

Supplementary Information

Microchip-based 3D-Cell Culture Using Polymer Nanofibers Generated by Solution Blow Spinning

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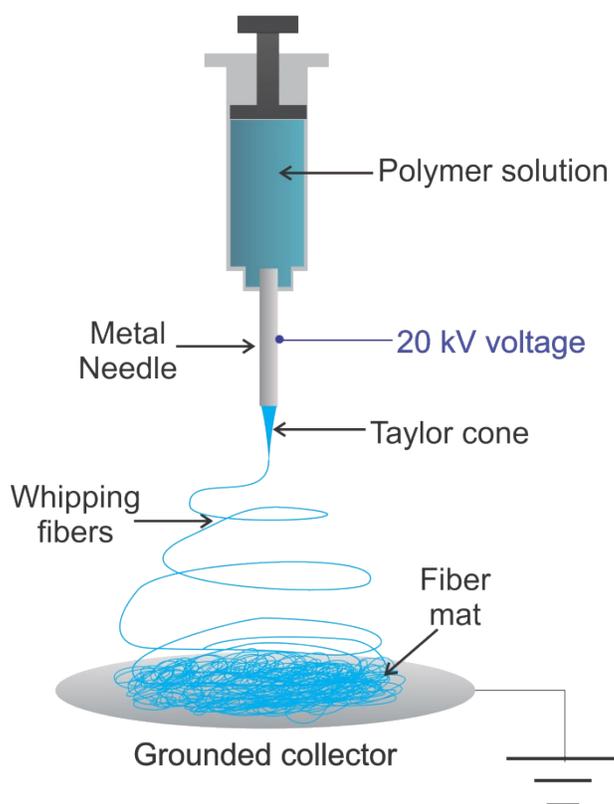


Figure S1. The process of electrospinning. A polymer solution is pumped through a metal needle. When the polymer solution is charged by a high voltage supply, a Taylor cone is formed at the tip of the metal needle, which can further burst into fine fibers. The fibers whip when they travel to the grounded collector, leaving a random mat of fibers on the collector.

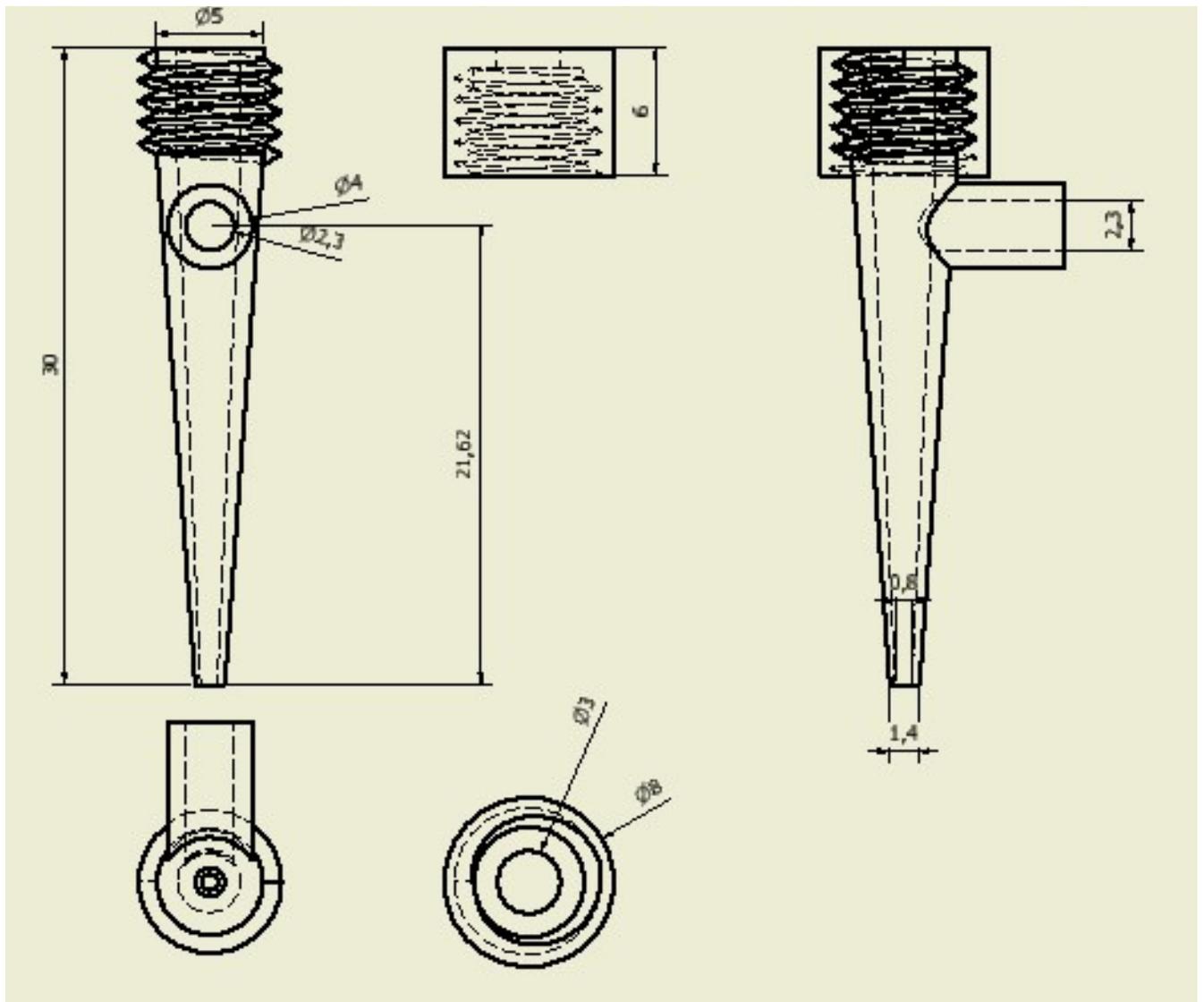


Figure S2. The assemble drafting of the 3D-printed gas sheath device. Units are in mm.

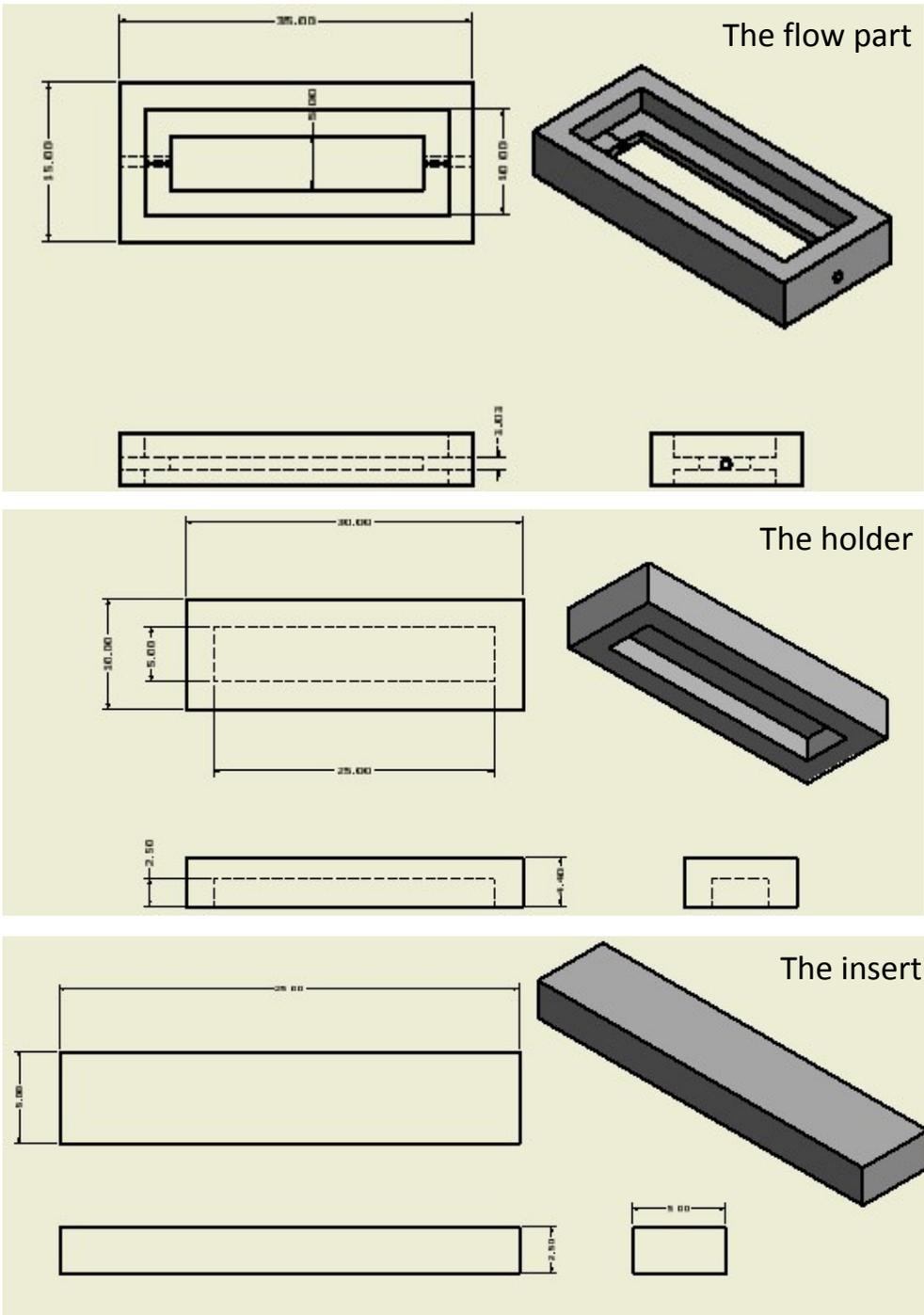


Figure S3. The assemble drafting of the flow part, holder and insert of the fluidic device. Units are in mm.

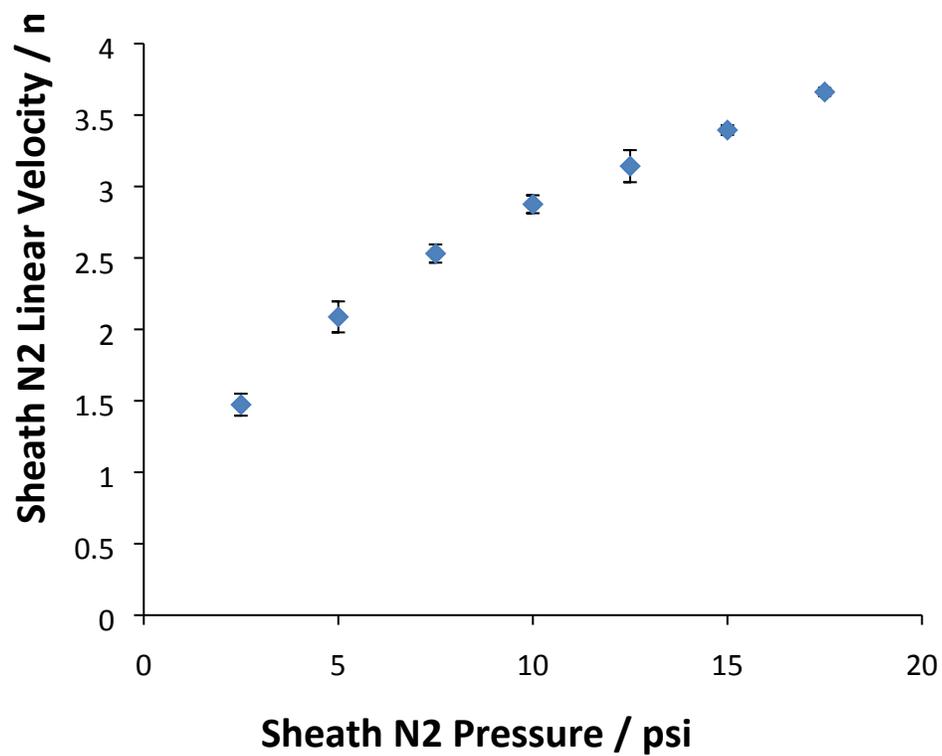


Figure S4. The correlation between gas (N₂) sheath pressure and gas (N₂) sheath linear velocity. (N=4, error= standard deviation)

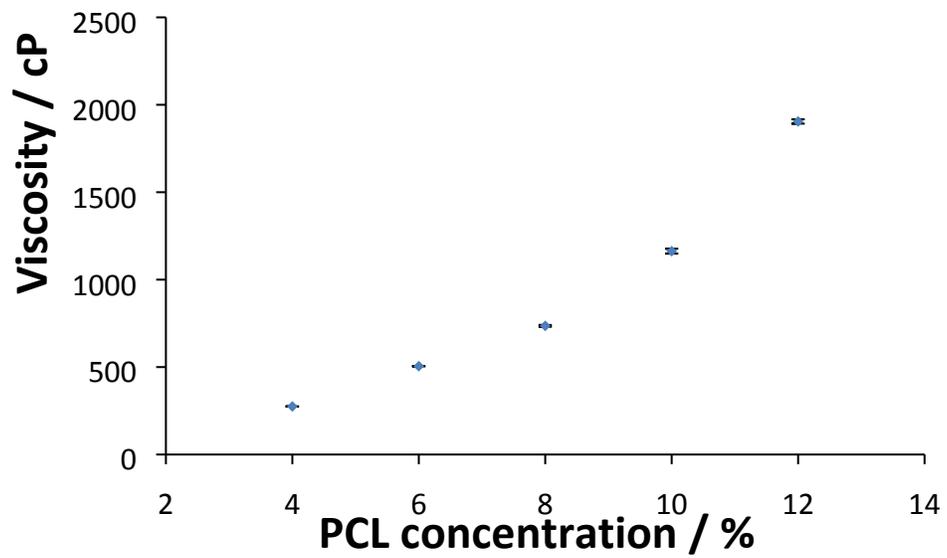


Figure S5. The correlation between PCL concentration and viscosity. (N=3, error = standard deviation)

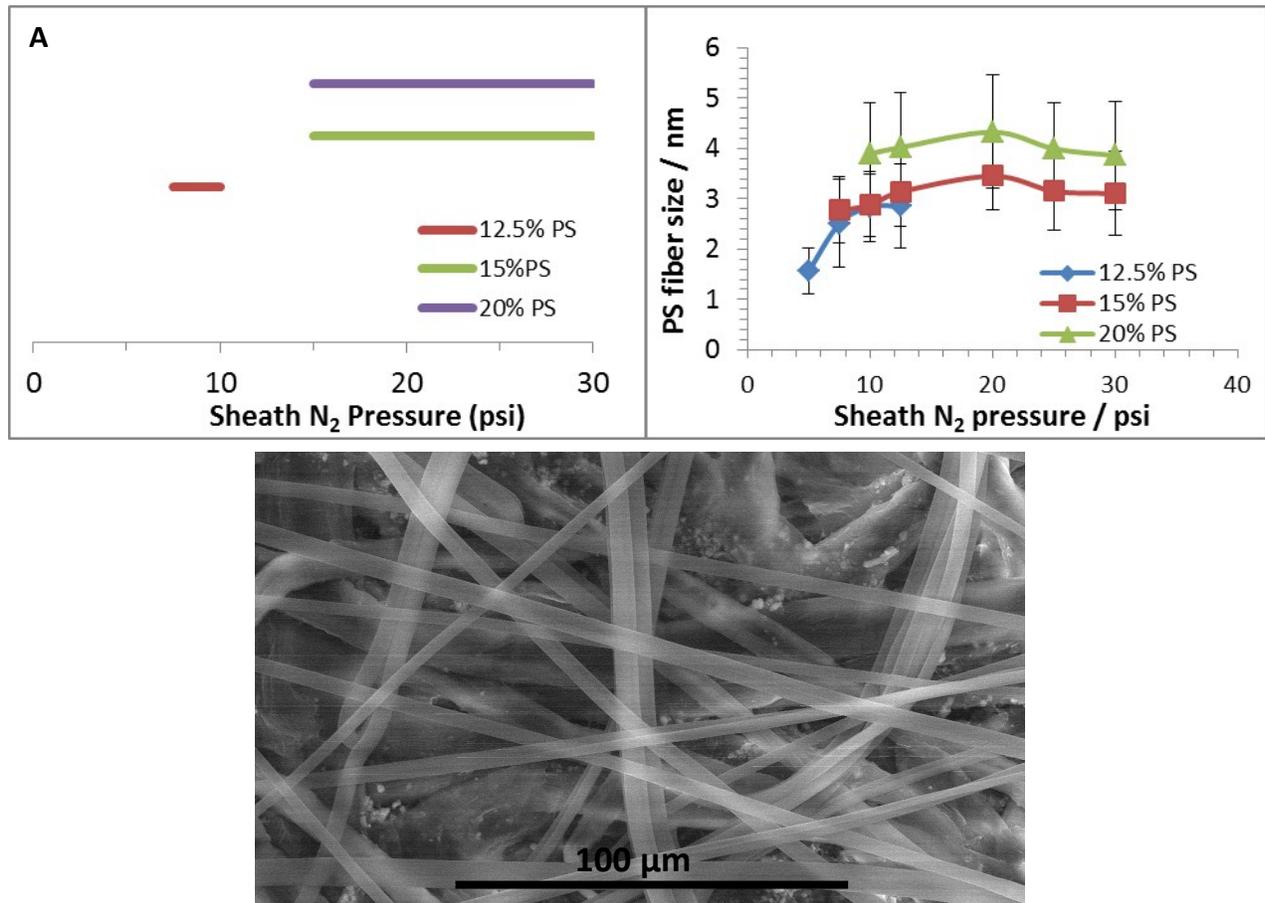


Figure S6. (A) optimal sheath pressure ranges for varying polystyrene (PS) solutions. The more concentrated polystyrene solutions form fibers in a larger range of sheath N₂ pressures. (B), fiber size versus sheath pressure of polystyrene (PS) solutions. (C), an SEM image of the solution blow spun fibers from 20% PS with 15 psi sheath N₂.

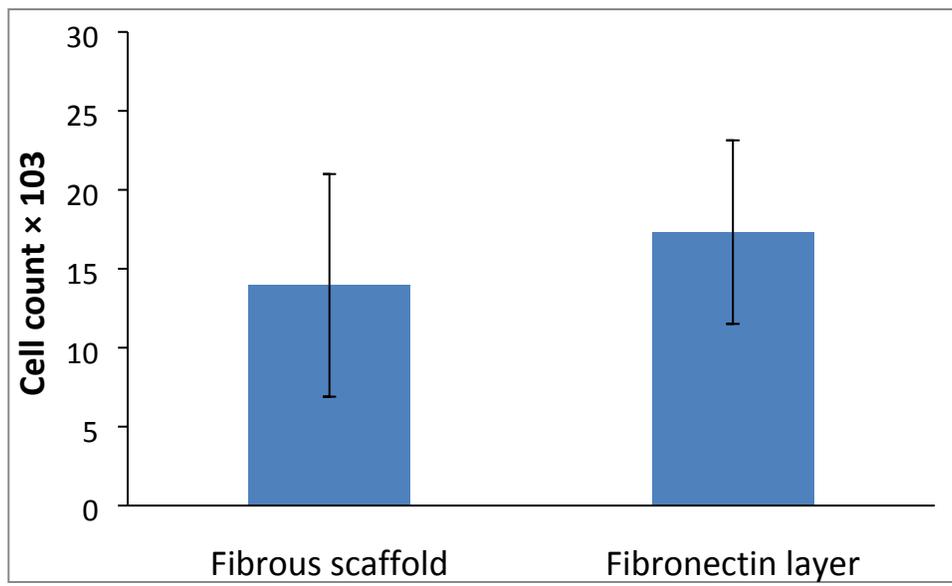


Figure S7. The Hoescht assay was used to quantitate the cells. The insert with cells was removed from the flow device, placed in a 1.7 mL centrifuge tube, and 1 mL of DI water was added. The insert was thoroughly vortexed for approximately 10 minutes to ensure cell lysis. Using a plate reader and fluorescence methods, a cell count was determined. Fibers had an average of $(14 \pm 7) \times 10^3$ cells (while fibronectin-coated inserts had $(17 \pm 6) \times 10^3$ cells; a t-test was performed to indicate there was not a significant difference between the cell counts on each substrate ($n=7$, average \pm stdev).



Figure S8. Wind-spun fiber deposition in a 6-well plate for 3D cell culture. PCL (12%) fibers were coated in wells B1 and A2 in the plate at 10 psi sheath N₂ pressure.

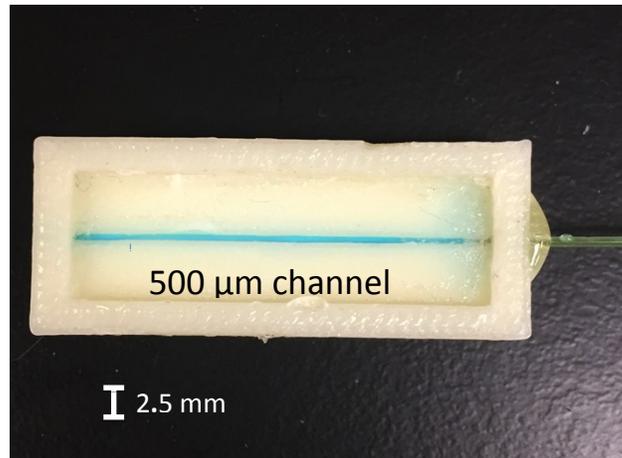


Figure S9. A similar fluidic device as in Figure 6, but with a smaller channel size of 500 μm by 500 μm (cross section). A blue dye solution was injected through to indicate the channel. The top side of the channel was sealed by a piece of transparency film using superglue so that the flow can be clearly seen by naked eyes.