OPEN ACCESS Freely available online

Pharmaceutical Analytical Chemistry

Perspective

Characteristics and Antimicrobial Properties of Nanoparticles

Harshitha Pulerma*

Department of Pharmaceutical Science, Bandirma Training and Research Hospital, Bandirma, Turkey

DESCRIPTION

The modification and synthesis of nanoparticles are the basis of the science known as nanotechnology. Nanoparticles have at least one or two dimensions that are 100 nm or smaller. Because of their small size and high surface-to-volume ratio, nanoscaled particles exhibit significantly higher biochemical and catalytic activity than equivalent-sized particles. This distinguishing characteristic sets them apart from their counterpart bulk materials [1]. Nanoparticles have the potential to be broad-spectrum antibacterial agents and can overcome newly developed antibiotic resistance. Superbugs, or germs that are resistant to practically all antibiotics, have been developed as a result of the overuse of common antibiotics. A potential remedy for this threat to public health could be nanoparticles.

Nano particles conjugated with antibiotics have a longer retention time in the body than free drugs alone. Nanoparticles containing biomolecules that target specific tissues, cells, or organs, such as antibodies, proteins, or DNA, improve their ability to penetrate cell membranes and specifically target specific tissues, cells, or organs [2]. Because each nanoparticle can deliver hundreds of drug molecules to a cell at the same time, drug-carrier nanoparticles provide greater control over antibiotic release at the target site. Drug release can occur passively, when entering a more acidic environment, such as the interior of a cell, or actively, when the nanoparticles are magnetically heated once in the desired location.

By altering the permeability of the cell membrane, silver nanoparticles in particular can enhance the effects of conventional antibiotic drugs, to which bacteria may have developed resistance. Silver nanoparticles can act as antibiotics by destroying the plasma membrane that surrounds bacteria. They also interact with DNA and other bacterial interior components by releasing silver ions, which generate reactive oxygen species within the cell [3]. Most bacteria live in a biofilm, which is a diverse collection of bacteria from various species that interact with one another, the biofilm, and their immediate surroundings. A solid substrate is required for the biofilm, and bacteria frequently migrate into biofilms using their flagella, where they multiply rapidly.

The high rate of bacterial binary fission and the large number of cells in a biofilm support a wide range of mutations, which leads to the development of antibiotic resistance by bacteria within a biofilm. The biofilm also protects the bacteria from the elements. Nanoparticles can inhibit biofilm formation by adhering to the surface of bacteria and causing a strong electrostatic interaction between the two. The larger surface-area-to-volume ratio of rod-shaped particles makes them more effective at destroying biofilm [4]. However apart from direct *in vivo* use as antimicrobial agents, nanoparticles are being considered as antibacterial agents for incorporation into implantable devices such as dental implants or heart valves, wound dressings, and bone cement. Nanoparticles are used in drug delivery, biomedical sciences, gene delivery, chemical industries, optics, mechanics, catalysis, and other fields.

Silver Nanoparticles (AgNP) are popular among metal nanoparticles due to their potent antibacterial and anti-inflammation properties. AgNP's are used in a variety of physical, biological, and pharmaceutical fields. For example, cream or ointment containing AgNP's is used to prevent bacterial infection in burns and wounds. Although AgNP is used in a variety of applications, the exact mechanism underlying particle formation is still unknown. The traditional method for producing AgNP nanoparticles with controlled and well-defined size and shape is to use a physical and chemical approach.

However, the use of toxic substances, high pressure, and energy in processes such as laser ablation, hydrothermal synthesis, solvo-thermal synthesis, pyrolysis, and inert gas condensation have resulted in a demand for more biologically compatible nanoparticles. The biological synthesis of AgNP has recently received a lot of attention [5]. In comparison to the traditional physical and chemical approaches, the biological method produces nanoparticles with a higher yield and stability. Bacteria, fungi, yeast, *actinomycetes*, and plants can biosynthesize AgNP, avoiding the use of toxic substances and allowing for further

Correspondence to: Harshitha Pulerma, Department of Microbiology, Bandirma Training and Research Hospital, Bandirma, Turkey, E-mail: harshita@pgmail.tr

Received: 23-Aug-2022, Manuscript No. PACO-22-21202; **Editor assigned:** 26-Aug-2022, PreQC No. PACO-22-21202 (PQ); **Reviewed:** 09-Sep-2022, QC No. PACO-22-21202; **Revised:** 16-Sep-2022, Manuscript No. PACO-22-21202 (R); **Published:** 23-Sep-2022, DOI: 10.35248/2471-2698.7.162

Citation: Pulerma H (2022) Characteristics and Antimicrobial Properties of Nanoparticles. Pharm Anal Chem.7: 162.

application in the medical and pharmaceutical fields. The use of plants in the synthesis of AgNP has received a lot of attention.

REFERENCES

1. Rafique M, Sadaf I, Rafique MS, Tahir MB. A review on green synthesis of silver nanoparticles and their applications. Artif Cells Nanomed Biotechnol. 2017;45(7):1272-91.
2. Abdelghany TM, Al-Rajhi AM, Al Abboud MA, Alawlaqi MM, Ganash Magdah A, et al. Recent advances in green synthesis of silver nanoparticles and their applications: about future directions: A review. BioNanoScience. 2018;8(1):5-16.
3. Shah M, Fawcett D, Sharma S, Tripathy SK, Poinern GE. Green synthesis of metallic nanoparticles *via* biological entities. Materials. 2015;8(11):7278-308.
4. Jyoti K, Baunthiyal M, Singh A. Characterization of silver nanoparticles synthesized using *Urtica dioica Linn* leaves and their synergistic effects with antibiotics. J Radiat Res Appl. Sci. 2016;9(3):27.
5. Iravani S, Korbekandi H, Mirmohammadi SV, Zolfaghari B. Synthesis of silver nanoparticles: Chemical, physical and biological methods. Res Pharm Sci. 2014;9(6):385.