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Supplemental Information

Integrating biological vasculature into a multi-organ-chip microsystem:

Supplemental Information

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Katharina Schimek, Mathias Busek, Sven Brincker, Benjamin Groth, Silke Hoffmann, Roland Lauster, Gerd Lindner, Alexandra Lorenz, Ulrike Menzel, Frank Sonntag, Heike Walles, Uwe Marx and Reyk Horland

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Description of Movies in Supporting Information

15 **Movie S1. Working principle of the micropump**

The MOC was loaded with red blood cells in a 0.9% NaCl solution (physiological haematocrit of 40%) and the pumping cycle was started at a pumping frequency of 0.476 Hz. The four different stages of the pumping cycle can be clearly identified by the retention time of the solution in the different pumping chambers.

20 **Movie S2. Morphological adaptation of HDMECs to shear stress in the MOC**

The MOC was heated to 37°C and the HDMECs were loaded into the MOC as described, followed by static incubation for 3 h to allow the cells to attach. Subsequently, dynamic cultivation was started with a pumping frequency of 0.476 Hz. Images were acquired by two-photon laser scanning microscopy at 5 min intervals for 66 h.

25 **Movie S3. Three-dimensional reconstruction of a microchannel after cultivation with HDMECs for 4 days**

HDMECs were stained for CD31 (red), vWF (green) and Hoechst 33342 (blue) as described. A three-dimensional image stack (1000 x 1000 pixels, depth increment 2 µm) was taken by two-photon laser scanning microscopy and processed using Imaris software.