1.4.4. Strategies for oral delivery of insulin

Different approaches, alone or in combination, have been developed to overcome the barriers of enzymatic degradation and improve the oral bioavailability of insulin like use of permeation enhancers (detergents, fatty acids or bile salts which improve the permeability through the mucus and epithelial layers and open the intercellular tight junctions) (Aungst, 2012), Surfactants and fatty acids affect the transcellular pathway by altering membrane lipid organization and therefore increase the oral absorption of insulin (Wadher et al., 2009), Enzyme inhibitors (Del Curto et al., 2009), enteric coating (Zhao et al., 2007), carrier systems (Chalasani et al., 2007) and chemical modifications of insulin (Shah et al., 2010).

Enzyme inhibitors slow the rate of degradation of insulin, which increases the amount of insulin available for absorption. The addition of proteolytic inhibitor such as diisopropylfluorophosphate (Danforth et al., 1959) or naturally occurring aprotinin (Owens et al., 1988) or inhibitors of insulin-degrading enzyme include 1,10 phenanthroline and bacitracin (Shaji & Patole, 2008) show some decreased in blood glucose level. However, although the effectiveness of enzyme inhibitors is not very high when used alone, they have the potential to be used in combination strategies with other methods to increase oral insulin absorption.

Enteric coating techniques with acrylic polymers were used to create a controlled release from oral insulin system (Foss et al., 2004).

Stefanov et al. have used liposomes prepared from phosphotidylcholine (PC) and cholesterol (CH) for oral insulin delivery. They have reported a significant reduction in blood glucose levels in diabetic rats. Further investigations with liposomes