J Nanomed Nanotechnol 2014, 5:5
http://dx.doi.org/10.4172/2157-7439.S1.019

OMICS Group Conferences
Accelerating Scientific Discovery

4th International Conference on
Nanotek & Expo

December 01-03, 2014 DoubleTree by Hilton Hotel San Francisco Airport, USA

Designing the perfect nanocarrier for theranostics

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Nanoparticles are increasingly used in medical applications such as drug delivery, imaging and biodiagnostics, particularly for cancer. The design of nanoparticles for tumor delivery has been largely empirical, owing to a lack of quantitative data on angiogenic tissue sequestration. Using fluorescence correlation spectroscopy, the deposition rate constants of nanoparticles into angiogenic blood vessel tissue were determined. It was shown that deposition is dependent on surface charge. Moreover, the size dependency strongly suggests that nanoparticles are taken up by a passive mechanism that depends largely on geometry. These findings imply that it is possible to tune nanoparticle pharmacokinetics simply by adjusting nanoparticle size. Furthermore, the properties of nanoparticles that can be exploited to induce fusion with cell membranes were exploited. Finally, a novel technique, multicolour fluorescence cross correlation spectroscopy that has been developed to measure hybrid nanoassembly *in situ* will be examined.

Biography

D T Cramb is a Professor, Head of Department of Chemistry, Adjunct Professor at the Department of Physiology and Pharmacology, Director of the Nanoscience Program, University of Calgary. He studies the behavior of nanoparticles in embryonic organisms. His group has developed sophisticated fluorescence spectroscopy technology that is unique in the world. He is a Fellow of the Canadian Chemical Society and was awarded the Thermo-Fisher Prize in Spectroscopy (2010). He has published over 60 manuscripts and holds grants from NSERC, CIHR and the Alberta government. He has given over 70 invited talks on Nanoscience in the past 5 years.

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Increased efficacy in prophylaxis of a fabricated ESA-nanoemulsion colloidal delivery system over ESA rich conventional emulsion formulation: Real time data

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For the first time, the present study entails to exhibit: i) the real-time rapid uptake of a fabricated nano-sized (d<200 nm) α-eleostearic acid (ESA) rich nanoemulsion (NE) formulation as compared to its precursor conventional emulsion system with the aid of flow cytometric monitoring in *ex-vivo* system (lymphocytes) ; ii) the NE's increased prophylactic efficacy against induced endogenous and exogenous Reactive Oxygen Species (ROS) in terms of cell viability and membrane integrity as evinced by flow cytometric and fluorescence microscopic analysis of different primary cells. Thus, the impact of size of bioactive lipid (ESA) in the light of nanotechnological applications is corroboratively evaluated. *Inter alia* findings of the study include fabrication of a formulation comprising non-toxic excipients with stabilized parameters for over 12 weeks, water like viscosity and constitutional advantage against chemical degradation. The physical characterization and morphology of the formulation was validated by particle size analyser and Transmission Electron Microscopy. It was found that ESA present in NE formulation at a concentration of ~70 μM exhibited maximum efficacy in protecting cells from oxidative damage against both endogenous and exogenous ROS in both lymphocytes and hepatocytes as compared to its corresponding presence in the CE formulation. The impact of ESA present in NE formulations at different concentrations too differed markedly w.r.t. its corresponding presence in CE colloidal systems.

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