Nanotechnology for Life Science

JPK Instruments contact:
Gabriela Bagordo: +49 30726243 500

Media contact:
Jezz Leckenby: +44 (0)1799 521881

JPK reports on research of the Mestroni Lab at the University of Colorado Denver which use the JPK NanoWizard® AFM to help in the characterization of cardiomyopathies.

Berlin, 24th April 2018: JPK Instruments, a world-leading manufacturer of nanoanalytic instrumentation for research in life sciences and soft matter, reports on the research of Professor Luisa Mestroni's research laboratory which specializes in the study of genetics of cardiac muscle diseases. They use the JPK NanoWizard® AFM to help the characterization of cardiomyopathies.

Professor Luisa Mestroni heads a laboratory studying the genetics of cardiac muscle diseases. Based at the University of Colorado Denver and working in conjunction with labs in Italy, the lab's interest is in the genes causing dilated cardiomyopathy, arrhythmogenic right ventricular cardiomyopathy/dysplasia (ARVD/C), left ventricular noncompaction and hypertrophic cardiomyopathy.

One of the group's PhD students is Ilaria Pecorari. She is studying the effect of the scaffold on the cardiac cells cytoskeleton. This is mainly focused on the study of mechanical behaviour and mechanotransduction phenomenon in cells carrying a genetic mutation that is responsible for the onset of a pathological condition. She describes the study: "I am currently investigating the response of certain type of cells to different mechanical stimuli, i.e. exposure of cells to substrates with tunable stiffness, but I am also probing the mechanical response of "healthy" and mutant cells via atomic force microscopy (AFM). For the latter, I am exploiting the setup provided by JPK Instruments, in which the atomic force microscope (NanoWizard®4a BioSciences) is coupled with a fluorescence microscope. I infect cells with viral constructs, so they will express both green fluorescent protein (GFP) and the mutant protein known as the cause of disease. The NanoWizard® enables me to simultaneously identify the cells expressing the mutant protein and probe them mechanically. Through the force-deformation curves and their post-processing analysis, I can detect if the genetic mutation affects the mechanical behaviour of a single cell. In the near future, I'd like to assess the mechanical properties of wild type (i.e. "healthy") and mutant cells on substrates with different rigidities (thus either stiff or soft)."

Describing her experiences with AFM, Ms Pecorari continued; "Having been a user of AFM for eight years, I first used an AFM from JPK in 2016 while working under the supervision

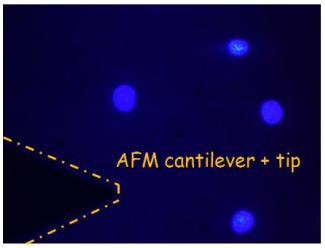
of Dr José Luis Toca-Herrera at the BOKU University in Vienna (Austria). Compared to other equipment I have used, the NanoWizard® is extremely user friendly. It is very intuitive, once the working principle of atomic force microscopy is clear. The variety of modes available, included the quantitative imaging (QI™) mode, allows the user to acquire a large variety of data on a sample. While working with living cells, it is crucial to control the temperature setting and the JPK PetriDishHeater™ is reliable and easy to use. The software for the post-processing of data is also very easy to use and quite automatic. So overall, I think that working with JPK's AFM has guaranteed a high degree of reliability of my observations."

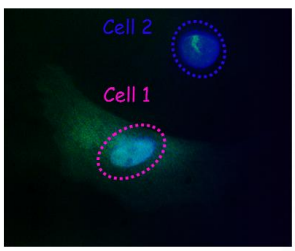
This work has been published in a review article in *Seminars in Cell & Development Biology* published by Elsevier in 2017. The group has also published an interesting paper where the AFM is used to monitor the beating of cardiomyocytes grown on a 3D carbon nanotube scaffold. The lead author is Dr Brisa Peňa and is published in the ACS' *Applied Materials & Interfaces*. It may be viewed here.

For more details about JPK's AFM systems and their applications for the materials, life & nano sciences, please contact JPK on +49 30726243 500. Alternatively, please visit the web site: www.jpk.com or see more on Facebook: www.jpk.com/facebook and on You Tube: http://www.youtube.com/jpkinstruments.

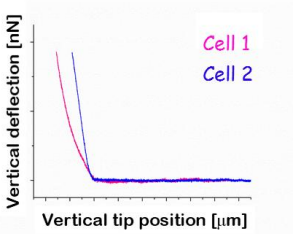
Attachments

Living cell nuclei are stained and probed. The cantilever of AFM is lowered onto a single nucleus so the tip can indent the sample. A force-deformation curve is generated. Force curves acquired on different cells can be compared in order to detect changes in the mechanical response of cells due to genetic mutations.





Cells infected with viral construct carrying both GFP and human mutant protein (BLUE: NucBlue™; GREEN: GFP).



Experimental summary of mechanical measurements in the research of Ilaria Pecorari

JPK Instruments

Nanotechnology for Life Science

PhD student, Ilaria Pecorari, of the Mestroni Lab with the JPK NanoWizard® 4a AFM measuring mechanical behaviour of single cells.

For high resolution copies of the images, either right click to download or contact Jezz Leckenby at Talking Science.

About JPK Instruments

JPK Instruments AG is a world-leading manufacturer of nanoanalytic instruments - particularly atomic force microscope (AFM) systems and optical tweezers - for a broad range of applications reaching from soft matter physics to nano-optics, from surface chemistry to cell and molecular biology. From its earliest days applying atomic force microscope (AFM) technology, JPK has recognized the opportunities provided by nanotechnology for transforming life sciences and soft matter research. This focus has driven JPK's success in uniting the worlds of nanotechnology tools and life science applications by offering cutting-edge technology and unique applications expertise. Headquartered in Berlin and with direct operations in Dresden, Cambridge (UK), Singapore, Tokyo, Shanghai (China), Paris (France) and Carpinteria (USA), JPK maintains a global network of distributors and support centers and provides on the spot applications and service support to an ever-growing community of researchers.

For further information:

JPK Instruments AG
Colditzstrasse 34-36
Haus 13, Eingang B
Berlin 12099
Germany
T +49 30726243 500
F +49 30726243 999
www.jpk.com
bagordo@jpk.com

Talking Science Limited
39 de Bohun Court
Saffron Walden
Essex CB10 2BA
United Kingdom
T +44 (0)1799 521881
M +44 (0)7843 012997
www.talking-science.com
jezz@talking-science.com