of therapeutic proteins comprise the preservation of their biological activities with an acceptable shelf-life, effective and safe transport at the site of action.

According to the route of administration, the most protein pharmaceuticals are usually formulated as solution or suspension and delivered by invasive routes such as intravenous, intramuscular and subcutaneous administration, which are not well tolerated by patients usually.

Although, the elimination after invasive administration of therapeutic proteins may range from a few minutes to several days, most protein has short half-lives in the blood stream. After administration, unwanted deposition may occur, resulting in the need of frequent administration of high doses to obtain therapeutic efficacy. Both unwanted distribution and repeated dose administration of therapeutic proteins can lead toxic side effects (Jain et al., 2012).

Upon subcutaneous injection, protein bioavailability may be as 100%, but also may be much lower, the fate depending on molecular weight, and site of injection. While proteins over 16 KDa can diffuse through the blood endothelial wall entering blood capillaries at the injected site, or enter the lymphatic system and the systemic circulation, lower molecular proteins are predominantly absorbed in the systemic circulation via, local blood capillaries (Nayak, 2014).

Alternative non-invasive protein delivery routes are currently emerging of greater importance and these include nasal, ophthalmic, buccal, vaginal, transdermal, pulmonary and oral routes (Jain et al., 2013).

Delivery of protein by the nasal route offers virtue of relatively rapid drug absorption, possible bypassing of presystemic clearance and relative ease of administration.