

Electronic Supplementary Information (ESI)

Real-Time Impedance-Based Cell Migration Measurements with Integrated Electrodes on Porous Membranes on Porous Membranes for Next Generation Microphysiological Systems

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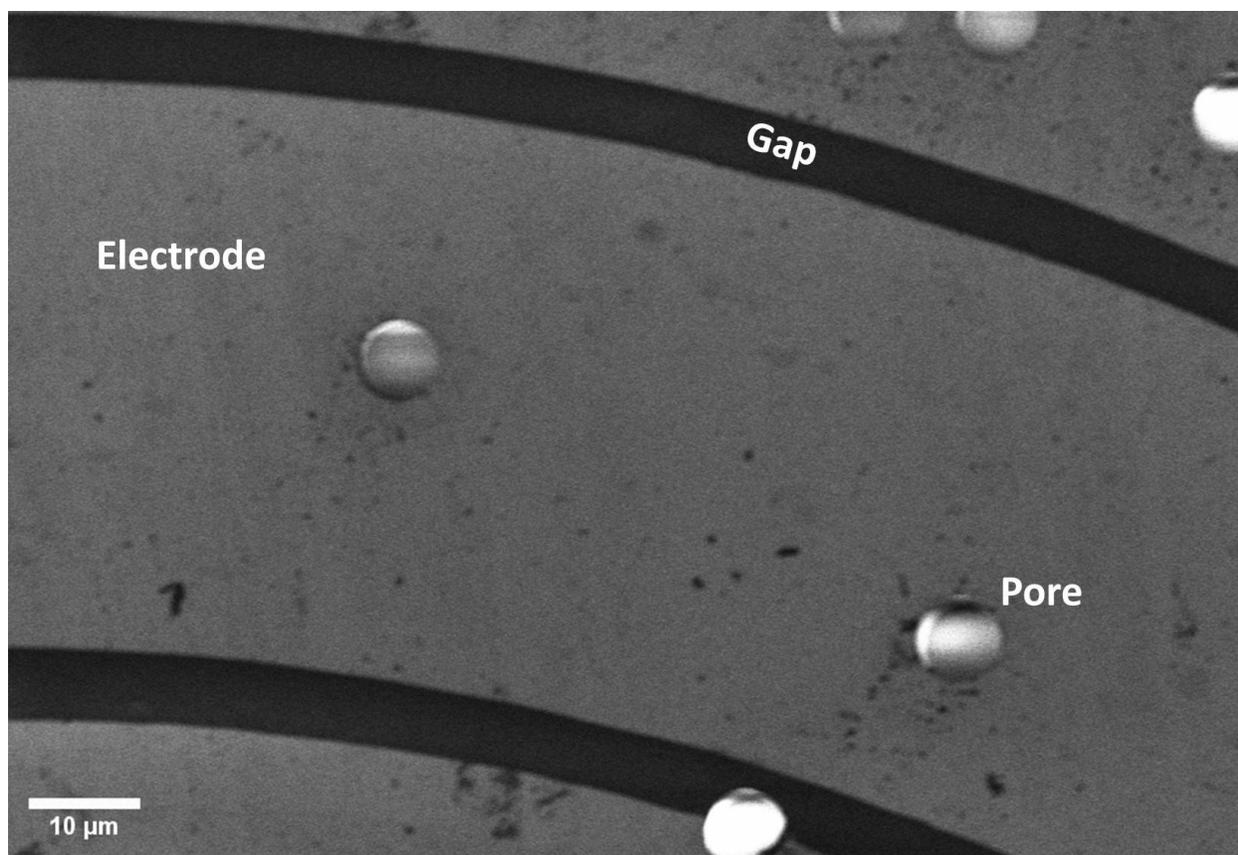


Fig. S1. Scanning Electron Microscopy (SEM) image of electrodes on one surface of the porous PET membrane, showing the electrodes, electrode gaps and pores (scale bar - 10 μm, magnification - 1000X).

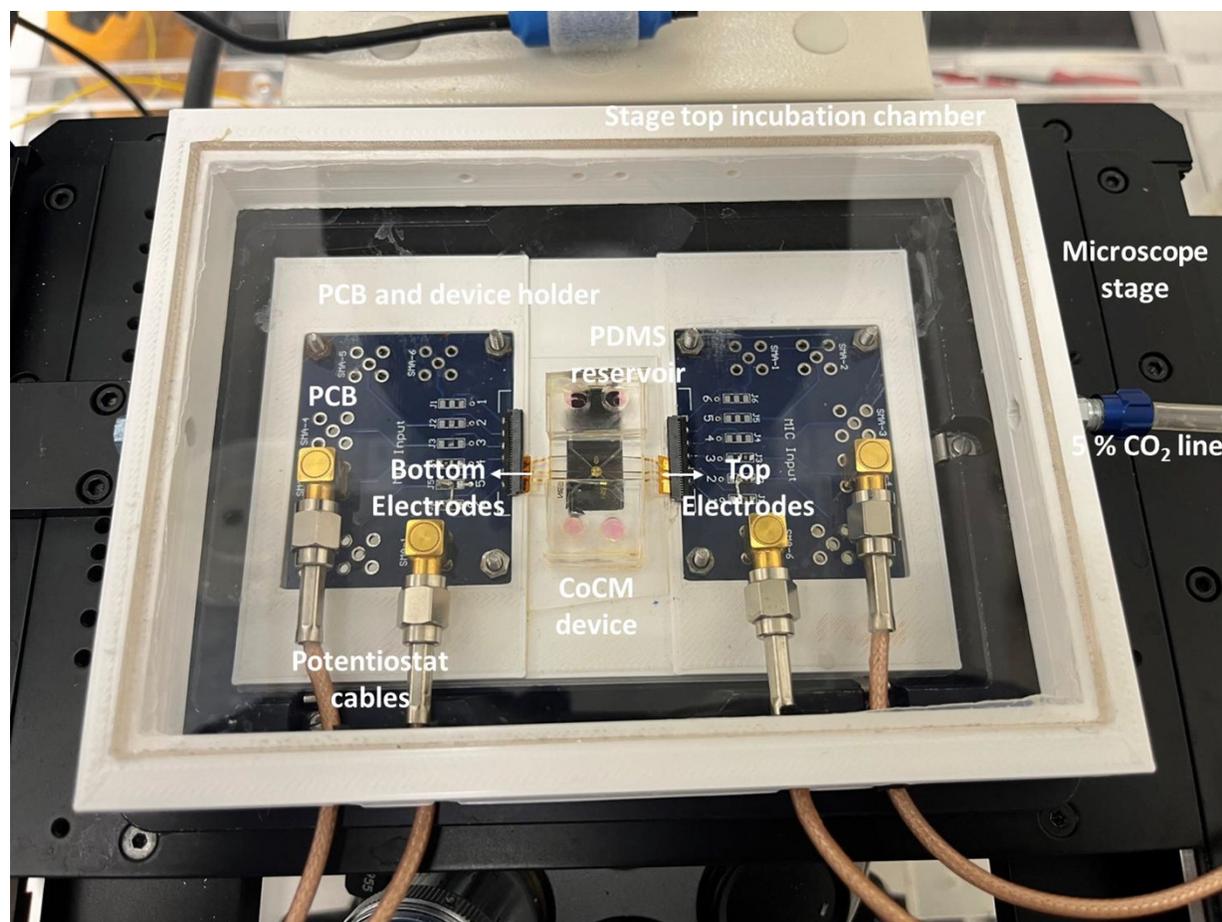


Fig. S2. Experimental setup for real-time parallel CoCM monitoring via impedance and image tracking.

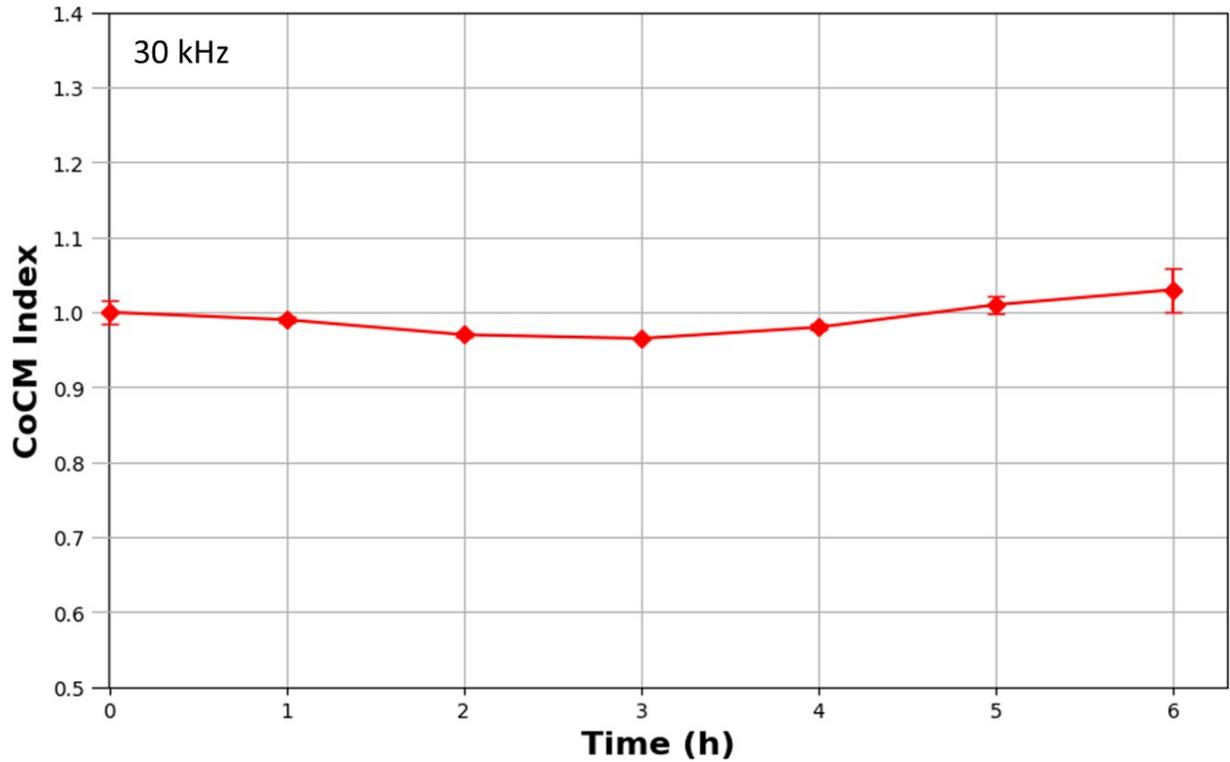


Fig. S3. Impedance measurements (CoCM Index) of a device with no cells (only media) showing minimal background variation at 30 kHz.

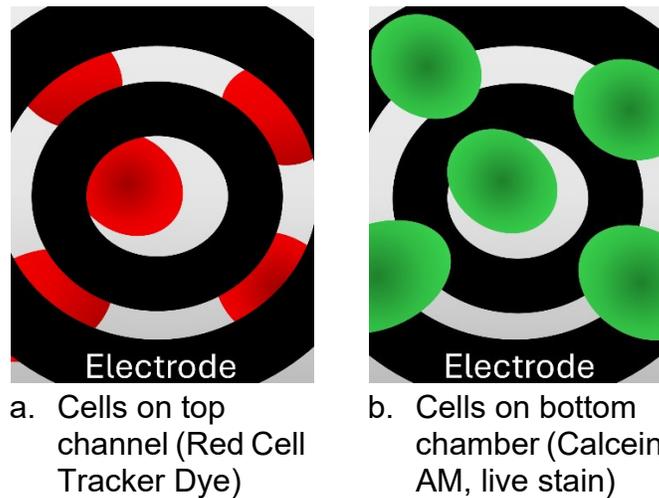


Fig. S4. Identification of cells for counting in the region of interest (ROI) at $t = 0$ after seeding in the top channel, and at $t = 70$ h after migration to the bottom channel.

At $t = 0$, cells in the top channel are positioned directly above the electrodes (membrane top side). The bottom electrodes block the light from the inverted microscope, obscuring the cells labeled with Red Cell Tracker (CMTPX; Fig. S4a). By $t = 70$ h, cells have migrated to the bottom channel, covering the electrodes and appearing in the focal plane of the bottom electrodes. Cells are labeled with the live green stain Calcein AM (Fig. S4b).



ESI_movie.mp4

Movie 1. Time-lapse movie showing CoCM of 786-O cells in the microfluidic chip over the 70 h experiment.

Time-lapse images were acquired throughout the experiment, including during media changes that required opening the microscope chamber, temporarily removing the condenser to fill the chip, then putting the condenser back in place and closing the microscope temperature and CO₂ controlled enclosure. Frames captured during these interruptions were removed, and the remaining images were stitched together and converted into a continuous video.