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Perspective

Biosynthesis of Nanoparticles for Industrialisation

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DESCRIPTION

Nanoparticles have bounteous functional platforms that can be employed for imaging and therapeutic functions. These platforms can be prepared from various inorganic and organic materials, but the inorganic platforms are very important for simultaneous therapy and diagnosis because of their easy modification, high drug loading capacity and stability. A wide variety of materials such as metal oxide ceramics, silicates, magnetic materials, lyposomes, dendrimers, emulsions etc. are used to make these nanoparticles. Traditional technologies use a top-down approach for constructing materials. Most objects are created starting from a bulk materials and then breaking it into smaller pieces using mechanical, chemical or other forms of energy until they absolutely form the desired construction example, integrated circuits in microelectronics. Alternatively, the building blocks of life such as enzymes, and other components of each living cells already act as machines at the nanoscale is incorporated by the bottom-up approach. Nanoscale materials are synthesized from atomic or molecular species *via* chemical reactions, granting for the precursor particles to increase in size. However, such methods are adverse as the chemicals used are generally toxic, flammable and not easily disposable owing to environmental concern, have low manufacturing rate and are expensive. Attempting for alternative and cheaper pathways for nanoparticle synthesis, scientists devoted to the development of a relatively new and largely uninvestigated area of research based on the biosynthesis of nanomaterial. An enormous attempt has been focused into the search for methods utilizing biological systems beneficial to produce metal nanoparticles at ambient temperature and pressure without requiring hazardous agents and generating poisonous by-products.

Biological synthesis of nanoparticles is a category of bottom-up approach in which the only significant reaction occurring is reduction/oxidation. Bacteria, fungi and yeast have been suggested as nanofactories for intra and extracellular synthesis of metals. Plants used for nanoparticle synthesis is a comparatively new and under-researched technique. Synthesis of metal NPs using plant extracts is very cost effective; it can be used as an economic and valid alternative for the large scale production of metal nanoparticles.

CONCLUSION

The bioreduction of metal nanoparticles takes place by the combinations of biomolecules found in plant extracts in the form of enzymes, proteins, amino acids, vitamins and polysaccharides, the reaction occurs between the plant leaves with metal ions. The efficient and rapid extracellular synthesis of Ag, Au and Cu nanoparticles using broth extracts of several plants has been reported, such as *Medicago sativa, Pelargonium graveolens*, wheat, lemongrass, *Humulus lupulus, Spinacia oleracea* and *Lactuca sativa*. However, *alfalfa, Chilopsis linearis* and *Sesbania* seedlings showed the synthesis of silver and gold nanoparticles inside living plant parts. Further nanoparticles can be used in drug delivery and in the determination of drugs in pharmaceuticals. The silver nanoparticle has many applications due to the large degree of commercialization. Silver (Ag) is an attractive material for its distinctive properties, such as good conductivity, chemical stability, catalytic activity and antimicrobial activity.