1.4.5 Glucosamine safety and toxicity

1.4.5.1 Orally administered GlcN

Oral administration of very large doses (5000–15,000 mg/kg body weight) of GlcN was found to be well tolerated without toxicity. Studies on mice, rats, rabbits and dogs received GlcN orally in doses of approximately 159–8000 mg/kg/day for 12–365 days did not show any adverse effects (Setnikar *et al.* 1991; Setnikar *et al.* 1983).

1.4.5.2 Intravenously administered GlcN

Several studies established the safety and toxicity of GlcN following I.V. infusion to rats. In these studies, doses ranged from 240 to 9937 mg/kg body weight. Meininger et al. reported that infusion of 564 mg/kg did not affect blood glucose levels (Meininger *et al.* 2000), whereas other studies used average infusion rates of 2496 mg/kg detected GlcN adverse effects on glucose metabolism. However, these results were difficult to be explained because of different GlcN oral BA which is 26% as compared to I.V. route. In addition to that oral GlcN administration did not induce alteration on glucose metabolism at very high doses (300–2149 mg/kg body weight) on rats, rabbits and dogs which is different from that of parenteral administration (Anderson *et al.* 2005).

1.4.5.3 Glucosamine safety on human

Administration of GlcN to more than 800 patients who were monitored continuously following infusion of large amounts of GlcN did not lead to any adverse effects. Other human clinical studies indicated that there were no adverse effects of GlcN administration on liver and kidney function, blood chemistries (white blood count, red