

# MICRO PARTICLE IMAGE VELOCIMETRY ( $\mu$ PIV) ON ENDOTHELIAL CELL CULTURES

## PROJECT AIM

Application of micro Particle Image Velocimetry ( $\mu$ PIV) to study the relation between flow-induced mechanical stimuli and gene-expression and re-modeling of endothelial cells (ECs).  $\mu$ PIV is used to measure the shear stress distribution and surface topography of EC cultures in microfluidic chips.

## PROGRESS

$\mu$ PIV was used to measure the shear stress distribution and surface topography of EC cultures in microfluidic chips. Experiments were carried out on a tapered shape micro channel to investigate the response of ECs to different pre-defined shear stress levels without the influence of variations in repetitive experiments. In particular the expression of eGFP-KLF2 promoter was studied. Experiment on living human ECs were carried out to study the remodelling of endothelial cells during 12 hours experiments. Correlation analysis between morphological characteristic of the cells and shear stress/shear stress gradient distribution where carried out.

## DISSERTATIONS

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## SCIENTIFIC PUBLICATIONS

1. Rossi, M.; Lindken, R.; Hierck, BP.; Westerweel, J.: Microfluidic system for characterization of biochemical and mechanical response of endothelial cells to shear flow. 1st European Conference on Microfluidics (mFlu'08), Bologna, Italy, 10-12 December 2008.
2. Rossi, M.; Lindken, R.; Hierck, BP.; Westerweel, J.: Microfluidic system for the study of mechanical and biochemical response of endothelial cells to flow - induced mechanical stimuli.  $\mu$ TAS2008 The 12th International Conference on Miniaturized Systems for Chemistry and Life Sciences, San Diego, USA, 12-16 October 2008.
3. Lindken, R.; Rossi, M.; Westerweel, J.: Messung und Simulation der Korrelationstiefe mit hochvergrößernden Objektiven für die micro Particle Image Velocimetry. Proc. of 16. Fachtagung Lasermethoden in der Strömungsmesstechnik, GALA, Karlsruhe, Germany, September 9-11, 2008.
4. Rossi, M.; Lindken, R.; Hierck, BP.; Westerweel, J.: Single-cell level measurement of shape, shear stress distribution and gene expression of endothelial cells in microfluidic chips. Proceedings of ASME ICNMM2008 6th International Conference on Nanochannels, Microchannels and Minichannels, paper# ICNMM2008-62049. Darmstadt, Germany, June 23-25, 2008.
5. Rossi, M.; Lindken, R.; Hierck, BP.; Poelmann, RE.; Westerweel, J.: Tapered microfluidic chip for the study of biochemical and mechanical response of endothelial cells to shear flow at subcellular level. Third Int. Symp. on Biomechanics in Vascular Biology and Cardiovascular Disease. Rotterdam, the Netherlands, 24-25 April, 2008.

## PROJECT LEADERS

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## RESEARCH THEME

Complex dynamics of fluids

## PARTICIPANTS

M Rossi.

## COOPERATIONS

Leiden University Medical Center

## FUNDED

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1<sup>st</sup> 100% 2<sup>nd</sup> - 3<sup>rd</sup> -

## START OF THE PROJECT

2006

## INFORMATION

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