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CHITIN AND CHITOSAN – MOST CONVENIENT NATURAL MATTER THAT USE IN DIFFERENT USEFUL WAYS

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ABSTRACT

Chitosan is a polysaccharide biopolymer obtained by alkaline deacetylation of natural chitins. Chitin is the most abundant natural amino polysaccharide. Chitosan is so prolific as to be capable of being applied in the production of products for a variety of uses; one of the advantage of chitin and its derivatives is the lasting quality of their hydrating effect. Traditional markets for the compounds include agriculture and food, cosmetics, healthcare, pulp and paper, textiles and water treatment, among others. The chemical also finds use in hair and skin care products including shampoos, conditioners and moisturizers. Furthermore, glucosamine, a chitin derivative is used in neutraceutical formulations for the treatment of joint problems.

INTRODUCTION

Chitin is the second abundant biopolymer in the nature, found in the shell of crustacean, the cuticles of insects, and the cell walls of fungi(1).Chitin in cell walls of fungi such as mushrooms is a straight-chain polymer composed of ß-1,4-N-acetylglucosamine (Cabib, 1981; Cabib, *et al.* 1988.) because chitin possesses many beneficially biological properties such as biocompatibility, biodegradability, haemostatic activity, and wound healing property, much attention has been paid to its biomedical applications (Dutta & Dutta, 2003; Dutta *et al.*1997).

MATERIAL AND METHODS

Preparation of Chitosan from Fungi: Three basic steps are involved in Chitin and Chitosan preparation i.e. Chitin Extraction, Chitosan Depolymerization, Chitin Deacetylation (Farkas, 1990).

RESULTS AND DISCUSSION

Antimicrobial Properties - Against some Gram +ve and -ve Bacteria: Chitosan generally showed stronger bactericidal effects for gram positive bacteria (Listeria monocytogenes, *Bacillus megaterium*, *Bacillus ceresus, Staphylococcus aureus, Lactobacillus plantarum*, L. brevis and L. vulgaris) than for gram negative bacteria (*E. coli, Pseudomonas fluorescens, Salmonella typhymurium* and *Vibrio parahaemolyticus*) in the prescence of 0.1% chitosan (Le *et al.* 1997).

Chitin and Chitosan in Cosmetics – Skin and Oral Care: Chitin and chitosan is good candidate for skin

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care: chitosan can function as moisturizer for skin. Both chitosan and chitin are already found in lotions, nail enamel, foundation eye shadow, lipstick, cleansing materials.Chitin and chitosan can be also used in toothpaste, mouthwash, and chewing gum.

Agriculture: Chitin treated seeds (wheat) were found to have growth accelerating and growth enhancing effects. Chitinous additions to the potting mixtures/ soils resulted in significant reduction in root knot worm infestations and suppression of fungal pathogens (Le *et al.* 1997).

Photography: In color photography, chitosan has been used as fixing agents for the acid dyes in gelatin and also act as an aid to improve diffusion, an important step in developing photographs (Farkas, 1990; Muzzarelli, 1977).

Industrial Application of Chitosan:

• **Paper Industry –** Biodegradaable chitin and chitosan can strenghten recycled paper and increase the environmetal friendliness of packaging and other products (Mumper *et al.* 1995; No and Meyers, 2000).

• **Textile industry –** In textile industry, chitin can be used in printing and finishing preparations, while the chitosan is able to remove dyes from dye processing effluents (www.geosites.com).

• **Food Industries –**The use of microcrystalline chitin (MCC) solved some of the problems such as flavor, color and shelf life, posed by other sources of fiber (Le *et al.* 1997).

Biomedical Application of Chitosan

• **Tissue Engineering –** Tissue engineering is the development and manipulation of laboratory grown cells tissues or, that would replace or support the function of defective or injured part of the body (Muzzarelli, 1977).

• **Wound Healing/Wound Dressing -** Regenerated chitin fibers, non-woven mats, sponges and films exhibit an increase in wound healing by over 30 percent biomedical materials (www.bae,ncsu.edu; www.vanson.com).

• **Gene Delivery -** Due to its positive charge, chitosan has the ability to interact with negative molecules such as DNA. This property was used for the first time to prepare a non-viral vector for a gene delivery system by Mumper in 1995 (www.vanson.com).

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