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The international debate on Gold Nanoparticles (AuNPs) and Their Anticancer Applications Leukaemia T-cells

Yashvant Rao
Associate Scientist, JMI New Delhi, India.

NPs of metals such as gold is a field of interest for researchers in the last few decades because of their chemical, biological, biomedical, anticancer, chemotherapeutic and drug delivery properties that are expressively different from the properties of bulk materials. Au NPs play an important role in biomedicine due to their ability to inhibit/cytotoxicity cell growth in media as well as in water treatment due to their ability to attach pollutants and aggregate into large composites. The significance of Au NPs is result of their nano size and large surface area in to volume ratio. The PEs for Au NPs synthesis was prepared out of dried plant resources collected from nearby places/market. Flower and leaves of (Basil) Ocimum tenuiflorum, flowers of (Neem) Azadirachta indica, leaves of (Mentha) Mentha spicata and peel of (orange fruits) Citrussinensis extracts acted as reducing agent for HAuCl4 to Au0 to Au NPs. The salts, 99.9%, were procured from Sigma– Aldrich and other chemicals were of analytical grade and used without further purification. The 1.0 millimolar (mM) HAuCl4/ AgNO3 aqueous solution was prepared using Millipore water of 5 □cm-1. In this method Au NPs were synthesised by single step process at RT. For this purpose biological resources (hazardless) were used for Au NPs synthesis.

The work we used was minimum resources and maximum output as well as natural resources. The green synthesis of Au NPs proved in the reaction mechanism and the characterization were confirmed by the UV–Vis, (Furrier Transform Infra-red) FT–IR and (Dynamic Light Scattering) DLS for the size and Au NPs. (Transmission Electron Microscopy) HR- TEM, (Selected Area Electron Diffraction) SAED, (Scanning Electron Microscopy) SEM and (Atomic Force Microscopy) AFM, were proved the morphology, topography, crystallanity, roughness, histogram, and size. (X–Ray Diffraction) XRD and (X–Ray Photoelectron Spectroscopy with Ultra High Vacuum) XPS with UHV were identifying the binding energy, crystallography and

geometrical phase of freshly prepared Au NPs. The details are mentioned in same chapter under the experimental procedure, reaction mechanism and characterization.

The blood cancer affects the blood, bone marrow and lymphatic system. Jurkat is the Human leukaemia T-cell lines a basic tool for encouraging the development of blood cancer which affects a large number of humans in the global, especially in UK and US according to scientific medical reports. The Au NPs is found as a milestone in the treatment of the blood cancer especially T-cells are found the anticancer properties. Au NPs was synthesized by natural herbal resources and confirmed with the structural characterization techniques. The Jurkat cell lines were treated with Au NPs and compared with the adverse drug reactions (ADR) (known anticancer drug) and found an excellent result for anticancer properties against Jurkat cell lines. The complete study was done with the SRB assay technique for the study of the anti-cancer property in Au NPs and proved with the pictorial graph of phase contrast microscope with analysis of images of control, positive control, BF Au NPs and BL Au NPs. The cytotoxicity and apoptosis of the Jurkat cell lines were analyzed with the SRB Assay and phase contrast microscope.

The application of nanotechnology for the treatment of cancer is mostly based on early tumor detection and diagnosis by nanodevices capable of selective targeting and delivery of chemotherapeutic drugs to the specific tumor site. Due to the remarkable properties of gold nanoparticles, they have long

been considered as a potential tool for diagnosis of various cancers and for drug delivery applications. These properties include high surface area to volume ratio, surface plasmon resonance, surface chemistry and multi-functionalization, facile synthesis, and stable nature. Moreover, the non-toxic and non-immunogenic nature of gold nanoparticles and the high permeability and retention effect provide additional benefits by enabling easy penetration and accumulation of drugs at the tumor sites. Various innovative approaches with gold nanoparticles are under development. In this review, we provide an overview of recent progress made in the application of gold nanoparticles in the treatment of cancer by tumor detection, drug delivery, imaging, photothermal and photodynamic therapy and their current limitations in terms of bioavailability and the fate of the nanoparticles.

With recent advances in nanotechnology and medical science, numerous nanoparticles and nanomaterials have emerged from different bulk elements such as gold, silver, iron, copper, cobalt, platinum, etc., which are synthesized either biologically or physiochemically. The ability to manipulate nanoparticle features, such as their physical, chemical and biological properties, opens up many possibilities to explore these nanoparticles in drug delivery as image contrast agents and for diagnostic purposes. Among various organic and inorganic nanoparticles, gold nanoparticles possess unique optical and Surface Plasmon Resonance (SPR) properties, due to which it has become the first choice for researchers, particularly in the biological and pharmaceutical field. Due to the optical properties of gold nanoparticles, they are especially utilized in ultrasensitive detection and imaging-based therapeutic techniques required for the treatment of lethal diseases, such as cancer. Cancer is a disease state caused by abnormal cell growth and is the third leading cause of mortality worldwide. According to the World Health Organization (WHO, www.who.int), cancer caused 8.8 million deaths in 2015. Current cancer treatment is based on chemotherapeutic drugs, usually involving chemo or radiation therapy, with the aim to kill the cancer cells. However, these treatments often result in several side effects due to the damage caused to the surrounding healthy tissues. In addition, delays in diagnosis and a high incidence of relapse result in lower survival rates. Treating cancer cells by utilizing a nanoparticle-based drug delivery approach plays a key role in overcoming the limitations of conventional treatment methodologies by providing simultaneous diagnosis and treatment. Consequently, a considerable amount of research focusing on gold nanoparticle-based nanocarrier development and their potential applications in cancer biology and nanomedicine has been carried out. In this review, we focus on providing further new insights for exploring the gold nanoparticle applications as a tool in cancer diagnostics and treatment.

Biography:

Yashvant Rao, Assistant Professor, Institute of Advance Medicine and Research, and Associate Scientist at Dept. of Biotechnology, School of Biosciences, JMI, New Delhi, India. He received his PhD and M.Phil Training in Nanoscience and Nanomedicine specialized in applications of Nanodevices for Anticancer, Antimicrobial drug delivery as drug carrier also. M.Sc. in Animal Biotechnology from BBAU (a central University) Lucknow, Total 10 Publications including Nature, Nanoscale research letters, Future Sciences, ACS, one manuscript under revision at BJC and 2 communicated. In 2019 received Young Scientist Award in India

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