Gold Nano Particles in Cancer Treatment

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Summary

Presently nano technology is an emerging branch of science, which has a wide range of applications in medicine, molecular biology, etc.In recent development, gold nano particles are used for the diagnosis and treatment of cancer. Gold nano particles have immense potential for cancer diagnosis and therapy on account of their surface plasmon resonance Enhanced light scattering and absorption .In preparation of Nano particles the drug is dissolved, entrapped, encapsulated, and attached to a nano particle matrix. At present most cancer treatment methods based on the chemotherapy, radiation therapy even though these are success full but the have substantial side effects. Modern nano technology, though offers the possibility of materials that selectively bind to particular type of cancer cells. It acts by sensitizing them to light with out effecting surrounding healthy tissues. gold nano particles have been used in-vivo to protect the drug entity in the systemic circulation restricted access of drug to the chosen sites and deliver the drug by controlled and sustained rate to the site of action.

Key Words: Gold nanoparticle, Surface plasmon binding ability, Cancer treatment

Introduction

Nano technology is a branch of science which is based on the controlling size of matter (or) drug in molecular size. Nano technology has received considerable awareness in bio medical science over the past decade. The common methods to treat cancer now a day are the chemotherapy, radiation therapy or by surgery, but in case of surgery it is quite difficult for the removal of malignant tumor and tumors in sensitive tissue such as brain. Gold nano particles can specifically focus tumors. modern nano technology, has a possibility of materials that selectively bind to particular types of cancer cells, sensitizing them to light with out effecting surrounding healthy tissues. Gold is a favored material for the nano spheres, shells, cages and rods because of its wide binding ability with biochemical functional groups and that made to target the specific type of cell [1]. It has long been known that heat is effective in treating tumor cells with out damaging near by tissues.

The gold particles have wide range of therapeutic application because of its absorbing ability of energy from near infrared light and it can, destroy tumors with minimum side effects. In recent years bio degradable polymers are used for coating nano particles. the nano particles can be coated with hydrophilic polymer such as poly ethylene glycol and these have ability to circulate for prolonged period in targeted organs [2].Gold nano partials can absorb different frequencies of light and can convert in to thermal energy these gold particles absorb near infra red frequency this light heats the rods but passes harmlessly through tissues. Gold nano rods could also used to kill the residual tumor cells left after surgery. gold nano particles are also used in the diagnosis of cancer,tuberculosis,rheumatoid arthritis etc and this can be imagined using technique know as scattering and interestingly nano rods in diagnosis is they have the ability to know whether it's a primary or secondary tumor and its origination.

Synthesis

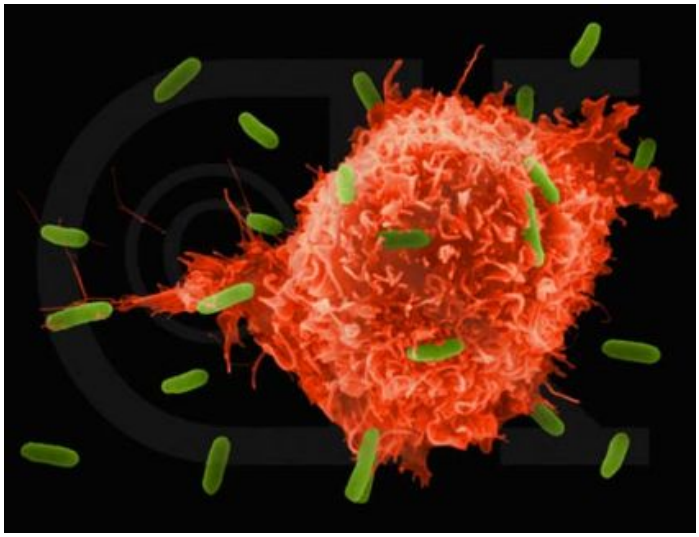
In reaction the gold salt HAuCL4 absorbs the UV light to generate an exited electron state and react with PEG which secures as both solvent and reducing agent the gold salt is gradually reduced to Au+. The surface regulating polymers expected to bind on the gold surface insulate partials from gold ions and further aggregation, therefore stopping growth and stabilizing the particles. [3]

Mechanism

The development of medical lasers, scientists have been turning to electromagnetic radiation to treat cancer. Photo dynamic therapy involves a photo sensitizer which becomes excited and generates singlet oxygen and other free radicals. The interaction of self with the oxygen causes irreparable damage to the cancers cells. The method requires short wave length of light, reducing the depth to which the light can penetrate and making deep tumor treatment and achievable. Another method of cancer treatment using electro magnetic radiation is photo thermal therapy using near infrared radiation from a laser may be used to penetrate through the skin to a deeper extent because the light will under go less absorption from tissues chronophers and water. Heat absorbed from the radiation will caused thermal denaturizing and coagulation of affected cells. [1]

Gold nano particles in cancer treatment:

Nano particles serving as agents of novel neo plastic treatments in various aspects Of cancer therapies as well as imaging .nano technology is developing a new generation of more effective cancer therapies capable of over coming biophysical, biomedical barriers that the body stages against conventional cancer therapies. Their inherently small size and Modifiability are allowing for innovative controlled and targeted techniques resulting in a reduction in drastic reduction in anti cancer treatment side effects and increased anti tumor efficacy.[8]



OTHERAPPLICATIONS OF GOLD NANOPARTICLE

Gold Nano Particles In Anti Microbial Activity:

Gold nano particles show antimicrobial properitys .AU NPS in organic, inorganic composit film.the sizeof nano particles are in the range of 12-16nm.the gold nano particles show antimicrobial property on gram –ve bacteria E.coli.it can be employed as environmental friendly antimicrobial [10]

Gold nano particles in diabetes:
The gold nano particles have insistent effect on the blood glucose level,lipid and serum biochemical profiles in diabetis provokes their effective role in controlling and increasing the organ function for better utilization of blood glucose .the gold nano particles are antioxidative agentby inhibiting the formation of free radicles,thus increasing the antioxidative enzyme and creating a sustained controle over hyperglycemic conditions which evoke potential of AUNP'S as a economic therapeutic remedy in diabetic treatment. [11]

Gold nano particles in HIV/aids:
The therapeutic efficacy of anti HIV agents often hampered by poor bio availability and lack drug penetration in drug penetration in infected target tissues using different types of nano technology based drug delivery system nano particles improve the therapeutic efficacy in HIV drugs to cellular and anatomical viral reservoir. Nano carriers can facilitate delivery across the blood brain barrier. Gold nano particles can even make failed HIV drugs work. [9].

Gold nano particles in tuberculosis:
Tuberculosis is a common deadly infectious disease caused by mycobacterium tuberculosis Gold nano particles derived with thiol modified oligo nucleotides was developed recently The nano particles are effective in treatment of tuberculosis and with less adverse effects. [2]

Successful Formulation of Gold Nano Particles:

s.no	Drug	Application
1	Gold nano particles conjugated to Thomsen Forereach disaccharide Antigen	Targeting drug delivery
2	Gold nano particles coated with a mixture of alkanethiol and trimethyl ammonium thiol ligands	Radio Sensitizer Targeting
3	Gold nano particles coated with thief glucose molecules and attached To anti epidermal growth factor receptor anti body	Radio Sensitizer Targeting
4	Gold nano particles served as radio frequency absorption enhancers	Thermotherapy

Table 1

Future Perspective:

Recent research on the successful use of gold nano particles in cancer diagnostics and therapy has already set stage of clinical applications in the near future currently they are increasing interest in research on the optimization of nano particles based on imaging and therapy techniques to physiological environment which will determine the clinical stage success of gold nano particles based nano medicine. The synthesis and bio conjugation of nano particle can be turned easily for desired application .the bio medical researchers and materials scientists in identification and characterization of biomedical strategies using interesting noble metal nano structure will impact the future of nano medicine greatly. [12]

Conclusion:

Gold nano particles are much effective in cancer treatment when compared to other drug delivery system. Gold nano particles have the ability to target specific tumor cells because of the optical properties and surface plasmon binding ability. These gold nano particles are able to convert light energy to thermal energy. Because of the specificity of nano participles they are much effective than other therapies. Gold nano particles are effective in degenerating the specific tumor cells without damaging surrounding tissues.

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