Supplementary data

Microfluidic dispensing system for localized stimulation of cellular networks

Tobias Kraus,[a,†] Elisabeth Verpoorte,[b] Vincent Linder,[a] Wendy Franks,[c] Andreas Hierlemann,[c] Flavio Heer,[c] Sadik Hafizovic,[c] Teruo Fujii,[d] Nico F. de Rooij,[a] and Sander Koster*[a,‡]

[a] *University of Neuchâtel, Institute of Microtechnology, Neuchâtel, Switzerland,* [b] *Groningen Research Institute of Pharmacy, University of Groningen, the Netherlands,* [c] *ETH Zurich, Physical Electronics Laboratory, Zurich, Switzerland,* [d] *Institute of Industrial Science, University of Tokyo, Japan,* †Present address: *ETH Zurich (Laboratory for Surface Science and Technology)/IBM, Zurich Research Laboratory, Zurich,* ‡ *Present address: Groningen Research Institute of Pharmacy, University of Groningen, A. Deusinglaan 1, P.O.Box 1 9700AV Groningen, the Netherlands, Fax: +31503637582; Tel: +31503633339; E-mail: Sander.Koster@Rug.nl*

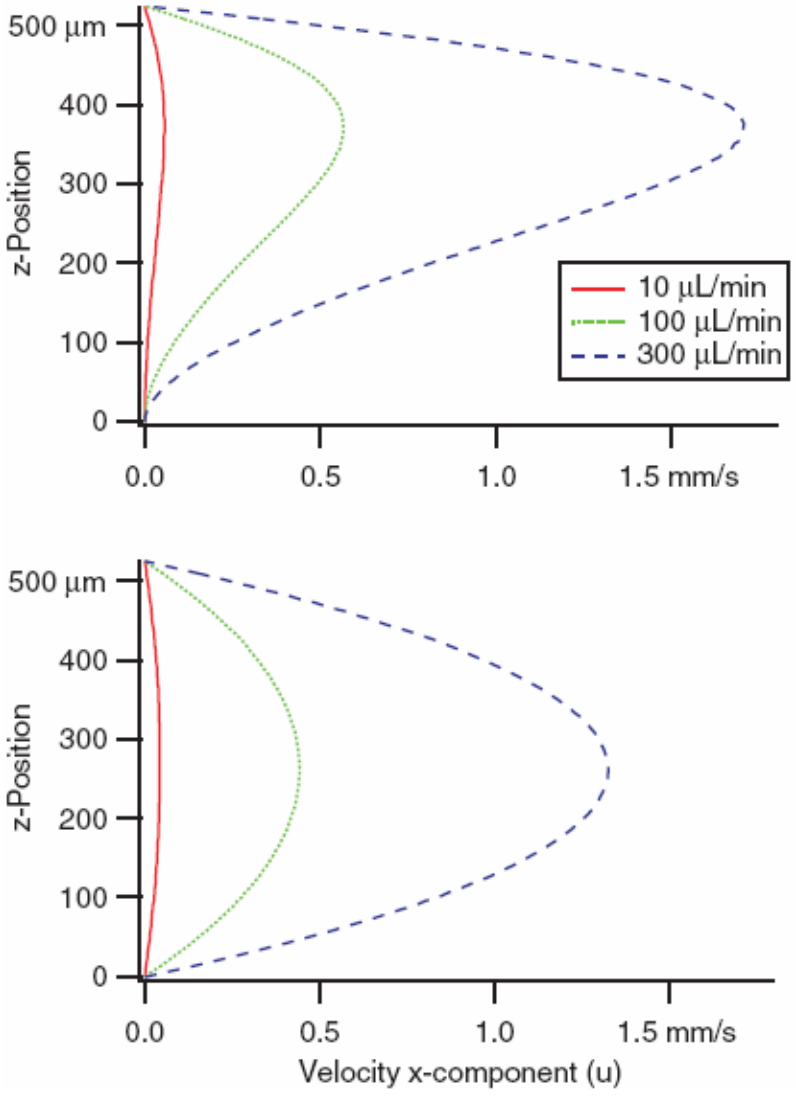

Fig. S1 x-components of the flow velocities in the cell cultivation chamber directly behind the expansion (top) and at a distance equal to one channel height (525 µm) downstream (bottom) derived from CFD simulation.

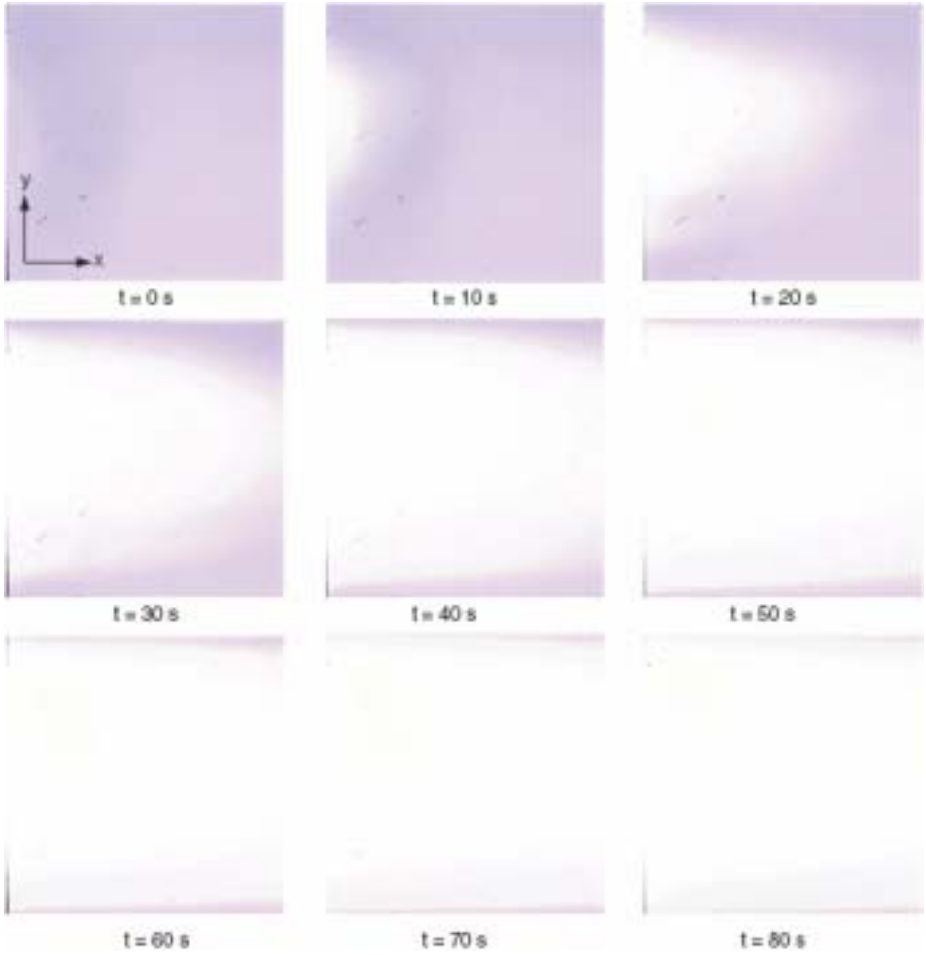

Fig. S2 Flushing of a dye-filled chamber in a large flow cell (the full 10×10 mm^2 of the chamber are shown). The nutrient flow rate is 100 µL/min. A gas bubble in the outlet region close to the lower right corner of the cell leads to deviations from ideal behaviour.

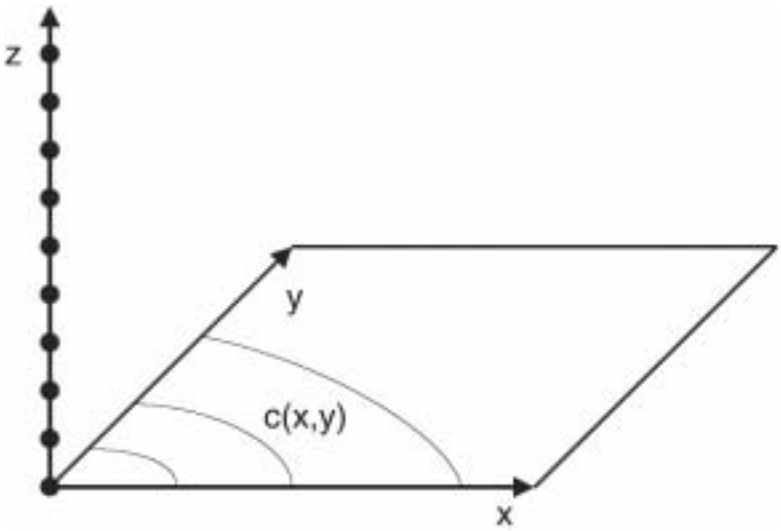

Fig. S3 Coordinate system used for solving the two-dimensional transport equation with a line source at the z-axis.

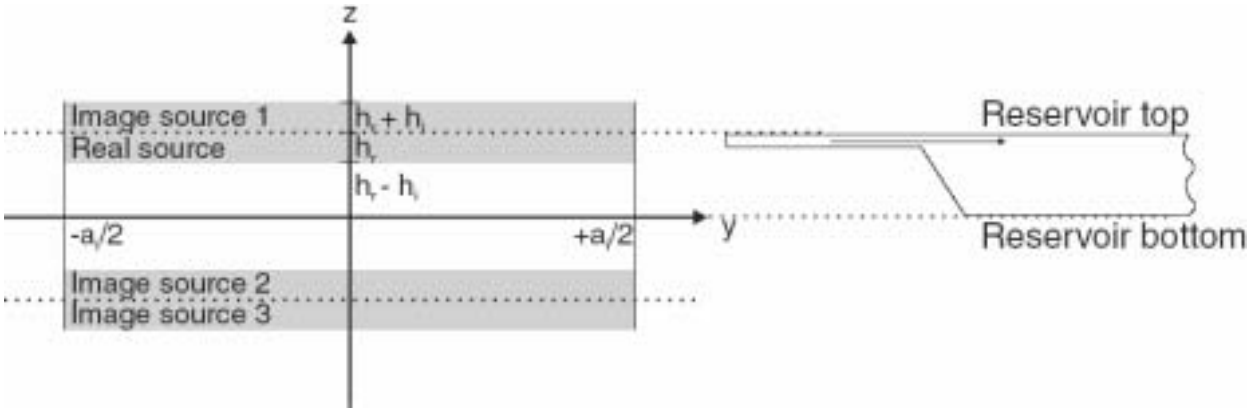

Fig. S4 Drug injection profile with image sources outside the boundaries for an injection width of h_i=100 µm. The schematic of the flow cell on the right has only been presented in the same figure to clarify the procedure of image sources. Note that the expansion of the nutrient inlet is not considered here.

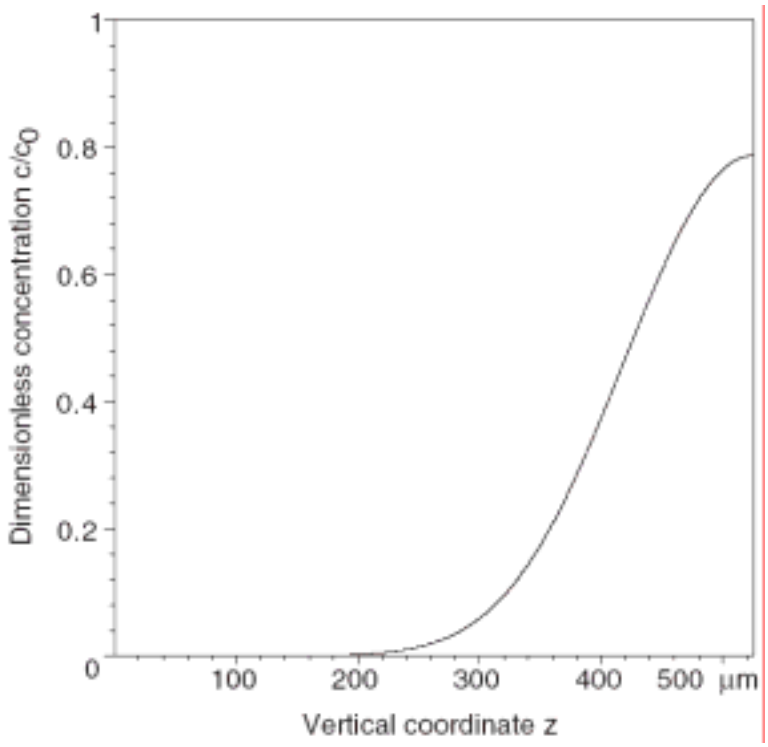

Fig. S5 Concentration profiles over the height of the chamber, 1 mm from the injection position. The diffusion coefficient is D=10^{-9} m^2/s, the velocity is the average nutrient velocity to be expected at a nutrient main flow rate of 100 µL/min.

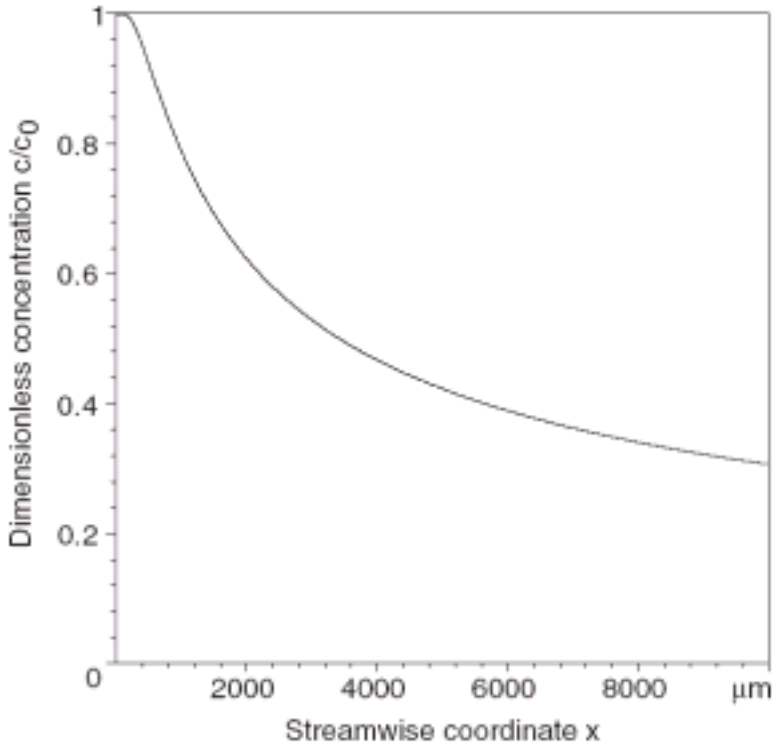

Fig. S6 Two dimensional concentration profile in the (x,z)-plane at z=525 µm with the image sources of Fig.10. The diffusion coefficient is $D=10^{-9}$ m^2/s, the velocity is the average nutrient velocity to be expected at a nutrient main flow rate of 100 µL/min.