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Editorial

Impact of Green Synthesis and Characterization of Nanoparticles in Pharmaceutical Applications

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As a result of the increasing harmony and integration between the various sciences, especially the sciences of chemistry, pharmacy, and medicine, the science of chemistry has a different and strong influences in both the pharmaceutical and medical sciences. With the fierce attack on nanotechnology in all scientific journals, it was necessary to maximize the benefit of this science in harmoniously linking the sciences of chemistry, pharmacy, and medicine. Especially since the science of nanotechnology chemistry was not only reaped by chemists, but also had abundant luck and effective, influential and tangible benefit in the pharmaceutical and medical sciences.

Nanotechnology science involves manipulation, reduction, and fabrication of materials on a nanoscale with dimensions between 1 and 100 nm. Nanotechnology has emerged as a powerful strategy for the development of nanoparticles, such as nanoemulsions, liposomes, nanocrystals, and nanocomplexes, applied in the diagnosis, treatment, or theranostics of several pathologies and diseases. Indeed, fabrication of the materials in nanoscale resulted in special physical, electrical, magnetic, surface and optical properties yielding unique advantages like improved stability, good strength, cost effectiveness, biocompatibility, definite and specific targeting, etc. These characteristics could be attributed to the very small size and a large surface-to-volume ratio of nanoparticles (NPs), which allows for greater interaction between the particle and its surroundings yielding highly influence a nanoparticle's fate in the body. All these findings resulted in the pharmaceutical and medicinal nanotechnologies, that interested of the molecular-scale fabrication of various functioning systems depending on entrapped, encapsulated, dissolved, or linked to the nanoparticle matrix is the active pharmaceutical ingredient. In other words, the recent advances in nanotechnology aim to develop highly targeted medicinal interventions for disease detection, prevention, and treatment.

So, the nanoparticles for pharmaceutical applications are interested in emerging new technologies to develop customized solutions for drug delivery systems including solid lipid nanoparticles, liposomes, polysaccharides, polyesters, micelles, etc. Thus, many uses for nanoparticulate drug delivery systems exist, including gene therapy, cancer therapy, AIDS therapy, and radiation. It can also be used to transport proteins, antibiotics, and vaccinations, as well as serve as vesicles to cross the blood–brain. Nanoparticles have been proven to be useful as drug delivery vehicles. To ensure the effectiveness of drug delivery systems, these systems must have the following: (i) They must positively affect the rate of absorption, distribution, metabolism, and excretion of the drug or other related chemicals in the body. (ii) They should allow the drug to bind to its target receptor and influence that receptor's signaling and activity. (iii) However, they should be compatible, easy to bind with a particular drug, and able to degrade into fragments after use that are either metabolized or driven out via normal excretory routes. Mechanism of an incorporation of the nanoparticles in the biological system: (i) Nanoparticles enter through the biological system by injection, inhalation, or the oral route, they entry into the systemic circulation. (ii) Nanoparticles would interact with various circulatory plasma proteins and immune cells before distributing into different organs. (iii) The blood capillaries and the lymphatic system play a major role in the absorption, distribution, retention, and removal of nanoparticles. As the fluids are reabsorbed into the blood, the lymph nodes identify foreign matter passing through. If

there is greater particle size then it would be recognized as foreign, and engulfed by macrophages and cleared from the body.

Currently, with advanced scientific progress, severe climate changes, and increasing demand for energy, it is necessary to access and rely on green nanotechnology. Because we are in the process of producing nanomaterials used in the medical and pharmaceutical fields, human health, which is closely linked to preserving the environment, will be one of the first concerns of all researchers. Due to the emergence of some disadvantages of nanotechnology, it has become necessary to rely strongly on green nanotechnology.

Green nanotechnology relies on the use of simple, safe and environmentally friendly methods. In fact, these methods are inexpensive and do not require complex steps to produce nanoparticles. Moreover, they do not require a lot of time and effort. With the multiplicity of physical and chemical methods (chemical precipitation, sol–gel, hydrothermal growth, solvothermal, microemulsion, solid-state chemical decomposition, ball milling, organometallic, and magnetron plasma) for preparing nanoparticles, and with the presence of many disadvantages of these methods including their high cost, their need for a lot of time and effort, and the complex and complex steps, it was necessary to have an economical, simple, and environmentally friendly method, which was in the biological methods that included the method of auto combustion based on a natural substance such as starch, egg white and The extracts of various parts of plants. The extracts of various parts of plants such as leaves, stems, roots, shoots, flowers, barks and seeds, play role of fuels in combustion route to prepare of various greener nanoparticles such as silver, gold and magnetite. Most of the authors working in this field indicated that these fuels act as reducing and stabilizing agents for the bio reduction reaction in the synthesis of various nano particles by combustion process. Despite the importance of the nanoparticles method, characterization techniques are also gaining great importance, including XRD, FTIR, SEM/EDS, TEM and XPS. Electrical, magnetic behaviors, particle size, surface charge, surface hydrophobicity and drug release are the main factors affecting nanoparticles physical stability and biological performance of the incorporated drug.

Finally, Green nanotechnology is a promising and diverse science with various advantages and different applications in the medical field. This modern, environmentally friendly technology has overcome traditional drug delivery systems and seized the opportunity to produce nano liposome-based COVID-19 vaccines with higher efficiency than other traditional vaccines in a successful attempt to confront the severe threat that has swept the world. The matter should not stop there, but requires more and more efforts to discover more nanoparticles for medical and pharmaceutical applications. In addition to the necessity of conducting additional studies to understand the unique properties of these magical particles.