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## *In situ* solid lipid nanoparticles of lopinavir: A simple technology to address complex biology

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Nano drug delivery technology offers the advantage of enhanced efficacy of drug molecules by altering its pharmacokinetic and pharmacodynamic properties. Although the highly active antiretroviral therapy (HAART) has reduced morbidity and mortality rate due to HIV, complete cure is not achieved due to insufficient drug concentration in the cellular and anatomical reservoirs of the body where the HIV harbors. In the present investigation, we present *in situ* SLN of Lopinavir based on simple technology, for simultaneous targeting of the reticulo-endothelial system (RES) reservoirs and also remote HIV reservoir sites *in vivo*. The *in situ* SLN concept is based on simple mixing of two components, component-A comprising Lopinavir, lipid and stabilizers and component B comprising stabilizers in an aqueous phase. Mixing components A and B results in the generation of nanoparticles *in situ*, with a high entrapment efficiency of Lopinavir >85% and an average size in the size range 200 nm to >1000 nm. Lipids evaluated consist of fatty acids, alcohol and stearates. The nature of lipid and vehicle used influenced both size and efficiency. An *in situ* SLN system with an average size of 300 nm and entrapment efficiency >85% with good reproducibility and stability was optimized. Pharmacokinetic data revealed increased  $t_{1/2}$  and volume of distribution (Vd) values. Bio-distribution study of the *in situ* SLN revealed high Lopinavir concentration in the RES reservoir sites of HIV such as liver, lungs, spleen, kidney and remote sites of brain and lymph node. *In situ* SLN provides simple technology to address a complex biological need, for effective anti-HIV therapy.

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## Application of metallocenes for synthesis of nitrogen doped-multiwalled carbon nanotubes

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Metallocenes are organometallic compounds made up of a transition metal centre bound to two cyclopentadienyl rings, resulting in a general formula  $[(\eta^5\text{C}_5\text{H}_5)_2\text{M}]$ . Common examples of metallocenes include those made from the  $d^8$  metals such as ferrocene and ruthenocene, and  $d^9$  and  $d^{10}$ , metals which include cobaltocene and nickelocene, respectively. In principle, these metallocenes are expected to exhibit similar chemistry as ferrocene, but may differ significantly in terms of their reactivity. Metallocenes have been investigated as catalysts for synthesis of multiwalled carbon nanotubes (MWCNTs). MWCNTs are typically synthesised through three main approaches, i.e., laser ablation, arc discharge and various types of chemical vapour deposition (CVD). However, the floating catalyst CVD is the most commonly used synthetic method. In this study, we aimed at the synthesis of nitrogen-doped MWCNTs (N-CNTs) via a CVD method. A carbon source of acetonitrile and different metallocenes were investigated. Variable synthesis temperatures (800, 850, 900, 950 and 1000 °C) were employed in the production of N-CNTs. N-CNTs were then characterised by use of transmission electron microscopy, scanning electron microscopy, energy dispersive X-ray spectroscopy, elemental analysis and Raman spectroscopy. Hollow tubular structures of N-CNTs with bamboo compartment were observed under transmission electron microscopy. Raman spectroscopy showed typical G- and D-bands which were due to graphitic carbon vibrations and defects, respectively.

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