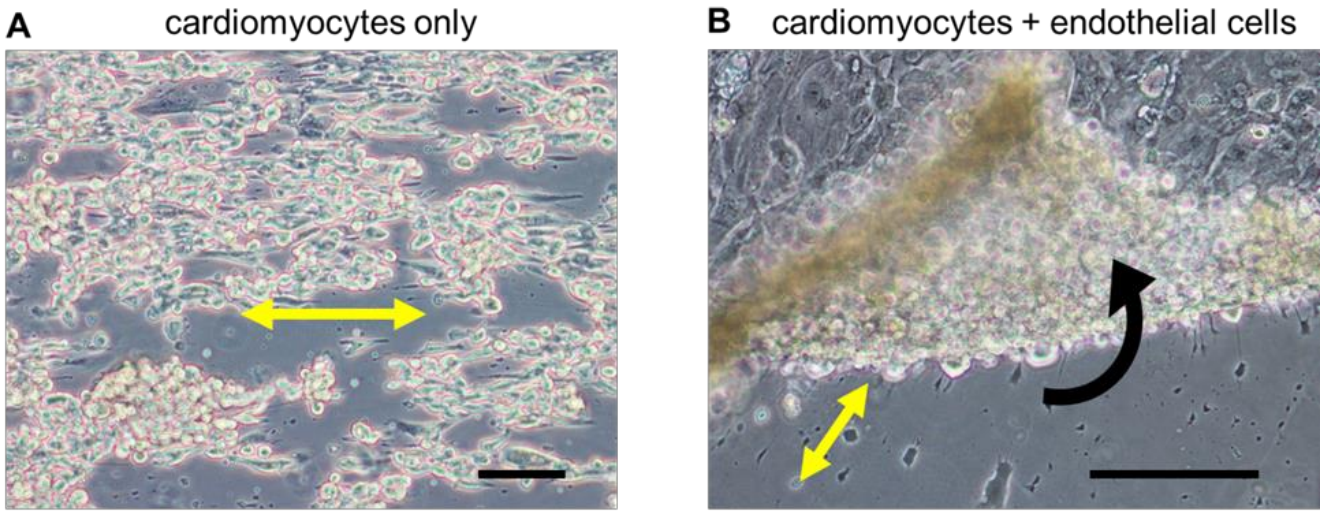
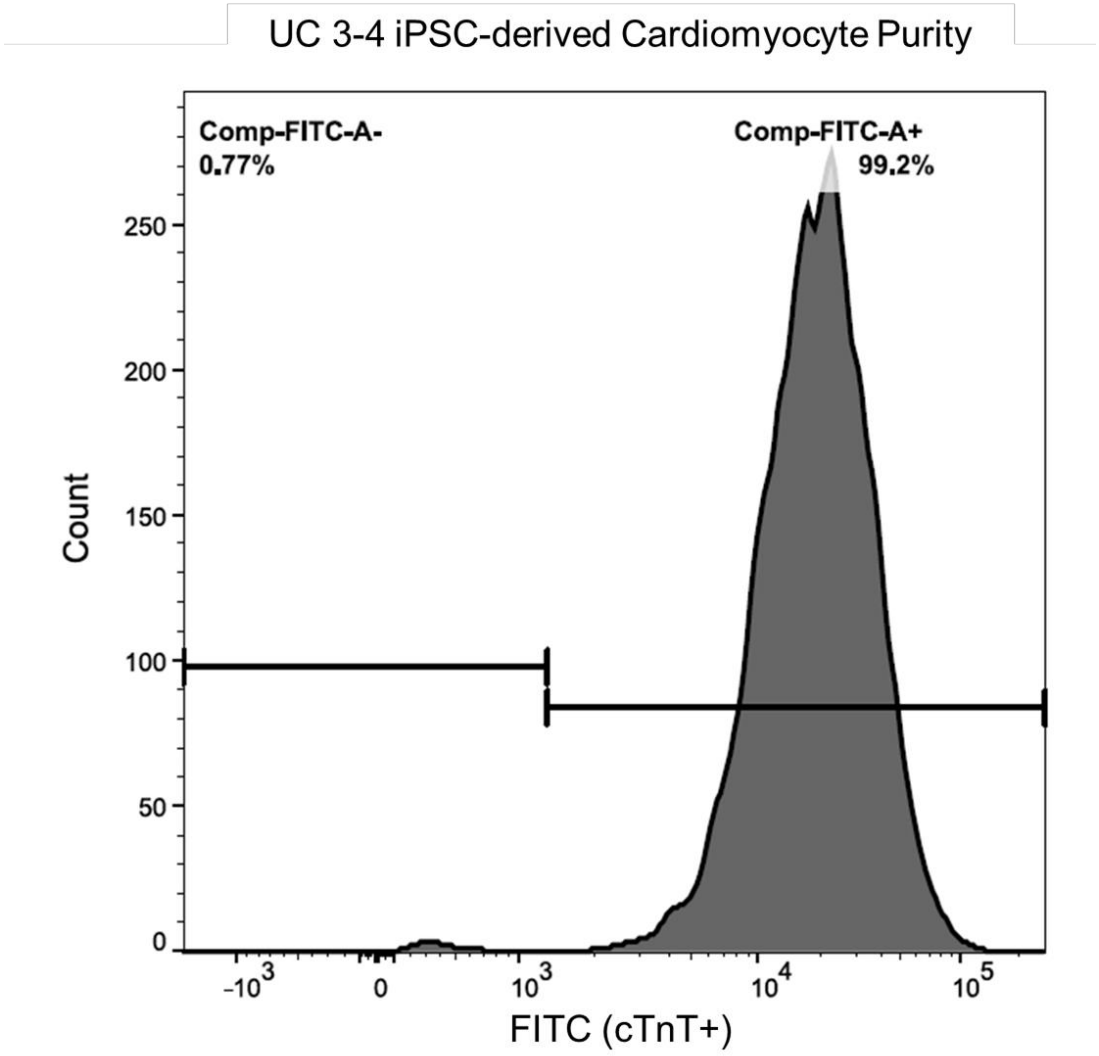
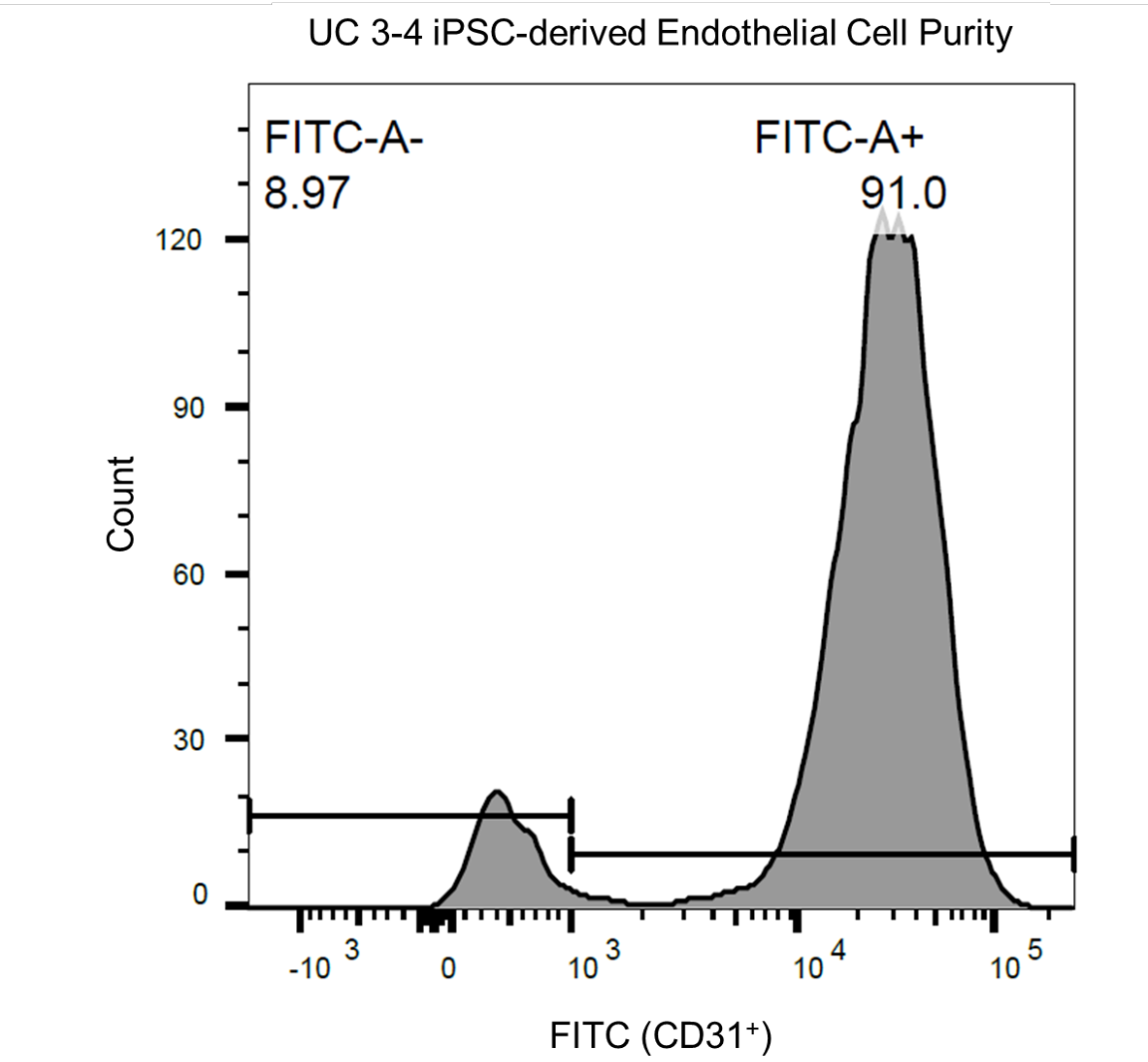


Supplemental Figure 1. Representative brightfield microscope images of detaching nanopatterned cardiac sheets without incorporation of stromal cells **(A)** and with incorporation of endothelial cells **(B)** demonstrating intact, spontaneous cardiac sheet detachment only in the co-culture condition. Direction of cell sheet detachment is labeled by the black arrow. Double headed yellow arrows in **(A)** and **(B)** denote the orientation of the nanotopography on the scaffold below. Scale bars, 100μm.



Supplemental Figure 2. Flow cytometry of purified iPSC-derived cardiomyocytes stained or cardiac troponin T (cTnT). Cells were subjected to lactate selection medium for 3 days and then harvested on day 17 for flow cytometry. 99.2% of cells were identified as positive for cTnT.



Supplemental Figure 3. Flow cytometry of iPSC-derived endocardial-like endothelial cells live-stained for CD31 surface markers on day 12. 91.0% of cells were identified as positive for CD31 surface markers.

Supplemental Video 1. Skeletal muscle tubes contract after culture with electrical stimulation. Skeletal muscle bilayer tube after 14 days in culture with 11 days of chronic electrical stimulation (1 Hz, 24 ms, 3 V pulses). Tubes were cultured in low serum containing medium for 3 days before beginning electrical stimulation to promote fusion myoblasts into myotubes.

Supplemental Video 2. Cardiac muscle tubes contract under electrical stimulation. Cross-sectional view of cardiac tube after 37 days in culture with chronic pacing using broad-field electrical stimulation (1 Hz, 3 V, 8 ms pulses).