LBMC UMR_T 9406 (Univ Eiffel – UCBL)
Université Gustave Eiffel, Campus de Lyon
25, avenue François Mitterrand
F-69675 Bron Cedex

https://lbmc.univ-gustave-eiffel.fr/

Scientific Seminar

Changes in Mechanical Properties of Endothelial Cells with Age Contribute to Impairment of Nuclear Shear Stress Mechanosensing

Jacques OHAYON, PhD
Laboratory TIMC-UGA, CNRS UMR 5525, BiomecaMot Group & Savoie Mont-Blanc University, Polytech Annecy-Chambéry, Department of Mechanical Engineering, Le Bourget du Lac, France

Information

Date: Wednesday, **July 01**
11:00 AM , Salle du Conseil
Université Gustave Eiffel, Campus de Lyon
25 av. F. Mitterrand, Bron

Presentation in **English**

Abstract

Mechanobiology, the study of cellular mechanical properties (MPs) and how they transduce physical stimuli into a biological response, is an active area of current research due to the implications in several disease processes[1]. Previous reports have shown that the MPs of senescent cells and those in an accelerated aging disease, Hutchinson-Gilford Progeria Syndrome[2,3], are altered significantly. However the granularity at which this information was collected needs refinement: there appear to be several different studies reporting composite stiffnesses as measured by atomic force microscopy (AFM) to be higher[2-4], lower[5], and unchanged[6] between young and aged cells. Current biomechanical measurements as taken by AFM require several assumptions about the geometry and material to be made[7] which do not hold true for senescent cells. Namely – senescent cells grow to be exceedingly large[8]. Here, we use a correlative super-resolution/AFM approach to perform measurements on individual cells to extract both the nuclear and cytoplasmic MPs (Fig. A-D). We then locate each cell previously measured with AFM and perform 3D structured illumination microscopy to extract the intracellular geometries (Fig. E). Using a two-compartment 3D-finite element model, we find that changes in MPs of ECs with age contribute to impairment of nuclear shear stress mechanosensing.

Short biography

Jacques Ohayon is Professor at Université de Savoie. His research interest is to understand the evolution of atheroma plaque vulnerability and to increase knowledge of the plaque growth process through the combined use of mathematical modeling based on the nonlinear continuum mechanics theory, finite element method, together with clinical and biological investigations and micromanipulation techniques. He contributed to the biomechanics of atherosclerotic plaque with in-vivo, molecular and AFM imaging, the investigation of arterial wall stiffness and residual stress/strain distributions in mouse and human atherosclerotic plaques, and the development of morphological indexes for atherosclerotic plaque rupture prediction.