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Editorial

Nanophysiology: Real-time phenomenal perspective in biology

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Nanotechnology deals with skilfully handling and controlling particles at the dimension of 10^{-9} meters. Manipulations of matter can be done at supramolecular, molecular and atomic levels for ones advantage **[1]**. Nanotechnology finds application in all fields of science including biology and medical science. Biological systems pose a very complex interaction, either sequential or concurrent, of substances at macro, micro and nano levels.

Invention of scanning tunnelling microscope (STM) and atomic force microscope (AFM) provided visualization of individual atoms and their relationship with other atoms in the form of strong or weak bonds. During 1990s in the field of life sciences especially molecular biology and molecular genetics, scientists realized that AFM is a resourceful tool which not only acts as microscope but can be used for measuring force and intervention which has broadened the scope of its utility in studying live cells at sub-cellular, molecular and sub-molecular level. In combination with fluorescence microscopy, AFM can be used for recognition of single molecule; interactions and adhesions between molecules; and the elasticity/stiffness in the living tissue **[2]**.

Nanophysiology is a science that deals with comprehensively understanding complex physiological phenomena occurring in an individual organism at the molecular level. Strides have been made to study these phenomena in-vitro using AFM along with other tools. We are in an era of rapid technological progress wherein the nanotechnology is gaining more and more application in medical science—a field known as nanomedicine. The applications include synthesis of nanomaterials, nanoelectronic biosensors which are incorporated in biological devices **[3]**. We are marching towards mankind's major leap in medical sciences where biological machines based on molecular nanotechnology will be devised having physiological, diagnostic and therapeutic use in-vivo.

AFM has been employed in nanophysiology of insects **[4,5]**. In human beings nanophysiological approaches have been tried in understanding functioning of various systems. Central nervous system (CNS) is of prime importance because of its complex nature, extremely fast activity and less elucidated mechanism. Novel approaches are attempted in comprehension of neuronal circuit physiology, structural and functional plasticity, and in evaluation of in-vitro and in-vivo nanodiagnostic tools for neuroimaging **[6]**. Researchers have used nanophysiological approaches in elucidating various aspects of neuronal functions like action potential (AP) generation, vesicular transport and adhering, transmitter release **[7,8]**. Also neuronal mechanism has been studied in receptor cells of special senses like inner hair cells of cochlea **[9]**.

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Likewise nanophysiological application is adopted in understanding of other systems and tissues. For example in the study of vascular endothelial function **[10,11]**.

Role of nanovesicles have been envisaged in apoptosis, autophagy, inflammation and coagulation and has been studied **[12]**.

Hence, nanophysiology gives phenomenal perspective in real-time for ongoing physiological processes in biological systems. Nanophysiology holds wider prospects in current time for development of futuristic personalized nanomedicine.

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