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If mechanics of cells can be described by elastic modulus in AFM indentation experiments? IGOR SOKOLOV, MAXIM DOKUKIN, Tufts University, NATALIIA GUZ, Clarkson University, VIVEKANAND KALAPARTHI, Tufts University — We study the question if cells, being highly heterogeneous objects, can be described with an elastic modulus (the Young's modulus) in a self-consistent way. We analyze the elastic modulus using indentation done with AFM of human cervical epithelial cells. Both sharp (cone) and dull AFM probes were used. The indentation data collected were processed through different elastic models. The cell was considered as a homogeneous elastic medium which had either smooth spherical boundary (Hertz/Sneddon models) or the boundary covered with a layer of glycocalyx and membrane protrusions ("brush" models). Validity of these approximations was investigated. Specifically, we tested the independence of the elastic modulus of the indentation depth, which is assumed in these models. We demonstrate that only one model shows consistency with treating cells as homogeneous elastic medium, the bush model when processing the indentation data collected with the dull probe. The elastic modulus demonstrates strong depth dependence in all other three models. We conclude that it is possible to describe the elastic properties of the cell body by means of an effective elastic modulus in a self-consistent way when using the brush model to analyze data collected with a dull AFM probe.

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