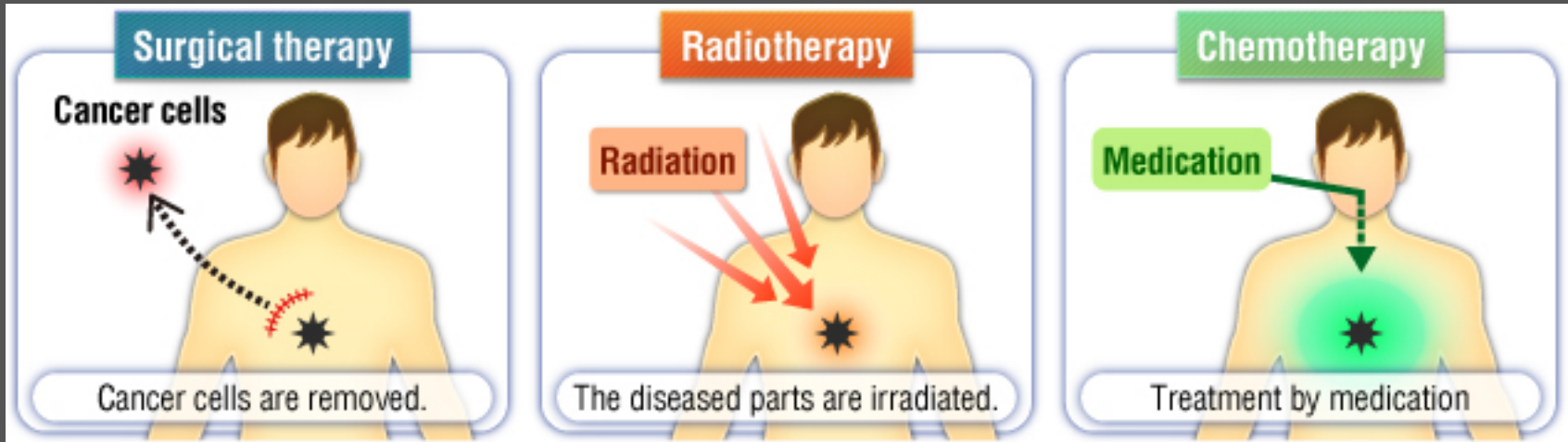# Cavitation enhanced drug-delivery

RAMONA DE LUCA

Sapienza University of Rome, Department of Mechanical and Aerospace Engineering, Rome, Italy

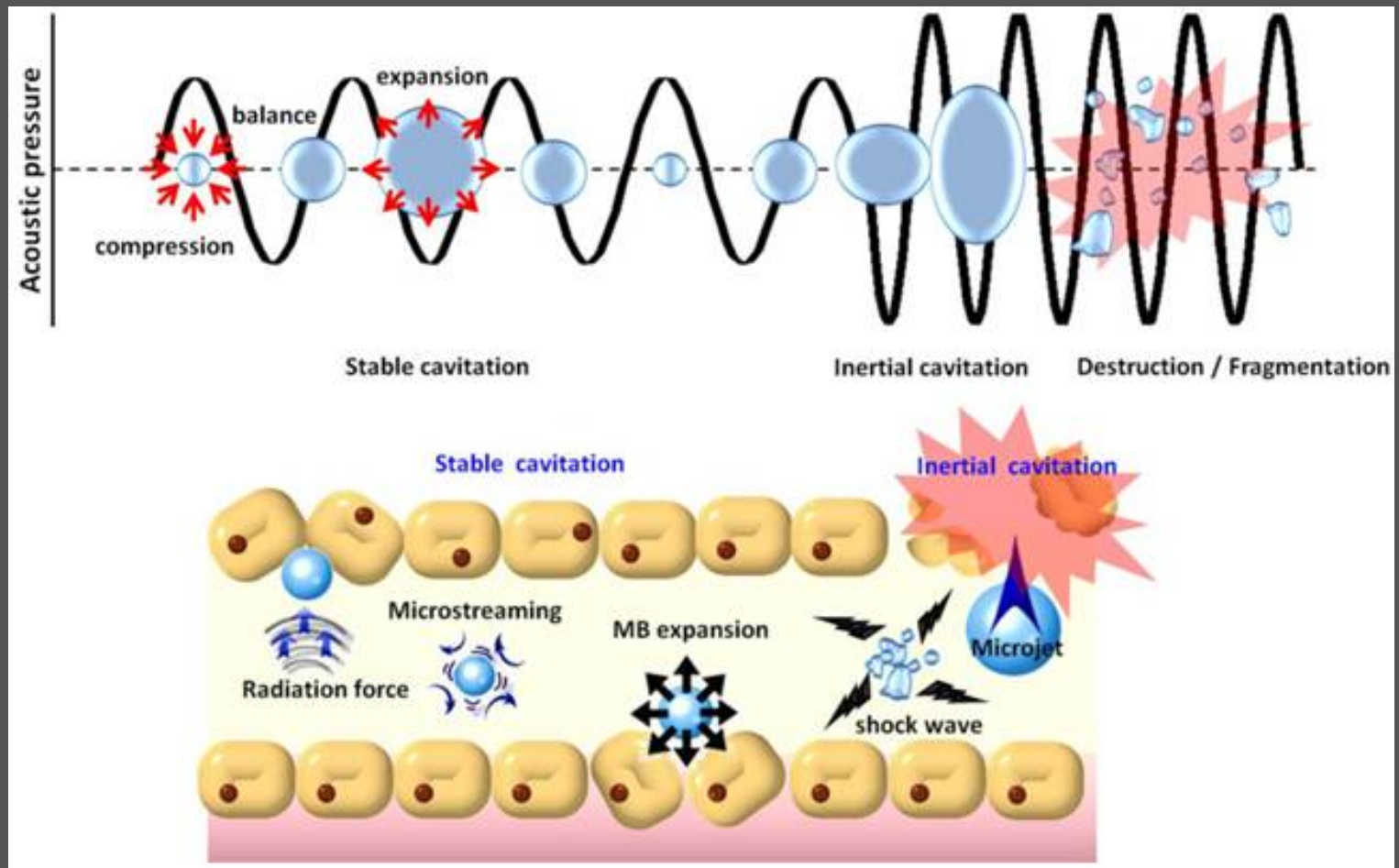*CLNS@Sapienza Istituto Italiano di Tecnologia, Rome, Italy*

`ramona.deluca@uniroma1.it`

Cancer therapy

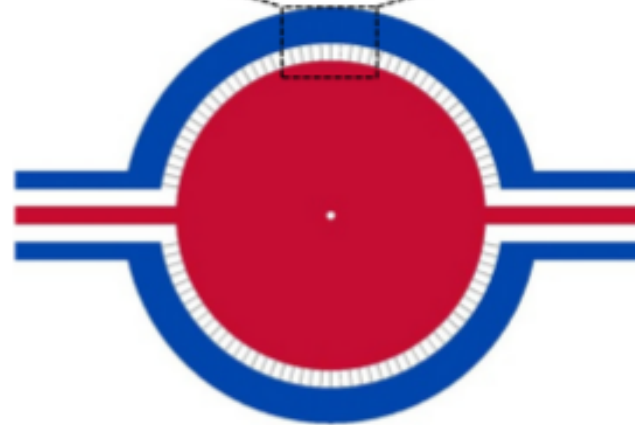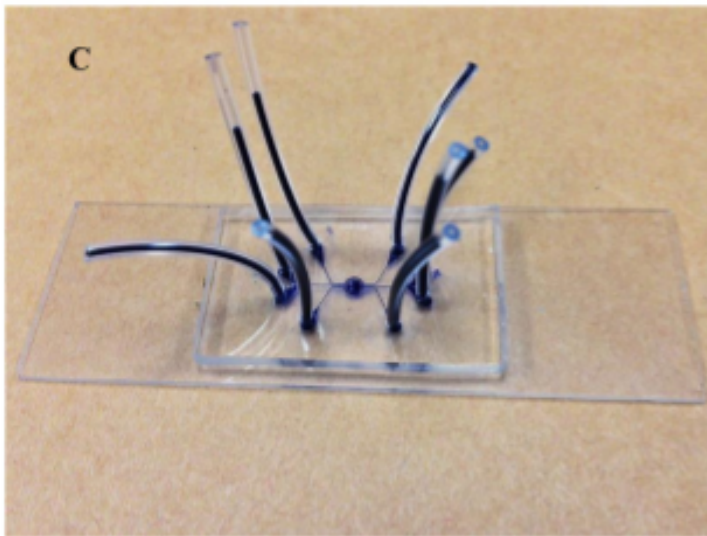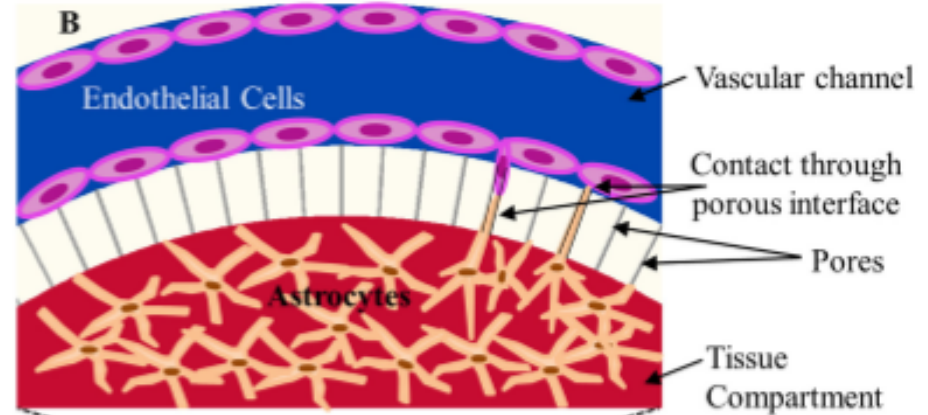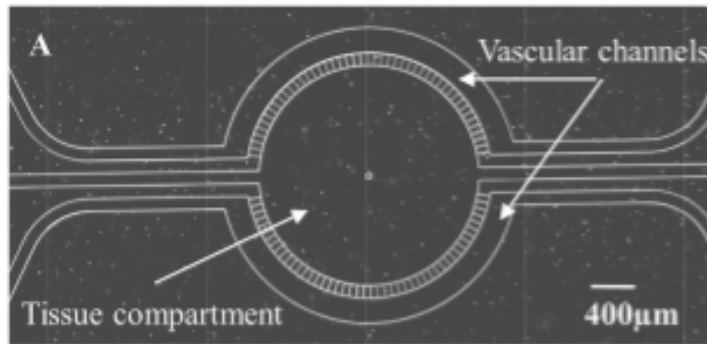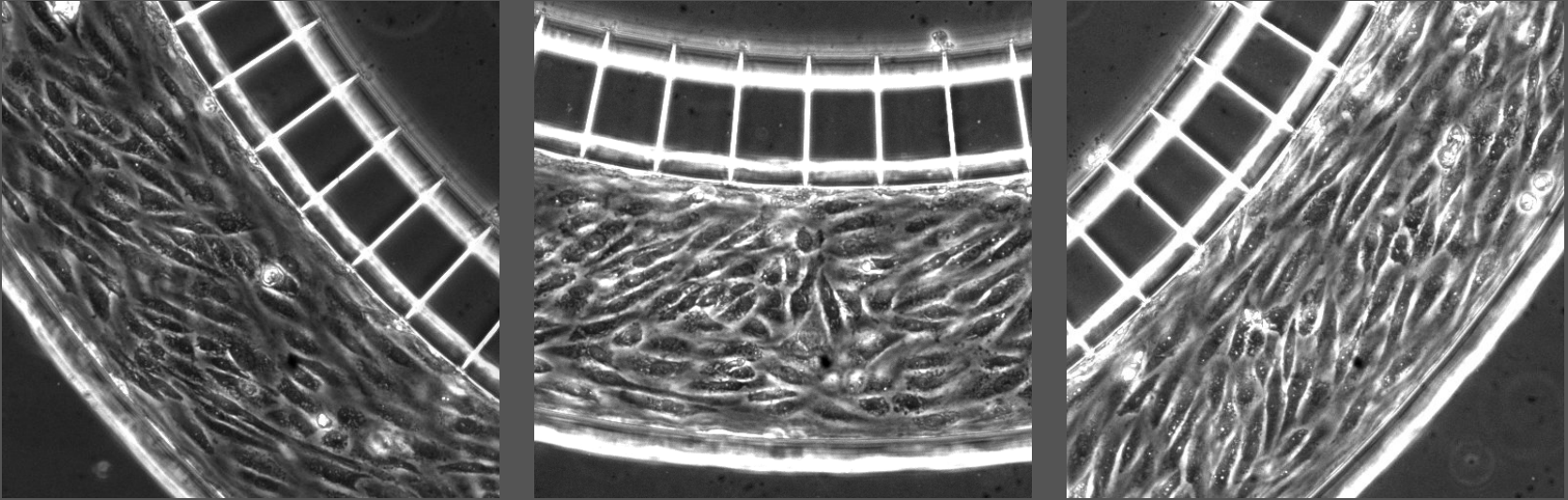| Surgical therapy	Radiotherapy	Chemotherapy
Cancer cells	Radiation	Medication
Cancer cells are removed.	The diseased parts are irradiated.	Treatment by medication

Microbubbles and ultrasound cavitation for targeted drug delivery

Microbubbles and ultrasound for drug delivery to solid tumours

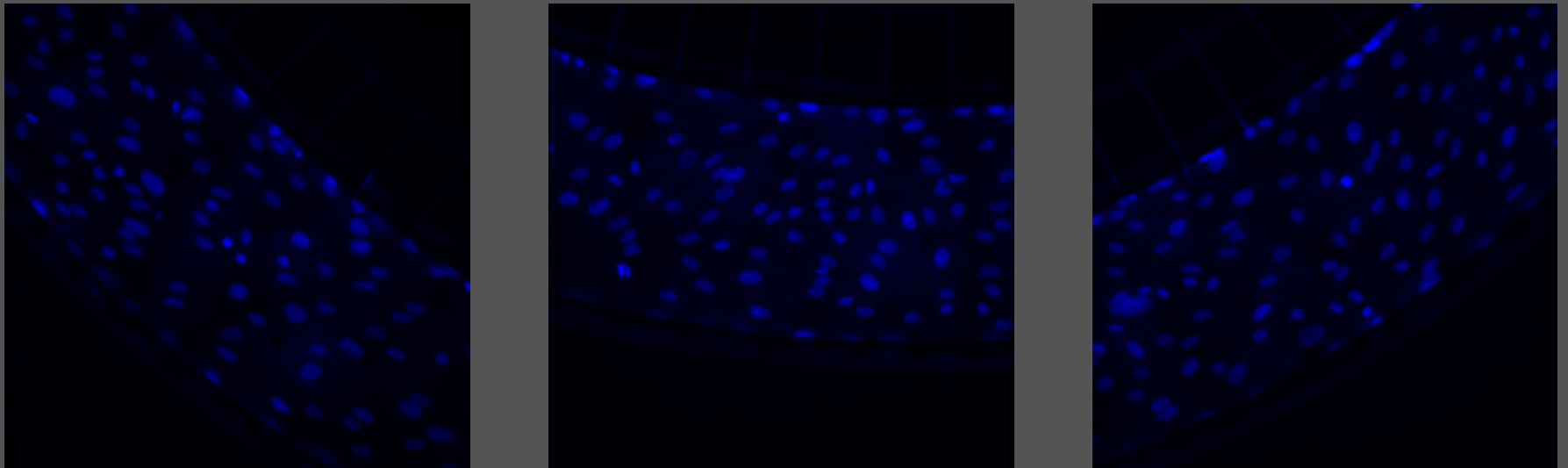Hao-Li Liu et al., Theranostics 2014

Blood vessel on a chip
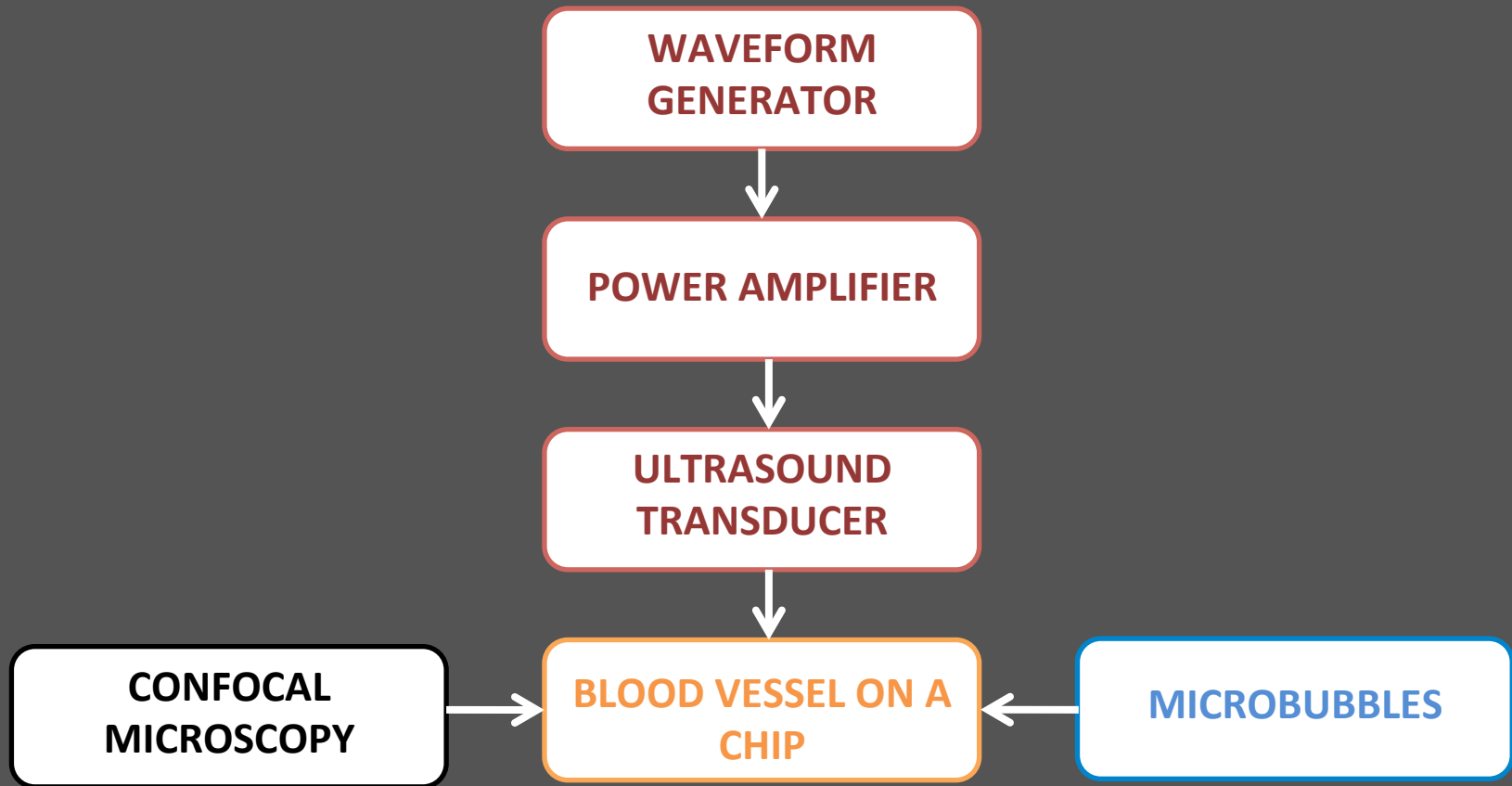
Blood vessel on a chip

Bright-field images of the bio-inspired chip: sections of the vascular channel with HUVECs (Human Umbilical Vein Endothelial Cells)
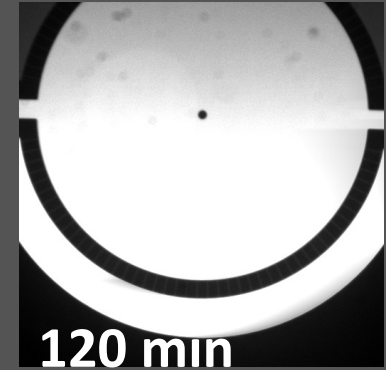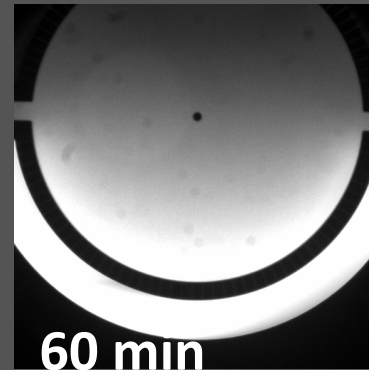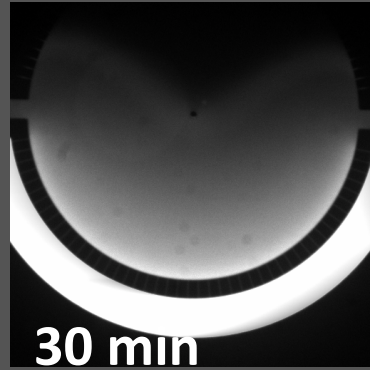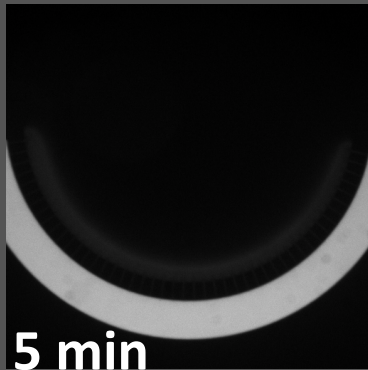
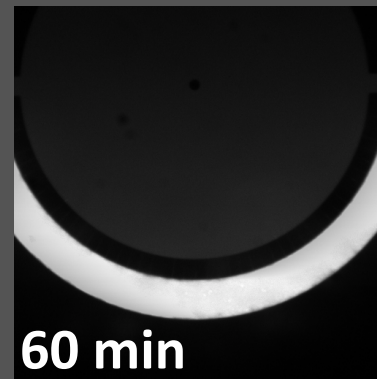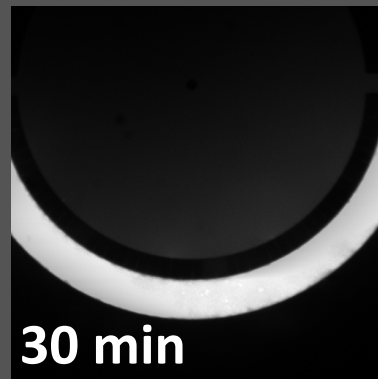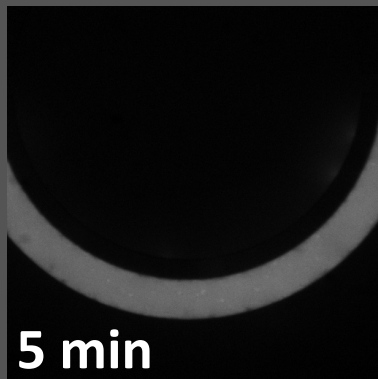**DAPI fluorescence images of HUVECs in the vascular channel**

Experimental set-up

Fluorescence microscopy for permeability measurement

Fluorescence microscopy for permeability measurement

CELL-FREE DEVICE

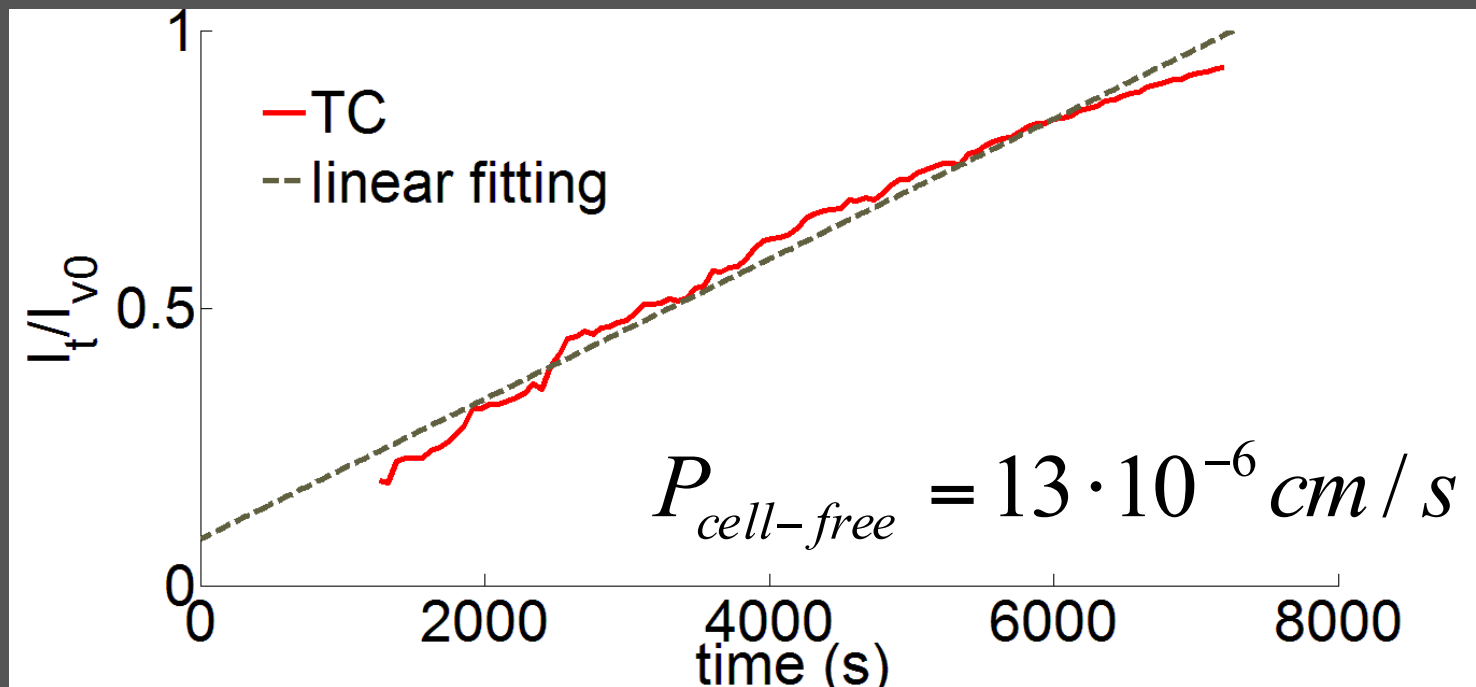**HUVECs CULTURED IN THE VESSEL CHANNEL**

Fluorescence microscopy for permeability measurement

$$P = \frac{1}{I_{v0}} \frac{V}{S} \frac{dI_t}{dt}$$
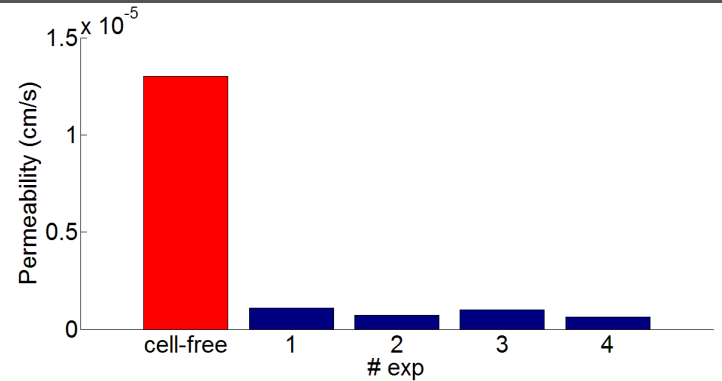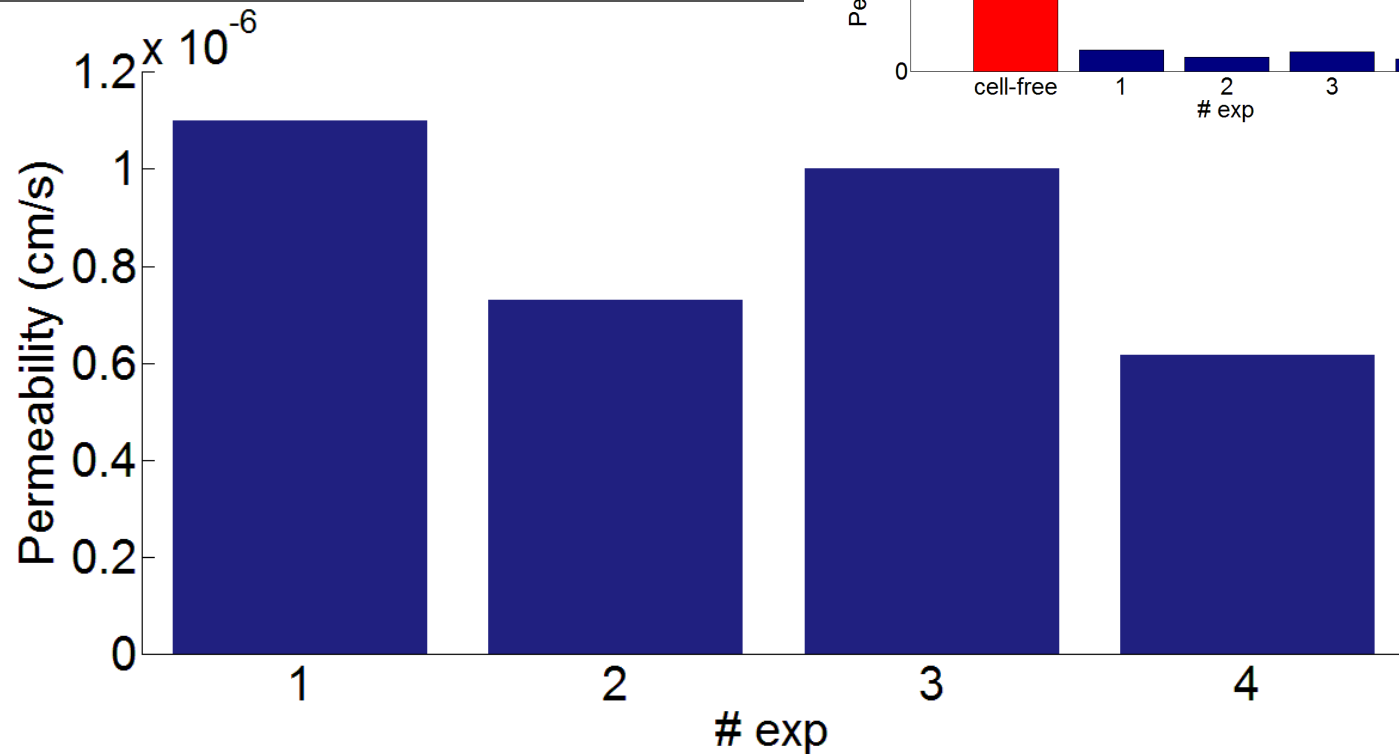
I_t → average intensity in the tissue compartment

I_{v0} → maximum fluorescence intensity of the vascular channel

V/S → ratio of vascular channel volume to its surface area
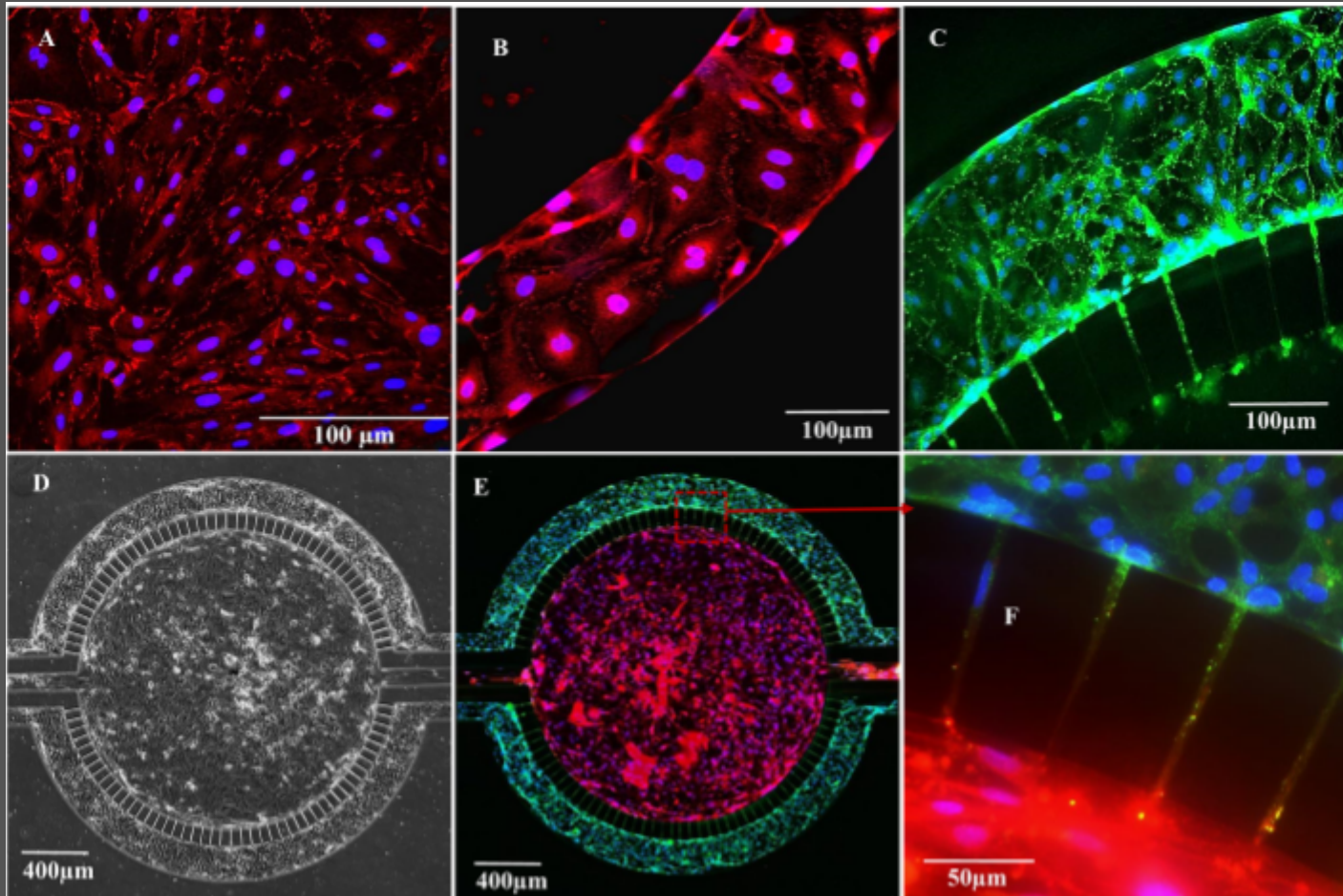

$$P_{cell-free} = 13 \cdot 10^{-6} \, cm/s$$

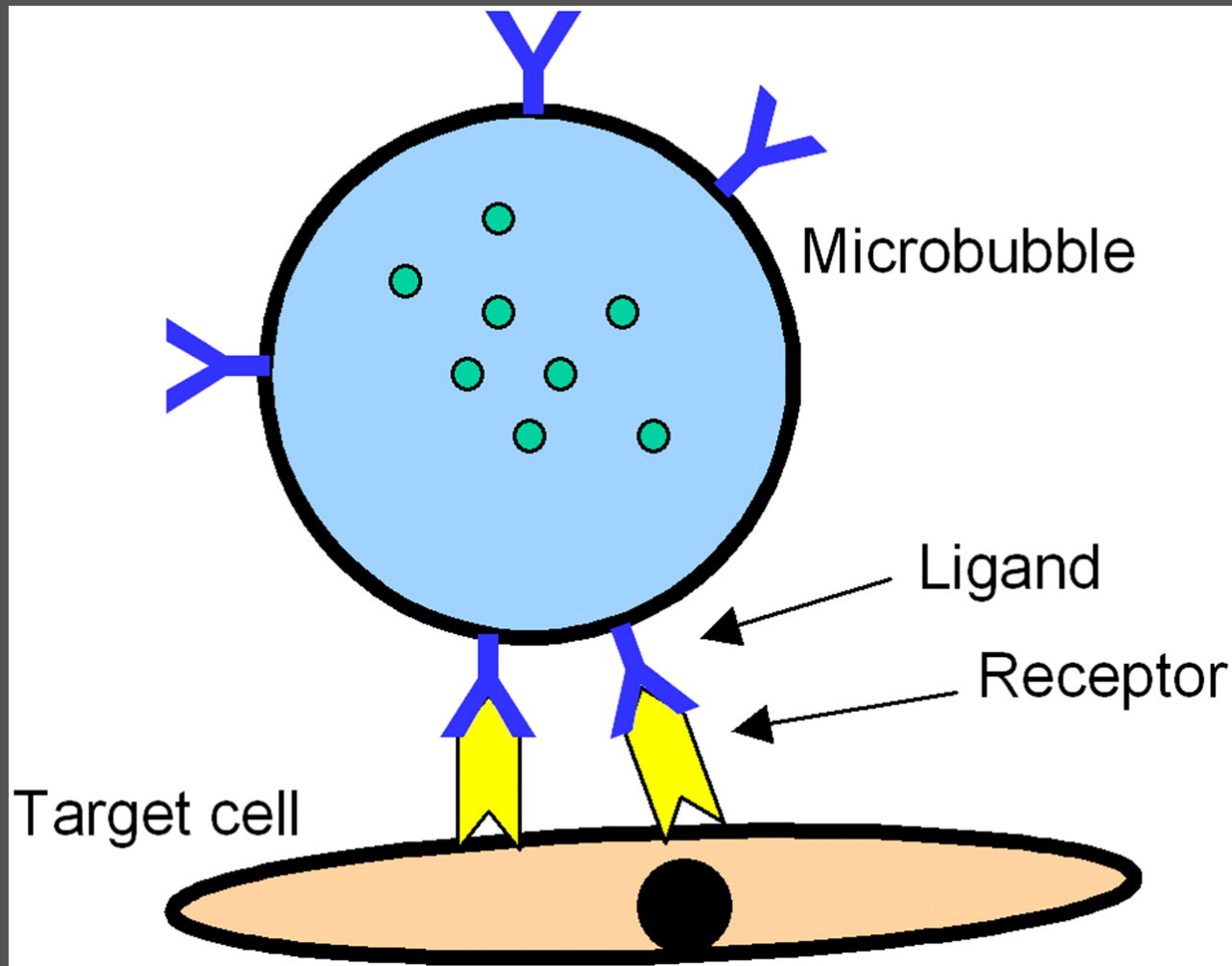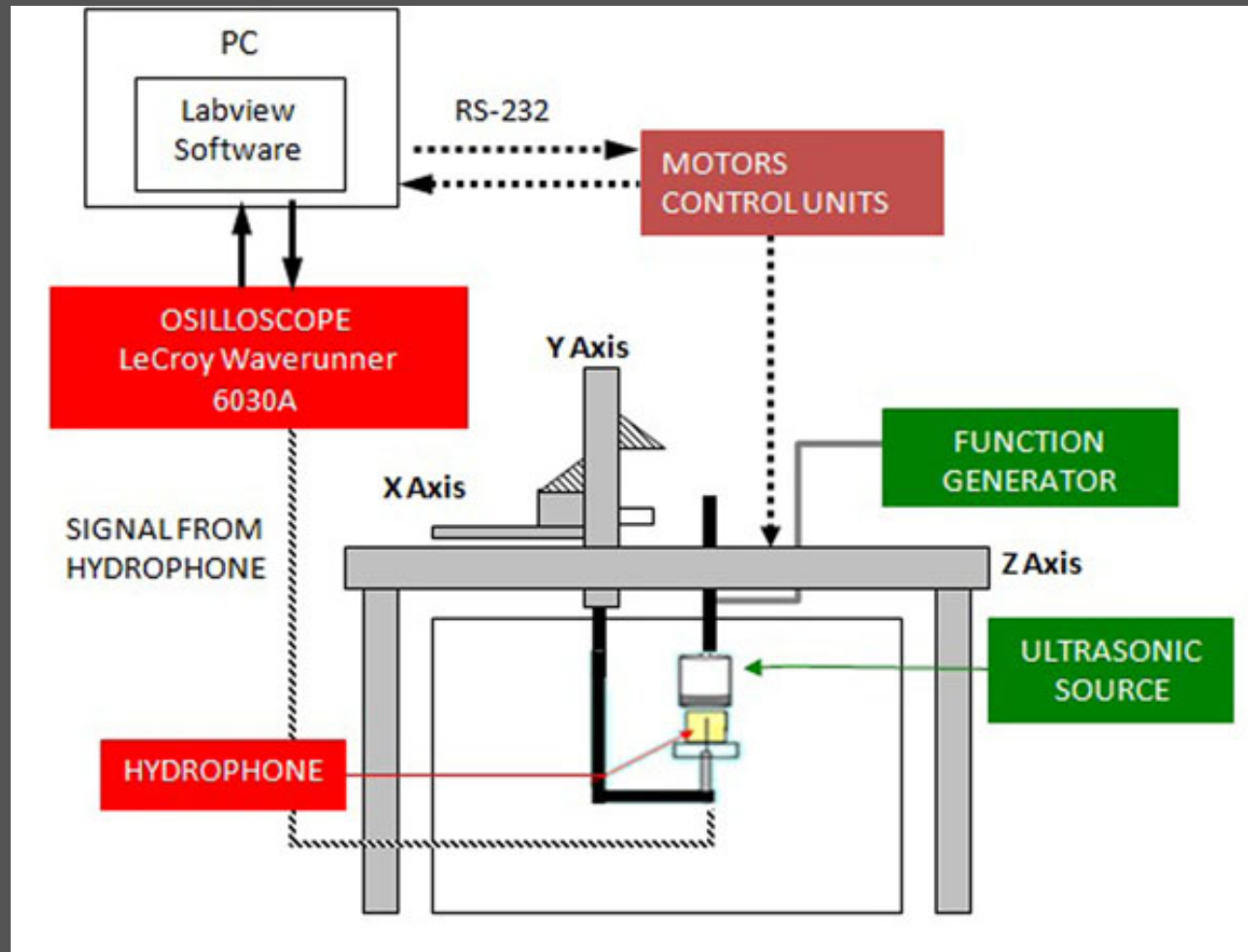# Fluorescence microscopy for permeability measurement

Perspectives: Breast cancer

Deosarkar et al., PLOS ONE 2015

Perspectives: functionalized microbubbles

Perspectives: US transducer characterization

Durando et al., J Ther Ultrasound 2014

Acknowledgements

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