Stability of gold nanoparticles in different ionic concentrations and pH: a comparison among synthetic protocols

Reference	Presenter	Authors (Institution)	Abstract
01-032	Cássia Priscila Cunha da Cruz	Freitas, L.F. (Instituto de Pesquisas Energéticas e Nucleares); da Cruz, C.C. (Instituto de Pesquisas Energéticas e Nucleares - IPEN); Batista, J.G.(Instituto de Pesquisas Energéticas e Nucleares); Varca, G.H. (Instituto de Pesquisas Energéticas e Nucleares); Lugao, A.B. (IPEN); Pires, M.A.(Instituto de pesquisas energéticas e nucleares);	There are several protocols for the synthesis of gold nanoparticles, and lately there is a trend for green methods in order to minimize the environmental impacts. The reduction of gold salts by epigallocatechin 3 gallate, for instance, generates stable and uniform nanoparticles without the use of toxic compounds, and so does the radiolytic synthesis protocol. For medical purposes, proteins like albumin and papain are useful coating agents, providing a better biological effectiveness. Here we present a comparison of different synthetic and protein coating protocols for gold nanoparticles regarding their stability in different NaCl concentrations and pH, aiming for the development of nanoparticles that are able to be administered in physiologic solutions to patients. The nanoparticles were synthesized via EGCG (2 mg mL 1) reduction of gold salt (5 mmol L 1) in phosphate buffer pH 7.0. Those nanoparticles were coated or not with albumin or papain (1 mg mL 1) using mercaptopropionic acid. Other protein coated gold nanoparticles were synthesized radiolytically by mixing 5 mmol L 1 NaAuCl4 with 1 mg mL 1 bovine serum albumin (BSA) or papain and 0.1 mol L 1 tert butanol. The solutions were irradiated with 10 kGy (60Co source, 5 kGy h 1) and the resulting suspensions were stored until use. The suspensions were added in 96 well plates to solutions with different pH and NaCl concentrations, and their absorption spectra were taken periodically to verify their stability. It was observed that BSA gold nanoparticles synthesized by both protocols were stable in concentrations of NaCl varying from 0.1% to 14.4% up to 72h. The papain gold nanoparticles synthesized by both protocols were stable in concentrations of NaCl varying from 0.1% to 14.4% up to 48h, but in 72h there was evidence of instability in the lowest and highest NaCl concentrations. The nanoparticles coated just with EGCG (without proteins) were stable in all NaCl concentrations and times, except in the highest concentration after 72h. Regarding the pH, BSA gold nanoparticles and papain gold nanoparticles synthesized radiolytically, as well as EGCG gold nanoparticles were stable at least in pH varying from 5 to 11, in all times analyzed. In conclusion, all the nanoparticles

tested are able to be administered to patients in physiological solutions, which have pH around 7.4 and NaCl concentrations around 0.9%, without the risk of aggregation and loss of biological activity.

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