Neuroblastoma response to stimuli as investigated through nanomotion sensing and correlative conventional and atomic force microscopy

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Atomic force microscopes are extremely versatile instruments capable of studying different aspects of biological systems with ultra-high resolution.

Conventional uses of this technique include the study of the morphology of living biological systems and the monitoring of the evolution of their mechanical properties with nanoscale resolution. More advanced studies can be performed by combining AFM ultrastructural information with conventional or fluorescence optical microscopy. Such correlative analysis can be carried out using the more advanced AFMs combined with high-magnification optical microscopes.

Furthermore, our team has demonstrated that nanometric scale oscillations exerted by biological specimens reflect the status of the microorganism metabolic activity and that AFM cantilevers can be exploited as high sensitivity devices to follow in real time such oscillations and their alterations in response to exposure to different chemical or physical stimuli.

In this presentation, we will provide an overview of the information that can be obtained by applying these characterization techniques to biological systems with a particular focus on neuroblastomas. These results represent the first steps of the COMA-SAN project (COMplexity Analysis in the Simplest Alive Neuronal network) to investigate the communication-mediated group behaviour of these cells, studying also how these patterns are altered by changes in environmental conditions. Overall, these studies open a path to produce a new means to understand the interactions between cells and possibly evidencing the complexity of group dynamics in cells.