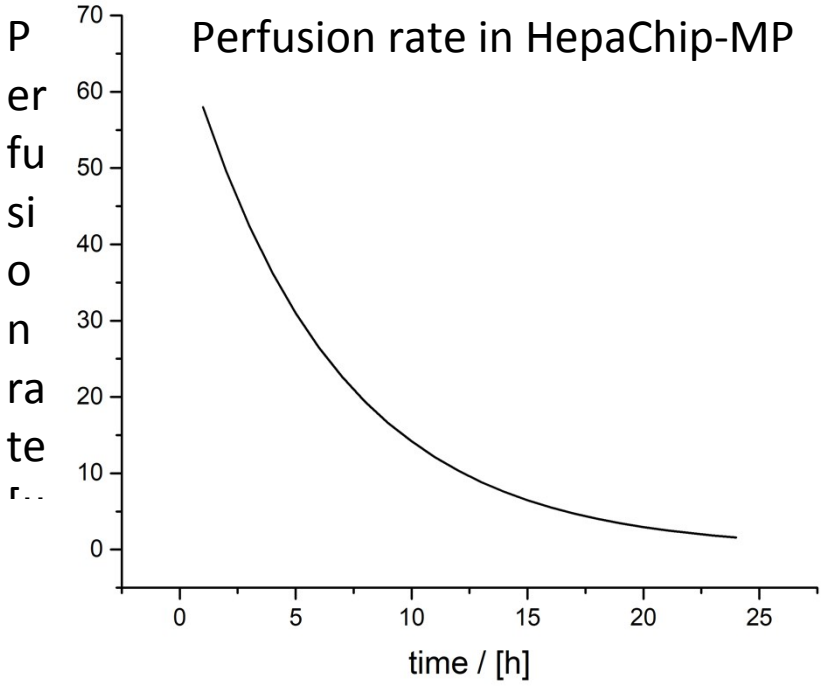
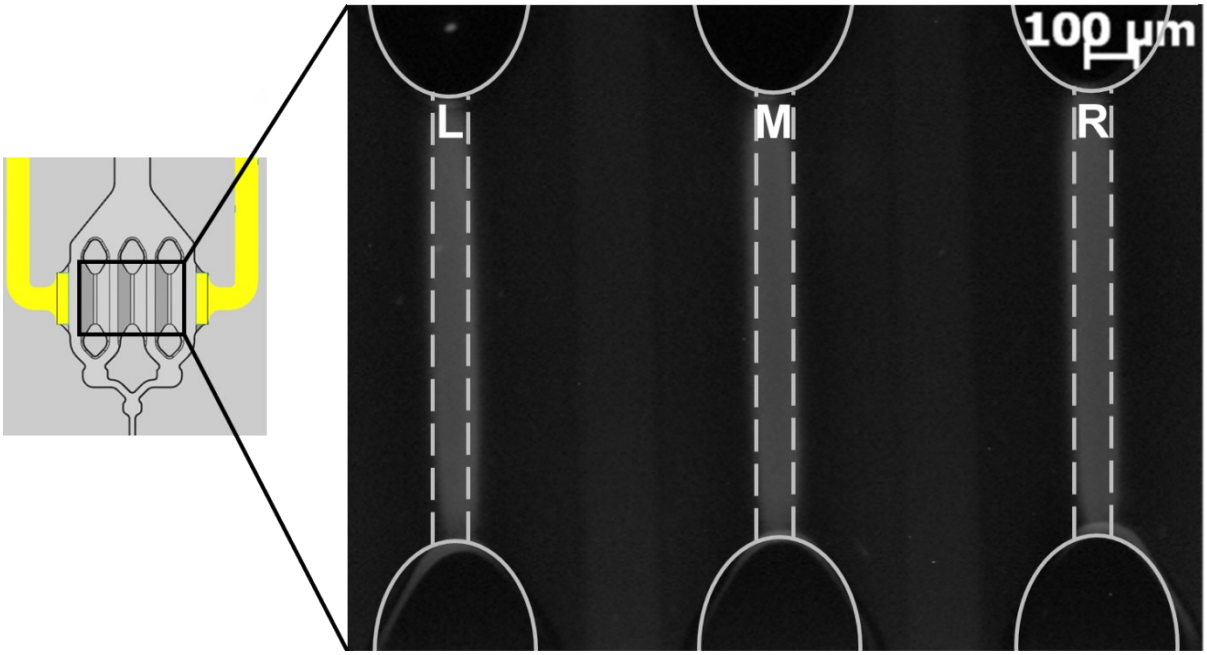
# Supplementary info:

## 1. Perfusion rate in HepaChip-MP as a function of time using gravity-driven flow




*Suppl.Fig. 1: Perfusion rate as a function of time. As the level difference between inlet and outlet reservoirs and thus pressure decreases, flow rate also decreases over time from approx. 60µL/h initially to 10 µL/h at 12 h. At the beginning of this experiment, the inlet was filled with 900 µl of medium while the outlet was empty.*

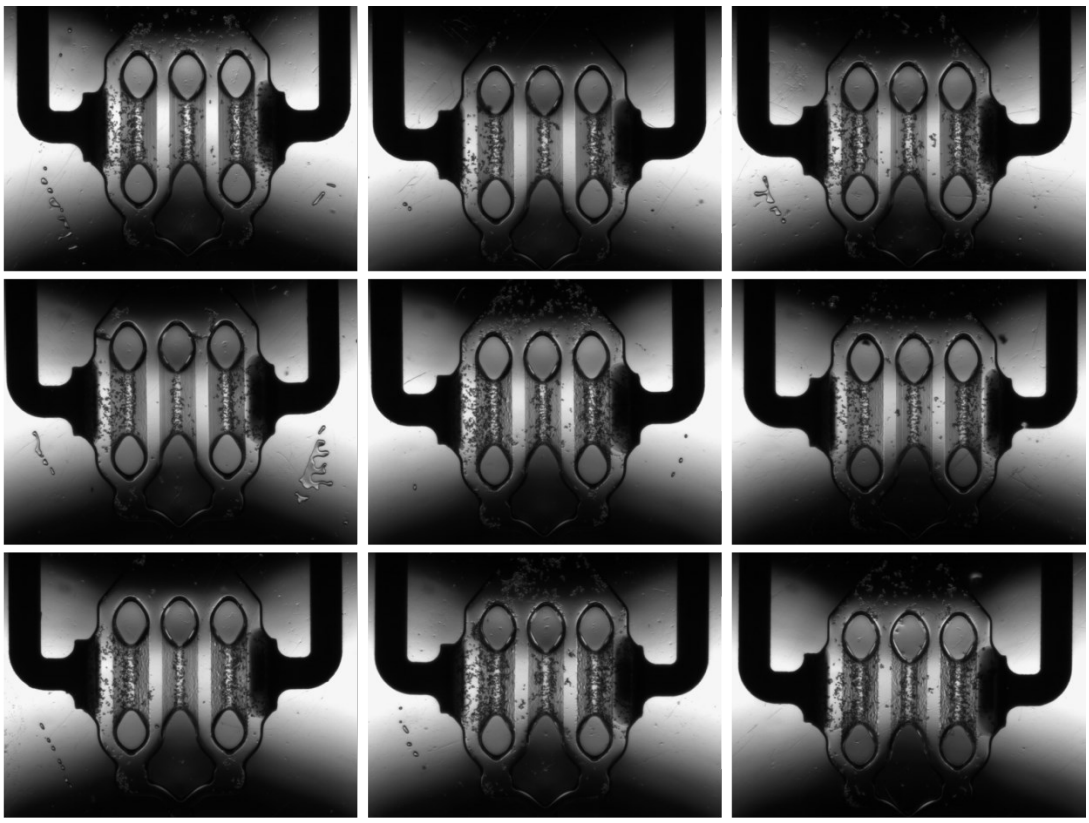
## 2. Selective coating of assembly ridges in HepaChip-MP by collagen-RITC.



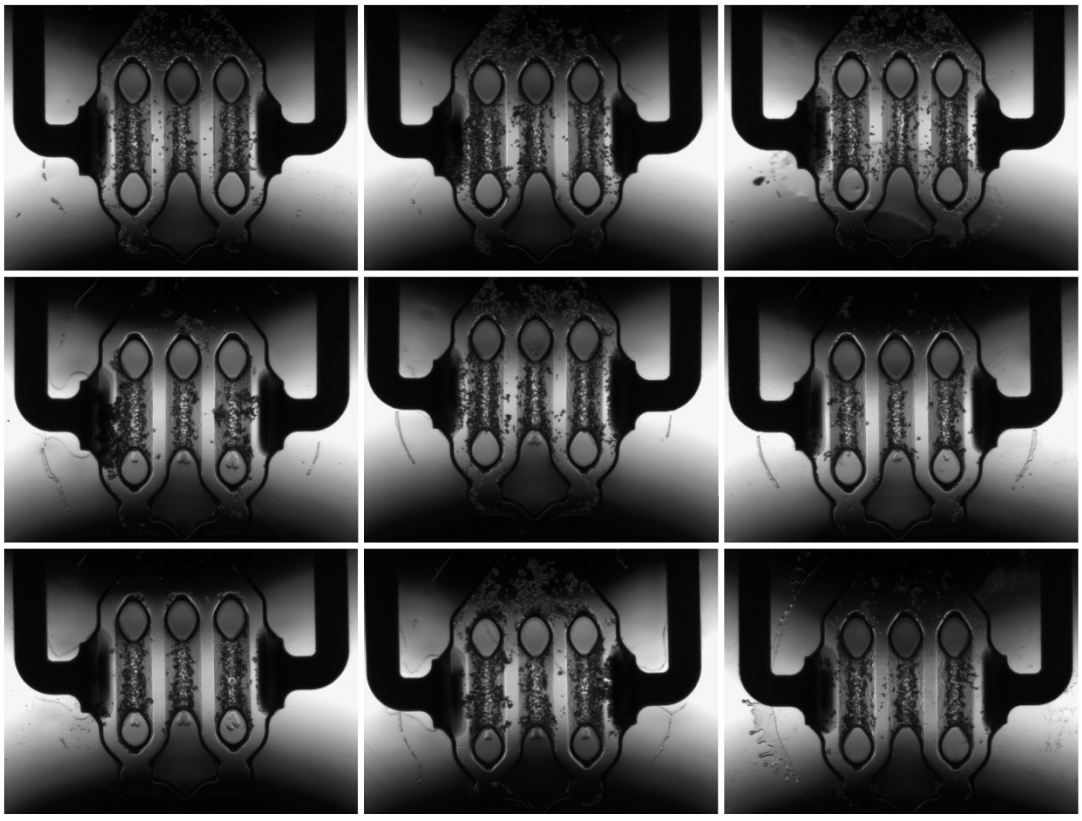

*Suppl.Fig. 2: Microscopic image of the assembly ridges (L, M, R, highlighted by dashed lines) in the culture chamber of HepaChip-MP selectively coated by fluorescently labeled collagen-RITC by perfusion with a mixture of collagen-RITC/Pluronic F127 [47]. Bright areas show the collagen-coated assembly ridges.*

## 3. Comparison of different cell culture chambers of the HepaChip-MP after cell assembly

Chip 1

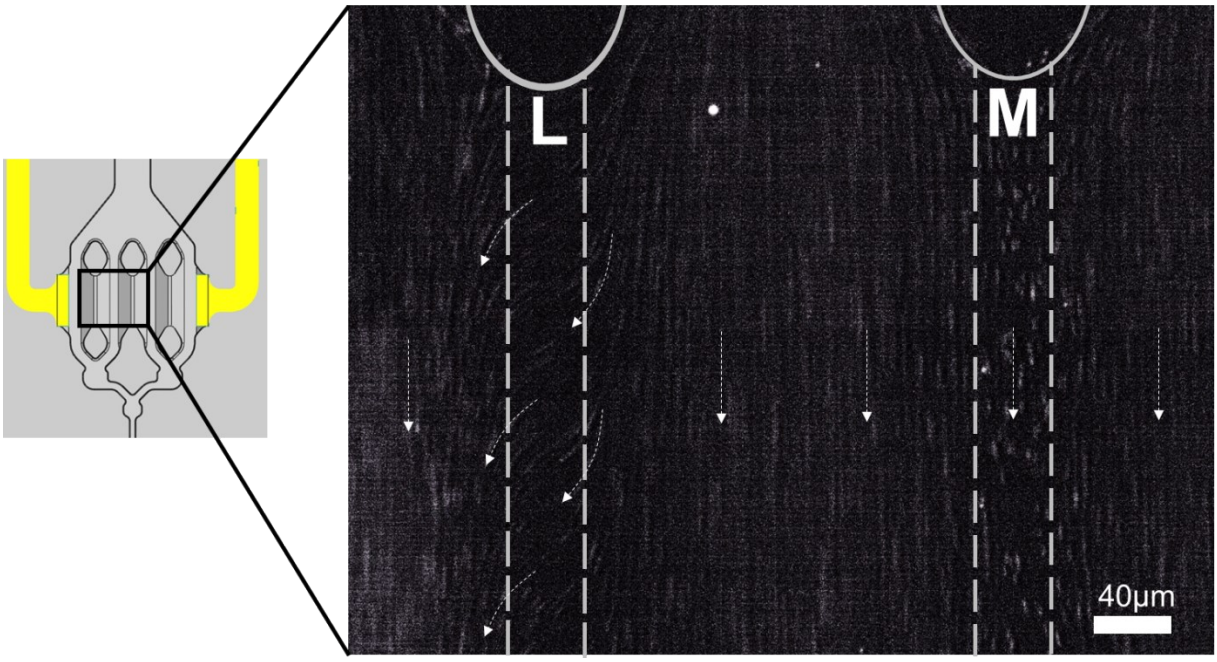


Chip 2



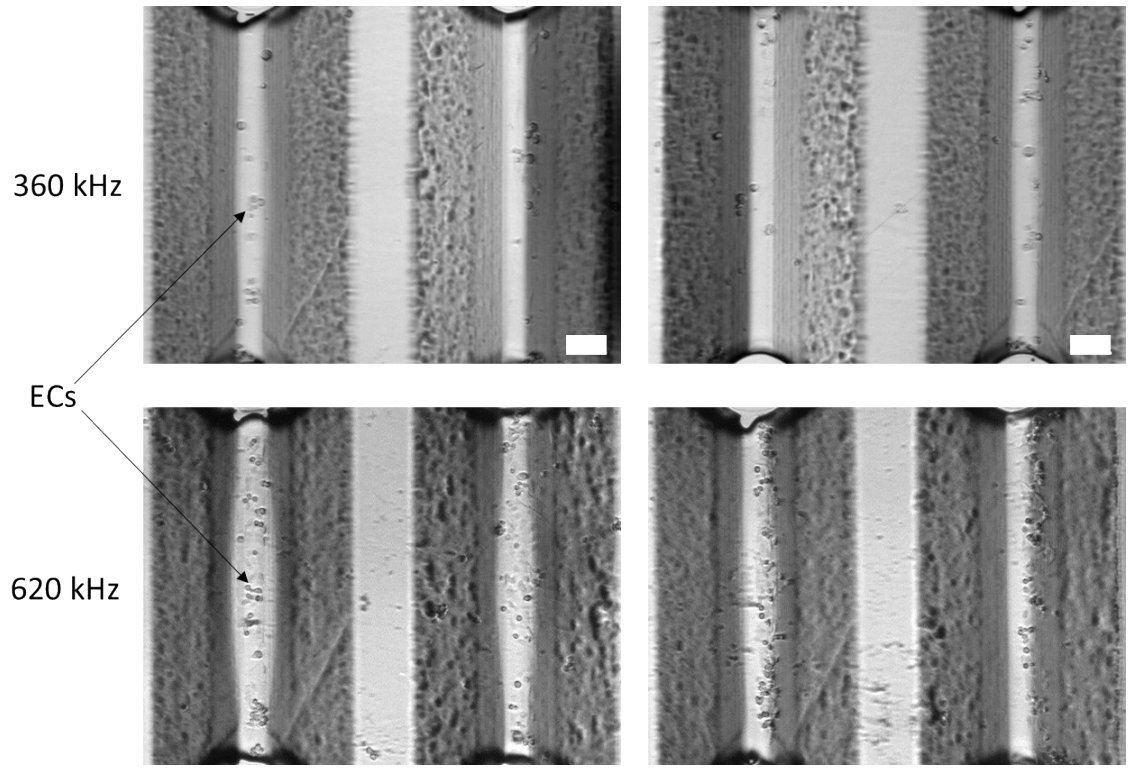
*Suppl.Fig. 3: Representative microscopic images of cell culture chambers of two HepaChip-MP after cell assembly. The images were taken no longer than 11 hours after cell assembly. The cells have been concentrated by the DEP on the three cell assembly ridges in the chambers.*

# 4. Flow of particles in culture chamber



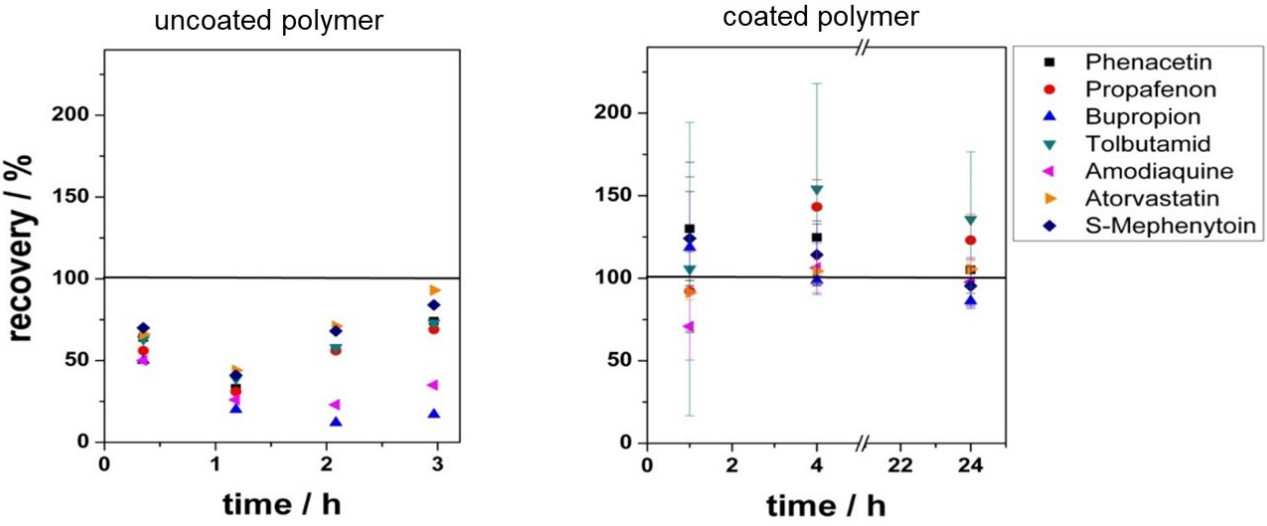

*Suppl.Fig. 4: Screenshot of a video showing the (high) pressure-driven perfusion of fluorescent beads (d= 5 µm) through a cell chamber of the HepaChip-MP to visualize flow patterns. The flow of the beads represents the flux lines of the medium flow at high flow rates. The beads tend to flow over the left assembly ridge (L) to the periphery while the beads on the middle cell culture ridge (M) flow parallel to the orientation of the assembly ridge as indicated by the dashed arrows.*

## 5. Optimization of the frequency of voltage used to assemble primary human liver endothelial cells




*Suppl.Fig. 5: Representative microscopic images after the assembly of HuLEC. Arrows indicate HuLEC assembled on an assembly ridge within a HepaChip-MP cell chamber. At a frequency of 360 kHz fewer cells are assembled on the assembly ridges (top panel) when compared to operation at a frequency of 620 kHz (bottom panel). The frequency of 360 kHz is routinely used to assemble PHH. This shows, that different cell types require different settings to attain high efficiency in the cell assembly by DEP. For this experiment, HuLEC at a concentration of 0,5 * $10^6$ cells/ml were used to compare the efficiency of the DEP assembly at different frequencies for this cell type.*

## 6. Adsorption of substances of COP uncoated and coated



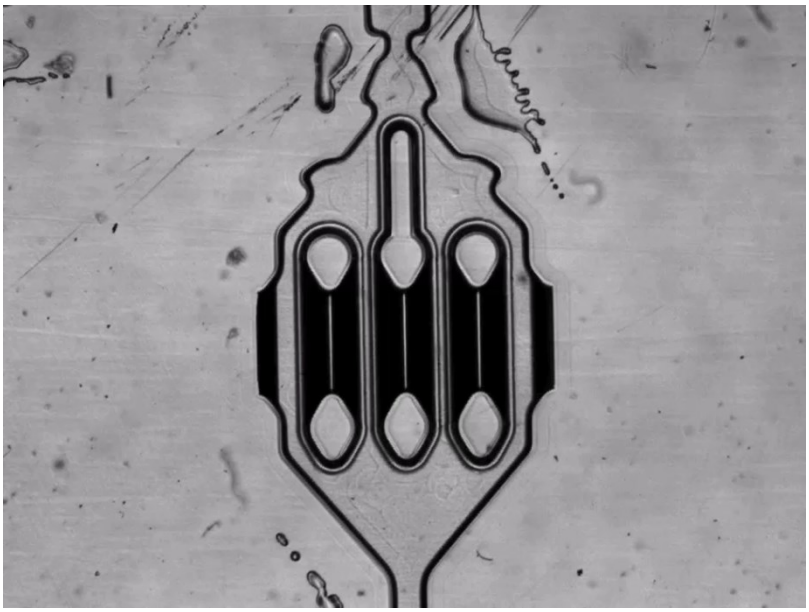

*Suppl.Fig. 6: Recovery rates of selected hydrophobic substances on uncoated COP (left) and COP coated by Pluronic F127 (right) over time. Coating yields a complete recovery even of very hydrophobic compounds from the chip.*

# I. Automation of HepaChip-MP priming and cell assembly


supplemental info\Pipettor_HepaChip_MP_neu.m4v

*Suppl.Vid. 1: Operation of HepaChip-MP using an automated pipetting instrument*

## II. Filling of cell chamber controlled by capillary stop structures at the chamber outlet



supplemental info\Hepachip-Befüllung-1.avi

*Suppl.Vid. 2: filling of cell chamber is controlled by capillary stop valve structures at the outlet of the chamber, by which inclusion of air bubbles is avoided.*