Microfluidic Assessment of Mechanical Cell Damage by Extensional Stress

Electronic Supplementary Information

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List of Supplementary Information

SI Text 1. Detailed information of numerical simulation.

SI Table S1. Numeric data for cell viability tests (6 repeated experiments) which were presented in Fig. 5 in the main text.

SI Movie 1. Sample movies for cell deformation in the cross-slot channel, which were used to obtain averaged deformability (Fig. 3): 30 fps (playback rate) at flow rate $\leq$ 500 μL/hr; 15 fps at flow rate = 1000 μL/hr; 8 fps at flow rate = 2000 μL/hr; 5 fps at flow rate = 3000 μL/hr.

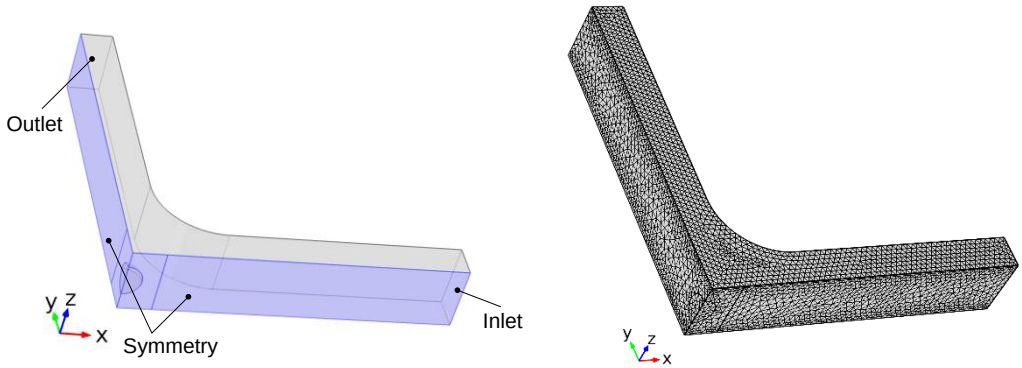
SI Text 1. Detailed information of numerical simulation.

In this work, incompressible Newtonian flows were simulated using a commercial computational fluid dynamics software (COMSOL Multiphysics®) with the following the fluid properties:

- Fluid properties:
  - Density: 1000 kg/m^3
  - Viscosity: 62 cP

The boundary conditions and finite element meshes, which were used for numerical simulations, were presented below:

- Boundary conditions and finite element meshes:



  - Inlet: $\dot{m} = 1/4\,\rho\dot{Q}$
  - Outlet: $P_{out} = 0$
  - Symmetry
  - Others: No slip

- Mesh information
  - Degree of freedom : 405,405
  - Number of element : 76,197

where $\dot{m}$ is mass rate at the inlet, ρ is fluid density and $\dot{Q}$ denotes volumetric flow rate. The pressure at the outlet (P_{out}) was set to 0.

SI Table S1. Numeric data for cell viability tests (6 repeated experiments) which were presented in Fig. 5 in the main text.

Viability of CHO-k1 cell

	500 μL/hr		1000 μL/hr		1500 μL/hr	
	Control	Experiment	Control	Experiment	Control	Experiment
1st	90.9	89.7	89.1	86.2	90.0	82.0
2nd	88.2	87.7	91.6	85.2	85.8	81.5
3rd	88.4	88.2	89.7	86.0	87.4	84.0
4th	88.6	90.2	93.5	86.7	92.2	86.0
5th	93.3	96.0	95.1	92.2	92.8	87.4
6th	87.7	84.6	86.8	83.1	85.6	76.2