# 1. INTRODUCTION

Disease and sickness have been a part of mankind's progress through the ages. It comes as no surprise that a substantial portion of the intellectual efforts of every historical age has been directed at understanding disease and finding cures. It is but natural that each of the formally organized and structured attempts has to depend on the knowledge base and paradigms that were available at the particular period of time when the system evolved and matured. As our view of the world changed, largely due to the efforts of science, newer systems of medicine emerged and older ones fell out of favour or even discarded. Over the last century or less, keeping pace with the advances made by modern science, the Western or allopathic medical system has been the dominant influence on the health care scene. There is no denying its contribution to our well-being. Yet, there remains the lingering reality that no single system of health care delivery is able to provide all the answers to health and disease.

Traditional medicines have been the starting point for the discovery of many important modern drugs (Patwardhan, 2005). This fact has led to chemical and pharmacological investigations and general biological screening programs for natural products all over the world. Ocean, the biggest wonder in the universe, covers almost three quarters of the surface of earth. It is not only a great source of a lot of beautiful living and non-living things, but also a treasure of plenty of substances, which are beneficial in all faces of our lifestyle and in our needs of day-to-day life. Marine organisms produce many bioactive substances, which are having a lot of potential biomedical and pharmaceutical applications.

Marine food has become an inevitable ingredient in our daily menu. Prawn shell, a main waste material of marine food industry, can be efficiently utilized by converting it into various useful marine polysaccharides byproducts such as chitin, chitosan, glucosamine etc. (Synowiecki and Al-Khateeb, 2003). The mucopolysaccharide, chitin is produced by the demineralization and deproteinisation of shrimp shell waste. It is considered as the second most

abundant biopolymer in the world next to cellulose (Sini *et al.*, 2005). Chitin can be converted into two value-added products, chitosan and glucosamine. Chitosan and glucosamine are having immense applications in the fields of biomedical, pharmaceutical and nutraceutical industries.

Chitosan [poly- (ß-1-4)-D-glucosamine] is prepared by the deacetylation of chitin using concentrated alkali (Krisana *et al.*, 2004; Shepherd *et al.*, 1997). It has profound applications in the fields of clarification and purification, chromatography, paper and textiles, photography, food and nutrition, agriculture, pharmaceutical and medical, cosmetics, biodegradable membranes and biotechnology. It has been reported to possess immunological (Nishimura *et al.*, 1984; Mori *et al.*, 1997) antibacterial (Tokura *et al.*, 1997; Tanigawa *et al.*, 1992) and wound healing activities (Okamoto *et al.*, 1993; Kweon *et al.*, 2003; Khnor and Lim, 2003). Chitosan is an effective and adequate haemostatic agent even under the most severe conditions of anticoagulation. Chitosan solution is found beneficial for healing "athletes foot" conditions (Allan *et al.*, 1984). Both hard and soft contact lenses can be made from chitosan. Sapelli *et al.* (1986) studied the application of chitosan in dentistry.

Han *et al.,* (1999) has reported that supplementation of chitosan can reduce high fat diet-induced lipidemia by its antilpidemic property. The free radical quenching property of this marine polysaccharide has also been studied in detail (Xing *et al.*, 2005). Reports by Filipovic-Grcic *et al.,* (2001) indicates the membrane stabilizing property of chitosan. In our laboratory, Anandan *et al.* observed the antiulcerogenic potential of chitosan against HCl-ethanol mixture induced peptic ulcer in rats. Since chitosan can wrap solid particles in liquids to bring them together and agglomerate, it is effectively utilized for the controlled release of drug (Krisana *et al.*, 2004). Dissolution properties and bioavailability of poorly soluble drugs can be improved by grinding them with chitosan. Though the beneficial effects of chitosan have been extensively studied, the antihepatotoxic potential of chitosan on lipid metabolism in antitubercular drugs-induced hepatoxicity has not yet been explored. Muzzarelli (1996) has reported that

supplementation of chitosan can prevent experimentally induced diabetic complications by its antioxidant and membrane stabilizing properties.

Glucosamine is another value added by-product prepared by the hydrolysis of chitin with conc. HCl. This is an amino monosaccharide having a lot of potential biomedical, pharmaceutical and industrial applications. It is an important constituent of cartilage and it has been used for the treatment of osteoarthritis (Timothy *et al.*, 2004). In combination with chondroitin sulfate, it can build blocks for cartilage, up-regulate chondrocyte and reduce the extent of cartilage degradation (Yu Shao *et al.*, 2004). Sal'nikova *et al.* (1990) suggests the antioxidant nature of glucosamine, by virtue of which it can trap and dismute free radicals. Glucosamine is an essential component required for glycoprotein synthesis in living beings (Wu *et al.*, 2004). Mutoh *et al.* (1995) reported the cytoprotectivity of glucosamine rich mucus.

In traditional medicine, the shrimp and cuttlefish exoskeleton powder has been used to cure arthritis, diabetes, stomach disorders, epilepsy and various liver disorders. Yet there is little documentary evidence regarding the exact mechanism of action involved in the cytoprotective effect of these marine polysaccharides. Glucosamine is the basic unit of chitin and chitosan and it is an essential component required for glycoprotein synthesis in living beings (Zhang *et al.*, 2004). The beneficial actions of chitin and chitosan may be ascribable to their basic unit glucosamine. Hence, it thought to be important to study the protective effect chitosan and glucosamine on experimentally induced ulcer and hepatotoxic conditions to derive a conclusion regarding the exact biochemical mechanism involved in the beneficial effects of shrimp and cuttle fish exoskeleton powder in alleviating the ulcerative and liver disorders by virtue of their antilipidemic, antioxidant and membrane stabilizing properties.