dextrorotatory isomer (Dahmer and Schiller 2008; Kirkham and Samarasinghe 2009; Xing *et al.* 2006).

1.4.1 Glucosamine in the treatment of osteoarthritis

GlcN is present in the connective and cartilage tissues and it contributes in the maintenance of the strength and flexibility of these tissues (Hua *et al.* 2005). The ability to synthesize GlcN decreases with age. Consequently, replenishing the levels of GlcN, especially GlcN hydrochloride and GlcN sulfate, would be useful for the prevention and treatment of osteoarthritis (OA) (Xing *et al.* 2006). GlcN treats OA and rheumatoid arthritis (RH) by its chondroprotective effect through normalizing cartilage metabolism by inhibiting the degradation and stimulating the synthesis of glycosaminoglycans. In addition to that, GlcN has anti-inflammatory effect because it suppresses neutrophil functions such as phagocytosis, chemotaxis, superoxide generation, and granule enzyme release (anti-reactive properties). GlcN also reduces the expression of NF-κB induced by proinflammatory cytokines. Moreover, GlcN reduces the production of nitric oxide and prostaglandin E_2 in plasma, hence, restores articular function (Hua *et al.* 2005; Matheu *et al.* 1999; Mendis *et al.* 2008; Nagaoka *et al.* 2011; Reginster *et al.* 2012; Xing *et al.* 2006).

1.4.2 Other Glucosamine effects

GlcN has been reported to function as an inhibitor of tumor growth since it can alter signaling molecules involved in protein translation. In addition it has been reported to alter uracil and adenine nucleotide contents, thus, results in disruption of the structure and function of cellular membranes. Moreover, GlcN has antioxidant and scavenging ability on