



Medical Nanotechnology Markets

Published: 2008-SEP-01

Pages: 183

Format: PDF

Description

Nanotechnology has reached critical mass. Nowhere is this more evident than in medicine. Rising medical costs, demands for less-invasive procedures and pressures for immediate feedback of medical conditions, all point to nanotechnology as offering a new approach in healthcare. According to U.S. National Science Foundation estimates, by 2015 the annual global market for nano-related goods and services will top \$1 trillion, thus making it one of the fastest-growing industries in history. Assuming that these figures prove to be accurate, nanotechnology will emerge as a larger economic force than the combined telecommunications and information technology industries at the beginning of the technology boom of the late 1990s. This TriMark Publications report covers the specific segments of the medical nanotechnology markets, with particular emphasis on those segments where this emerging technology is or shows the potential to be most impactful. Nanotechnology, a field of science and technology that aims to control matter at the atomic, molecular and macromolecular level, potentially has far-reaching and paradigm-shifting implications for biology, drug discovery and medical technologies. The discipline has already yielded healthcare discoveries that have been used for drug delivery and diagnostic purposes. In this study, we describe various nanotechnologies under development for biological and medical purposes and assess their potential. Moreover, this analysis is arranged to provide an overview of the regulatory issues faced by the medical nanotechnology industry and focuses on how specific segments within the industry are poised for high future growth.

Table of Contents

-

- 1 Overview 6

- 1.1 Statement of Report 6

- 1.2 About This Report 6

- 1.3 Scope of the Report 8

- 1.4 Methodology 8

- 1.5 Executive Summary 10

-

- 2 Medical Products (Drugs, Devices and Nutraceuticals) Nanotechnology Markets 13

- 2.1 Background 13

- 2.2 Market Calculations 13

- 2.3 Market Demands 14

- 2.4 Market Overview 18

- 2.4.1 The Role of Nanotechnologies in Medicine 18

- 2.4.2 Nanotechnology Sector Challenges 21

- 2.4.3 Nanotechnology Sector Drivers 21

- 2.4.4 Nanotechnology Sector Restraints 21

- 2.5 Nanotechnology Medical Product Market Segments 21

- 2.5.1 Overview 21

- 2.5.2 World Markets 22

- 2.5.3 U.S. Market 24

- 2.5.4 European Market 25

- 2.5.5 Japanese Market 26

- 2.5.6 Asian Market 27

- 2.5.7 Middle East 29

- 2.5.8 ROW 30

-

- 3 Medical and Life Science Nanotechnology Markets 32

- 3.1 Nano-Particles 33

- 3.2 Market for Nano-Particles in Life Sciences and Medicine 34

- 3.2.1 Key Players 34

- 3.2.2 Application Manufacturers 36

- 3.3 Dendrimers 36

- 3.3.1 PAMAM Dendrimers 36

3.3.2 Market for Nanocapsules in Life Sciences and Healthcare 37

3.3.3 Key Players 37

3.4 Market for Nanoporous and Nanostructured Materials in Life Sciences and Healthcare 37

3.4.1 Key Players 37

3.4.2 Nanofiltration 38

3.5 Nanodevices, Nanosensors and Quantum Dots 38

3.5.1 Sector Overview 38

3.5.2 Market for Quantum Dots in Life Sciences and Medicine 39

3.5.3 Commercial Applications for Quantum Dots 39

3.5.4 Key Players 40

3.5.5 Nanomaterials Suppliers 41

3.5.6 Application Manufacturers 41

3.6 Nanocoatings 42

3.7 Nanocomposites 42

3.8 Nanoarrays 42

3.8.1 Bead NanoArrays: A High-Sensitivity Detection System 43

3.9 Fullerenes 43

3.9.1 Key Applications and Market Opportunities 44

3.9.2 Medical Market Uses for Carbon Nanotubes 44

3.9.3 Key Players, Including Application Manufacturers, End Users and Nanomaterials Suppliers 45

3.10 Liposome-like Nano-Particles 45

3.10.1 Nanostructured Lipid Carriers 46

3.10.2 DauxoXome® Liposomal Formulation 46

3.11 Nanosensors 46

3.11.1 Microcantilever Sensors and Photonic Sensors 46

3.11.2 Field-Effect Nanoplate Devices 46

3.11.3 Electrochemical-Transducing Electrode Systems 47

4 Technology Issues 48

4.1 Nanotechnology in Drug Delivery and Development 48

4.1.1 Drug Delivery Using Nanotechnology 50

4.1.2 Design of Nanotechnology-Based Drug Delivery Systems 52

4.1.3 Using Magnetic Nano-Particles in Targeted Drug Delivery 53

4.1.4 Cancer Drug Delivery 53

4.1.5 Nano-Particle-Mediated Delivery of siRNA 55

4.1.6 Targeting Angiogenesis with Nano-Particles 55

4.1.7 Nanosystems and Inflammation 56

4.1.8 The Chiral Drug Development Process 56

4.1.9 Reasons Why the Drug Delivery Market is Rapidly Expanding 57

4.2 Categories of Medical Nanotechnology Products 57

4.2.1 Surgical Steel Devices 58

4.2.2 Contrast-Enhancing Agents for MRI (Magnetic Resonance Imaging) 58

4.2.3 Wound Dressings / Anti-Microbial Textiles 59

4.2.4 Nanocoated Surgical Blades 59

4.2.5 Suture Needles and Microneedles 59

4.2.6 Catheters for Minimally-Invasive Surgery 59

4.2.7 Optical Nanosurgery 59

4.2.8 Nanocoated or Nanocontoured Implant Surfaces 60

4.3 Biosensors and Biodetection 60

4.3.1 Cantilever Arrays 60

4.3.2 Nanosensors 60

4.3.3 Optical Sensors 60

4.3.4 Nano-Particle Sensors and Detectors 61

4.3.5 In Vitro Diagnostics 61

4.3.6 Imaging, In Vivo Diagnosis and Theranostics 64

4.4 Vaccines—Virus-Like Particles (VLPs) 65

4.5 Transdermal Drug Delivery 65

4.6 Phage Microarrays 65

4.7 Neuroscience 66

4.8 Nanotechnology Materials for Medical Products 67

4.8.1 Dental Materials 67

4.8.2 Bone Replacement 68

4.8.3 Contact Lenses 68

4.9 New Drug Development 68

4.10 Future Directions 69

4.10.1 Sources of Nano Development 69

4.10.2 Commercialization 70

4.10.3 Current/Pending Clinical Trials on New Products and Emerging Technologies 70

4.10.4 Future Directions 72

4.11 Key Technology Findings for Medical Uses of Nanotechnology 72

5 Business Trends 74

5.1 Market Forces 74

5.1.1 Market Drivers 74

5.1.2 Market Restraints 74

5.1.3 Medical / Clinical Studies 74

5.1.4 Demographics 75

5.2 Market Prospects 75

5.3 Marketing and Distribution 75

5.4 Competitive Landscape 76

5.5 Business Developments 76

5.5.1 Drug Pedigrees 76

5.6 Acquisitions and Partnerships 77

5.7 Key Players 77

5.8 Patent Climate 77

5.9 Investment Climate 78

5.9.1 U.S. Government 79

5.9.2 Europe 80

5.10 Venture Capital Environment 80

5.10.1 Medical and Health Nanotech Venture Companies 81

5.10.2 Pharma and Biotech Nanotech Venture Companies 83

5.11 Business Strategies for Medical Nanotechnology 88

5.12 Nanotechnology Questions 90

5.12.1 What Are the Near-Term Business Opportunities in the Medical Nanotechnology Markets? 90

5.12.2 What Are the Business Models Currently Used by Companies in the Medical Nanotechnology Markets? 90

5.12.3 How Will Manufacturers, Researchers, Physicians, Patients and Payers Influence the Medical Nanotechnology Markets? 91

5.12.4 What Are the Drivers and Bottlenecks Influencing the Medical Nanotechnology Markets? 91

5.12.5 What Are the Current and Emerging Technologies used in the Medical Nanotechnology Markets? 91

5.12.6 Who Holds the Proprietary Rights to the Medical Nanotechnology Markets, Especially in such a Multidisciplinary Environment? 92

5.12.7 What Are Current Applications of These Technologies? 92

5.12.8 What Regulatory Processes Must Medical Nanotechnology Undergo in the U.S., Japan and Europe? 92

5.12.9 How Will New or Emerging Medical Nanotechnologies Change Treatment and Payment Paradigms? 92

5.12.10 How Will Medical Nanotechnologies Reduce Adverse Clinical Reactions and Decrease Total Patient Care Cost? 93

5.12.11 How Will Medical Nanotechnology Reduce Healthcare Expenditures? 93

5.12.12 How Will Medical Nanotechnology Decrease Patient Diagnostic Testing Costs? 93

5.12.13 What is the Role of Nanotechnology in Drug Development? 93

5.12.14 Which Medical Nanotechnology Product Categories Are Driving Growth? 94

5.12.15 How Are Biomarkers Being Developed Using Nanotechnology? 94

5.12.16 What Companies Are Developing Nanotechnology Drug Delivery Systems? 94

5.12.17 How Are Nano-Optical Tagging Technologies Used in Animal Drug Safety Assessment Studies? 94

5.12.18 What Nanotechnology Platforms Are Being Used in Point of Care Diagnostic Testing? 95

6 Technology Assessment 96

6.1 Current Technologies for Nano 96

6.1.1 Nanodiagnostics 96

6.1.2 Competitive Analysis of Nano-Particle Assays 99

6.1.3 In Vivo Imaging 99

6.1.4 In Vitro Clinical Diagnostics 99

6.2 Future Technologies 101

6.3 Technology Accelerators, Roadblocks and Challenges 103

6.3.1 Technology Accelerators 103

6.3.2 Technology Roadblocks and Challenges 103

6.3.3 Public Awareness 104

6.4 Nanotechnology Product Trends and New Concepts for Medical Applications 106

6.4.1 Market Trends—Diagnostics 106

6.4.2 Market Trends—Therapies 115

6.4.3 Market Trends—Preventive and Other 120

6.4.4 Nanofibers in Medical Applications 124

6.4.5 Dental Applications 125

6.4.6 Optical Applications 126

6.5 Production Methods 126

7 Medical Nanotechnology Market Regulation and Reimbursement 128

7.1 Market Segments 128

7.1.1 Diagnostics 128

7.1.2 Therapies 128

7.1.3 Preventive 128

7.2 Customer Needs 128

7.3 Competitor Analysis 128

7.4 Pricing Pressures 129

7.5 U.S. Medicare and Other Government Agency Issues 129

7.6 Third-Party Reimbursement 129

7.7 Regulatory Trends 129

7.7.1 Regulatory Policy for Nanotechnology Drugs and Medical Devices 130

7.7.2 Current Good Manufacturing Practices (cGMPs) 133

7.7.3 Current Progress 134

7.7.4 Future Regulatory Trends 134

7.7.5 Key Issues 136

7.7.6 Labeling Requirements 136

7.8 Government Initiatives 136

7.8.1 NNI Research Centers 137

7.8.2 NNI Centers and Networks of Excellence 137

7.8.3 FDA's Nanotechnology Task Force 137

7.8.4 Dutch Government Nano Action Plan 138

7.8.5 Other Research Centers 138

7.9 Medical Regulatory and cGMPs Issues 139

7.10 New Technology Concerns 140

7.11 Use Environment 141

7.11.1 Cancer 141

7.11.2 Medical Review 141

7.12 Risk Assessment 141

7.12.1 Risk Management (ISO 14971:2007) 141

7.12.2 Toxicology Assessment 141

7.12.3 Safety Evaluation 142

7.13 Cautions for Medical Nanotechnology Platforms 144

7.13.1 ETUC Precautionary Principle Applied to Nanotechnologies 145

7.13.2 Possible Risks to Human Health from Nanotechnology Products 145

8 Corporate Profiles 146

8.1 Abbott Laboratories 146

8.2 Abraxis Biosciences 146

8.2.1 NDA Pipeline 147

8.3 Aduro BioTech 148

8.4 Advanced Magnetics (AMAG Pharmaceuticals) 148

8.5 Alnis BioSciences 149

8.6 APP Pharmaceuticals 149

8.7 Arrowhead Research Corporation 150

8.8 Baxter International 151

8.9 Bristol-Myers Squibb 151

8.10 Caliper 151

8.11 Capsulation NanoScience AG 152

8.12 CytRx Corporation 152

8.13 Dendritech, Inc. 152

8.14 Dendritic Nanotechnologies, Inc. 152

8.15 Dow Chemical 153

8.16 DuPont 153

8.16.1 The Framework 155

8.17 Elan Drug Delivery (see also Bristol-Myers Squibb) 156

8.18 Evident Technologies 157

8.19 Evolved Nanomaterial Sciences (ENS) 157

8.20 Flamel Technologies 157

8.21 General Electric 160

8.22 GlaxoSmithKline 160

8.23 Honeywell International 160

8.24 Invitrogen 161

8.25 Nano-C 162

8.26 Nanocyl SA 163

8.27 Nanogen, Inc. 163

8.28 Nanolab Systems 164

8.29 NanoPass Technologies, Ltd. 164

8.30 Nanophase Technologies Corporation 164

8.31 Nanospectra Biosciences 165

8.32 Nanosphere, Inc. 165

8.33 Nanosys 166

8.34 New England Precision Grinding (NEPG) 166

8.35 Novartis 167

8.36 Novavax 167

8.37 Nucrust (Westaim) Pharmaceuticals 168

8.38 Orthovita 168

8.39 Phillips 168

8.40 pSivida Corporation 169

8.41 Quantum Dot Corporation 169

8.42 Roche 170

8.43 Sandvik Bioline 170

8.44 Starpharma Holdings, Limited 171

8.45 Sigma Aldrich 172

8.46 Wyeth Pharmaceuticals 173

9 Appendix: Nanotechnology References 174

10 Appendix: Glossary of Terms in Nanotechnology 175

10.1 Bionanotechnology 175

10.1.1 Nanopore Sequencing 175

10.1.2 Cantilevers with Functionalized Tips 175

10.1.3 Microneedles 175

10.1.4 Microchips for Drug Delivery 175

10.1.5 Nucleic Acid Lattices and Scaffolds 176

10.1.6 Nanofibers as Biomaterials 176

10.1.7 Carbon Nanotubes 177

10.2 Definition of Nano-Particles with Biological and Medical Applications 177

10.2.1 Superparamagnetic Iron Oxide Crystals 177

10.2.2 Quantum Dots 178

10.2.3 Dendrimers 178

10.2.4 Polymeric Micelles 178

10.2.5 Liposomes 178

10.2.6 Nanospheres 179

10.2.7 Aquasomes (Carbohydrate-Ceramic Nano-Particles) 179

10.2.8 Polyplexes/Lipopolyplexes 179

11 Appendix: NNI Centers and Networks of Excellence 180

11.1 National Science Foundation 180

11.2 Department of Energy 181

11.3 Department of Defense 181

11.4 National Aeronautics and Space Administration (NASA) 182

11.5 National Institute for Occupational Safety and Health 182

11.6 National Institute of Standards and Technology 182

11.7 National Institutes of Health 182

LIST OF FIGURES

Figure 2.1: End-User Markets for Nanotechnology, 2007 15

Figure 2.2: Nanometer Scale 18

Figure 2.3: International Per Capita Healthcare Spending by Country, 2006 22

Figure 2.4: World Nanomedical Market Shares, 2007 23

Figure 2.5: Total Spending on Healthcare in the U.S., 1960 to 2007 24

Figure 3.1: Nanotechnology Applications 33

Figure 3.2: Carbon Nanotubes 44

Figure 4.1: Depiction of nab Technology 49

Figure 7.1: FDA Product Validation Chart 133

Figure 7.2: FDA Product Lifecycle Model 135

Figure 8.1: Sigma Aldrich Sales Distribution 172

LIST OF TABLES

Table 2.1: Global Market for Nanotechnology Products, 2005 to 2013 15

Table 2.2: Nanotechnology Materials for Consumer Products, 2005 to 2013 16

Table 2.3: Nanotechnology Markets Worldwide by Industry, 2002 to 2015 16

Table 2.4: Nanotechnology Development Worldwide by Region, 2002 to 2015 16

Table 2.5: Currently-Growing Nanofabrication Techniques 18

Table 2.6: Global Nanomedicine Market, 2004 to 2013 22

Table 2.7: Nanomedicine Market Revenues by Product Segment, 2007 23

Table 2.8: Global Nanomedicine Market by Geographic Segment, 2004 to 2013 23

Table 2.9: U.S. Nanomedicine Market, 2004 to 2013 24

Table 2.10: European Nanomedicine Market, 2004 to 2013 25

Table 2.11: Japanese Nanomedicine Market, 2004 to 2013 26

Table 2.12: Japanese Nanotechnology Product Market Forecast 27

Table 2.13: Government Funding for Nanotechnology Research and Development, 1997 to 2008 30

Table 2.14: Global Nanotechnology R&D Spending, 1997 to 2013 30

Table 2.15: Global Growth in Nanotechnology R&D, 1997 to 2013 31

Table 3.1: Global Market for Nanotechnology Applications in the Life Sciences, 2005 to 2012 32

Table 3.2: Market for Nano-Particles in Life Sciences and Medicine, 2004 to 2012 34

Table 3.2: Market for Nanostructured Materials in Life Sciences and Medicine, 2004 to 2012 37

Table 3.4: Market for Nanodevices in Life Sciences and Medicine, 2004 to 2012 39

Table 3.5: Commercial Applications of Quantum Dots 40

Table 3.6: Market for Nanocomposites in Life Sciences and Medicine, 2004 to 2012 42

Table 3.7: Liposomal Formulations Used in Nanotechnology 45

Table 3.8: Types of Nanoparticulate Drug Delivery Systems 47

Table 4.1: FDA-Approved Drugs Developed with Nanotechnology-Based Formulations 49

Table 4.2: Key Effectors of Drug Delivery Using Nanomaterials 50

Table 4.3: Nanoscale Applications for Drug Delivery in Pharmaceutical Drug Development 51

Table 4.4: Drug Delivery Nanotechnology Market Drivers Ranked in Order of Impact 51

Table 4.5: Drug Delivery Nanotechnology Market Restraints Ranked in Order of Impact 51

Table 4.6: Anti-Cancer Drugs Formulated Using Nanomaterials 54

Table 4.7: Nanomaterials for in vitro RNAi Delivery 54

Table 4.8: Use of Peptide-Based Nanotubes for Biological Active Targets 55

Table 4.9: Lab-on-Chip and Microfluidic Chip Technology Innovations 62

Table 4.10: Diagnostic Nanotechnology Market Drivers Ranked in Order of Impact 63

Table 4.11: Diagnostic Nanotechnology Market Restraints Ranked in Order of Impact 63

Table 4.12: FDA-Approved In Vivo Imaging Materials Developed with Nanotechnology-Based Formulations 64

Table 4.13: Application Areas for Phage Nanotechnology Platforms 66

Table 4.14: Application Areas for Neuroscience Nanotechnology Platforms 66

Table 4.15: Nanotechnology Application Areas for Medical Nanomaterials 67

Table 4.16: FDA-Approved Dental Biomaterials Developed with Nanotechnology-Based Formulations 68

Table 4.17: Drug Discovery Nanotechnology Market Drivers Ranked in Order of Impact 68

Table 4.18: Drug Discovery Nanotechnology Market Restraints Ranked in Order of Impact 68

Table 4.19: Examples of Proposed U.S. NNI Interagency Collaborative Activities 70

Table 5.1: Medical Nanotechnology Market Drivers—Global, 2008 to 2016 75

Table 5.2: Medical Nanotechnology Market Restraints—Global, 2008 to 2016 75

Table 5.3: U.S. Nanotechnology Patents Issued per Year, 1996 to 2006 78

Table 5.4: Sources of Nanotechnology Funds 79

Table 5.5: National Government Funding Leaders for Nanotechnology, 2007 79

Table 5.6: Total Investments in Venture-Backed Nanotechnology Companies, 1997 to 2008 81

Table 5.7: Leading Nanotechnology Start-Up Companies 81

Table 6.1: Summary of Key Advantages for Nanotechnology 96

Table 6.2: Nanotechnology Platforms Used for Diagnostics and Imaging 96

Table 6.3: FDA-Approved In Vitro Diagnostics Developed with Nanotechnology-Based Formulations 97

Table 6.4: Applications of Veridex Nanotechnology Platform for Diagnostic Assays 98

Table 6.5: Characteristics of Gold Nano-Particle Technology for Diagnostic Testing 100

Table 6.6: Overview of Future Nanomedical Technology Development 101

Table 6.7: Recent Developments in Nanotechnology for Drug Delivery and Drug Discovery 101

Table 6.8: Recent Developments in Nanomaterials and Nanotechnology-Based Devices 102

Table 6.9: Recent Nanotechnology Applications in Diagnostics 102

Table 6.10: Future Nanomedical Technology Platforms 102

Table 6.11: Additional Global Market Trends 127

Table 8.1: AMAG Nanotechnology Products and Candidates 149

Ordering

Order Online - <http://www.bioseeker.com/market-research-report/medical-nanotechnology-markets.html>

Order by Fax - using the form below

Order by Post - print the order form below and send to:

BioSeeker Group
Björnnäsvägen 21
11419 STOCKHOLM
SWEDEN

Fax Order Form

To place an order via fax simply print this form, fill in the information below and fax the completed form to +46-8-56849191. If you have any questions please visit <http://www.bioseeker.com/market-research-report/contacts/>

Order Information

Please verify that the product information is correct:

Product Name: **Medical Nanotechnology Markets**

Web Address: <http://www.bioseeker.com/market-research-report/medical-nanotechnology-markets.html>

Format: PDF

Price: 2890 EUR (Single User License)

Delivery of hard copy or CD-ROM is subject to a Courier charge of 50 EUR.

Delivery within Sweden is subject to VAT at 25%.

Contact Information

Please enter all the information below in **BLOCK CAPITALS**

Title: _____

Name: _____

Email Address:* _____

Job Title: _____

Organization: _____

EU companies must supply: VAT / BTW / MOMS
MWST / IVA / FPA number:

Address: _____

Zip Code: _____

City: _____

State: _____

Country: _____

Phone Number: _____

Fax Number: _____

Payment Information

Please indicate the payment method you would like to use by selecting the appropriate box.

- Pay by credit card:**
- American Express
 - Master Card
 - Visa

Cardholder Name: _____

Expiry Date (MM/YY): _____

Card Number: _____

CVV Number: _____

- Pay by check:**

Please post the check, accompanied by this form, to:
BioMarket Group
Björnnäsvägen 21
11419 STOCKHOLM
SWEDEN

- Pay by wire transfer:** Please transfer funds to:

Account number: 43521169

Swift code: HANDSESS

IBAN number: SE74 6000 0000 0000 4352 1169

Bank Address: Handelsbanken, Stockholm, Sweden

If you have a Marketing Code please enter it below:
Marketing Code: _____

Please supply purchase order number if needed: _____

* Please refrain from using free email accounts when ordering (e.g. Yahoo, Hotmail, Gmail)

Please note that by ordering from BioSeeker Group you are agreeing to our Terms and Conditions at <http://www.bioseeker.com/market-research-report/biomarket-group-full-terms-and-conditions/>

Please fax this form to: +46-8-56849191