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Temperature induced solubilization of hydrophobic active pharmaceutical ingredient lamoterigine in different pluronics - A detailed solubilization, SANS, DLS, HTM, *in-vitro* release and microscopy study

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Pluronic (Tri–block copolymers) play an important role in pharmaceutical performance to increase the solubility and bioavailability of hydrophobic drugs. These micelles often lack stability, exhibit unsatisfactory drug loading capacity, or have broad size distribution this work aims to solve this issue by studying the solubilization of hydrophobic drugs in different pluronic micelles at variable temperature. Herein, a series of five pluronic micelles viz. P84, P85, F127, F108 and F68 have been select for study solubilization of hydrophobic drug Lamotrigine (LAM) at different temperatures i.e. 37^0C, 47^0C and 57^0C using UV-Visible spectroscopy. We have observed that solubilization of LAM increased with increase in the temperature. The morphological and structural changes taking place in pluronics by increasing the temperature was determined using small angle neutron scattering (SANS) measurements, Scanning electron microscopy (SEM), heat transfer methods (HTM), and dynamic light scattering (DLS). From SANS measurements we observed that at 57^0C, in case of P84 micelles there is remarkable increase in the aggregation number and resulting in the conversion of the spherical micelles in to prolate ellipsoidal micelles. This is first report in which we explained the structural changes that occur in the thermoresponsive micellar media with the help of HTM methods. A significant difference between hydrodynamic diameter (Dh) of loaded and unloaded micelles assure that LAM was solubilized in pluronic micelles. The SANS results revealed that aggregation number decreases in the presence of LAM, causing the number density of micelles to increase. In vitro drug release study of five different pluronic formulations show sustained release behaviour. The present results demonstrate that by changing the temperature we can modulate the Structure (morphology), drug loading capacity as well as release behaviour from the pluronic micelles.

Biography

Pankaj Singla is pursuing PhD under the supervision of Prof. R. K. Mahajan from GNDU, Amritsar India and currently he is working as Visiting PhD scholar under the supervision of Dr. Marloes Peeters in Manchester Metropolitan University, Manchester UK. His area of interest is to deliver the hydrophobic drugs viz. anticancer drugs, antiepileptic drugs via Polymeric based nanoparicles.

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