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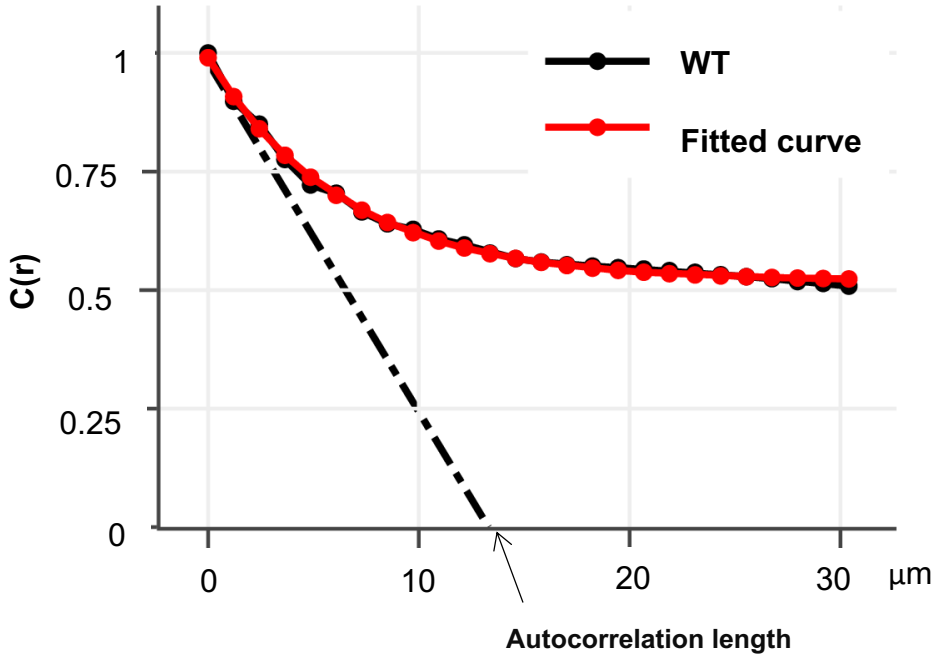
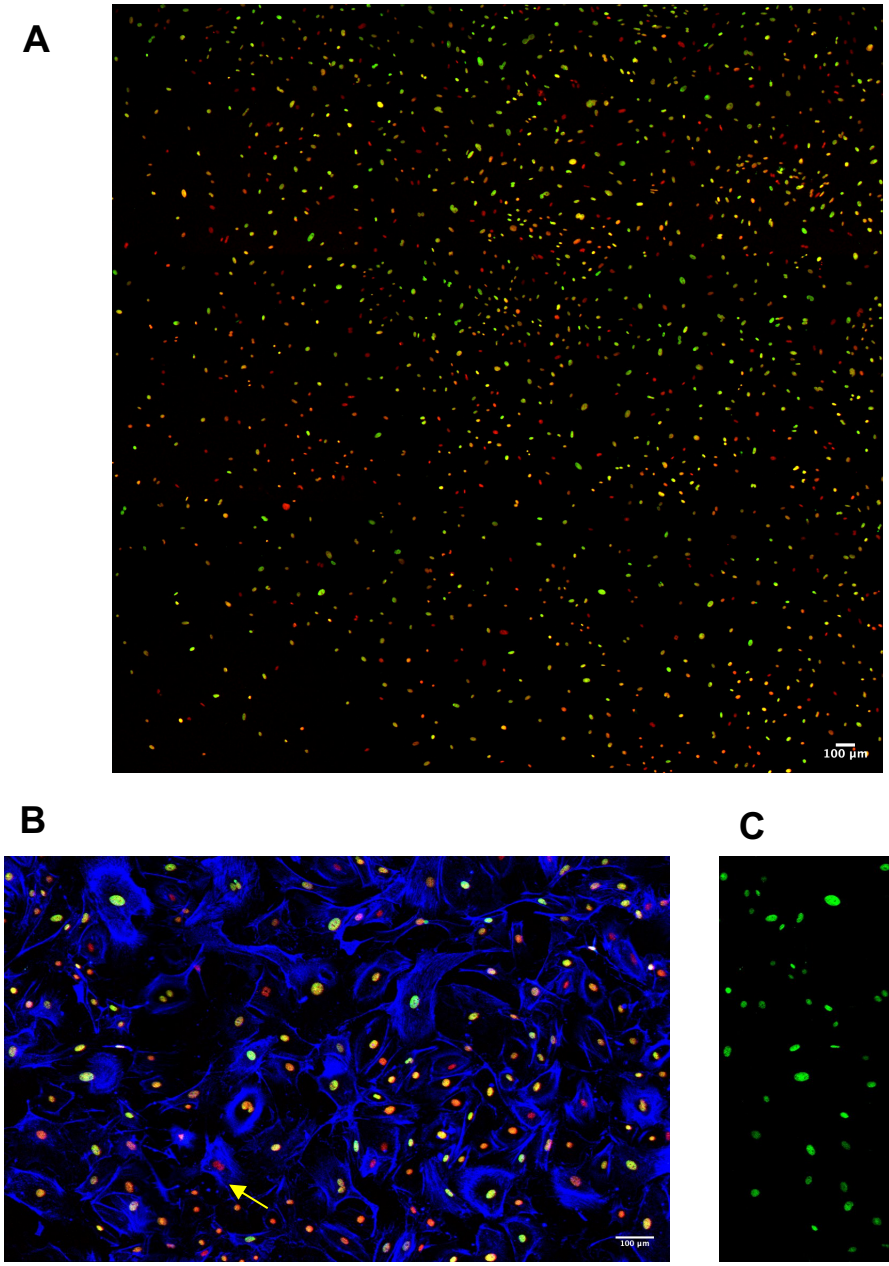
SUPPLEMENTARY INFORMATION

Figure S1, related to Figure 4C. Quantification of autocorrelation length for a representative podocyte.



Black curve represents actual spatial autocorrelation C(r) calculated as described in methods. Red curve represents curve fit to this actual data using the equation $ae^{-r/b} + c$. The x-axis intercept of the tangent line (dashed line) for the fitted autocorrelation curve at r=0 defines the autocorrelation length for this podocyte. The higher the autocorrelation length, the more spatially correlated the F-actin across the cell.

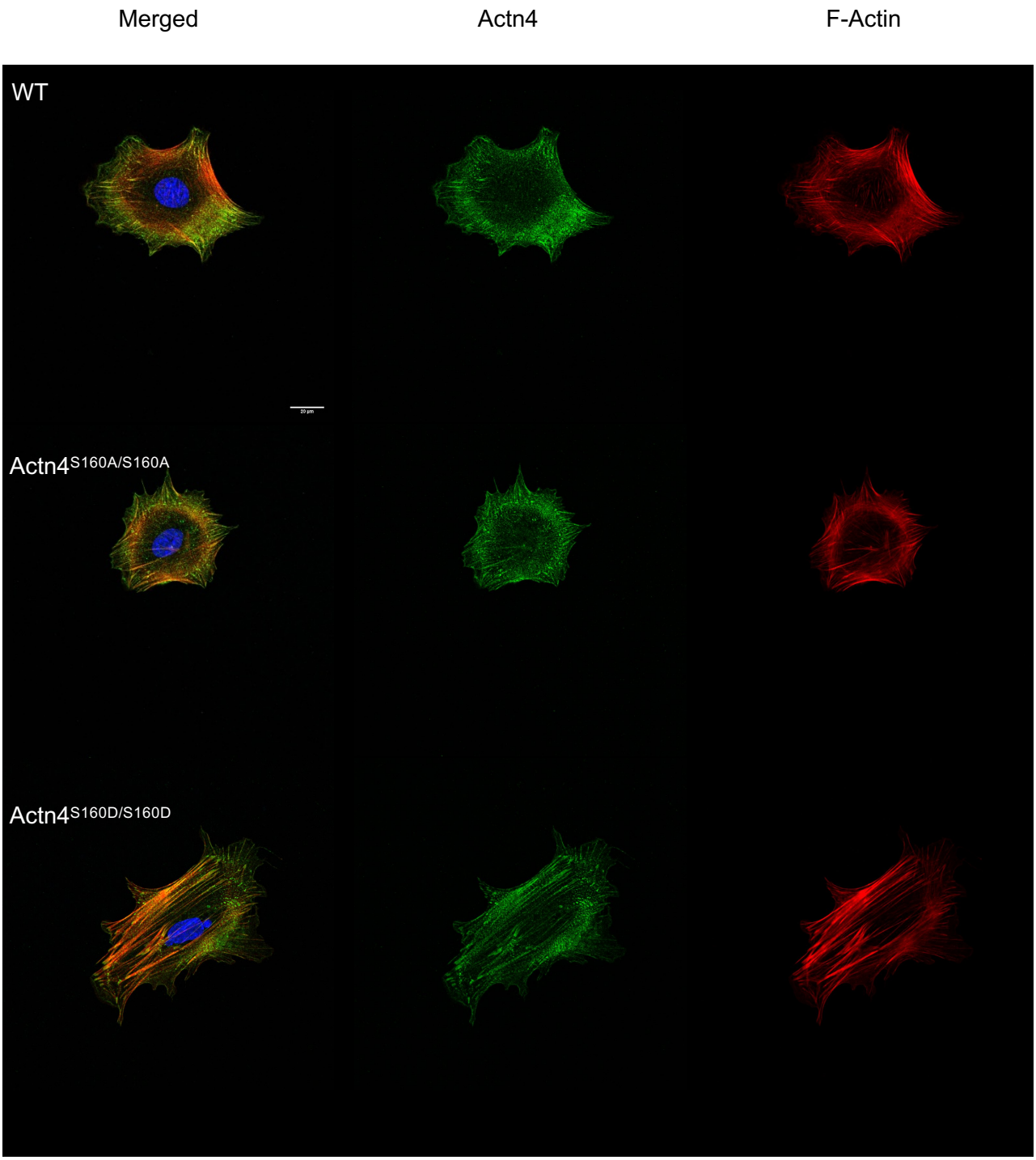
Figure S2, related to Figure 4 and Figure 5. Representative immunofluorescence image of WT-1 (podocyte-specific marker), used to assess the purity of mouse podocyte on day 24 since the day of isolation



Images was collected using Zeiss LSM 710 confocal microscope system equipped with a plan-Apochromat 10x/0.45 Water objective lens.

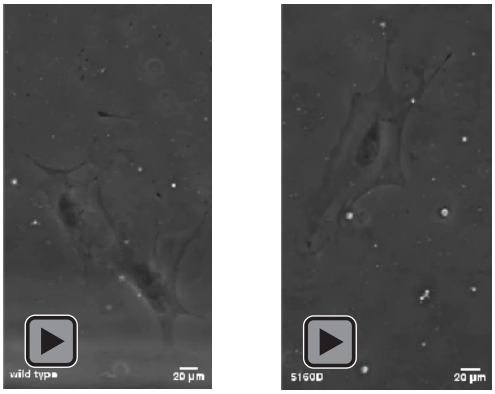
(A) Merged image of all cells showing nuclei staining (red pseudocolor) and WT-1 staining (green pseudocolor) at 10x magnification. Scale bar is 100 µm. Image analysis was done using Fiji – ImageJ to quantify cells that did not stain positive for WT-1. 10% of cells stained negative for WT-1, indicating 90% purity from podocyte isolation.
(B) Zoomed-in lower-right subsection of image (A) showing nuclei staining (red pseudocolor) and WT-1 staining (green pseudocolor). Shown also is F-actin staining (blue pseudocolor). Yellow arrow indicates podocyte that stains positive for nucleus but negative for WT-1 (example of non-podocyte). Scale bar is 100 µm.
(C) Zoomed-in lower-right subsection of image (B) showing only WT-1 staining (green pseudocolor).

Figure S3, related to Figure 4A. Representative immunofluorescence images of F-actin filaments and Actn4.



F-actin (right column in red) and Actn4 (middle column in green) distribution within WT, Actn4$^{S160D/S160D}$ and Actn4$^{S160A/S160A}$ grown on a collagen I coated coverslip (63X magnification). Left column shows the merged images of F-actin and Actn4. Scale bar is 100 µm.

Figure S4, related to Figure 5C. Supplementary videos showing continuous stream of images depicting Actn4$^{S160D/S160D}$ (right) podocyte detachment and WT (left) podocyte adherence in response to 48 hr simultaneous fluid shear stress and cyclic strain.



Images were collected every 5 min throughout 48-hr period. Scale bar is 100 µm. Images were collected using Zeiss Axio Observer system equipped with a 5x/0.16 phase objective lens.