

superoxide and hydroxyl radicals. Therefore, it is considered as a desired antioxidant food supplement because it is non-toxic and free from side effects (Xing *et al.* 2006).

1.4.3 Glucosamine Pharmacokinetics

1.4.3.1 Orally administered GlcN

GlcN is absorbed rapidly following oral administration with 26% BA as compared to I.V. administration. Its peak plasma concentration (C_{max}) can be reached after 3 hours (T_{max}). However, GlcN undergoes substantial first-pass metabolism and its elimination $t_{0.5}$ was estimated to be 15 hours (Anderson *et al.* 2005; Henrotin *et al.* 2012; Kirkham and Samarasinghe 2009; Persiani *et al.* 2005). Other studies have shown that non-serum $t_{0.5}$ of GlcN ranges from 28-58 hours (Kirkham and Samarasinghe 2009). GlcN plasma concentration was shown to remain above baseline for up to 48 hours after oral administration (Henrotin *et al.* 2012). It has been also reported that GlcN shows linear PK at the dose range of 750-1500 mg, whereas increasing the dose up to 3000 mg could deviate such linearity (Persiani *et al.* 2005)

1.4.3.2 Intravenously administered GlcN

Following I.V. administration of radiolabeled GlcN, about 10% of the labeled GlcN was found as free GlcN in plasma; which was cleared by the liver and kidney and excreted in the urine. The remaining 90% was bound to plasma proteins. Peak plasma concentration was reached at 8 hours (T_{max}) (Anderson *et al.* 2005). GlcN V_d was found to be 2.12 L and its apparent terminal $t_{0.5}$ was found to be one hour (Aghazadeh-Habashi *et al.* 2002).