

showed good effect in the skin of experimental animals (Bandenhorst et al., 2014). Additional approaches to facilitate transdermal delivery of proteins include altering skin characteristics by physical tools such as iontophoresis, sonophoresis, and electroporation. Combination of chemical enhancers and iontophoresis also showed facilitated transdermal delivery of proteins.

Delivering therapeutically active protein and peptides by the oral route has been a challenge for many years. The oral route is unsuitable for the systemic delivery of therapeutic peptides and proteins because of the potential degradation by the strongly acid environment in the stomach and by the proteolytic enzymes in the intestinal tract, as well as presystemic elimination in the liver. For such drugs to be absorbed through the GIT, they must be protected from enzyme and must traverse through the luminal barriers into the blood stream in an unchanged form (Nayak, 2014; Jitendra et al., 2011).

To overcome this problem, a variety of permeation enhancers including mixed bile salts fatty acids micelles, chelators, surfactants, lipids and also using excipients like mucoadhesives polymers and enzymes inhibitors. Another approach is by chemical modification of the proteins and their hydrophobisation or lipidization to improve their enzymatic stability and membrane penetration (Muheem et al., 2014).

Currently only two peptide and protein based drugs (Interferon alpha and human growth hormone) that can be given orally are known to be in clinical developed (Jitendra et al., 2011).