J Nanomed Nanotechnol 2013, 4:6
http://dx.doi.org/10.4172/2157-7439.S1.015

OMICS Group Conferences
Accelerating Scientific Discovery

3rd International Conference on
Nanotek & Expo

December 02-04, 2013 Hampton Inn Tropicana, Las Vegas, NV, USA

Cellular uptake and cytotoxic effect of broccoli phytochemical based gold nanoparticles (B-AuNPs): Enhanced cancer therapeutic efficacy

Menka Khoobchandani, Kavita Katti, Ajit Zambre and Kattesh V. Katti
University of Missouri, USA

Cancer continues to be a vexing health problem worldwide as it is the second leading cause of death where a cure from a single modality is seldom possible. Because of high death rates and serious side effects associated with conventional therapies, many cancer patients seek alternative and complementary methods of treatment. Recently, application of nanotechnology for the design and development of a new generation of molecular imaging and therapeutic agents has received considerable attention. Size-dependent properties make nanoparticles very unique and indispensable in many areas of pharmaceutical chemistry. Phytochemicals from various plant species provide an untapped resource with excellent pharmaceutical action. However, the limited bioavailability of phytochemicals as they enter the *in vivo* system has hampered progress in the effective utilization of plant species in alternative medicine. Therefore, an empirical approach is proposed to find effective ways to embed phytochemicals onto nanoparticles so that cocktail of phytochemicals can be delivered with improved bioavailability. Toward this vision, plant extract derived from broccoli is being actively investigated in our laboratory. Broccoli (*Brassica oleracea*) is rich in micronutrients: vitamin C, folic acid, and phytochemicals such as glucosinolates (GLs) and their derivatives isothiocyantes, and polyphenols. Isothiocyante derivatives have recently garnered great interest for their potential role in the maintenance of human health. In the present study, we report a rapid and nontoxic 'green nanotechnology' route for the synthesis of stable gold nanoparticles from broccoli extract. We have also investigated the *in vitro* cytotoxic effects of broccoli derived gold nanoparticles (B-AuNP) against various cancerous cell lines followed by cell internalization studies. Physicochemical properties, such as size, charge, and morphology of broccoli phytochemical based gold nanoparticles (B-AuNPs), were determined by various techniques including UV-visible spectrophotometry, transmission electron microscopy (TEM), differential centrifugal sedimentation (CPS Instruments) and hydrodynamic size measurements. The core sizes of B-AuNPs are in the range of 10-20 nm as measured from TEM techniques which was also corroborated by CPS technique. Hydrodynamic diameter of B-AuNPs is 100±5 nm, suggesting that broccoli phytochemicals are capped on gold nanoparticles. The negative zeta potential of -29.0 mV for B-AuNPs indicates that the particles repel each other and there is no tendency for the particles to aggregate. The content of gold metal in B-AuNPs is estimated around 0.480 mg/ml by atomic absorption spectrophotometry. In-vitro cytotoxic effects of B-AuNPs are confirmed by MTT assay against various cancerous cell lines. The order of cytotoxic activity of B-AuNPs in terms of IC-50 value was as follows: MDA-MB-231 (160 µg/ml)>PC-3 (150 µg/ml)>U266 (125 µg/ml)>SkBr3 (80 µg/ml)>T47D (22 µg/ml). The cellular localization of B-AuNPs against breast and prostate cancer cell lines was evaluated using dark field optical microscopy and transmission electron microscopic image analysis. Broccoli phytochemicals based gold nanoparticles showed synergistic effect and excellent internalization of prostate (PC-3) and breast (MDA-MB-231 and T47D) cancer cells at concentration of 25 and 50 µg/ml respectively with incubation time 18 hr. This unique synergistic cocktail effect of B-AuNPs may provide new opportunities for generating biocompatible AuNPs for applications in *in vitro* and *in vivo* nanoparticulate-mediated molecular imaging and therapy.

khoobchandanim@health.missouri.edu

Magnetic nanoparticles: Synthesis and application

Nguyen Hoang Luong
VNU University of Science, Vietnam

This research discussed on the synthesis, functionalization, and application of magnetic nanoparticles Fe_3O_4, FePt and FePd, as well as their magnetic properties. The size and shape of magnetic nanoparticles have been controlled by developing methods such as co-precipitation, sonoelectrodeposition and sonochemistry. FePt and FePt nanoparticles show hard magnetic properties and are good candidates for application in ultrahigh-density magnetic recording. Silica- and amino-coated magnetic nanoparticles are suitable for labeling and detection applications in biomedicine. Finally, some promising perspectives in this research will be pointed out.

Biography

Nguyen Hoang Luong received his Ph.D. degree in Solid State Physics at the University of Hanoi in 1984. He received the degree of Doctor of Habilitation at University of Mining and Metallurgy, Krakow, Poland, in 1999. He is the author/co-author of over 50 publications in international journals. His research interests include the magnetic properties of rare-earth intermetallic compounds, synthesis, characterization and application of nanostructures based on magnetic and metallic materials.

luongnh@vnu.edu.vn