INVESTIGATION OF MECHANICAL PROPERTIES OF LIVING CELLS BY COMBINED OPTICAL MICROSCOPY AND ATOMIC FORCE MICROSCOPY

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KEY WORDS: living cells, cancer cells, elasticity, Fluorescence, Atomic Force Microscopy, tumor suppressive factors

The invasive power of cancer cells is often related to their intrinsic mechanical properties. Atomic Force Microscopy (AFM) has proved itself to be the technique of choice to investigate living cells properties in situ and provide mechanical information in response to various external stimuli. Derivative of tapping mode, the phase signal reflects the energy dissipated between the tip and the sample during each tap on the surface but is a contribution of several factors. Force spectroscopy allows stiffness mapping but suffers from a lack of resolution and a lack of control of the nominal force applied on the sample.

More recently, the combination of most of commercial AFMs with inverted optical microscopy (IOM) techniques, especially epifluorescence, confocal and TIRF, enables easy and straightforward navigation to the location of interest and also displaying both AFM and optical information simultaneously. Moreover, the development of new AFM systems allows the user to gently control the force applied on the sample.

In the first part of this presentation was investigated the effect of two cytoskeleton-disrupting agents, Nocodazole and Latrunculin, on different types of living cells on cell mechanical properties. Actin and tubulin networks were fluorescently labeled. We clearly demonstrate that the drugs induce a specific change in elasticity, which can be correlated to a change in fluorescence signal.

In a second part, we aimed at studying the differences in elasticity between wt MCF7 cells and cells transfected p10 and p53 (tumor suppressive factors). A clear difference in mechanical properties was observed, which can be directly correlated to a difference in invasive properties.

This type of results may see AFM-IOM combination emerge as a potential diagnosis tool in cancer research.