A State of the Art Review on Recent Trends in Nanobiotechnology

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ABSTRACT: Nanobiotechnology is a newly coined concept that defines the integration of engineering and molecular biology of the two current yet distant worlds. Nanobiotechnology is an interface between biology and nanotechnology. This is a mix of three terms: NANO is small, BIO is living stuff, and tools are about TECHNOLOGY. It is an emerging area of advancement of science and technology. Nanobiotechnology refers to the capacity at atomic and molecular levels to produce and control biological and biochemical materials, devices, and systems (billionth of a meter). Therefore, it is a mixture of physical sciences, molecular engineering, genetics, chemistry, and biotechnology, and holds great promise for developments in pharmaceuticals and health care. At the forefront of the rapidly developing field of nanotechnology are nano materials. These materials are superior, indispensable in many areas of human operation and, above all, a tiny tool for learning about living things due to their peculiar size-dependent properties.

KEYWORDS: Biotechnology, Material, Nanobiotechnology, Nano, Science.

INTRODUCTION

Opened up by rapid developments in science and technology, nanotechnology offers many new opportunities to advance medical science and the treatment of diseases. The concepts of engineering, electronics, physical and material science, and molecular or submicron processing are applied[1]. It is the development and use at the level of atoms, molecules, and supra-molecular structures of materials, devices, and systems through the regulation of matter on the nanometer scale. It is the general term for the design and use of functional structures measured on a nanometer scale with at least one characteristic dimension (one billionth of a meter). To refer to the development of new structures with nanoscale dimensions between 1.0 and 1000 nm, the term "nanotechnology" is widely used. In this respect, at nanoscale stages, the word "nanoscience" is used in research.

There are many explanations why scientists of diverse interests and backgrounds, including physicists, chemists, engineers, materials scientists, and bio-scientists, have converged to deal with things on a nanoscale and to understand them. Nanotechnology offers methods for testing and interpreting biotechnology processes. It provides technology platforms for biological systems research and transformation, while biology provides nanotechnology with approaching models and bio assembled components. Nanotechnology has made inroads, including self-assembly, cellular processes, and structures, to discover fundamental biological processes. The reason for this approach to nanobiotechnology is that nanoscale basic life processes take place; for example, proteins that are in the nanoscale range take care of most cellular processes and basic cellular structure components, such as mitochondria (protein body), which play an important role in cellular metabolism[2].

In this way, protein (the building blocks of all organelles) serves as the building blocks of bio-nano machines. To design and construct machinery at the molecular level, nanotechnology makes additional use of biological components. Thus, by designing living cells to perform certain tasks, creating certain molecules, or linking biological processes with man-made technology such as computer chips, it could make cellular engineering feasible and thus allow scientists to monitor them. Likewise, biological molecules may serve as light-collecting and light-transforming elements, as signal converters, as catalysts, as pumps, or as motors in energy-producing nano-machines or as specific products for task monitoring or data storage[3].

Thus, as applied to biological systems in biotechnology, nanobiotechnology extends the vocabulary of engineering to the nano level: "The fact that biological processes are in a way dependent on molecular machines and clearly defined structures shows that the construction of new nano machines is now physically possible for days to come[4]."

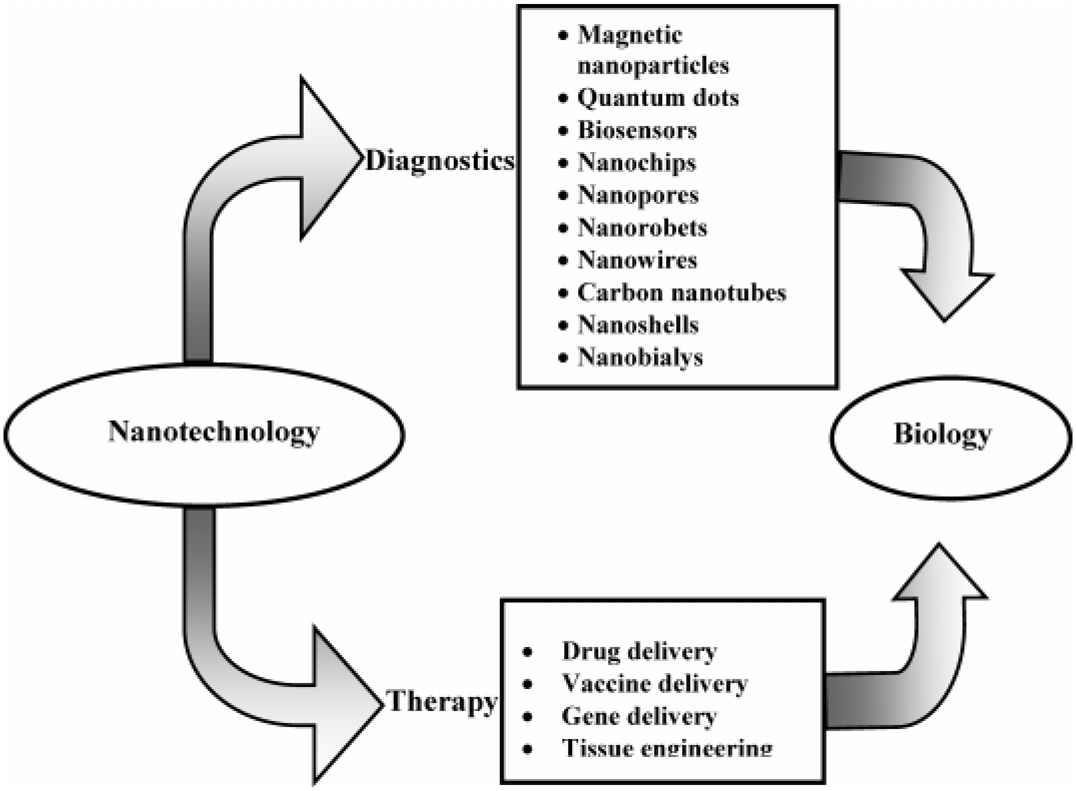

Figure 1: Illustrates the applications of the nanotechnology in the drug delivery[4].

In choosing an immobilization technique appropriate for building nano devices such as bio-electronic devices, the attachment of biomolecules such as DNA to the surface of nano materials plays a crucial role. Some general aspects of using the immobilization technique include long-term usage, quick response, operational reliability and reproducibility of the electrochemical bio recognition case. The selection of the most suitable immobilization protocol is strictly based on the transducing nanomaterial characteristics, and robust immobilization chemistries are typically favoured in order to avoid desorption from the sensing layer of the probes. Figure 1 illustrates the applications of the nanotechnology in the drug delivery. Figure 2 illustrates the interface of nanobiotechnology in between the nanotechnology and biology[5].

DISCUSSION

Physicians may detect diseases or predispositions to diseases much earlier than at present, using nanotechnology-based diagnostic methods. Recently, important areas in molecular biology have been revolutionized by nanotechnology, especially diagnostics and therapy at molecular and cellular levels. The convergence of nanotechnology, genetics, and photonics opens up the possibility of using nano devices to detect and manipulate atoms and molecules that have the potential for a broad range of medical uses at the cellular level. The nano probes were made with optical fibers that were pulled down to tips with distal ends of approximately 30-50 nm in size. The nanoscale size of this new sensor class enables measurements to be made in the smallest of conditions. One such atmosphere that has created a lot of interest is that of individual cells[6].

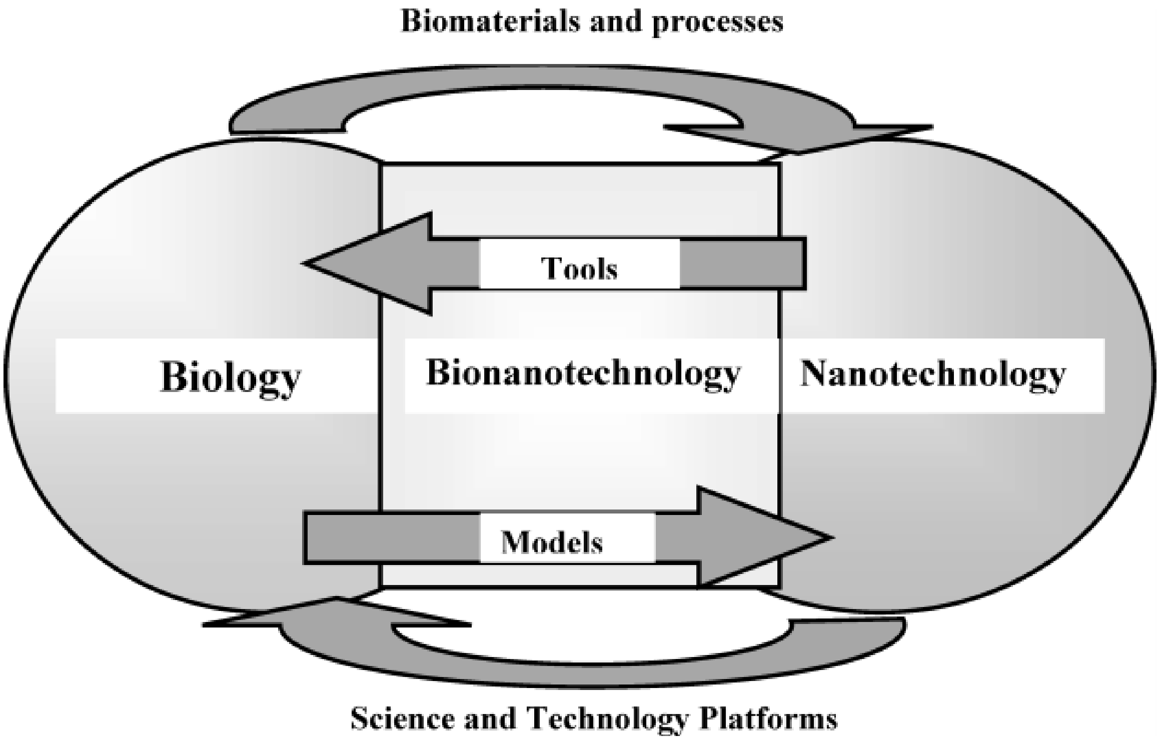

Figure 2: Illustrates the interface of nanobiotechnology in between the nanotechnology and biology[7]**.**

It has become possible to measure individual chemical species in particular locations within a cell using these nano biosensors[8]. Diagnostics are generally largely limited to in vitro use, with individual diagnostic tests conducted in centralized clinical laboratories[9]. Nanotechnology has immense potential for both the multiplexing of in vitro diagnostic experiments and the miniaturization of in vivo sensors. Improving the use of fluorescent markers for diagnostic and screening purposes will definitely be one of the first applications of nanotechnology. While fluorescent markers are widely used in basic research and clinical diagnostic applications, current techniques have many inherent drawbacks, including the need for color-matched lasers, fluorescence fading even after single use, and the lack of multiple dye discriminatory capability due to the tendency of the different dyes to bleed together[10].

CONCLUSION

Here, we discussed advances related to different aspects of the integration of nanotechnology and biotechnology. We have addressed the importance of nano biology in biotechnology in this regard. Subsequently, in the area of diagnosis, therapeutics, and tissue engineering, we have outlined a range of applications of nanotechnology in accordance with biology. We have also highlighted several possible fields in which nanoscience in biosciences has potential significant effects and addressed unique opportunities and challenges in this burgeoning field. Nano pharmaceuticals and nano diagnostics deliver new perspectives on health care, as demonstrated by the multitude of scientific publications on the integration of nanotechnology with biology. These developments are then implemented in many different ways in the biomedical field. In the field of nanomedicine, a few medical products are already offering a glimmer of benefits. Current preclinical research promises new ways of diagnosing the disorder, delivering specific treatment and acutely and non-invasively monitoring the impact. While nano devices have a lucrative application, their development at the nanometer level implies only a restricted programmatic modification of matter.

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