**Modular Bioreactors in Tissue Engineering: the role of mechanical signals**

The highly interdisciplinary area of tissue engineering, by its nature, involves several fields of research from basic materials development to stem cell handling to clinical applications.

While the need for quick applications is driven by necessity we are still far away from understanding how the hybrid system of material scaffolds-cells-biomolecules operates optimally either in-vitro (in a bioreactor) or in-vivo.

In our effort to monitor some basic responses of particular cells to specific environments we have developed a bioreactor able to supply a multitude of mechanical cues, singly or in combination to endothelial cells.

In this presentation we will provide evidence of the importance of substrate stretching and frequency of stretching, of the shear rate of the flowing feeding medium on top of the cells, and of a simulated microgravity environment to the morphological adaptation of the cells and the rearrangement of its cytoskeletal proteins for each particular adaptation.

It will also be shown how the combination of these signals correlates with specific gene expressions.