Transaction: 420367195-19625 Date delivered: 7/19/2011 Licensee: Ms Tornese Company: Instituto Nacional de Technologia Industrial

OCTOBER 2010

# **CHITIN & CHITOSAN**

# A Global Strategic Business Report

MCP-2039





Transaction: 420367195-19625 Date delivered: 7/19/2011 Licensee: Ms Tornese Company: Instituto Nacional de Technologia Industrial

# **CHITIN & CHITOSAN**

#### **MCP-2039**

#### **CONTENTS**

5.

1. INTRODUCTION, METHODOLOGY &	
PRODUCT DEFINITIONS	1
Study Reliability and Reporting Limitations	1
Disclaimers	
Data Interpretation & Reporting Level	
Quantitative Techniques & Analytics	
Product Definitions and Scope of Study	
Introduction to Biopolymers	
Chitin: A Modified Form of Glucose	4
Chitosan	
2. INDUSTRY OVERVIEW	5
A Primer	5
Current and Future Analysis	
Chitosan Market by End-Use	
3. TRENDS AND ISSUES	6
New Innovations in the Medical Textiles Industry	
Food and Drug Administration (FDA) Approval	
CosaminDS Ranked No.1	
Diverse Views on Use of Glucosamine/Chondroitin for	
Treating Osteoarthritis	6
High Production Cost	
Factors Curbing the Market	7
4. PRODUCT OVERVIEW	8
Introduction to Biopolymers	8
Applications of Biopolymers	
Degradation: No more a Problem with Biopolymers	8
Synthesis of Biopolymers	
Forms of Biopolymers	
Starch and Glucose	
Linear Biopolymers	9
Chitin and Chitosan: Most Common Form of Natural	
Biopolymers	9
Chitin: A Modified Form of Glucose	10
Chitosan	10
Evolution of Chitin and Chitosan	
Chitin and Chitosan at a Glance	
Features	
Solubility	
Chitin and Chitosan: The Chemical Structure	
Physical Forms of Chitosan and its Applications	
Production Process	
Structure of Chitin and Chitosan	
Chitin	
Chitosan	
Properties of Chitin and Chitosan	
Chitin	
Chitosan	
Sources of Extraction	
Chitin	
One of the Nature's Most Common Organic Compound.	
Chitin and Chitosan from FLS	
Chitin Extraction	
From Shells	
Industrial Manufacturing Process	16

END-USE APPLICATIONS: A BROAD SPECTRUM
General Applications
Glucosamine – A Major Derivative of Chitin
Production Process
Table 1: Sales of Major Arthritic Remedies
in US\$ Million for the Years 2004 and 2005 (includes corresponding Graph/Chart)21
Glucosamine for Back Pain
Chitin in Water Treatment
Coagulant and Water Purification
Substitute to Other Chemical Flocculants
As a Filtration Agent for Pools and Spas
Filtration in Lab Decolorization Module
Removal of Metal Ions
Treatment of Industrial Wastes
Nuclear Wastewater Treatment
Detoxification
Decolorization of Dye House Water
Cosmetics and Toiletries
As a better Substitute to Chemical Formulations
Chitin as a Moisturizing Agent
In Hair Care Products
Trend Towards Natural Products
Moisturizing Lotions and Men's Shaving Products
Chitosan in Cosmetics and Toiletries
Reduced Static Charge and Adherence
In Hair Setting Lotions
In Skin Care Products
As a Skin Moisturizer
Table 2: A Typical Moisturizing Lotion Containing
Chitosan (In %) (includes corresponding Graph/Chart)
Color Cosmetics for Skin and Hair
In Fragrances
In Flagrances
In Soaps
Food & Beverages
In Retention of Flavors
As a Fining Agent in Beverages
As an Anti-Cholesterol Agent
As a Fat Substitute to 'Olestra'
As an Animal Feed Additive
Chitin in Food & Beverages
In Foods and Pharmaceuticals
In Production of Glucosamine
Chitosan in Food & Beverages
As a Food Preservative
Germination



CHITIN & CHITOSAN - A GLOBAL STRATEGIC BUSINESS REPORT 10/10 This Report Is Protected With Digital Watermarks. Copyrights per US & ICC protocols. This Document May Not Be Printed, Copied or Distributed Outside Your Organization in Any Form Without Our Express Written Permission © Global Industry Analysts, Inc., Phone: 408-528-9966, Fax: 408-528-9977, 6150 Hellyer Avenue, San Jose, CA 95138, USA www.StrategyR.com



## MCP-2039

#### CONTENTS

	Aiding in Defense Mechanism
	In Treating Hypoinsulinaemia
	Effect of Chitosan DAC in Treating Chronic Renal Problems 39
	Observations Highlighting Chitin Properties
	Absorption of Insulin across Nasal Mucosa
	Chitosan in Protein Adsorption Studies
	As a Catalyst in Medicine
	Interaction of Chitinase A with Chitin
	Presence of Chitinase in Human Serum
	High Affinity of Chitovibrin towards Chitin and
	Chito-Oligomers
	Chitin Synthases Promoting Cell Wall Formation
	Influence of Cationic Chitosan on Cell Types
	Chitin in Cuticle of Crustaceans
	Chitin Synthase Genes in Hyphae Growth
	Multiple Chitin Synthetase in Fungal Cells
	Chitin Binding Domain for Efficient Hydrolysis
	Varying Chitin Synthetase for Physiological Functions
	As a Hepatic Arterial Chemoembolization Agent
	Chitinase Activity in Human Serum and Leukocytes
	Controlled Release of Endothelial Cell Growth Factor
	from Chitosan Albumin Micro Spheres for
	Localized Angiogenesis
	Inhibition of Phagolysis in a Bacillus Thuringiensis
	Culture by Chitosan
	Effect of Joint Administration of Heparin and Chitosan
	Sulfate Ether on Haemostatic Function as Coagulant
	Chitobiase Providing Insights Into Tay-Sach Disease
	Effect of Liposome-albumin Coatings on Ferric ion
	Retention and release from Chitosan Beads
	Chitin and Chitosan in Reducing Mutagens
	Reaction Mechanism of Chitosanase from Streptomyces43
	Effects of Chitosan on Experimental Abscess with
	Staphylococcus Aureus in Dogs43
	Continuous and Massive Intake of Chitosan Affects
	Mineral and Fat-soluble Vitamin Status in Rats Fed
	on a High-Fat Diet44
	Chitosan in Prevention of Hemorrhagic Cystitis in Rats44
	Chitosan in Inhibition of Infection of Bacteriophages44
	Synthesis of Chitosan-Amino Acid Conjugates and
	Their Usage in Heavy Metal Intakes
	Determination of Lead Water Samples44
	Permeability and Blood Compatibility Properties of
	Chitosan Polyethylene for Haemodialysis
	Biologically Derived Chitosan in Release of Disease
	Resistance Proteins
1	<b>RESEARCH &amp; DEVELOPMENT IN RECENT</b>
	PAST- A PERSPECTIVE BUILDER
	Glucosamine to Treat UV- Related Skin Damage
	N,N-Dimethyl N-ethyl Chitosan Developed for Oral Drug
	in, in-Dimensy in-empt Chitosan Developed for Oral Drug

Delivery	45
A New Nanocapsule Being Developed by Chulalongkorn	
University	45
Chitosan to Help Detect Explosives and Bioagents	45
Chitosan Solution Increases the Shelf Life of Eggs	46
Paclitaxel-Incorporated Chitosan Hydrogel Inhibits	
Tumor Growth	46



CHITIN & CHITOSAN - A GLOBAL STRATEGIC BUSINESS REPORT 10/10 This Report Is Protected With Digital Watermarks. Copyrights per US & ICC protocols. This Document May Not Be Printed, Copied or Distributed Outside Your Organization in Any Form Without Our Express Written Permission © Global Industry Analysts, Inc., Phone: 408-528-9966, Fax: 408-528-9977, 6150 Hellyer Avenue, San Jose, CA 95138, USA www.StrategyR.com

6.

Sign

Chitosan Dissolved in Formic or Acetic Acid Forms

More Effective Packaging Material

### **CHITIN & CHITOSAN**

#### **MCP-2039**

#### **CONTENTS**

.. 46

Glucosamine Feared to Affect Fertility	46
7. PRODUCT INTRODUCTIONS/INNOVATIONS	47
Forum Health to Launch Glucosamine Hydrochloride	
Supplement	47
University of Missouri Develops Biodegradable and	
Edible Films	47
Kitozyme Unveils KiOnutrime-Cs and KiOnutrime-CG	47
HemCon Medical Technologies Rolls Out Chitogauze	
Dressing Platform	47
Organic Growing Systems Develops Organisan II-YS <sup>™</sup>	47
Hokkaido Soda to Roll Out Cell-Culture Medium's	
Trail Samples	48
Pharma Base Introduces Osamine <sup>™</sup> Pharmaceutical	
Grade Glucosamine	48
Ethical Naturals Launches Green-Grown	48
Dr Organics Unveils Body Shot	48
Shiseido Develops Hyaluronic Acid Molecule	48
8. PRODUCT INNOVATIONS/LAUNCHES IN	
<b>RECENT PAST-A PERSPECTIVE BUILDER</b>	49

Health Perception Launches GlucOsamax Extra	49
Herbalife Unveils a Series of Anti-Aging Products	
Containing Glucosamine	49
Schiff Nutrition Launches New Move Free® Advanced	
Reno Introduces New Liquid Dietary Supplement	49
Health Perception Launches ArheumaCare	50
Neptune Technologies Introduces Glucosamine/NKO™	
BR Pharmaceuticals Reintroduces Valupak	50
Imagenetix Announces the Launch of Glucosamine/	
Celadrin® Combination	50
Elations Announced Plans to Introduce New Dietary	
Supplement	50
Kyowa Hakko Kogyo to Launch Hakko Glucosamine K	51
Procter & Gamble Develops Chitosan-based	
New Breathable Absorbent Articles	51
DECENIT INDUCTOV A CTIVITY	50
RECENT INDUSTRY ACTIVITY	52
MatsyaFed Commences Commercial Manufacturing of	
Chitosan Capsules	52
Koyo Chemical to Expand Product Portfolio	52
HaloSource Opens New Production Facility in India	52
HaloSource® Obtains Environmental Protection Agency	
Registration for HaloPure BR® Technology	52
HemCon Medical Technologies Signs Collaborative	

MatsyaFed Commences Commercial Manufacturing of		
Chitosan Capsules	52	
Koyo Chemical to Expand Product Portfolio	52	
HaloSource Opens New Production Facility in India	52	
HaloSource® Obtains Environmental Protection Agency		
Registration for HaloPure BR® Technology	52	
HemCon Medical Technologies Signs Collaborative		
Development Agreement with ProMetic BioSciences	53	
Netech, Nihon Pharmaceutical and Yaizu Suisankagaku		
Industry Ink Agreement	53	
HemCon Medical Technologies and Zimmer Dental Ink		
Agreement	54	
Cargill Partners with Elations	54	
Navamedic Inks Agreement with Queisser Pharma	54	
Archimedes Development Acquires Fennopharma	54	
Lescarden Receives First Poly-NAG Order from		
Pascual Laboratories	55	

HemCon Medical Technologies Selects SanguiBioTech's ChitoSkin Technology	
Navamedic Divests ChitiNor to Seagarden	5
10. CORPORATE ACTIVITY IN RECENT PAST- A PERSPECTIVE BUILDER	56
Navamedic Signs Final Agreement with Grünenthal	
Navamedic Enters into a Deal with William Ransom	
Navamedic Begins Commercial Chitin Production	
Vanson HaloSource Changes to HaloSource	
Navamedic Signs Agreement with French Partner to Market Glucomed	
Navamedic Enters into Agreement with Nergard Group	
ChitiNor AS Signs a Letter of Intent with Lytone Enterprise	
Zonagen Discontinues Chitosan (Z 216) Development	57
11. FOCUS ON SELECT PLAYERS	58
Advanced Biopolymers AS (Norway)	
Biothera, Inc. (US)	
CarboMer, Inc. (US)	
Dalian Xindie Chitin Co., Ltd. (China)	
HaloSource, Inc. (US)	
Heppe Medical Chitosan GmbH (Germany) Kunpoong Bio Co., Ltd. (South Korea)	
Meron Biopolymers (India)	
Primex Ehf (Iceland)	
QBas Co., Ltd.	
Sonat. Co (Russia)	
Taizhou Candorly Sea Biochemical & Health	
Products Co., Ltd. (China)	51
V-Labs, Inc. (US)	51
12. GLOBAL MARKET PERSPECTIVE	52
Table 3: World Recent Past, Current & Future Analysis for	
Chitin Derivatives by Geographic Region – US, Canada,	
Japan, Europe, Asia-Pacific (excluding Japan), and Rest	
of World Markets Independently Analyzed with Annual	
Sales Figures in Metric Tons for years 2007 through 2015 (Includes Corresponding Graph/Chart)	62
	52
Table 4: World Historic Review for Chitin Derivatives	
by Geographic Region – US, Canada, Japan, Europe, Asia-Pacific (excluding Japan), and Rest of World Markets	
Independently Analyzed with Annual Sales Figures	
in Metric Tons for years 2001 through 2006 (Includes	
Corresponding Graph/Chart)	63
Table 5: World 11-Year Perspective for Chitin Derivatives	
by Geographic Region – Percentage Breakdown of Volume	
Sales for US, Canada, Japan, Europe, Asia-Pacific	
(excluding Japan), and Rest of World Markets for	
Years 2005, 2010 & 2015 (Includes Corresponding	
Graph/Chart)	64
Table 6: World Recent Past, Current & Future Analysis for	
Glucosamine by Geographic Region – US, Canada, Japan,	
Europe, Asia-Pacific (excluding Japan), and Rest of World	
Markets Independently Analyzed with Annual Sales Figures	

9.1

www.StrategyR.com

# CHITIN & CHITOSAN - A GLOBAL STRATEGIC BUSINESS REPORT 10/10 This Report Is Protected With Digital Watermarks. Copyrights per US & ICC protocols. This Document May Not Be Printed, Copied or Distributed Outside Your Organization in Any Form Without Our Express Written Permission © Global Industry Analysts, Inc., Phone: 408-528-9966, Fax: 408-528-9977, 6150 Hellyer Avenue, San Jose, CA 95138, USA



Page iii

# in Metric Tons for years 2007 through 2015 (Includes

#### MCP-2039

#### **CONTENTS**

.70

 Table 9: World Recent Past, Current & Future Analysis

 for Chitosan by Geographic Region – US, Canada, Japan,

 Europe, Asia-Pacific (excluding Japan), and Rest of World

 Markets Independently Analyzed with Annual Sales Figures

 in Metric Tons for years 2007 through 2015 (Includes

 Corresponding Graph/Chart)

 68

Table 11: World 11-Year Perspective for Chitosan by Geographic Region – Percentage Breakdown of Volume Sales for US, Canada, Japan, Europe, Asia-Pacific (excluding Japan), and Rest of World Markets for Years 2005, 2010 & 2015 (Includes Corresponding Graph/Chart).....

 Table 13: World Historic Review for Other Chitin Derivatives

 by Geographic Region – US, Canada, Japan, Europe, Asia 

 Pacific (excluding Japan), and Rest of World Markets

 Independently Analyzed with Annual Sales Figures

 in Metric Tons for years 2001 through 2006 (Includes

 Corresponding Graph/Chart)

 72

Table 16: World Historic Review for Chitosan Consumption in Water Treatment by Geographic Region – US, Canada, Japan, Europe, Asia-Pacific (excluding Japan), and Rest of World Markets Independently Analyzed with Annual Sales Figures in Metric Tons for years 2001 through 2006 (Includes Corresponding Graph/Chart)

Table 18: World Recent Past, Current & Future Analysis for Chitosan Consumption in Cosmetics & Toiletries by Geographic Region – US, Canada, Japan, Europe, Asia-Pacific (excluding Japan), and Rest of World Markets Independently Analyzed with Annual Sales Figures in Metric Tons for years 2007 through 2015 (Includes Corresponding Graph/Chart).....

 Table 20: World 11-Year Perspective for Chitosan Consumption

 in Cosmetics & Toiletries by Geographic Region – Percentage

 Breakdown of Volume Sales for US, Canada, Japan, Europe,

 Asia-Pacific (excluding Japan), and Rest of World Markets

 for Years 2005, 2010 & 2015 (Includes Corresponding

 Graph/Chart)
 79

 Table 23: World 11-Year Perspective for Chitosan Consumption

 in Food & Beverages by Geographic Region – Percentage

 Breakdown of Volume Sales for US, Canada, Japan, Europe,

 Asia-Pacific (excluding Japan), and Rest of World Markets

 for Years 2005, 2010 & 2015 (Includes Corresponding

 Graph/Chart)
 82

Table 24: World Recent Past, Current & Future Analysis for Chitosan Consumption in Healthcare/Medical Applications by Geographic Region – US, Canada, Japan, Europe, Asia-Pacific (excluding Japan), and Rest of World Markets Independently Analyzed with Annual Sales Figures in Metric Tons for years 2007 through 2015 (Includes Corresponding Graph/Chart).....



CHITIN & CHITOSAN - A GLOBAL STRATEGIC BUSINESS REPORT 10/10 This Report Is Protected With Digital Watermarks. Copyrights per US & ICC protocols. This Document May Not Be Printed, Copied or Distributed Outside Your Organization in Any Form Without Our Express Written Permission © Global Industry Analysts, Inc., Phone: 408-528-9966, Fax: 408-528-9977, 6150 Hellyer Avenue, San Jose, CA 95138, USA www.StrategyR.com



83

Page iv

**MCP-2039** 

94

#### **CONTENTS**

86

Table 27: World Recent Past, Current & Future Analysis for Chitosan Consumption in Agrochemicals by Geographic Region – US, Canada, Japan, Europe, Asia-Pacific (excluding Japan), and Rest of World Markets Independently Analyzed with Annual Sales Figures in Metric Tons for years 2007 through 2015 (Includes Corresponding Graph/Chart).....

 Table 29: World 11-Year Perspective for Chitosan Consumption

 in Agrochemicals by Geographic Region – Percentage

 Breakdown of Volume Sales for US, Canada, Japan,

 Europe, Asia-Pacific (excluding Japan), and Rest of

 World Markets for Years 2005, 2010 & 2015 (Includes

 Corresponding Graph/Chart)

 88

 Table 30: World Recent Past, Current & Future Analysis

 for Chitosan Consumption in Biotechnology Applications

 by Geographic Region – US, Canada, Japan, Europe,

 Asia-Pacific (excluding Japan), and Rest of World Markets

 Independently Analyzed with Annual Sales Figures in

 Metric Tons for years 2007 through 2015 (Includes

 Corresponding Graph/Chart)

 89

Table 33: World Recent Past, Current & Future Analysis for Chitosan Consumption in Pulp & Paper by Geographic Region – US, Canada, Japan, Europe, Asia-Pacific (excluding Japan), and Rest of World Markets Independently Analyzed with Annual Sales Figures in Metric Tons for years 2007 through 2015 (Includes Corresponding Graph/Chart).....

 Table 34: World Historic Review for Chitosan Consumption in

 Pulp & Paper by Geographic Region – US, Canada, Japan,

 Europe, Asia-Pacific (excluding Japan), and Rest of World

 Markets Independently Analyzed with Annual Sales Figures

 in Metric Tons for Years 2001 through 2006 (includes

 corresponding Graph/Chart)

 93

Table 35: World 11-Year Perspective for Chitosan Consumption in Pulp & Paper by Geographic Region – Percentage Breakdown of Volume Sales for US, Canada, Japan, Europe, Asia-Pacific (excluding Japan), and Rest of World Markets for Years 2005, 2010 & 2015 (Includes Corresponding Graph/Chart)......

 Table 41: World 11-Year Perspective for Chitosan Consumption

 in Photography Products by Geographic Region – Percentage

 Breakdown of Volume Sales for US, Canada, Japan, Europe,

 Asia-Pacific (excluding Japan), and Rest of World Markets

 for Years 2005, 2010 & 2015 (Includes Corresponding

 Graph/Chart)
 100

#### CHITIN & CHITOSAN - A GLOBAL STRATEGIC BUSINESS REPORT 10/10 This Report Is Protected With Digital Watermarks. Copyrights per US & ICC protocols.



This Report Is Protected With Digital Watermarks. Copyrights per US & ICC protocols. This Document May Not Be Printed, Copied or Distributed Outside Your Organization in Any Form Without Our Express Written Permission © Global Industry Analysts, Inc., Phone: 408-528-9966, Fax: 408-528-9977, 6150 Hellyer Avenue, San Jose, CA 95138, USA www.StrategyR.com

Page v



13.

**MCP-2039** 

#### **CONTENTS**

14. C

Table 44: World 11-Year Perspective for Chitosan	Consumption
in Miscellaneous Applications by Geographic Regio	on –
Percentage Breakdown of Volume Sales for US, Ca.	nada,
Japan, Europe, Asia-Pacific (excluding Japan), and	1
Rest of World Markets for Years 2005, 2010 & 2011	5
(Includes Corresponding Graph/Chart)	
THE UNITED STATES	
A. Market Analysis	

Current & Future Analysis	104
Chitosan Market by End-use	104
Specialty Supplements Dominating Other Dietary	
Supplements	104
Glucosamine/chondroitin: The Largest Product Segment	104
Treatment of Industrial Waste Waters - A Major	
Application of Chitin	105
Chemicals for Treatment of Industrial &	
Municipal Water	105
Other Key Application Areas	105
Chitin in Biomedicine - Market with Excellent	
Growth Potential	105
Emphasis on Production of High Grade Chitin	105
Breakthrough in Production Process	106
Pricing Conditions for Chitin and Chitosan	106

#### B. Market Analytics

 Table 47: US 11-Year Perspective for Chitin Derivatives

 by Product Derivative – Percentage Breakdown of

 Volume Sales for Glucosamine, Chitosan and Other

 Markets for 2005, 2010 & 2015 Years (Includes

 Corresponding Graph/Chart)

 107

 Table 49: US Historic Review for Chitosan by End-Use

 Application – Water Treatment, Cosmetics & Toiletries,

 Food & Beverages, Healthcare/Medical, Agrochemicals,

 Cell Culture and Miscellaneous Markets Independently

 Analyzed with Annual Sales Figures in Metric Tons

 for Years 2001 through 2006 (Includes

 Corresponding Graph/Chart)

	Table 50: US 11-Year Perspective for Chitosan byEnd-Use Application – Percentage Breakdown ofVolume Sales for Water Treatment, Cosmetics &Toiletries, Food & Beverages, Healthcare/Medical,Agrochemicals, Biotechnology, Pulp &Paper,Textile Finishes, Photography Products, andMiscellaneous Markets for Years 2005, 2010 &2015 (Includes Corresponding Graph/Chart)110
41	NADA
١.	Market Analysis
	Current & Future Analysis
2	Market Analytics
	Table 51: Canadian Recent Past, Current & Future         Analysis for Chitin Derivatives by Product Derivative –         Glucosamine, Chitosan, and Other Markets Independently         Analyzed with Annual Sales Figures in Metric Tons         for Years 2007 through 2015 (Includes Corresponding         Graph/Chart)         112
	Table 52: Canadian Historic Review for Chitin         Derivatives by Product Derivative – Glucosamine,         Chitosan, and Other Markets Independently Analyzed         with Annual Sales Figures in Metric Tons for         Years 2001 through 2006 (Includes         Corresponding Graph/Chart)         112
	Table 53: Canadian 11-Year Perspective for ChitinDerivatives by Product Derivative – PercentageBreakdown of Volume Sales for Glucosamine,Chitosan and Other Markets for Years 2005, 2010 &2015 (Includes Corresponding Graph/Chart)
	Table 54: Canadian Recent Past, Current & Future         Analysis for Chitosan by End-Use Application – Water         Treatment, Cosmetics & Toiletries, Food & Beverages,         Healthcare/ Medical, Agrochemicals, Biotechnology,         Pulp & Paper, Textile Finishes, Photography Products         and Miscellaneous Markets Independently Analyzed         with Annual Sales Figures in Metric Tons for         Years 2007 through 2015 (Includes         Corresponding Graph/Chart)
	Table 55: Canadian Historic Review for Chitosan by End-Use Application – Water Treatment, Cosmetics & Toiletries, Food & Beverages, Healthcare/Medical, Agrochemicals, Cell Culture and Miccellaneous Markets

 Table 56: Canadian 11-Year Perspective for Chitosan by

 End-Use Application – Percentage Breakdown of Volume

 Sales for Water Treatment, Cosmetics & Toiletries,

 Food & Beverages, Healthcare/Medical, Agrochemicals,

 Biotechnology, Pulp & Paper, Textile Finishes,

 Photography Products, and Miscellaneous Markets

 for Years 2005, 2010 & 2015 (Includes

 Corresponding Graph/Chart)

 116



CHITIN & CHITOSAN - A GLOBAL STRATEGIC BUSINESS REPORT 10/10 This Report Is Protected With Digital Watermarks. Copyrights per US & ICC protocols. This Document May Not Be Printed, Copied or Distributed Outside Your Organization in Any Form Without Our Express Written Permission © Global Industry Analysts, Inc., Phone: 408-528-9966, Fax: 408-528-9977, 6150 Hellyer Avenue, San Jose, CA 95138, USA www.StrategyR.com



Page vi

#### **MCP-2039**

#### CONTENTS

15. JAPAN	.117	1
A. Market Analysis	. 117	
Current & Future Analysis	. 117	
Chitosan Market by End-use		
Biomedical Applications - Potential Growth Segment		
B. Market Analytics	. 118	
Table 57: Japanese Recent Past, Current & Future Analysis for Chitin Derivatives by Product Derivative – Glucosamine, Chitosan, and Other Markets Independently Analyzed with Annual Sales Figures in Metric Tons for Years 2007 through 2015 (Includes Corresponding Graph/Chart)	. 118	
Table 58: Japanese Historic Review for Chitin Derivatives by Product Derivative – Glucosamine, Chitosan, and Other Markets Independently Analyzed with Annual Sales Figures in Metric Tons for Years 2001 through 2006 (Includes		
Corresponding Graph/Chart)	. 118	
Table 59: Japanese 11-Year Perspective for Chitin Derivatives by Product Derivative – Percentage Breakdown of Volume Sales for Chitosan, Glucosamine and Other Markets for Years 2005, 2010 & 2015 (Includes Corresponding Graph/Chart)	. 119	
Table 60: Japanese Recent Past, Current & Future Analysis for Chitosan by End-Use Application – Water Treatment, Cosmetics & Toiletries, Food & Beverages, Healthcare/ Medical, Agrochemicals, Biotechnology, Pulp & Paper, Textile Finishes, Photography Products and Miscellaneous Markets Independently Analyzed with Annual Sales Figures in Metric Tons for Years 2007 through 2015 (Includes		
Corresponding Graph/Chart) Table 61: Japanese Historic Review for Chitosan by End-Use Application – Water Treatment, Cosmetics & Toiletries, Food & Beverages, Healthcare/Medical, Agrochemicals, Cell Culture, and Miscellaneous Markets Independently Analyzed with Annual Sales Figures in Metric Tons for Years 2001 through 2006 (Includes Corresponding Graph/Chart)		
Table 62: Japanese 11-Year Perspective for Chitosan by End-Use Application – Percentage Breakdown of Volume Sales for Water Treatment, Cosmetics & Toiletries, Food & Beverages, Healthcare/Medical, Agrochemicals, Biotechnology, Pulp & Paper, Textile Finishes, Photography Products, and Miscellaneous Markets for Years 2005, 2010 & 2015 (Includes Corresponding Graph/Chart)		17. A
16. EUROPE	. 123	
A. Market Analysis	123	
Market Overview		
Current & Future Analysis		

	Table 63: European Recent Past, Current & Future
	Analysis for Chitin Derivatives by Product Derivative –
	Glucosamine, Chitosan, and Other Markets
	Independently Analyzed with Annual Sales Figures
	in Metric Tons for Years 2007 through 2015
	(Includes Corresponding Graph/Chart)124
	Table 64: European Historic Review for Chitin Derivatives
	by Product Derivative - Glucosamine, Chitosan, and
	Other Markets Independently Analyzed with Annual
	Sales Figures in Metric Tons for Years 2001
	through 2006 (Includes Corresponding
	Graph/Chart)125
	Table 65: European 11-Year Perspective for Chitin
	Derivatives by Product Derivative – Percentage
	Breakdown of Volume Sales for Chitosan, Glucosamine
	and Other Markets for Years 2005, 2010 & 2015
	(Includes Corresponding Graph/Chart)
	The second s
	Table 66: European Recent Past, Current & Future
	Analysis for Chitosan by End-Use Application – Water
	Treatment, Cosmetics & Toiletries, Food & Beverages,
	Healthcare/ Medical, Agrochemicals, Biotechnology,
	Pulp & Paper, Textile Finishes, Photography Products
	and Miscellaneous Markets Independently Analyzed
	with Annual Sales Figures in Metric Tons for
	Years 2007 through 2015 (Includes
	Corresponding Graph/Chart)
	Corresponding Graph/Charly
	Table 67: European Historic Review for Chitosan
	by End-Use Application – Water Treatment,
	Cosmetics & Toiletries, Food & Beverages,
	Healthcare/Medical, Agrochemicals, Cell Culture,
	and Miscellaneous Markets Independently Analyzed
	with Annual Sales Figures in Metric Tons for
	Years 2001 through 2006 (Includes
	Corresponding Graph/Chart)
	Table 68: European 11-Year Perspective for Chitosan by
	End-Use Application – Percentage Breakdown of Volume
	Sales for Water Treatment, Cosmetics & Toiletries,
	Food & Beverages, Healthcare/Medical, Agrochemicals,
	Biotechnology, Pulp & Paper, Textile Finishes,
	Photography Products, and Miscellaneous Markets
	for Years 2005, 2010 & 2015 (Includes Corresponding
	Graph/Chart)
SI	A-PACIFIC
Α.	Market Analysis
	Current & Future Analysis
	Chitosan Market by End-use
	Focus on Select Markets – A Historic Perspective
	China – Major Market
	Focus on Major Issues
	Water Treatment Chemicals Market130
	Table 69: Chinese Water Treatment Chemicals
	Market: Production Estimates for 1990, 2010



#### CHITIN & CHITOSAN - A GLOBAL STRATEGIC BUSINESS REPORT 10/10 This Report Is Protected With Digital Watermarks. Copyrights per US & ICC protocols. This Document May Not Be Printed, Copied or Distributed Outside Your Organization in Any Form Without Our Express Written Permission © Global Industry Analysts, Inc., Phone: 408-528-9966, Fax: 408-528-9977, 6150 Hellyer Avenue, San Jose, CA 95138, USA www.StrategyR.com

Chitosan Market by End-use ...... 123



Page vii

#### MCP-2039

#### CONTENTS

India	
Export Scenario - Historic Perspective	
Raw Materials for Chitin/Chitosan Being	
Thrown Away	131
Thailand	
Production Trends	
B. Market Analytics	

 Table 70: Asia-Pacific Recent Past, Current & Future

 Analysis for Chitin Derivatives by Product Derivative –

 Glucosamine, Chitosan, and Other Markets Independently

 Analyzed with Annual Sales Figures in Metric Tons

 for Years 2007 through 2015 (Includes

 Corresponding Graph/Chart)

 132

 Table 71: Asia-Pacific Historic Review for Chitin

 Derivatives by Product Derivative – Glucosamine,

 Chitosan, and Other Markets Independently

 Analyzed with Annual Sales Figures in Metric

 Tons for Years 2001 through 2006 (Includes

 Corresponding Graph/Chart).

 133

Table 73: Asia-Pacific Recent Past, Current & Future Analysis for Chitosan by End-Use Application – Water Treatment, Cosmetics & Toiletries, Food & Beverages, Healthcare/ Medical, Agrochemicals, Biotechnology, Pulp & Paper, Textile Finishes, Photography Products and Miscellaneous Markets Independently Analyzed with Annual Sales Figures in Metric Tons for Years 2007 through 2015 (Includes Corresponding Graph/Chart)......134

C	urrent & Future Analysis
	Chitosan Market by End-use
B. Ma	arket Analytics
Т	able 76: Rest of World Recent Past, Current & Future
	nalysis for Chitin Derivatives by Product Derivative –
G	lucosamine, Chitosan, and Other Markets Independently
A	nalyzed with Annual Sales Figures in Metric Tons
fe	or Years 2007 through 2015 (Includes
C	Corresponding Graph/Chart)
T	able 77: Rest of World Historic Review for Chitin
Ľ	Perivatives by Product Derivative – Glucosamine,
	hitosan, and Other Markets Independently Analyzed
	ith Annual Sales Figures in Metric Tons for
	ears 2001 through 2006 (Includes
C	Corresponding Graph/Chart)
T	Cable 78: Rest of World 11-Year Perspective for
	Chitin Derivatives by Product Derivative – Percentage
	reakdown of Volume Sales for Glucosamine,
	Thitosan and Other Markets for Years 2005, 2010 &
2	015 (Includes Corresponding Graph/Chart)
	Cable 79: Rest of World Recent Past, Current & Future
	nalysis for Chitosan by End-Use Application – Water
	reatment, Cosmetics & Toiletries, Food & Beverages,
	Iealthcare/Medical, Agrochemicals, Biotechnology,
	Pulp & Paper, Textile Finishes, Photography Products
	nd Miscellaneous Markets Independently Analyzed
	vith Annual Sales Figures in Metric Tons for
	ears 2007 through 2015 (Includes
C	Corresponding Graph/Chart)
	Cable 80: Rest of World Historic Review for Chitosan by
	End-Use Application – Water Treatment, Cosmetics &
	oiletries, Food & Beverages, Healthcare/Medical,
	grochemicals, Cell Culture, and Miscellaneous
	Aarkets Independently Analyzed with Annual Sales
	Figures in Metric Tons for Years 2001 through
2	006 (Includes Corresponding Graph/Chart)140

 18. REST OF WORLD
 137

 A. Market Analysis
 137

 Table 81: Rest of World 11-Year Perspective for Chitosan

 by End-Use Application – Percentage Breakdown of

 Volume Sales for Water Treatment, Cosmetics &

 Toiletries, Food & Beverages, Healthcare/Medical,

 Agrochemicals, Biotechnology, Pulp & Paper,

 Textile Finishes, Photography Products, and

 Miscellaneous Markets for Years 2005, 2010 & 2015

 (Includes Corresponding Graph/Chart)



CHITIN & CHITOSAN - A GLOBAL STRATEGIC BUSINESS REPORT 10/10 This Report Is Protected With Digital Watermarks. Copyrights per US & ICC protocols. This Document May Not Be Printed, Copied or Distributed Outside Your Organization in Any Form Without Our Express Written Permission © Global Industry Analysts, Inc., Phone: 408-528-9966, Fax: 408-528-9977, 6150 Hellyer Avenue, San Jose, CA 95138, USA www.StrategyR.com

Signature

Page viii

#### **MCP-2039**

#### **COMPETITION**

1.	Advanced Biopolymers AS (Norway) 14	42
2.	Aexim Chemicals (Bangladesh)	43
3.	Aqua Premier Co., Ltd. (Thailand) 14	44
4.	Bannawach Bio-Line Co., Ltd. (Thailand) 14	45
5.	Beijing Research Institute of Chemical Engineering and	
	Metallurgy (China) 1	46
6.	Biothera (USA) 1	48
7.	CarboMer, Inc. (USA)1	50
8.	Cargill, Inc. (USA) 1	52
9.	Carmeda AB (Sweden)1	69
10.	Chitochid Limited Partnership (Thailand) 1	69
11.	Dalian Xindie Chitin Co., Ltd. (China)1	70
12.	Dalwoo-Chitosan BLS (Korea) 1	70
13.	Dongying Development Zone Marine Biochemicals	
	Co., Ltd. (China)	71
14.	FabriChem, Inc. (USA) 1	72
15.	FMC BioPolymer (USA) 1	74
	NovaMatrix (Norway)	74
16.	Fuzhou Corona Science and Technology Development	
	Co., Ltd. (China) 1	
	Golden-Shell Biochemical Co., Ltd. (China) 1	
	Guanyun Bioscience And Technology Co., Ltd. (China) 1	
	HaloSource, Inc. (USA) 1	
	Health Perception (UK) Ltd. (UK) 1	
	Heppe Medical Chitosan GmbH (Germany) 1	
22.	Jiande Biochemical Industry Plant Corporation (JBICHEM)	
	(China)	
	Jinan Haidebei Marine Bioengineering Co., Ltd. (China)1	
	Kiotek Corporation (Taiwan) 1	
	Kitozyme SA (Belgium)	
26.	Kitto Life Co., Ltd. (South Korea)1	86

27.	Kraeber GmbH & Co. (Germany)	188
28.	Kunpoong Bio Co., Ltd. (Korea)	190
29.	Marinard Biotech (Canada)	191
30.	Marine Chemicals (India)	192
31.	Maypro Industries, Inc. (USA)	193
32.	Meron Biopolymers (India)	193
33.	Navamedic ASA (Norway)	194
	Chitinor AS (Norway)	.194
34.	Novozymes A/S (Denmark)	195
35.	Oligopharm Co., Ltd. (Russia)	202
36.	Pharmed Medicare (India)	.203
37.	Primex EHF (Iceland)	204
38.	Qbas Co., Ltd. (Taiwan)	204
39.	Qingdao Haoda Marine Health Food Co., Ltd. (Chain)	.205
	Qingdao Yunzhou Biochemistry Co., Ltd. (China)	
41.	Rongcheng Luyang Chemical Co., Ltd. (China)	.207
42.	Seafresh Chitosan (Lab) Co., Ltd. (Thailand)	.207
43.	Shanghai Nicechem Co., Ltd. (China)	.208
44.	Shanghai Seaflag Biochemistry Product Co., Ltd. (China)	.210
45.	Shangyu Biotech Co., Ltd. (China)	.210
46.	Sino Lion (USA) Ltd. (USA)	.211
47.	Sonat Company (Russia)	.212
48.	Taizhou Candorly Sea Biochemical & Health Products	
	Co., Ltd. (China)	.213
49.	. United Chitotechnologies, Inc. (USA)	.214
50.	V-Labs, Inc. (USA)	.216
51.	Weifang Dacheng Salt Chemical Industrial Co., Ltd.	
	(China)	
	. Yaizu Suisankagaku Industry Co., Ltd. (Japan)	
53.	. Yuhuan Ocean Biochemical Co., Ltd. (China)	.218
54	Theijang Aoving Biotechnology Co. 1td (China)	219



CHITIN & CHITOSAN - A GLOBAL STRATEGIC BUSINESS REPORT 10/10 This Report Is Protected With Digital Watermarks. Copyrights per US & ICC protocols. This Document May Not Be Printed, Copied or Distributed Outside Your Organization in Any Form Without Our Express Written Permission © Global Industry Analysts, Inc., Phone: 408-528-9966, Fax: 408-528-9977, 6150 Hellyer Avenue, San Jose, CA 95138, USA www.StrategyR.com

