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Book Reviews

Advances in Chitin Science, Volume VI
Proceedings from the 5th International Conference of the European Chitin Society, Trondheim, Norway, June 26–28, 2002; K.M. Vårum, A. Domard, O. Smidsrød (Eds.); NTNU (nobipol@biotech.ntnu.no), Trondheim, 2003, xii + 350 pages, ISBN: 82-471-5901-5 (EURO90/USD90)

Chitin is the world's second most plentiful natural polymer, next to cellulose. Chitin is a polymer of 2-acetamido-2-deoxy-D-glucopyranose units linked β-1,4. Chitin, like cellulose, is not readily solubilized in water and thereby its direct use is limited except for glucosamine production. However, chitosan, derived from chitin by (partial) chemical or enzymatic removal of the *N*-acetyl groups, is a co-polymer of deacetylated (glucosamine) and acetylated (*N*-acetyl-glucosamine) sugar units. Chitosan's "free amino groups" bestow cationic properties that makes chitosan unique among natural biopolymers. Many of chitosan's functional properties are due its cationic nature. For example chitosan and its derivatives are being used in non-viral gene delivery by taking advantage of the ability of the natural polycation to complex DNA. Chitosan continues to be used as an effective flocculent for removal of impurities from drinking water and waste streams, and chitosan's ability to bind to negatively charged surfaces such as skin, hair, tissue, microbial surfaces is key to many useful applications.

This volume describes the recent advances in characterization, structure–function relationships, sources, functional properties and commercial applications of chitin and chitosan. It is divided into sections: Invited lectures (11), sources, production and biological aspects (4), chemical structure and modification (4), enzymatic modification (8), functional properties (8), applications (6) and poster presentations (51).

Chitin, the structural component in both crustacean shells and in the cell walls of many fungi, is in sufficient concentration to make commercial extraction feasible. Crustacean shells are in abundant supply as a by-product of the crab and shrimp packing industries and the discarded crustacean shells once an environmental liability, are now considered a valuable resource. An alternate source of raw material in development is the "spent" fungal mycelia used to produce alcohol, citric acid, etc. by fermentation. There is increased interest in using fermentation of fungi as commercial sources chitin and chitosan.

Commercial applications of these natural polymers are increasing with major producers located in Asia, North America and Europe with increased interest in Mexico, Central America and South America. Chitin is used mainly to make glucosamine and chitosan, an aqueous-acid soluble polymer. Oligosaccharides of both chitin and chitosan are being exploited extensively partly due to their lower molecular weight allowing increased penetration into cell membranes, etc.

Major application areas for chitosan include: fat reducing dietary supplement, wound dressings, tissue engineering, immunopotentiation, anti-bacterial, anti-odor, oral and nasal drug delivery, lotions, creams and shampoos, functional foods, water purification, agricultural biocide, industrial, fibers/textiles, paper, oilfield drilling/recovery additive, etc. In January 2001 chitosan was self-affirmed as GRAS (Generally Recognized As Safe) and GRAS is expected to accelerate chitosan's use in food applications. New methods of producing and characterizing chitosan will to lead to novel and more cost-effective products.

The demand for glucosamine for the treatment of arthritis and osteoarthritis is huge with worldwide sales of $392 million (Nutraceutical World, May/June, 2000) making glucosamine the No.1 nutraceutical sold in the US. The National Institutes Of Health (NIH) is enrolling patients in a major, long term, nation wide (costing $14 million) clinical trail [Glucosamine/Chondroitin Arthritis Intervention Trial (GAIT)] to review glucosamine's effectiveness and safety, alone and in combination with chondroitin sulfate, in treating arthritis (final results in 2005).

This book is an excellent source of information from the key researchers around the world about chitin, chitosan, oligosaccharides, component monosaccharides and derivatives and their applications.

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Wound Healing: Methods and Protocols, L.A. DiPietro, A.L. Burns (Eds.); Humana Press, Inc., Totowa, NJ, USA, 2003, xv + 467 pages, ISBN 0-89603-999-4 ($135.00)

Rapid progress in cell and molecular biotechnology in recent years has led to significant advances in the field of tissue repair. This has resulted in a wealth of information about the healing process that has great relevance beyond wound healing itself, since the injury repair process extends into many broad fields such as cancer, inflammation and atherosclerosis. This volume is part of the *Methods in Molecular Medicine Series* and aims to provide scientists from many disciplines with a compendium of classical and contemporary protocols from recognised experts in the field of wound healing. It is split into two parts, the first of which details methods for studying tissue repair using a broad range of wound healing models.

The process of wound healing encompasses many different biological processes, including epithelial growth and differentiation, fibrous tissue production and function, angiogenesis, and inflammation. For this reason, the choice of model systems is broad, and includes a large array of both in vivo and in vitro models. The first part details 13 separate in vivo animal models and four in vitro models of wound healing, as well as several reviews of specific impaired healing model systems in which underlying systemic and genetic conditions influence the healing process (e.g. in aging and diabetes mellitus). Such powerful models illustrate biochemical, molecular, and surgical techniques designed for the manipulation of the healing wound.

The second part of the volume details multiple methods for the analysis of the individual biological processes observed in the healing wound, providing information on sensitive assays for the assessment of tissue healing. Such information is useful for the study of many biological processes, including angiogenesis, epidermal differentiation and repair, and acute inflammation. Specific topics covered include endothelial cell migration assay, collagen synthesis analysis, and detection of reactive oxygen intermediate production by macrophages. In many cases several different approaches to a single process are examined, with sample results and analyses provided to help the users in selecting the approach most suited to the problem at hand.

This informative volume provides a highly practical collection of widely used model systems and methods for studying the injury repair process and is therefore highly recommended as a valuable reference source for all individuals with interests in wound healing.

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