Integrated nanobiomechanics of the living system

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ABSTRACT

Of many levels of mechanical interactions that govern the life, cellular and subcellular mechanical interactions are most significant. The reason why they are important, almost needless to point out, is that cell is the location of the life. We have therefore focused on the nanoscale mechanics of the cell and its environment to build the integrated nanobiomechanics [1-5]. In our current studies of mechanical phenomena in the living body including cell-to-cell mechanical interactions [1], ligand to receptor force transmission on the cellular surface, molecular-to-molecular transduction of mechanical properties [2], are integrated. Integration, here, means that we can coordinate three major measures of the physical research, that is, theory, experiment and computation [3-6]. Our research group is composed of theoretical physicists, experimental biomechanicists, and computational mechanicists in one laboratory and have conducted truly co-operative research works "integratedly".

So far we have mainly concentrated into healthy or normal life phenomena. However, boundaries of normal condition are delineated by abnormal or diseased phenomena. Those boundaries must be carefully determined by studying various pathological degradation by diseases. It is noteworthy that the boundary between healthy and diseased condition is not usually clearly divided. They are continuous. Therefore we are now study the transition and difference between normal healthy mechanical condition and disease pathological escape. By this study, we are trying more deeply the life. Research of the pathological state is of course potentially useful to find measures of diagnosis and treatment of diseases. Though our principal purpose of the proposed study is to understand the mechanics and mechanism of the life, we will be able to contribute to medicine.

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