EDITORIAL

NANOTECHNOLOGY AND BIOSENSORS

Evangelyn C. Alocilja[1], Santiago M. Benites[2], and Ruben K. Briceño[2]

Nanotechnology is the creation of useful and functional materials, devices and systems through the control and manipulation of matter at the nanometer size. It exploits the novel phenomena and properties arising from the nanometer length scale. One nanometer is one billionth (10^{-9}) of a meter, very close to the atomic level. For example, atoms of phosphorus, sulfur and chlorine are about 0.1 nm in covalent radius. To provide a practical perspective, a typical human hair is about 10,000 nm in diameter.

Although nanotechnology is a relatively recent phenomenon, the development of its central concepts was initiated over a long period of time. On December 29, 1959, Richard Feynman gave a lecture entitled *"There is Plenty of Room at the Bottom."* His lecture provided the inspiration for the field of Nanotechnology. In that lecture, Feynman envisioned the ability to manipulate individual atoms and molecules to create things of importance to society. Inspired by Feynman's lecture, Eric Drexler published a book entitled "Engines of Creation: The Coming Era of Nanotechnology" in 1986 which proposed the idea of a nanoscale "assembler" which would be able to build a copy of itself and of other items of arbitrary complexity. Nanotechnology got its boost in the 1980s with the invention of scanning tunneling microscope (an instrument for imaging surfaces at the atomic level) by IBM which led to the discovery of fullerenes in 1985. In the 1990s, the term "nanotechnology" gained serious attention by the scientific community.

Materials at the nanometer scale exhibit unique size dependent properties that are different from their bulk state. Nanotechnology then involves manipulating these size-dependency to create new and novel products and systems in various sectors, including biotechnology, health care, food safety, water quality, chemicals, electronics, computers, tools, equipment, systems and diagnostic devices.

Nanotechnology is increasingly playing a major role in the development of biosensors to achieve high sensitivity, specificity, robustness, reproducibility and long-shelf life that are critical to diagnostic assays. Nanomaterials are used to introduce new signal transduction mechanisms in biosensing modalities. They are also used to allow rapid and simple analysis, improve portability and increase utility at the point of care and point of use.

Modern medicine has evolved and speed up greatly thanks to technology, most of the physician decisions are now based at least in part on lab and image results only possible by technology. Nowadays a new revolutionary kind of technology is making a big impact on health, and has the potential to change modern medicine forever, and it's important for a developing country like Peru to updated and keep up the advances on science. Peru has to make the transition from old practices and old not reliable technology to current and more specific medical practices based on current science trends like nanotechnology.

This new tool for medicine can be used in different sub areas such us diagnostic, treatment and even pharmacologically, at a more cost-effective rate which will be later translated into a great asset for the new Peruvian approach of preventative health. More on nano-biosensors will be covered in the next editorial article.

[1]PhD, Professor, Department of Biosystems and Agricultural Engineering, Michigan State University, East Lansing, MI 48824, USA

[2] Research Department. Universidad César Vallejo, Peru.