Evaluation of synthesized gold nanoparticles with reducing sugars as a drug carrier for therapeutic purposes

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**Introduction:** Gold nanoparticles (AuNPs), owing to their unique characteristics, including enhanced permeability and retention in tumor tissue, light absorbance and surface plasmon resonance in near-infrared light and their ability to be conjugated with drugs or other agents, have been widely used in biomedical science. Using gold nanoparticles is a potential strategy for medical treatment of cancer. Also AuNPs may exhibit cytotoxic properties against certain types of cancer cell lines. The inhibition of angiogenesis is one of the most promising strategies for the application of AuNPs in anticancer therapy. Tumor growth heavily depends on blood vessel formation, providing a constant flow of nutrients and oxygen, as well as metabolic wastes removal. Thus, the inhibition of angiogenesis is one of the main strategies of current anticancer therapy. On the other hand, AuNPs can easily permeate tumor vasculature and remain in tumors owing to the enhanced permeability.Using reducing sugars, especially glucose, to synthesize gold nanoparticles is a clever idea to trap cancer cells. Because cancer cells need several key factors for angiogenesis, one of which is glucose metabolism and its use can be effective on targeting nanoparticles containing a drug and other anti-cancer agents.

**Methods:** A method for gold nanoparticle (AuNP) synthesis during a reduction reaction from reducing sugars and starch in phosphate buffer has been developed and AuNP of well-defined size have been successfully synthesized.

**Results and Conclusion:** The presence of phosphate buffer is essential for glucose and starch to reduce the gold salt to AuNPs mainly by controlling the pH. Heating at 80–94 °C accelerates the synthesis reaction in phosphate buffer. In fact a mixture of starch and gold solution gives a black solution. Instead glucose is the reducing agent, most likely oxidized to gluconic acid that stays in solution. Starch is the capping agent that prevents aggregation of the AuNPs. The starch concentration is key parameter and the higher the concentration, the smaller the size and the larger the concentration of AuNPs. UV-Vis spectroscopy visualizes and follows the formation of the AuNP reactions in solution based on the 520–540 nm plasmon band.

**Keyword:** Gold nanoparticles, Drug delivery, Reducing Sugars, nanotechnology

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