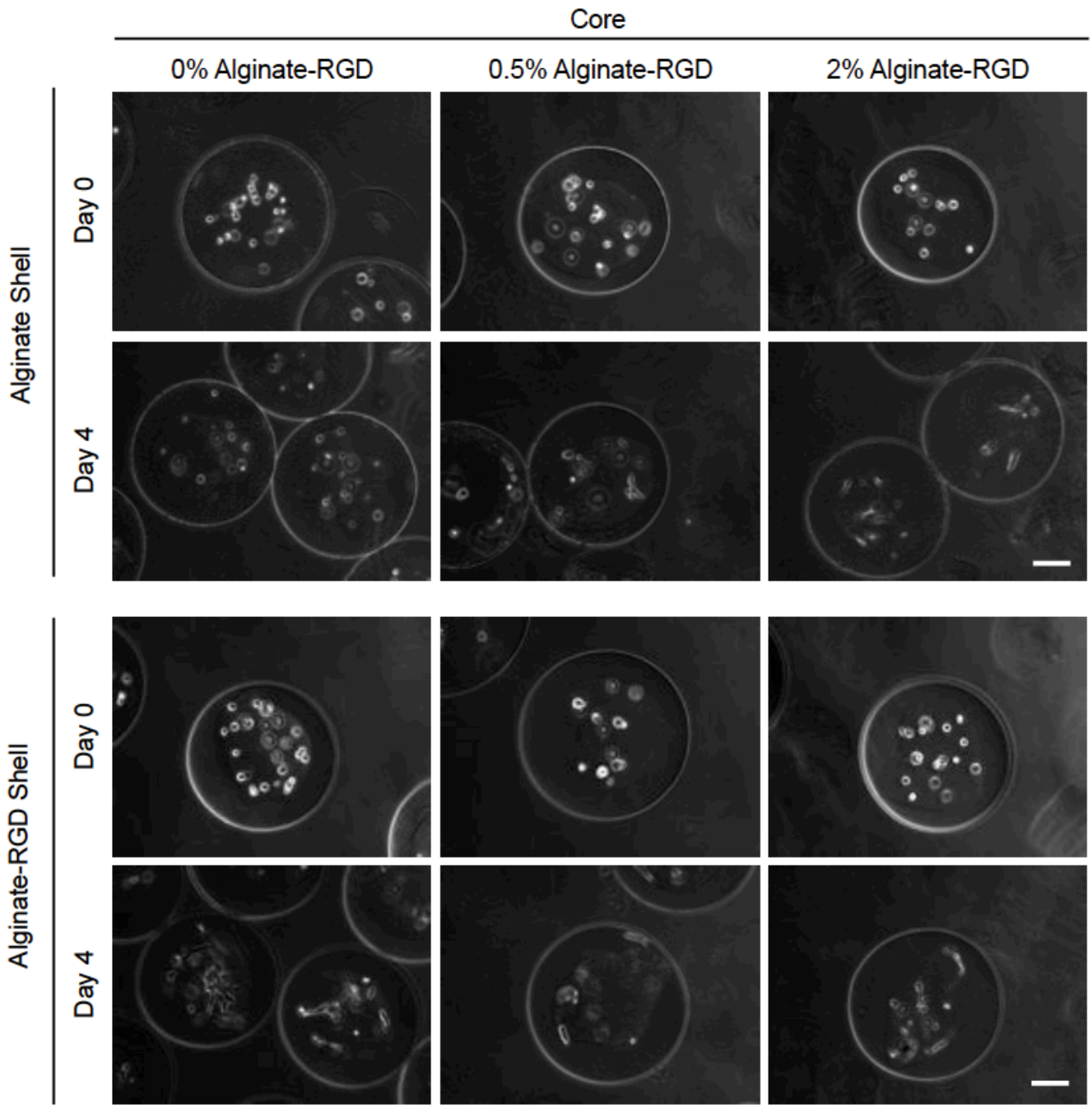
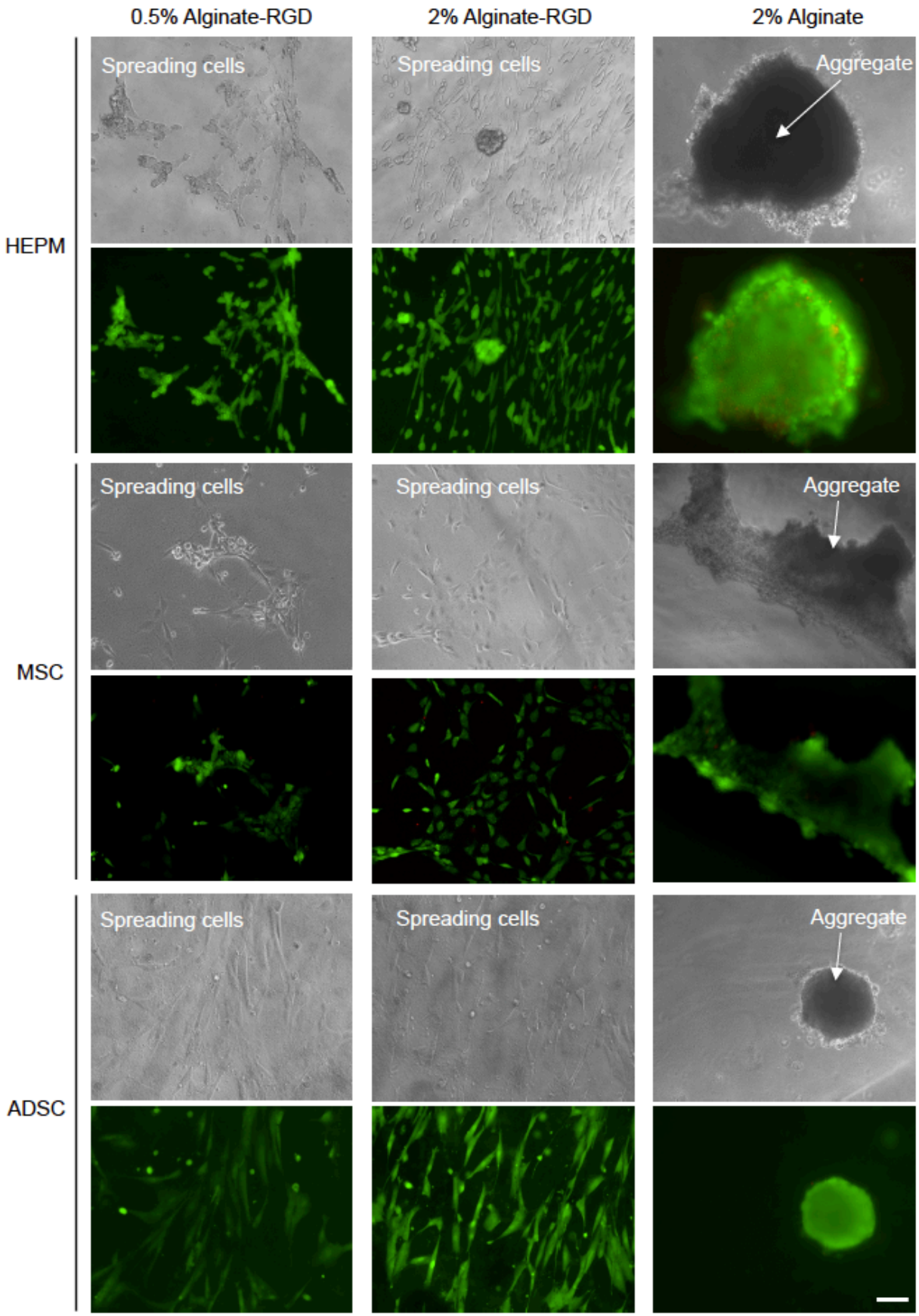


Dumbleton_Figure S6



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