Supplementary Material (ESI) for Lab on a Chip

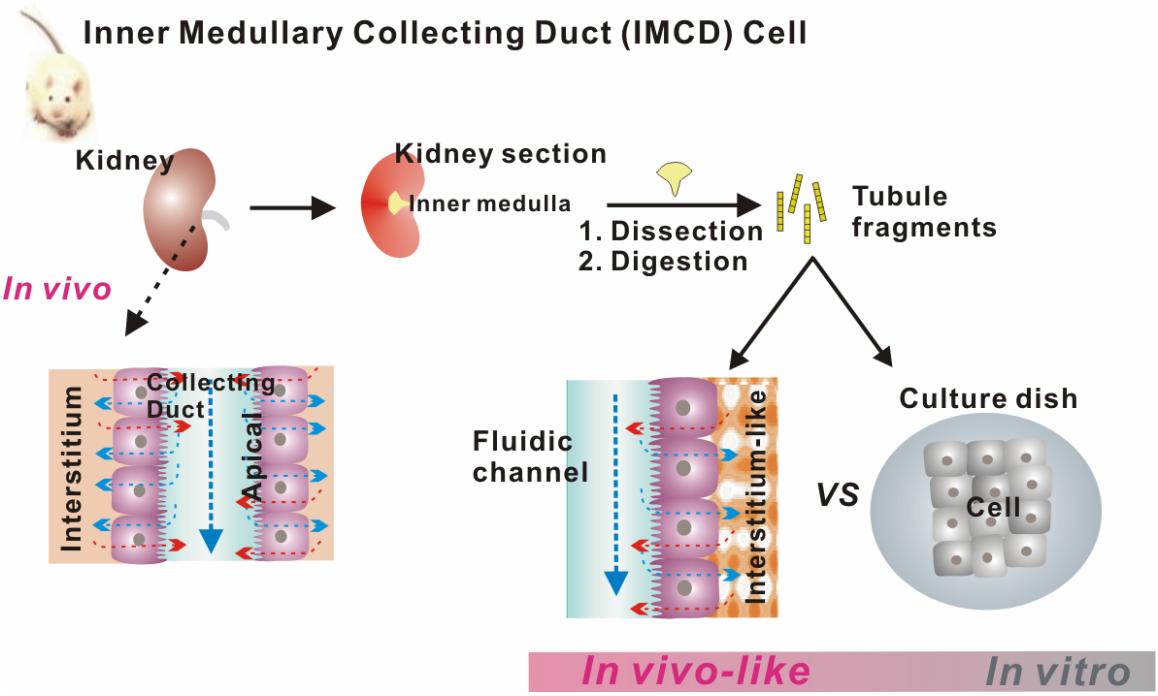
Supplementary information

A multi-layer microfluidic device for efficient culture and analysis of renal tubular cells

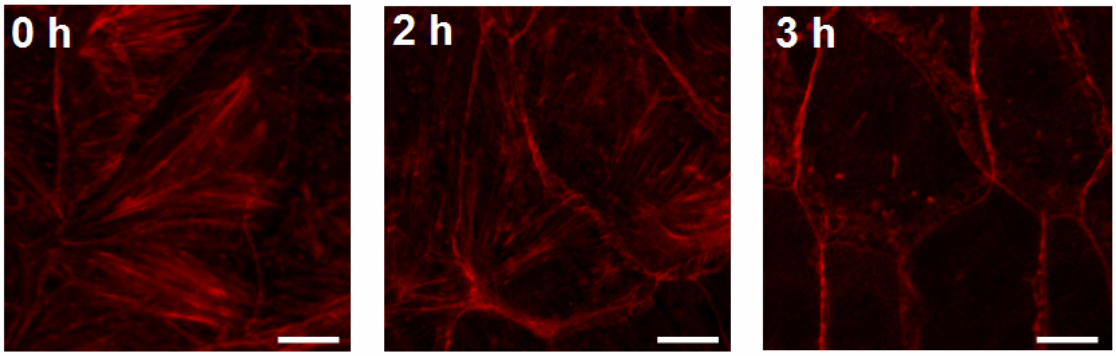
Kyung-Jin Jang[1,2] & Kahp-Yang Suh[1,2]*

[1]Interdisciplinary Program in Nano-Science and Technology, Seoul, 151-747, Korea
[2]School of Mechanical and Aerospace Engineering, Seoul National University, Seoul, 151-747, Korea

*To whom correspondence should be addressed. E-mail: sky4u@snu.ac.kr



Supplementary Figure 1. Schematic of resembling renal tubular environments *in vitro*: from primary IMCD cell culture to multi-layer microfluidic device (MMD). The major advantage of primary cell culture is that cells have inherent properties of the derived tissue. In the traditional cell culture, however, tubule fragments are cultured on cell culture dish after dissection and digestion procedures of isolated kidney, resulting in dissimilar environments from *in-vivo* in terms of biological functions and mechanical properties of the substrate[1]. This figure shows our motivation to develop a multi-layer microfluidic device (MMD) for studying structure and functions of renal tubule cells. To mimic renal tubular environments, an interstitium-like porous membrane substrate was inserted in a sandwich format between a PDMS microfluidic channel and a PDMS well (mass reservoir) to enable the transport of molecules and stimulus as well as the application of a fluidic shear stress to the cultured cells.



Supplementary Figure 2. Time-lapse fluorescent microscopic images of F-actin depolymerization of the IMCD cells in a MMD, in response to a fluidic shear stress over time. Regarding the dynamic aspect of actin reorganization, the IMCD cells were exposed to a fluid shear stress of ~1 dyn/cm^2 over the time span of 1 to 3 h and stained with TRITC-phalloidin. As clearly seen from the figures, F-actins were initially assembled into thick bundles in the cytoplasm (0 – 1 h), started to depolymerize, forming thin fibers (2 h), and finally depolymerized and dot-like F-actin patterns and thick actin fibers at the cell periphery were observed (3 h). Scale bar: 10 μm. These data suggest that the current device can be used to obtain dynamic information about the cell physiology.

Supplementary Material (ESI) for Lab on a Chip

Supplementary references

1. Abbott, A. Cell culture: Biology's new dimension. *Nature* **424**, 870-872 (2003).