EDITORIAL

NANOBIOLOGY IS THE FUTURE!

Biological systems are inherently nano in scale. Unlike nanotechnology, nanobiology is characterized by the interplay between physics, materials science, synthetic organic chemistry, engineering and biology. Nanobiology is a new discipline, with the potential of revolutionizing medicine: it combines the tools, ideas and materials of nanoscience and biology; it addresses biological problems that can be studied and solved by nanotechnology; it plans ways to construct molecular devices using biomacromolecules; and it attempts to build molecular machines utilizing concepts seen in nature. Its ultimate aim is to be able to predictably manipulate these, tailoring them to specified needs (1). Inspection of the protein structure databank illustrates the breadth of scaffolds, shapes and properties that protein molecules and their building blocks can provide. Nanobiology is a field where interdisciplinary collaborations are essential and disciplines converge (2), which should enable the quantitation, leading to a better understanding of the regulatory networks within cells and between cells of an organism. These networks dictate how a cell responds to external stimuli, which in turn activates signalling cascades. It should allow the addressing of a broad range of questions on the structure and function of the cytoskeleton; the nuclear envelope; signal transduction by membrane embedded receptors; the nanomechanical properties of the extracellular matrix; nuclear transport; and voltage induced channel gating (3).

Nanobiology, as a field of study between nanotechnology and biology, encompasses a wide range of research topics that can be divided into two basic categories: 1. nanotechnologies applied to biological systems, and 2. the development of biologically inspired nanotechnologies. It acts as the merger of biological research with nanotechnologies such as nanodevices, nanoparticles, or unique nanoscale phenomena with wide range of applications in areas such as health care, cosmetics, food and feed, environmental health, mechanics, optics, biomedical sciences, chemical industries, electronics, space industries, drug-gene delivery, energy science, optoelectronics, catalysis, single electron transistors, light emitters, nonlinear optical devices, and photo-electrochemical applications. Moreover, selection of solvent medium and selection of eco-friendly, nontoxic reducing and stabilizing agents are the most important issues, which serves as an imperative technique in the development of environmentally and economically friendly processes (4-9).

Although molecular biologists have been working with nano-sized biomolecules (Nano is a unit prefix meaning "one billionth"), for the last few decades, nanobiology was not defined as a discipline until researchers started making a focused effort to use our knowledge of nanotechnology in tackling biological problems. Nano-biological structure and system research mainly focuses on using nanotechnology to detect, measure, or probe biological systems. For instance, nanotechnology can be used to create nanochips or nanopatterned devices to screen large number of biological targets. Because of the small size of these systems, researchers can use smaller sample sizes, perform faster analyses, or use smaller amounts of expensive chemicals and reagents. In addition, unique physical phenomena at the nanoscale can be harnessed for sensing, detection and analytical purposes (10).

To sum up, advanced research in nanobiology can be a promising future to scientific world because of its various applications, but still there are some health hazard concerns due to their uncontrollable use and discharge to natural environment, which should be pondered to make it more suitable and environmentally responsive.

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