

## Collagen-loaded nanoformulations for topical application: Development, evaluation and *In-vivo* skin deposition study in healthy human volunteers

Iqbal Ahmad<sup>1</sup>, Sohail Akhter<sup>1</sup>, Aseem Bhatnagar<sup>2</sup>, Roop K Khar<sup>1</sup> and Farhan J Ahmad<sup>1</sup>

<sup>1</sup>Nanoformulation Research Lab, Jamia Hamdard University, India

<sup>2</sup>Division of Nuclear Medicine, DRDO, India

Collagen (Col) is a group of naturally occurring proteins found commonly in the connective tissues of mammals. It exhibits high biodegradability, weak antigenicity and excellent biocompatibility. Col containing creams and dermal fillers are currently in use for various skin ailments like wrinkles, acne and scars. However, it is non-penetrable to the stratum corneum owing to its large molecular weight as well as high hydrophilicity. The aim of the present study is to develop Col-loaded liposomal (CL) and niosomal (CN) gel followed by their ex-vivo skin permeation and deposition study and in vivo deposition study on healthy human volunteers (6male & 6female) using  $\gamma$ -scintigraphy. CL and CN were prepared by ethanol injection method and optimized by Box-Behnken model to get the CL and CN of particle size (Z-avg) 300nm with maximum entrapment efficiency (%EE). For ex-vivo and in vivo studies, formulations were prepared by <sup>99m</sup>Tc-labeled Col (<sup>99m</sup>Tc-Col). Ex-vivo skin permeation and deposition study was performed using Franz diffusion cell and counting the radioactivity in the donor chamber and in the skin after 6h respectively. In vivo skin deposition study on healthy human volunteers were performed by applying <sup>99m</sup>Tc-Col on the hand (male and female) and back (male) followed by washing after 4h. Difference in prewash and post wash radioactivity (measured by  $\gamma$ -scintigraphy) represents the Col deposition in the skin. Optimized CL and CN showed Z-Avg of 295.6nm and 291.8nm, %EE of 89.85% and 49.89% and maximum drug release of 78.45% and 89.78%, respectively. ERS showed 5fold and 6fold increase in Col deposition for CL and CN, respectively as compared to simple Col gel. IHS revealed around 350% and 250% enhancement in the Col deposition in males and females, respectively. CN showed greater but insignificant deposition as compared to CL. Conceivable applications of this research could be the incorporation of suitable APIs into Col for enhanced and controlled drug delivery to treat various skin disorders as well as cosmetic cases.

### Biography

Iqbal Ahmad had completed his M.Pharm (Pharmaceutics) at the age of 25 years from Hamdard University. Currently he is pursuing Ph.D. in Pharmaceutics. He has published 10 papers in reputed journals.