

Editorial**Perspective of the Future of Pharmaceutical Technology in Iran**

Hossein Vahidi

Pharmaceutical industry is currently undergoing a transient phase with new orientation. Loss of financial resources, presence of new therapeutic agents and increasing cost of research and development have called for a full-scale restructuring within the pharmaceutical industry to retain even the most basic competitiveness. The development of new technologies has been as one way out of the dilemma. Although at the end of the 20th century biotechnology was celebrated as the key technology and many scientists all around the world including Iranian scientists and pharmaceutical companies were optimistic about this basic science, today's technology is most certainly nanotechnology.

Nanotechnology which is defined as a group of techniques and structures ranging less than one hundred nanometers in size is in comparison to biotechnology, still in its infancy. Viewed from the current perspective of the pharmaceutical industry, nanotechnology is a cross-sectional platform expected to revolutionize all known branches of technology by creating new markets in a new way. Nanotechnology mainly influences two aspects of the development of new medicines:

1) Screening systems and assays for the discovery, synthesis and characterization of new chemical entities.

2) Drug delivery formulations in nano-scaled carrier systems.

Biochips and microarrays are systems which can perform the synthesis, as well as the highly sensitive analytical and biological investigation of millions of potential drug candidates in tiny amounts simultaneously. This "lab-on-chip" principle provides the basis for an accelerated more efficient discovery and optimization. The sheer speed of these techniques, the high throughput sample capacity, and low consumption of substances are especially attractive qualities for the pharma which hope to reduce the three to four year development phase for drug candidates in half with the help of these systems.

The nano-trend has also appeared in the field of drug formulation in the guise of new drug delivery systems. Nanoparticles based on polymers, proteins, carbohydrates or lipids are designed to provide a protective shield around the active drug molecules for defense against degrading mechanisms in the body. These carrier systems also protect the body against undesired drug reactions by reducing interactions with tissues other than target organ. Another application, based on the coating of surfaces with nanolayers of biomaterials can increase the biocompatibility of the implants, modify the drug release profiles and increase the tissue specificity of particulate carrier systems. To adjust the release of drugs to the requirements of the individual patient, nanosensors have been developed which measure physiological changes or drug levels even at the scale of single cells. Such systems are especially suitable for the new biotechnological drug compounds primarily of highly sensitive molecules.

Nanotechnology will also bring new capabilities, giving us new ways to make things, heal our bodies, and care for the environment. It will also bring unwelcome advances in weaponry and give us yet more ways to foul up the world on an enormous scale. It won't automatically solve our problems; even powerful technologies merely give us more power.

The potentials of nanotechnology are enormous and the list of nanotechnological innovations seems endless. In such a short context, it is impossible to describe more than a handful of the more prominent achievements. However, the actual economic benefit of this field remains to be seen. Since nanotechnology is still in its infancy, the forecasts of experts are conservative at present. Yet the consensus remains that it will take many years and will require much more fundamental investigation before all the possibilities of nanotech are acknowledged.

In conclusion, based on the facts mentioned above, since Iranian pharmacists especially those who are working in research centers and universities are quite experienced and knowledgeable in the following fields

introducing new bioactive molecules

introducing new sources of biological compounds

formulation of new pharmaceutical agents (proteins, peptides, hormones, vaccines, etc.,)

preparation of nanoparticles

formulation of novel drug delivery systems

There is no doubt that they will be more successful in the area of nanotechnology than biotechnology.

As usual, Iranian scientists have a lot of work ahead and a lot of hard decisions to make if they hope to harness new developments to good ends. The main step in paying attention to nanotechnology at the moment, before it is completely established, is to get a head start on understanding the fundamentals of nanotechnology and its future applications.

Hossein Vahidi is an Associate professor of Biotechnology in School of Pharmacy Shaheed Beheshti University of Medical Sciences. he can be reached at hovahidi@yahoo.com.