Electronic Supplementary Material (ESI) for Lab on a Chip. This journal is © The Royal Society of Chemistry 2022 В Α **David Functional Analysis** PCA of On-chip EC cocultured with FB vs Conventional EC cocultured with FB **Enriched terms** 20 COL1A2 PC2: 23% variance 10 Top Genes Log2FC COL6A3 Up-regulated 0 Condition On-chip EC COL1A1 cocultured with FB Conventional EC Enrichment cocultured with FB -10term score Enrichment term score -20 -30-20 PC1: 37% variance Ε D C GO Pathway Analysis Volcano Plot **GO Pathway Analysis** On-Chip EC Monoculture vs Conventional EC Monoculture Upregulated in On-chip EC cocultured with FB RNA catabolic process On-chip EC renal system development Conventional EC cocultured with FB cocultured with FB nuclear-transcribed mRNA 20 kidney development catabolic process urogenital system development AQ₽1 mRNA catabolic process extracellular matrix organization P adjusted nuclear-transcribed mRNA 15 0.00006 extracellular structure organization catabolic process, 0.00009 -Log₁₀ P nonsense-mediated decay SERPING1 0.00012 external encapsulating P adjusted SRP-dependent cotranslational protein targeting to membrane 0.00015 structure organization 0.00018 1e-13 9FITM1 regulation of angiogenesis 2e-13 10 regulation of vasculature protein targeting to ER - 3e−13 development cell-substrate adhesion cotranslational protein targeting to membrane 5 establishment of protein Upregulated in Conventional EC cocultured with FB localization to endoplasmic reticulum adjusted 0.010 SH3 domain binding protein localization to endoplasmic reticulum 0.015 receptor inhibitor activity 0.020 0 0.025 receptor antagonist activity translational initiation 0.030 10 2.5 7.5 10.0 30 Log₂ fold change