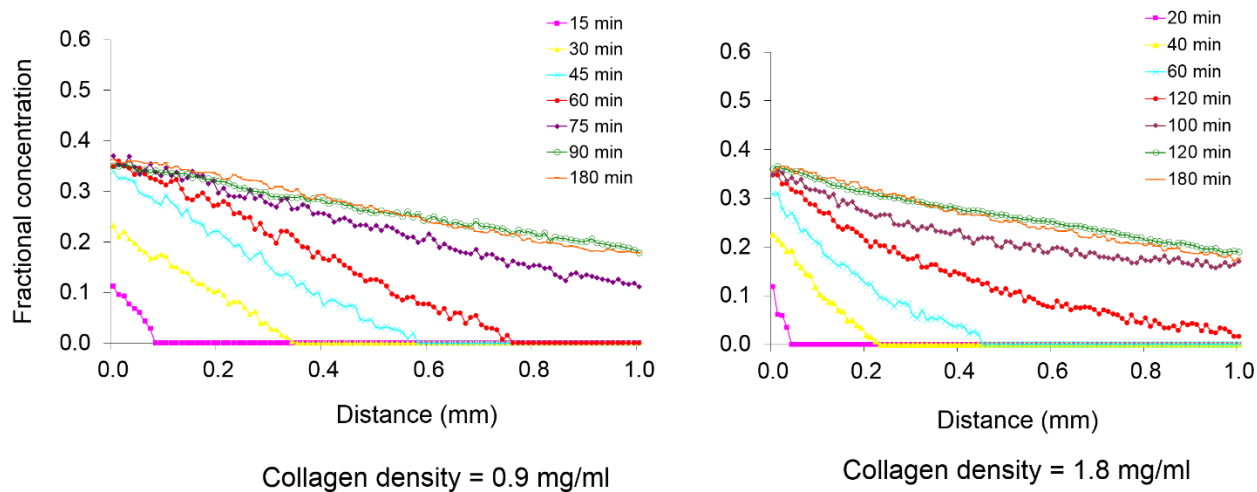
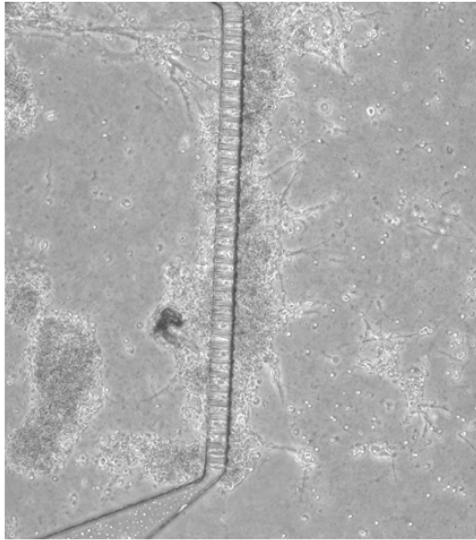


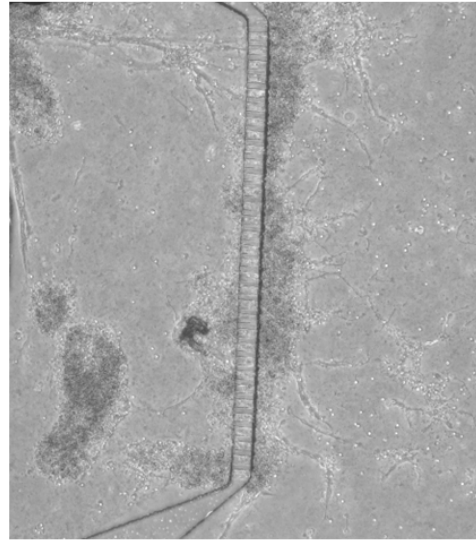
Supplementary Fig. S1: Concentration gradient of fluorescent particles with the same molecular weight as NGF within the cell culture chamber of the microfluidic device after 3 hrs of NGF injection into the source channel. The fluorescent intensity within the cell culture reservoir is very low after this time showing low rate of diffusion of particles into this environment. Particle concentration increases within the cell culture reservoir by time; so, a varying gradient of NGF also exists between the cell culture chamber and the cell culture reservoir.



Supplementary Fig. S2: Development of concentration gradient profiles over time. Fractional concentration gradient profile of FITC-labeled dextran (MW = 10 kDa, similar to NGF) in the microfluidic device. For lower density gels, the gradient more quickly stabilizes to form an equilibrium profile (~90 min for 0.9 mg/ml collagen compared to 120 min for 1.8 mg/ml); however, at equilibrium, the concentration profile within all gels is identical.

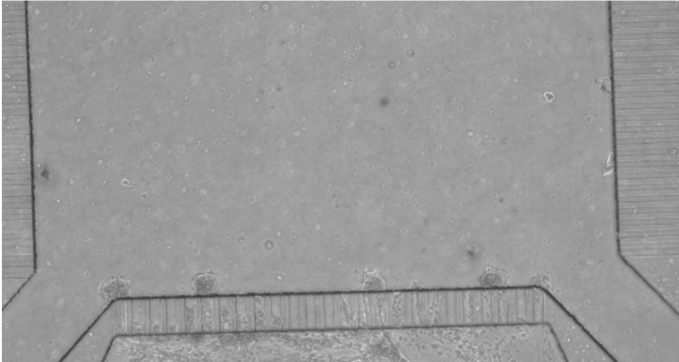


24 hrs after injection

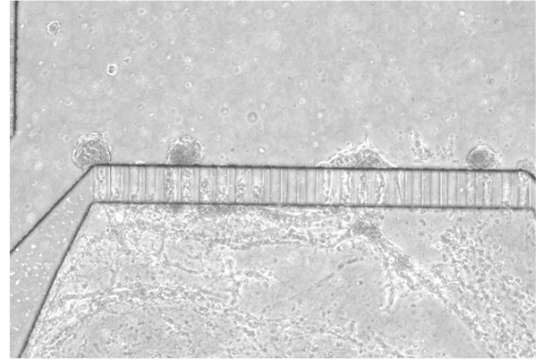


48 hrs after injection

Supplementary Fig. S3: NPC migration within collagen matrix of 0.9 mg/ml density and in response to uniform NGF concentration of 15 ng/ml. Some cells could initially migrate into the cell culture chamber, but stopped migration after 24 hrs.

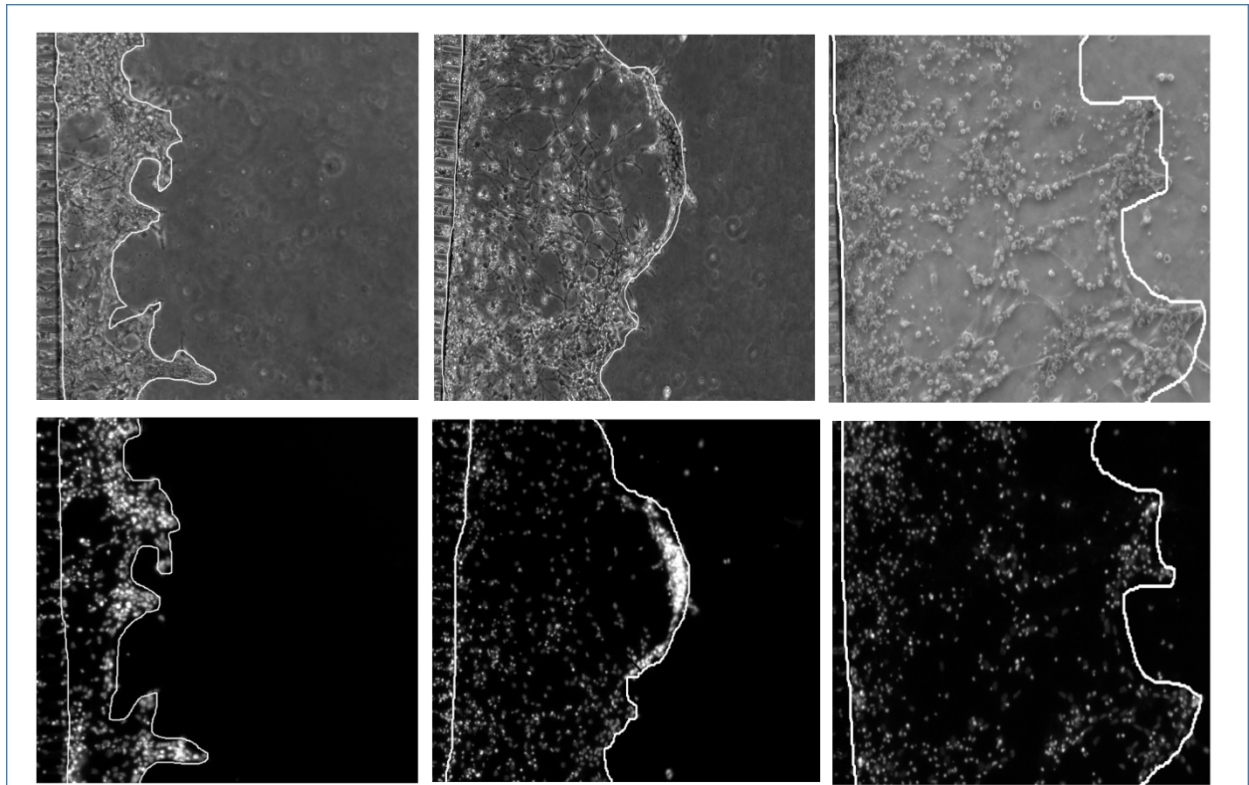


24 hrs after injection



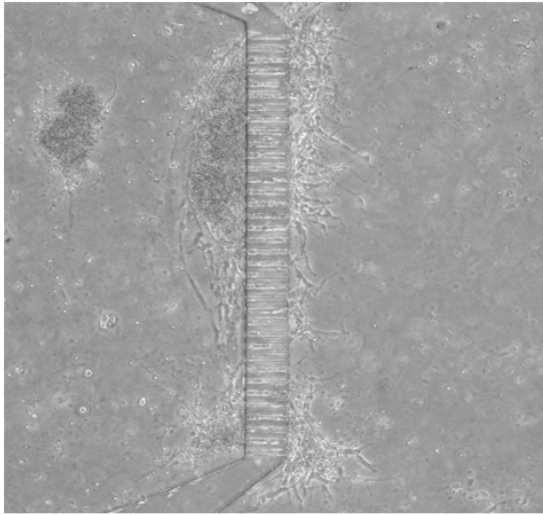
48 hrs after injection

Supplementary Fig. S4: NPC migration within collagen matrix of 2.5 mg/ml density and in response to uniform NGF concentration of 20 ng/ml. The cells could not significantly migrate into the cell culture chamber.

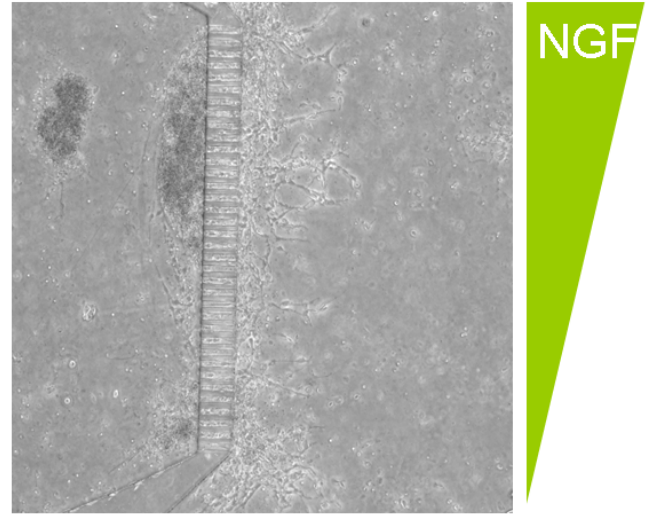


Collagen density = 1.8 mg/ml Collagen density = 0.9 mg/ml Collagen density = 0.45 mg/ml

Supplementary Fig. S5: Phase contrast (top) and fluorescent (bottom) images of NPC within varying collagen matrix densities. These images were used to quantify the cell densities and average cell migration distance based on their nuclei positions and their distributions within the cell culture chamber of the microfluidic device.

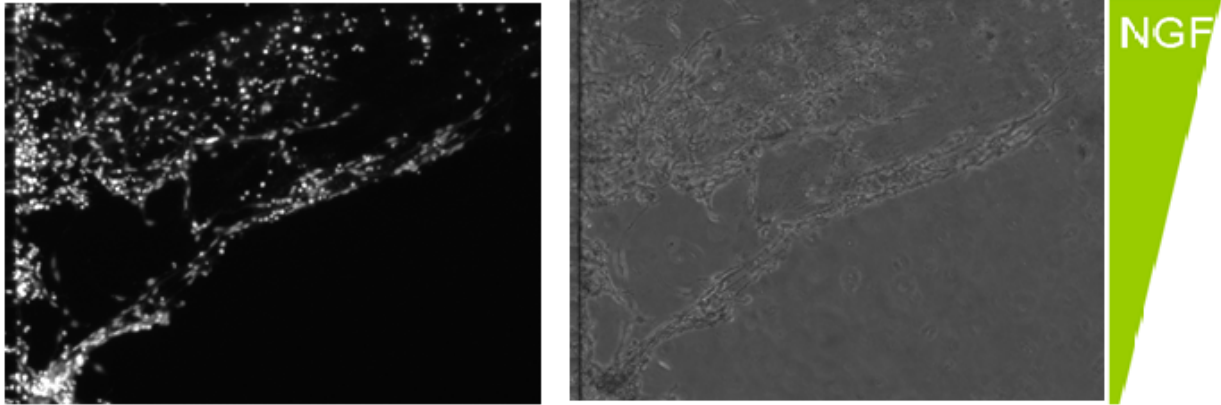


24 hrs after injection



48 hrs after injection

Supplementary Fig. S6: NPC migration within collagen matrix of 0.9 mg/ml density and in response to NGF concentration gradient of 10 ng/ml/mm with higher and lower absolute concentrations of 29 and 19 ng/ml respectively. The cells did not form aligned protrusions towards NGF gradient.



Supplementary Fig. S7: NPC migration within collagen matrix of 0.9 mg/ml density and in response to NGF concentration gradient of 30 ng/ml/mm with higher and lower absolute concentrations of 58 and 28 ng/ml respectively. DMI was measured to be 0.75 by calculating the average normalized cell distances from the sink channel using the fluorescent left figure. Many cells form aligned protrusions towards NGF gradient as can be observed in the phase contrast right figure.