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Optimization and evaluation of meropenem loaded solid lipid nanoparticles

Rahul S Kalhapure, Ellen K G Mhango, Mahantesh Jadhav, Chunderika Mocktar and **Thirumala Govender**
University of Kwazulu-Natal, South Africa

The rampant antibacterial resistance has been aggravated by decline in introduction of new antimicrobial scaffolds. In recent years this problem is being addressed by introducing new effective and targeted delivery systems for currently existing antibiotics. Among all the delivery strategies, antibiotics incorporated into nanoparticles have shown potential to effectively treat the infectious from susceptible as well as resistant bacteria. In the present investigation, meropenem loaded solid lipid nanoparticles (MRPN-SLNs) were developed using Box-Bhenken design (BBD). A three-factor, three-level design of experiment (DOE) with response surface methodology (RSM) was run to evaluate the main and interaction effect of several independent formulation variables that included amounts of lipid (X1), surfactant (X2) and sonication time (X3). The dependent variables included particle size (Y1), zeta potential (Y2) and entrapment efficiency (Y3). The optimized MRPN-SLNs yielded the Y1, Y2 and Y3 values of 112.61±0.66 nm, -20.43±0.99 mV and 89.94% respectively. Morphological investigations using transmission electron microscopy revealed that SLNs were nearly spherical shaped particles. Differential Scanning Calorimetry and X-ray diffraction studies showed that meropenem was present in the amorphous form in SLNs. *In vitro* meropenem release from SLNs followed the Korsmeyer-Peppas model (R2=0.9938) and release was controlled by diffusion (Fickian) mechanism. Further, MRPN-SLNs had a prolonged *in vitro* antibacterial activity against *E. coli*.

Biography

Rahul S Kalhapure is currently a NRF-DST Postdoctoral Researcher in the Discipline of Pharmaceutical Sciences, University of KwaZulu-Natal. His areas of interest are design and synthesis of materials for pharmaceutical applications and nano drug delivery systems for various classes of drugs, antibiotics in particular. He has published more than 20 papers in ISI journals and has been serving as a Reviewer for journals of international repute.

kalhapure@ukzn.ac.za

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