Squeezing cells with AFM probe: what we can learn from it?

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Atomic force microscope (AFM) can be used to study various physical properties of cells. A particular interest has been focused on stiffness of malignant and aging cells, on cell responses to various treatments. To make this approach suitable for practical and maybe clinical applications, the measurements have to be quantitative and repeatable. A traditional way to do that is to characterize cells with a modulus of elasticity (*aka* Young's modulus). This concept, however, can only be applied to a homogeneous and isotropic material. The cell is obviously neither one.

In this talk, I will describe how to deal with this contradiction. I will demonstrate that the cells can properly be described with a modulus of elasticity, discuss the limits of this approximation. Furthermore, I will show that the analysis of AFM force curves allows to extract not only the stiffness of cells, but to obtain unique information about the pericellular coat layer, a large pericellular layer which surrounds all eukaryotic and some prokaryotic cells. Multiple examples of cells, from fish to human, from neurons to osteoblasts will be given. Particular focus will be on what information we can extract about the pericellular layer from the AFM measurements.