

Figure S1: **A)** Design of the bioreactor system. **B)** Global cross-section view of the bioreactor. Scale bar: 10 mm. **C)** Representation of the deformable membrane in its flat state (left) and maximum inflated state (right). Scale bar 5 mm.

Figure S2: **A)** Nominal strain vs radius plot. Circumferential and radial strains are reported for each level of pressure applied. At each location the deformation varies between zero and the magnitude indicated here. Strains were calculated from the finite element model of the membrane; regions from 1 to 5 are highlighted. **B)** Nominal circumferential strain. Finite Element Model for PDMS membrane exposed to a pressure of 90 mbar, leading to an apex WD of 5% (left) and membrane exposed to a pressure of 540 mbar, leading to an apex WD of 13% (right). **C)** Membrane partition for the image analysis. Regions from 1 to 5 are highlighted. Due to the axial symmetry the 5 squares are representative of the whole membrane.