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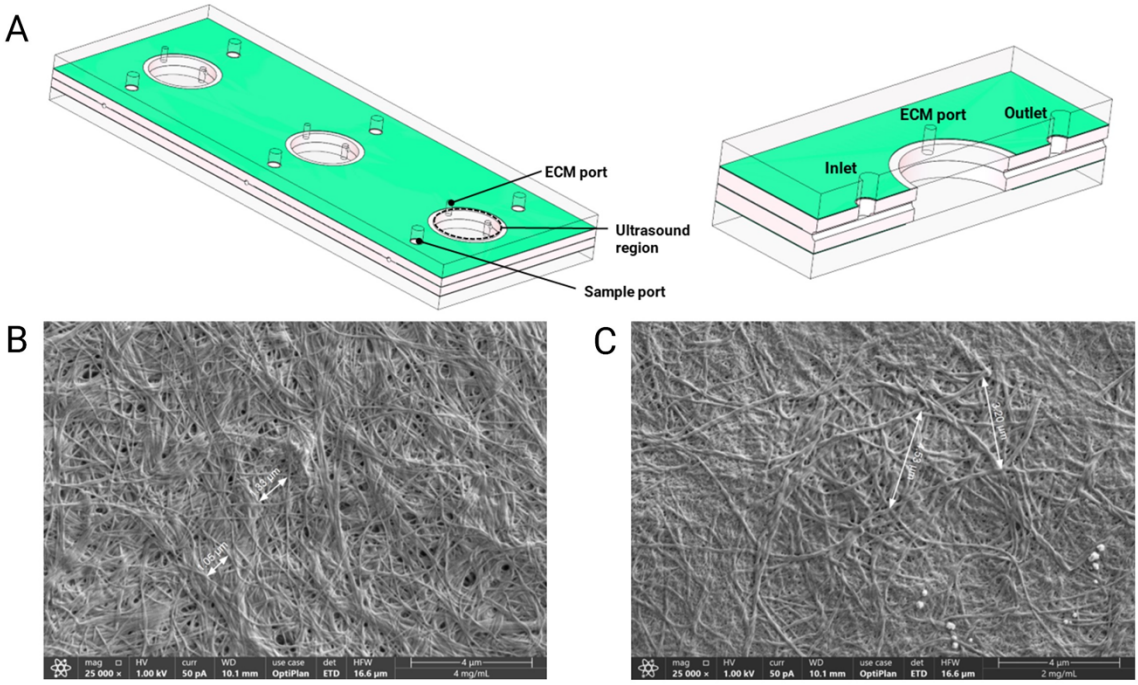
Supplemental Figures



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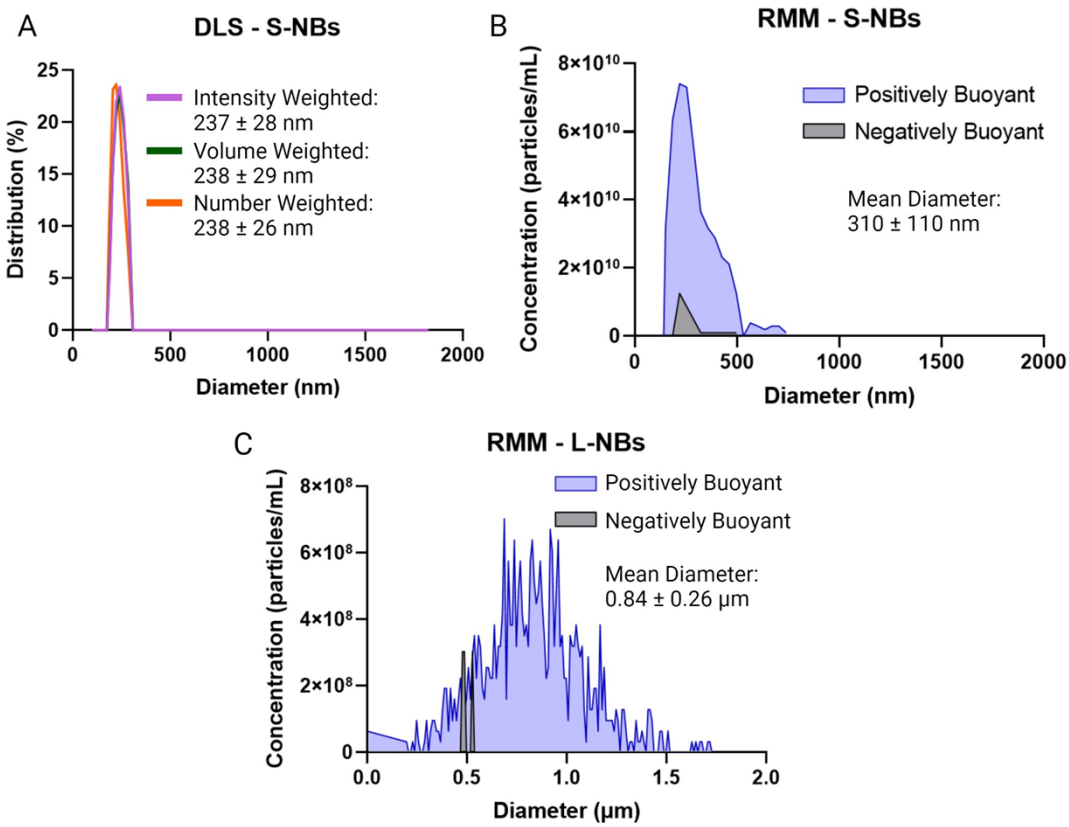
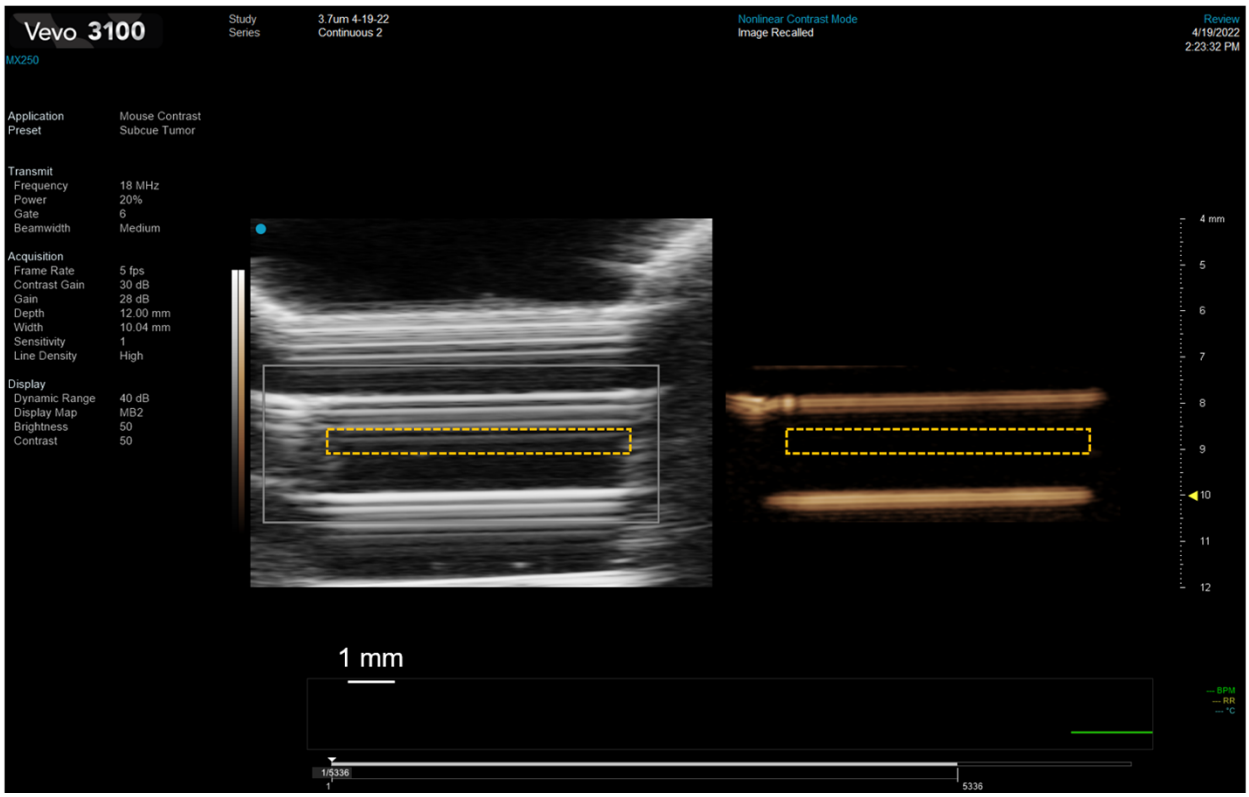
Mean pore size (µm)		
Density	Measured	Reported
2 mg/mL	3.8 ± 1.0	3.7 ± 1.5
4 mg/mL	1.0 ± 0.3	1.3 ± 0.7

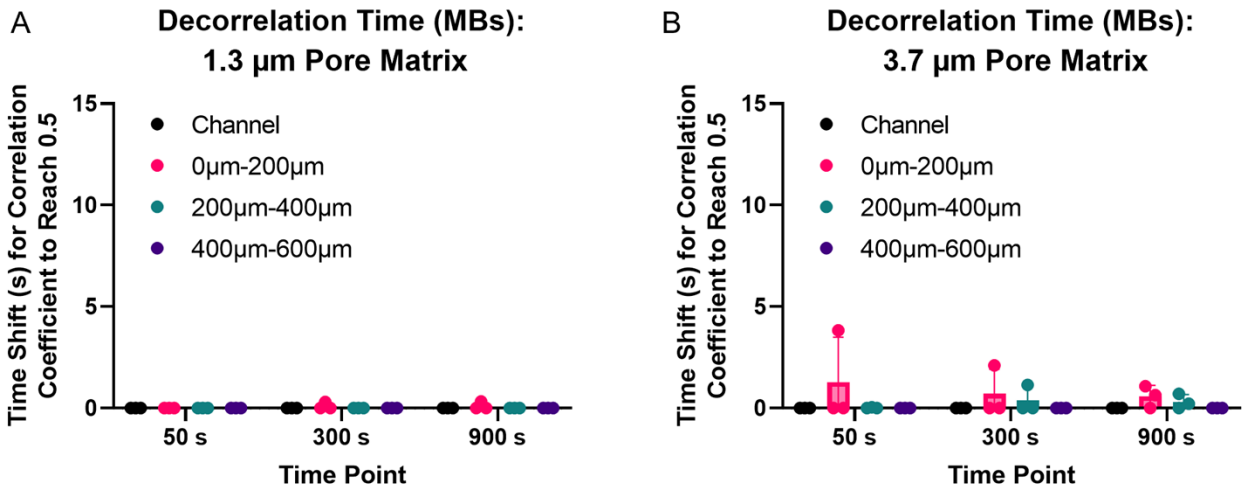
Supplemental Fig. 1. **Microfluidic chip setup.** (A) Detailed schematics of the microfluidic chip. The left schematic includes three inlet, outlet, and matrix experimental chambers. The sample port represents where the sample inlet and outlets are; the ECM port represents where the matrix is injected before solidification; and the ultrasound region is the section of the chip where ultrasound is applied. It is important to note that the ultrasound region is not obstructed by PMMA or DSA, only a PDMS lid. (B) SEM of 4 mg/mL and (C) 2 mg/mL collagen concentration ECM. (D) Table of collagen I pore sizes compared to literature values reported by Chen et al. (Chen et al., 2020). Pore sizes were estimated by measuring the distance between top layer fibrils.



Supplemental Fig. 2. Representative DLS and RMM of S-NBs and L-NBs. (A) DLS results for S-NBs with intensity, volume, and number weighted averages. (B) RMM results for S-NBs with the mean diameter of positively buoyant bubbles. (C) RMM results for L-NBs with the mean diameter of positively buoyant bubbles.



Supplemental Fig. 3. Example image of matrix seen on ultrasound before nanobubbles enter the channel. The yellow box represents the ROI of the lumen.



Supplemental Fig. 4. Autocorrelation analysis with microbubbles (MBs). (a) Decorrelation time of MBs in 1.3 µm and (b) 3.7 µm pore size collagen matrices.