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PROCEEDINGS

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FACULTY OF INDUSTRIAL TECHNOLOGY - UPN "VETERAN" JATIM
CHEMISTRY DEPARTMENT, BIOMEDICINAL POSTGRADUATE PROGRAM
UDAYANA UNIVERSITY

PROCEEDINGS

Bali International Seminar on Science and Technology

"Strengthening Basic Sciences and Technology For Industrial Sustainability"

"Organized by :
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AND
CHEMISTRY DEPARTMENT, BIOMEDICINAL POSTGRADUATE PROGRAM
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GLOBAL REQUIREMENTS OF CHITOSAN FOR MEDICAL AND FOOD APPLICATIONS

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Abstract

Chitosan is a biopolymer obtained by deacetylation of chitin which widely distribute in nature and biologically safe. This polymer exhibits several favor properties, such as biodegradability, biocompatibility, low toxicity and ability to form film/hydrogel.

Chitosan offers a wide range of unique application such as in medical application for hypocholesterolemic, antimicrobial, and wound-healing properties, drug delivery, and biologically active agent. For food application, chitosan is used for dietary ingredient, food preservative, edible film and coatings.

To fulfill the requirement of medical and food application, it is necessary to prepare several tests, grouped in preliminary, confirmatory and other tests. The characterization of chitosan used for the applications including moisture content, form identification, ash and protein content, insolubility, turbidity, color, UV absorption, chemical identification tests, viscosity and molecular weight determination.

The main limitations in the use of chitosan in several applications are its high viscosity and low solubility at neutral pH. Low molecular weight and oligomer chitosan can be used to overcome the limitations.. Low molecular weight (Mw) chitosans and oligomers can be prepared by degradation of chitosan such as chemical hydrolysis, oxidative degradation, irradiation of chitosan and enzymatic hydrolysis. For medical application, high degrees of deacetylation of chitosan is the important parameter of chitosan for medical and food applications. For some specific applications, these smaller molecules have been found to be much more useful.

Keywords: *chitosan; medical application; molecular weight*

1. Introduction

Among the novel families of biological macromolecules whose relevance is becoming increasingly evident, are chitosan and its derivative chitin. This wide range of applications includes biomedicine, food, biotechnology, agriculture and cosmetics, among others. The importance of chitosan in the last year is mainly evident in medical and food application.

Chitin and Chitosan are described as a family of linear polysaccharides consisting of varying amounts of 1,4-β- linked residues of N-acetyl-2 amino-2-deoxy-D-glucose (A residues) and 2-amino-2-deoxy-D-glucose residues (D residues). Chitosan samples have a high amount of D units and hence the polymer is soluble in acidic aqueous media. Some authors consider that chitosan is the polymer with at least 60% of D residues [1]. Chitin is the second most abundant natural polymer in nature after cellulose and it is found in the structure of a wide number of invertebrates (crustaceans, exoskeleton, insects cuticles) and the cell walls of fungi, among others. On the other hand, chitosan only occurs naturally in some fungi (Mucoraceae) [2].

Chitosan can also prepared by cleavage of N-acetyl groups of the chitin A residues. This reaction is rarely conducted to full completion, hence chitosan polymeric chain is generally described as a copolymeric structure comprised of D glucosamine (D residues) along with N-acetyl residues

The aim if this paper is to present the global requirement and characterization of chitosan for medical and food application. The paper has been divided into the following sections : the first part is devoted to the preparation, effects of the preparation process on the properties of chitosan, characterization, and regulatory aspects. The second part covers the main biological aspects of the polymer and relates these properties to the physicochemical characteristics. Finally, medical and food applications of chitosan are presented emphasizing the effect of DD and Mw on these applications.

2 Methods of Preparation

2.1. Chitin Deacetylation

Chitosan is prepared by hydrolysis of acetamide groups of chitin. This is normally conducted by severe alkaline hydrolysis treatment. Thermal treatments of chitin under strong aqueous alkali are usually needed to give partially deacetylated chitin (DA lower than 30%), regarded as chitosan. Usually, sodium or potassium hydroxides are used at concentration of 30-60% w/v at high temperature (100-125°C). The process to prepare chitin and chitosan from raw material involved several