

## Tissue Engineering: Technologies and Therapeutic Areas – A Global Market Overview

*The report reviews, analyzes and projects the global market for Tissue Engineering Technologies and Therapeutic Areas for the period 2012-2022*

Published: September 2015

Report Code: BT009

Pages: 279

Charts: 113

Price: \$4050 Single User License, \$6750 Enterprise License

### SUMMARY

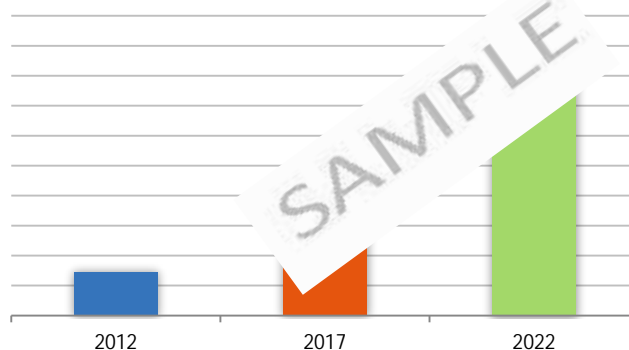
Despite being in existence for about two decades, the field of tissue engineering can still be assumed to be a developing discipline involving basic and applied multidisciplinary biomedical research. This subject utilization of the principles and methods employed in engineering and life sciences, which are then combined with clinical expertise with a focus on developing biological tissue substitutes that enable in restoring, maintaining or enhancing the function of diseased or damaged human tissues. Researchers from a wide range of disciplines have collaborated in fostering the development of a host of exceptional inventions, state-of-the-art research tools and scientific techniques that are finding diverse application in this as yet nascent area. While the initial clinically relevant efforts in tissue engineering were focused on generating bioengineered skin substitutes for severely burned patients, the past two decades have witnessed considerable evolution in this field, with the ideas and applications of these principles being employed for an extensive array of tissues and organs. Skin, cartilage, bone, blood vessels, pancreas, heart valves, breast, nerves, trachea, bowel, kidney, lung and liver comprise some of the distinctive instances of areas where tissue engineered substitutes have either been employed or are under investigation.

Worldwide market for Tissue Engineering technologies explored in this study includes Cell Culture, Immunomodulation and Stem Cell. The report also focuses on therapeutic applications of tissue engineering comprising Cardiovascular, Dental/Oral Neurological, Oncology, Orthopedic, Skin/Integumentary and Others. The markets for the above mentioned technologies and therapeutic applications are analyzed in terms of USD. Global market for Tissue Engineering, estimated at US\$23 billion in 2015, forecast to reach US\$27.3 billion in 2015, and is further expected to register a CAGR of about 23% between 2016 and 2022 to touch a projected US\$94.2 billion by 2022.

This report review, analyze and projects the tissue engineering market for global and the regional markets including North America, Europe, Asia-Pacific and Rest of World. The regional markets further analyzed for 5 independent countries across North America – The United States and Canada; and Europe – France, Germany and the United Kingdom.

The study includes 113 charts (includes a data table and graphical representation for each chart), supported with meaningful and easy to understand graphical presentation, of market numbers. The report profiles 31 key global players and 39 major players across North America – 28; Europe – 7; Asia-Pacific – 3; and Rest of World – 1. The research also provides the listing of the companies engaged in research and development and services of tissue engineering. The global list of companies covers addresses, contact numbers and the website addresses of 300 companies.

Global Tissue Engineering Market Analysis (2012-2022)  
in USD Million



## SAMPLE COMPANY PROFILE

### ACELL INC. (UNITED STATES)

6640 Eli Whitney Drive, Columbia, MD 21046, United States  
 Phone: (800) 826-2926, 410-715-1700  
 Fax: (410) 715-4511  
 Website: www.acell.com

#### Business Profile

ACell, Inc, established in 1999 and based in Columbia, Maryland, is a regenerative medicine company engaged in developing, manufacturing and commercializing extracellular matrix devices that are used for repairing and remodeling damaged tissues and organs in a variety of surgical procedures. The company's proprietary urinary bladder matrix (UBM) technology platform is based on an extracellular matrix (ECM) derived from porcine urinary bladder. ACell's offerings include MatriStem® technology (a non-crosslinked, resorbable and acellular material), MatriStem® Wound Care Matrix (a wound care device with regenerative medicine technology), MatriStem® Plastic Surgery Matrix (a plastic surgery and wound care device) and MatriStem® Hernia Matrix (a general surgery device). MatriStem®, comprising collagens, carbohydrates and proteins arranged in a complex, three-dimensional arrangement of ECM components, helps in facilitating the body's own regenerative capabilities that enables in restoring normal site-appropriate tissue.

#### Current Indications

##### Surgically Implanted Products

MatriStem® surgical devices are sterile, porcine-derived, naturally-occurring extracellular matrix sheets that help in maintaining and supporting healing environment for soft tissue reinforcement. This product finds application for acute wounds, chronic wounds and various surgical procedures.

##### Products

Product	Particulars
MatriStem® Surgical Matrix RS	Intended for implantation to reinforce soft tissue where weakness exists in patients requiring urological, gastroenterological or plastic and reconstructive surgery. Includes, but is not limited to the procedures of hernia and body wall repair, colon and rectal prolapse repair, tissue repair and esophageal repair.
MatriStem® Surgical Matrix PSM (3-Layer)	Intended for implantation to reinforce soft tissue where weakness exists in patients requiring urological, gastroenterological or plastic and reconstructive surgery. Includes, but is not limited to the procedures of hernia and body wall repair, colon and rectal prolapse repair, tissue repair and esophageal repair.

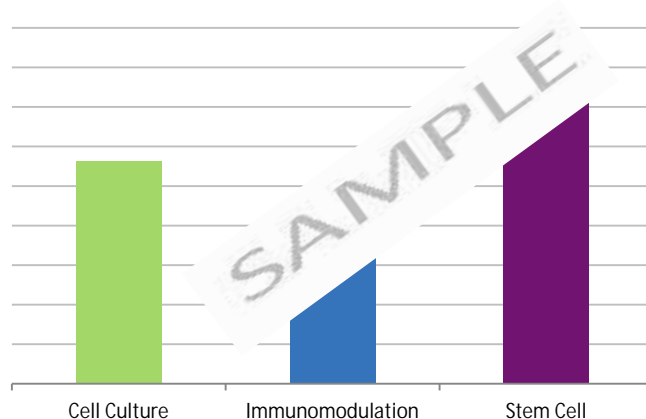
.....more

## SAMPLE TABLE/CHART

Glance at 2017 Global Tissue Engineering Market Share (%) by Technology – Cell Culture, Immunomodulation and Stem Cell



Asia-Pacific Tissue Engineering Market Analysis (2022) by Technology – Cell Culture, Immunomodulation and Stem Cell in USD Million



## KEY PLAYERS PROFILED

- Acelity L.P. Inc.
- Acell Inc.
- Biocomposites Ltd.
- Biotissue Technologies GmbH
- C. R. Bard, Inc.
- Cellerant Therapeutics, Inc.
- Cryolife Inc.
- Cytograft Tissue Engineering, Inc.
- Cytori Therapeutics, Inc.
- Episkin
- Gamida Cell Ltd.
- Histogenics Corporation
- Integra Lifesciences Holdings Corporation
- International Stem Cell Corporation
- Japan Tissue Engineering Co Ltd
- Koninklijke DSM NV
- Lifecord International Co Ltd
- RTI Surgical, Inc.
- Stemcell Technologies Inc.

.....more

## TABLE OF CONTENTS

### PART A: GLOBAL MARKET PERSPECTIVE ..... 1

<b>1. INTRODUCTION</b> .....	1
1.1 Product Outline.....	4
1.1.1 Biomaterials.....	4
1.1.2 Cells .....	4
1.1.3 Biomolecules.....	4
1.1.4 Aspects of Engineering Design.....	4
1.1.5 Biomechanical Design Aspects.....	4
1.1.6 Informatics to Support Tissue Engineering .....	4
1.1.7 Stem Cell Research .....	5
1.1.8 Tissue Engineering Technologies .....	5
1.1.8.1 Cell Culture .....	5
1.1.8.1.1 Applications of Cell Culture.....	5
1.1.8.1.2 Cell Culture in Tissue Engineering.....	6
1.1.8.2 Immunomodulation.....	7
1.1.8.2.1 Immunomodulatory Effect of Mesenchymal Stem Cells in Tissue Engineering.....	7
1.1.8.3 Stem Cell.....	8
1.1.8.3.1 Categories of Stem Cells .....	8
1.1.8.3.2 Scaffolds.....	9
1.1.8.3.3 Stem Cell Technology in Tissue Engineering.....	10
1.1.8.3.3.1 Bone Tissue Engineering.....	10
1.1.8.3.3.2 Cardiac Tissue Engineering .....	11
1.1.8.3.3.3 Liver Tissue Engineering.....	11
1.1.8.3.3.4 Neural Tissue Engineering.....	12
1.1.8.3.3.5 Other Applications.....	13
1.1.9 Therapeutic Applications of Tissue Engineering and Regenerative Medicine.....	14
1.1.9.1 Cardiovascular Applications.....	14
1.1.9.1.1 Cardiac Tissue Engineering: An Overview .....	14
1.1.9.1.2 Identification of Basic Cell Responses .....	15
1.1.9.1.3 3-Dimensional Tissue Engineering .....	17
1.1.9.1.4 Further 3-D Approaches and Considerations.....	18
1.1.9.1.5 Cardiovascular Tissue Engineering and Bioreactor Technology.....	19
1.1.9.1.6 Limiting Cells or Materials.....	19
1.1.9.2 Dental/Oral Applications.....	20
1.1.9.2.1 Dental Tissue Regeneration through Tissue Engineering Strategy.....	20
1.1.9.2.2 Harvesting Teeth Created by Tissue Engineering.....	20
1.1.9.2.3 Research Goals Currently Targeted.....	21
1.1.9.2.4 Process of Tissue Engineering for Tooth Replacement: What Future Trends Indicate .....	21
1.1.9.3 Neurology Applications.....	22
1.1.9.3.1 Neural Tissue Engineering or Neuroregeneration.....	22
1.1.9.3.2 Biomaterial Scaffold Development for Nerve Tissue Engineering: Biomaterial Mediated Neural Regeneration .....	22
1.1.9.4 Oncology Applications .....	31
1.1.9.4.1 Cancer.....	31
1.1.9.4.2 Cancer Biology from Tissue Engineering's Perspective .....	31
1.1.9.4.3 Tissue Engineering Technology Platforms' Translation into Cancer Research .....	31
1.1.9.5 Orthopedic Applications .....	32
1.1.9.5.1 Bone Regeneration Using Orthopedic Tissue Engineering.....	32
1.1.9.5.2 Articular Cartilage Degeneration and Osteoarthritis, Repair, Regeneration and Transplantation .....	33
1.1.9.6 Skin/Integumentary Applications.....	35
1.1.9.6.1 Burns.....	35
1.1.9.6.2 Diabetic Ulcers.....	35
1.1.9.6.3 Venous Ulcers.....	36

1.1.9.6.4 Plastic and Reconstructive Surgery .....	36
1.1.9.7 Other Applications.....	36
1.1.9.7.1 Autoimmune Disorders.....	36
1.1.9.7.2 Ophthalmology .....	37
1.1.9.7.3 Organ Replacement/Transplant .....	38
1.1.9.7.4 Urology .....	40
<b>2. KEY MARKET TRENDS.....</b>	<b>46</b>
2.1 Tissue Engineering Enters the "4D" Age .....	46
2.2 Cartilage Restoration Gets a Boost with Novel Tissue Engineering Approach.....	48
2.3 3-D Designs for Neural Tissue Engineering Witnesses Advancements.....	48
2.4 Peripheral Nerve Injuries Repaired Using Tissue Engineering.....	49
2.5 Biosensor Application in Tissue Engineering Gaining Prominence .....	50
2.6 Protein Mimic Offers Potential as Glue in Tissue Engineering.....	52
2.7 3D-Printed Biopolymers in Tissue Engineering Applications.....	53
2.8 Novel Tissue Scaffold Technology Shows Promise in Rebuilding Large Organs .....	55
2.9 Co-Cultures Based on Stem Cells Foster Progression in Tissue Engineering .....	55
2.10 Rapid Growth in Use of Collagen-Based Biomaterials for Tissue Engineering Applications....	57
2.11 Tissue Engineering Gaining Ground in Corneal Stem Cell-Based Therapies .....	58
2.12 Tissue Engineering for Blood Vessels Making Steady Progress .....	59
2.13 Tissue Engineering Helps in Growing Leg Muscle from Cells in a Dish .....	60
2.14 Advancements in 3D Printing and Tissue Engineering Technology.....	61
2.15 Click Chemistry Finds Application in Tissue Engineering.....	62
<b>3. KEY GLOBAL PLAYERS.....</b>	<b>63</b>
Acelity L.P. Inc. (United States) .....	63
Acell Inc. (United States).....	64
Athersys, Inc. (United States).....	66
Biocomposites Ltd. (United Kingdom).....	67
Biotime, Inc. (United States) .....	68
Biotissue Technologies GmbH (Germany).....	71
C. R. Bard, Inc. (United States) .....	72
Caladrius Biosciences, Inc. (United States).....	73
Cellerant Therapeutics, Inc. (United States).....	74
Cryolife Inc. (United States) .....	75
Cytograft Tissue Engineering, Inc. (United States) .....	76
Cytori Therapeutics, Inc. (United States) .....	77
Episkin (France).....	78
Gamida Cell Ltd. (Israel) .....	79
Histogenics Corporation (United States).....	80
Integra Lifesciences Holdings Corporation (United States).....	81
International Stem Cell Corporation (United States) .....	82
Japan Tissue Engineering Co Ltd (Japan).....	83
Koninklijke DSM NV (The Netherlands).....	84
Lifecord International Co Ltd (South Korea).....	85
Ocata Therapeutics, Inc (United States).....	86
Organogenesis Inc. (United States) .....	88
Osiris Therapeutics, Inc. (United States) .....	89
Piramal Enterprises Limited (India).....	90
RTI Surgical, Inc. (United States) .....	91
Stemcell Technologies Inc. (Canada).....	92
Taxus Cardium Pharmaceuticals Group, Inc. (United States) .....	93
TETEC® Tissue Engineering Technologies AG (Germany) .....	94
Tissue Regenix Group PLC (United Kingdom) .....	95

Viacyte, Inc. (United States).....	96
Zimmer Biomet Holdings Inc. (United States) .....	97
<b>4. KEY BUSINESS TRENDS .....</b>	<b>98</b>
Japanese PMDA Approved an Expanded Indication for CryoLife's BioGlue .....	98
Caladrius Biosciences is the New Corporate Name of NeoStem .....	98
USPTO Issued a New Patent for Ocata's RPE Therapy to Treat Macular Degenerative Diseases.....	99
Acelity L.P. Inc. formed Distribution Pact with Joerns RecoverCare.....	99
Use of ESI's Clinical-Grade hES Cells in Preclinical Research to Treat Huntington's disease .....	99
EMA Slated ATMP Classification for NBS20, NeoStem's Lead Immuno-oncology Product Candidate.....	100
BioTime's ESI and BRICOH Sign a Selective License Agreement .....	100
Display of Early Clinical Data Exhibiting the Competence of PanC-Dx™ at AACR 2015 Annual Meeting .....	101
Celgene and Mesoblast Ink Collaborative Agreement ....	101
Japan Patent Office Issued New Patent to ISCO .....	101
Athersys Marked MultiStem® Cell Therapy Development and Commercialization Pact with Chugai .....	102
Issuance of Two New US Patents for Ocata's HMC Technology.....	102
ESI BIO and Pivotal Scientific Ltd form Stem Cell Products Distribution Pact .....	102
ESI BIO and 2B Scientific Partnered to Distribute Stem Cell Products in the UK and Ireland.....	103
Osiris and Stryker Inked Collaboration to Develop and Commercialize BIO4™ .....	103
Ocata Therapeutics is the New Name of Advanced Cell Technology.....	103
Osiris Established Strategic Alliance with Arthrex to Develop and Commercialize Cartiform®.....	104
Acelity is the New Name of Centaur Guernsey.....	104
Advanced Cell Technology Received US Patent Extending the Making Process of Renewable Stem Cell Source-based Dendritic Cells.....	104
CorCell Released Novel Service Offering to Differentiate and Expand Mesenchymal Stem Cells .....	105
REDDSTAR Project Utilized Excellagen® flowable dermal matrix and Cyndacel-M™ mesenchymal stromal stem cell therapy .....	105
Advanced Cell Technology Detected a Novel Process to Yield Effective MSCs from Pluripotent Stem Cells .....	106
Advanced Adipose Tissue Injector for Enhanced Fat Grafting Procedures Acquired by LifeCell .....	106
Organogenesis Takeover Shire's Dermagraft® Assets.....	106
Japan Patent Office Issued Novel Patents for Athersys' Cell Therapy Technology.....	107
European Medicines Agency Grants Orphan Drug Designation for MultiStem® Therapy of Athersys.....	107
Tissue Regenix Mark Seven Individual Regional Sales Distribution Deals in the US .....	107
New TTF-IPS Technology Developed by International Stem Cell Corporation .....	108
Consolidation of BioTime's Research Products Business into a New ESI BIO Division .....	108
Systagenix Acquired by KCI .....	108
Cardium Joined Forces with Boston Children's Hospital Researchers.....	108
Launch of REVOLVE™ System by LifeCell .....	109
ViaCyte Received Funds from JDRF and CIRM to Develop a New Stem Cell Therapy .....	109
<b>5. GLOBAL MARKET OVERVIEW .....</b>	<b>110</b>
5.1 Global Tissue Engineering Market Overview by Technology .....	111
5.1.1 Global Tissue Engineering Technology Overview by Geographic Region.....	113
5.1.1.1 Cell Culture .....	113
5.1.1.2 Immunomodulation.....	115
5.1.1.3 Stem Cell.....	117

5.2 Global Tissue Engineering Market Overview by Application..... 119

5.2.1 Global Tissue Engineering Application Overview by Geographic Region..... 121

5.2.1.1 Cardiovascular ..... 121

5.2.1.2 Dental/Oral ..... 123

5.2.1.3 Neurological..... 125

5.2.1.4 Oncology ..... 127

5.2.1.5 Orthopedic ..... 129

5.2.1.6 Skin/Integumentary ..... 131

5.2.1.7 Other Applications ..... 133

**PART B: REGIONAL MARKET PERSPECTIVE .. 135**

**REGIONAL MARKET OVERVIEW ..... 137**

**1. NORTH AMERICA ..... 137**

1.1 North American Tissue Engineering Market Overview by Region ..... 138

1.2 North American Tissue Engineering Market Overview by Technology ..... 140

1.2.1 North American Tissue Engineering Technology Overview by Region ..... 142

1.2.1.1 Cell Culture ..... 142

1.2.1.2 Immunomodulation ..... 144

1.2.1.3 Stem Cell ..... 146

1.3 North American Tissue Engineering Market Overview by Application ..... 148

1.3.1 North American Tissue Engineering Application Overview by Region ..... 150

1.3.1.1 Cardiovascular ..... 150

1.3.1.2 Dental/Oral ..... 152

1.3.1.3 Neurological..... 154

1.3.1.4 Oncology ..... 156

1.3.1.5 Orthopedic ..... 158

1.3.1.6 Skin/Integumentary ..... 160

1.3.1.7 Other Applications ..... 162

1.4 Major Market Players ..... 164

Acelity L.P. Inc. (United States) ..... 164

Kinetic Concepts, Inc (United States) ..... 164

LifeCell Corporation (United States) ..... 165

Acell Inc. (United States) ..... 166

Athersys, Inc. (United States)..... 168

Biotime, Inc. (United States) ..... 169

Asterias Biotherapeutics, Inc. (United States)..... 172

ESI BIO (United States)..... 172

OncoCyte Corporation (United States) ..... 173

C. R. Bard, Inc. (United States) ..... 174

Caladrius Biosciences, Inc. (United States)..... 175

Cellerant Therapeutics, Inc. (United States)..... 176

Cryolife Inc. (United States) ..... 177

Cytograft Tissue Engineering, Inc. (United States) ..... 178

Cytori Therapeutics, Inc. (United States) ..... 179

Histogenics Corporation (United States) ..... 180

Integra Lifesciences Holdings Corporation (United States) .... 181

International Stem Cell Corporation (United States) ..... 182

Lifeline Cell Technology LLC (United States) ..... 183

Kensey Nash Corporation (United States) ..... 185

Ocata Therapeutics, Inc (United States)..... 186

Organogenesis Inc. (United States) ..... 188

Osiris Therapeutics, Inc. (United States) ..... 189

RTI Surgical, Inc. (United States) ..... 190

Stemcell Technologies Inc. (Canada)..... 191

Taxus Cardium Pharmaceuticals Group, Inc. (United States) : 192

ViacYTE, Inc. (United States) ..... 193

Zimmer Biomet Holdings Inc. (United States) ..... 194

1.5 North American Tissue Engineering Market Overview by Country ..... 195

1.5.1 The United States ..... 195

1.5.1.1 Market Overview by Technology ..... 195

1.5.1.2 Market Overview by Application ..... 197

1.5.2 Canada ..... 199

1.5.2.1 Market Overview by Technology ..... 199

1.5.2.2 Market Overview by Application ..... 201

**2. EUROPE ..... 203**

2.1 European Tissue Engineering Market Overview by Region ..... 204

2.2 European Tissue Engineering Market Overview by Technology ..... 206

2.2.1 European Tissue Engineering Technology Overview by Geographic Region ..... 208

2.2.1.1 Cell Culture ..... 208

2.2.1.2 Immunomodulation ..... 210

2.2.1.3 Stem Cell ..... 212

2.3 European Tissue Engineering Market Overview by Application..... 214

2.3.1 European Tissue Engineering Application Overview by Geographic Region..... 216

2.3.1.1 Cardiovascular ..... 216

2.3.1.2 Dental/Oral ..... 218

2.3.1.3 Neurological..... 220

2.3.1.4 Oncology ..... 222

2.3.1.5 Orthopedic..... 224

2.3.1.6 Skin/Integumentary ..... 226

2.3.1.7 Other Applications ..... 228

2.4 Major Market Players ..... 230

Biocomposites Ltd. (United Kingdom)..... 230

Biotissue Technologies GmbH (Germany)..... 231

Episkin (France)..... 232

Koninklijke DSM NV (The Netherlands)..... 233

Systagenix Wound Management Limited (UK) ... 234

TE TEC® Tissue Engineering Technologies AG (Germany) 235

Tissue Regenix Group PLC (United Kingdom) ..... 236

2.5 European Tissue Engineering Market Overview by Country ..... 237

2.5.1 France ..... 237

2.5.1.1 Market Overview by Technology ..... 237

2.5.1.2 Market Overview by Application ..... 239

2.5.2 Germany ..... 241

2.5.2.1 Market Overview by Technology ..... 241

2.5.2.2 Market Overview by Application ..... 243

2.5.3 The United Kingdom ..... 245

2.5.3.1 Market Overview by Technology ..... 245

2.5.3.2 Market Overview by Application ..... 247

2.5.4 Rest of Europe ..... 249

2.5.4.1 Market Overview by Technology ..... 249

2.5.4.2 Market Overview by Application ..... 251

**3. ASIA-PACIFIC ..... 253**

3.1 Asia-Pacific Tissue Engineering Market Overview by Technology ..... 253

3.2 Asia-Pacific Tissue Engineering Market Overview by Application..... 255

3.3 Major Market Players ..... 257

Japan Tissue Engineering Co Ltd (Japan)..... 257

Lifecord International Co Ltd (South Korea)..... 258

Piramal Enterprises Limited (India) ..... 259

**4. REST OF WORLD ..... 260**

4.1 Rest of World Tissue Engineering Market Overview by Technology..... 260

4.2 Rest of World Tissue Engineering Market Overview by Application ..... 262

4.3 Major Market Player ..... 264

Gamida Cell Ltd. (Israel) ..... 264

**PART C: GUIDE TO THE INDUSTRY ..... 265**

1. NORTH AMERICA ..... 265

2. EUROPE ..... 273

3. ASIA-PACIFIC ..... 276

4. REST OF WORLD ..... 277

**PART D: ANNEXURE ..... 278**

1. RESEARCH METHODOLOGY ..... 278

2. FEEDBACK ..... 280

**LIST OF CHARTS, TABLES & FIGURES**

**PART A: GLOBAL MARKET PERSPECTIVE ..... 1**

Chart 1: Global Tissue Engineering Market Analysis (2012-2022) in USD Million ..... 110

Chart 2: Global Tissue Engineering Market Analysis (2012-2022) by Technology – Cell Culture, Immunomodulation and Stem Cell in USD Million ..... 111

Chart 3: Glance at 2012, 2017 and 2022 Global Tissue Engineering Market Share (%) by Technology – Cell Culture, Immunomodulation and Stem Cell..... 112

Chart 4: Global Cell Culture Tissue Engineering Market Analysis (2012-2022) by Region – North America, Europe, Asia-Pacific and Rest of World in USD Million ..... 113

Chart 5: Glance at 2012, 2017 and 2022 Global Cell Culture Tissue Engineering Market Share (%) by Region – North America, Europe, Asia-Pacific and Rest of World..... 114

Chart 6: Global Immunomodulation Tissue Engineering Market Analysis (2012-2022) by Region – North America, Europe, Asia-Pacific and Rest of World in USD Million 115

Chart 7: Glance at 2012, 2017 and 2022 Global Immunomodulation Tissue Engineering Market Share (%) by Region – North America, Europe, Asia-Pacific and Rest of World ..... 116

Chart 8: Global Stem Cell Tissue Engineering Market Analysis (2012-2022) by Region – North America, Europe, Asia-Pacific and Rest of World in USD Million ..... 117

Chart 9: Glance at 2012, 2017 and 2022 Global Stem Cell Tissue Engineering Market Share (%) by Region – North America, Europe, Asia-Pacific and Rest of World. 118

Chart 10: Global Tissue Engineering Market (2010-2020) by Application – Cardiovascular, Dental/Oral, Neurological, Oncology, Orthopedic, Skin/Integumentary and Other Applications in USD Million..... 119

Chart 11: Glance at 2012, 2017 and 2022 Global Tissue Engineering Market Share (%) by Application – Cardiovascular, Dental/Oral, Neurological, Oncology, Orthopedic, Skin/Integumentary and Other Applications. 120

Chart 12: Global Tissue Engineering Market Analysis (2012-2022) in Cardiovascular Applications by Region – North America, Europe, Asia-Pacific and Rest of World in USD Million ..... 121

Chart 13: Glance at 2012, 2017 and 2022 Global Tissue Engineering Market Share (%) in Cardiovascular Applications by Region – North America, Europe, Asia-Pacific and Rest of World ..... 122

Chart 14: Global Tissue Engineering Market Analysis (2012-2022) in Dental/Oral Applications by Region – North America, Europe, Asia-Pacific and Rest of World in USD Million ..... 123

Chart 15: Glance at 2012, 2017 and 2022 Global Tissue Engineering Market Share (%) in Dental/Oral Applications by Region – North America, Europe, Asia-Pacific and Rest of World..... 124

Chart 16: Global Tissue Engineering Market Analysis (2012-2022) in Neurological Applications by Region – North America, Europe, Asia-Pacific and Rest of World in USD Million ..... 125

Chart 17: Glance at 2012, 2017 and 2022 Global Tissue Engineering Market Share (%) in Neurological Applications by Region – North America, Europe, Asia-Pacific and Rest of World..... 126

Chart 18: Global Tissue Engineering Market Analysis (2012-2022) in Oncology Applications by Region – North America, Europe, Asia-Pacific and Rest of World in USD Million..... 127

Chart 19: Glance at 2012, 2017 and 2022 Global Tissue Engineering Market Share (%) in Oncology Applications by Region – North America, Europe, Asia-Pacific and Rest of World..... 128

Chart 20: Global Tissue Engineering Market Analysis (2012-2022) in Orthopedic Applications by Region – North America, Europe, Asia-Pacific and Rest of World in USD Million ..... 129

Chart 21: Glance at 2012, 2017 and 2022 Global Tissue Engineering Market Share (%) in Orthopedic Applications by Region – North America, Europe, Asia-Pacific and Rest of World..... 130

Chart 22: Global Tissue Engineering Market Analysis (2012-2022) in Skin/Integumentary Applications by Region – North America, Europe, Asia-Pacific and Rest of World in USD Million..... 131

Chart 23: Glance at 2012, 2017 and 2022 Global Tissue Engineering Market Share (%) in Skin/Integumentary Applications by Region – North America, Europe, Asia-Pacific and Rest of World..... 132

Chart 24: Global Tissue Engineering Market Analysis (2012-2022) in Other Applications by Region – North America, Europe, Asia-Pacific and Rest of World in USD Million..... 133

Chart 25: Glance at 2012, 2017 and 2022 Global Tissue Engineering Market Share (%) in Other Applications by Region – North America, Europe, Asia-Pacific and Rest of World..... 134

**PART B: REGIONAL MARKET PERSPECTIVE .. 135**

Chart 26: Global Tissue Engineering Market Analysis (2012-2022) by Region – North America, Europe, Asia-Pacific and Rest of World in USD Million..... 135

Chart 27: Glance at 2012, 2017 and 2022 Global Tissue Engineering Market Share (%) by Region – North America, Europe, Asia-Pacific and Rest of World..... 136

**NORTH AMERICA..... 137**

Chart 28: North American Tissue Engineering Market Analysis (2012-2022) in USD Million ..... 137

Chart 29: North American Tissue Engineering Market Analysis (2012-2022) by Region – United States and Canada in USD Million..... 138

Chart 30: Glance at 2012, 2017 and 2022 North American Tissue Engineering Market Share (%) by Region – United States and Canada..... 139

Chart 31: North American Tissue Engineering Market Analysis (2012-2022) by Technology – Cell Culture, Immunomodulation and Stem Cell in USD Million..... 140

Chart 32: Glance at 2012, 2017 and 2022 North American Tissue Engineering Market Share (%) by Technology – Cell Culture, Immunomodulation and Stem Cell..... 141

Chart 33: North American Cell Culture Tissue Engineering Market Analysis (2012-2022) by Region – United States and Canada in USD Million..... 142

Chart 34: Glance at 2012, 2017 and 2022 North American Cell Culture Tissue Engineering Market Share (%) by Region – United States and Canada ..... 143

Chart 35: North American Immunomodulation Tissue Engineering Market Analysis (2012-2022) by Region – United States and Canada in USD Million..... 144

Chart 36: Glance at 2012, 2017 and 2022 North American Immunomodulation Tissue Engineering Market Share (%) by Region – United States and Canada..... 145

Chart 37: North American Stem Cell Tissue Engineering Market Analysis (2012-2022) by Region – United States and Canada in USD Million ..... 146

Chart 38: Glance at 2012, 2017 and 2022 North American Stem Cell Tissue Engineering Market Share (%) by Region – United States and Canada..... 147

Chart 39: North American Tissue Engineering Market Analysis (2012-2022) by Application – Cardiovascular, Dental/Oral, Neurological, Oncology, Orthopedic, Skin/Integumentary and Other Applications in USD Million..... 148

Chart 40: Glance at 2012, 2017 and 2022 North American Tissue Engineering Market Share (%) by Application – Cardiovascular, Dental/Oral, Neurological, Oncology, Orthopedic, Skin/Integumentary and Other Applications. 149

Chart 41: North American Tissue Engineering Market Analysis (2012-2022) in Cardiovascular Applications by Region – United States and Canada in USD Million..... 150

Chart 42: Glance at 2012, 2017 and 2022 North American Tissue Engineering Market Share (%) in Cardiovascular Applications by Region – United States and Canada ... 151

Chart 43: North American Tissue Engineering Market Analysis (2012-2022) in Dental/Oral Applications by Region – United States and Canada in USD Million..... 152

Chart 44: Glance at 2012, 2017 and 2022 North American Tissue Engineering Market Share (%) in Dental/Oral Applications by Region – United States and Canada ... 153

Chart 45: North American Tissue Engineering Market Analysis (2012-2022) in Neurological Applications by Region – United States and Canada in USD Million..... 154

Chart 46: Glance at 2012, 2017 and 2022 North American Tissue Engineering Market Share (%) in Neurological Applications by Region – United States and Canada ... 155

Chart 47: North American Tissue Engineering Market Analysis (2012-2022) in Oncology Applications by Region – United States and Canada in USD Million..... 156

Chart 48: Glance at 2012, 2017 and 2022 North American Tissue Engineering Market Share (%) in Oncology Applications by Region – United States and Canada ... 157

Chart 49: North American Tissue Engineering Market Analysis (2012-2022) in Orthopedic Applications by Region – United States and Canada in USD Million..... 158

Chart 50: Glance at 2012, 2017 and 2022 North American Tissue Engineering Market Share (%) in Orthopedic Applications by Region – United States and Canada ... 159

Chart 51: North American Tissue Engineering Market Analysis (2012-2022) in Skin/Integumentary Applications by Region – United States and Canada in USD Million 160

Chart 52: Glance at 2012, 2017 and 2022 North American Tissue Engineering Market Share (%) in Skin/Integumentary Applications by Region – United States and Canada ..... 161

Chart 53: North American Tissue Engineering Market Analysis (2012-2022) in Other Applications by Region – United States and Canada in USD Million..... 162

Chart 54: Glance at 2012, 2017 and 2022 North American Tissue Engineering Market Share (%) in Other Applications by Region – United States and Canada ... 163

**The United States ..... 195**

Chart 55: United States Tissue Engineering Market Analysis (2012-2022) by Technology – Cell Culture, Immunomodulation and Stem Cell in USD Million ..... 195

Chart 56: Glance at 2012, 2017 and 2022 United States Tissue Engineering Market Share (%) by Technology – Cell Culture, Immunomodulation and Stem Cell ..... 196

Chart 57: United States Tissue Engineering Market Analysis (2012-2022) by Application – Cardiovascular, Dental/Oral, Neurological, Oncology, Orthopedic, Skin/Integumentary and Other Applications in USD Million ..... 197

Chart 58: Glance at 2012, 2017 and 2022 United States Tissue Engineering Market Share (%) by Application – Cardiovascular, Dental/Oral, Neurological, Oncology, Orthopedic, Skin/Integumentary and Other Applications. 198

**Canada ..... 199**

Chart 59: Canadian Tissue Engineering Market Analysis (2012-2022) by Technology – Cell Culture, Immunomodulation and Stem Cell in USD Million ..... 199

Chart 60: Glance at 2012, 2017 and 2022 Canadian Tissue Engineering Market Share (%) by Technology – Cell Culture, Immunomodulation and Stem Cell ..... 200

Chart 61: Canadian Tissue Engineering Market Analysis (2012-2022) by Application – Cardiovascular, Dental/Oral, Neurological, Oncology, Orthopedic, Skin/Integumentary and Other Applications in USD Million ..... 201

Chart 62: Glance at 2012, 2017 and 2022 Canadian Tissue Engineering Market Share (%) by Application – Cardiovascular, Dental/Oral, Neurological, Oncology, Orthopedic, Skin/Integumentary and Other Applications. 202

**EUROPE ..... 203**

Chart 63: European Tissue Engineering Market Analysis (2012-2022) in USD Million ..... 203

Chart 64: European Tissue Engineering Market Analysis (2012-2022) by Region – France, Germany, United Kingdom and Rest of Europe in USD Million..... 204

Chart 65: Glance at 2012, 2017 and 2022 European Tissue Engineering Market Share (%) by Region – France, Germany, United Kingdom and Rest of Europe..... 205

Chart 66: European Tissue Engineering Market Analysis (2012-2022) by Technology – Cell Culture, Immunomodulation and Stem Cell in USD Million ..... 206

Chart 67: Glance at 2012, 2017 and 2022 European Tissue Engineering Market Share (%) by Technology – Cell Culture, Immunomodulation and Stem Cell ..... 207

Chart 68: European Cell Culture Tissue Engineering Market Analysis (2012-2022) by Region – France, Germany, United Kingdom and Rest of Europe in USD Million..... 208

Chart 69: Glance at 2012, 2017 and 2022 European Cell Culture Tissue Engineering Market Share (%) by Region – France, Germany, United Kingdom and Rest of Europe .... 209

Chart 70: European Immunomodulation Tissue Engineering Market Analysis (2012-2022) by Region – France, Germany, United Kingdom and Rest of Europe in USD Million ..... 210

Chart 71: Glance at 2012, 2017 and 2022 European Immunomodulation Tissue Engineering Market Share (%) by Region – France, Germany, United Kingdom and Rest of Europe..... 211

Chart 72: European Stem Cell Tissue Engineering Market Analysis (2012-2022) by Region – France, Germany, United Kingdom and Rest of Europe in USD Million..... 212

Chart 73: Glance at 2012, 2017 and 2022 European Stem Cell Tissue Engineering Market Share (%) by Region – France, Germany, United Kingdom and Rest of Europe .....213

Chart 74: European Tissue Engineering Market Analysis (2012-2022) by Application – Cardiovascular, Dental/Oral, Neurological, Oncology, Orthopedic, Skin/Integumentary and Other Applications in USD Million.....214

Chart 75: Glance at 2012, 2017 and 2022 European Tissue Engineering Market Share (%) by Application – Cardiovascular, Dental/Oral, Neurological, Oncology, Orthopedic, Skin/Integumentary and Other Applications..... 215

Chart 76: European Tissue Engineering Market Analysis (2012-2022) in Cardiovascular Applications by Region – France, Germany, United Kingdom and Rest of Europe in USD Million ..... 216

Chart 77: Glance at 2012, 2017 and 2022 European Tissue Engineering Market Share (%) in Cardiovascular Applications by Region – France, Germany, United Kingdom and Rest of Europe..... 217

Chart 78: European Tissue Engineering Market Analysis (2012-2022) in Dental/Oral Applications by Region – France, Germany, United Kingdom and Rest of Europe in USD Million ..... 218

Chart 79: Glance at 2012, 2017 and 2022 European Tissue Engineering Market Share (%) in Dental/Oral Applications by Region – France, Germany, United Kingdom and Rest of Europe..... 219

Chart 80: European Tissue Engineering Market Analysis (2012-2022) in Neurological Applications by Region – France, Germany, United Kingdom and Rest of Europe in USD Million ..... 220

Chart 81: Glance at 2012, 2017 and 2022 European Tissue Engineering Market Share (%) in Neurological Applications by Region – France, Germany, United Kingdom and Rest of Europe..... 221

Chart 82: European Tissue Engineering Market Analysis (2012-2022) in Oncology Applications by Region – France, Germany, United Kingdom and Rest of Europe in USD Million..... 222

Chart 83: Glance at 2012, 2017 and 2022 European Tissue Engineering Market Share (%) in Oncology Applications by Region – France, Germany, United Kingdom and Rest of Europe..... 223

Chart 84: European Tissue Engineering Market Analysis (2012-2022) in Orthopedic Applications by Region – France, Germany, United Kingdom and Rest of Europe in USD Million ..... 224

Chart 85: Glance at 2012, 2017 and 2022 European Tissue Engineering Market Share (%) in Orthopedic Applications by Region – France, Germany, United Kingdom and Rest of Europe..... 225

Chart 86: European Tissue Engineering Market Analysis (2012-2022) in Skin/Integumentary Applications by Region – France, Germany, United Kingdom and Rest of Europe in USD Million ..... 226

Chart 87: Glance at 2012, 2017 and 2022 European Tissue Engineering Market Share (%) in Skin/Integumentary Applications by Region – France, Germany, United Kingdom and Rest of Europe..227

Chart 88: European Tissue Engineering Market Analysis (2012-2022) in Other Applications by Region – France, Germany, United Kingdom and Rest of Europe in USD Million ..... 228

Chart 89: Glance at 2012, 2017 and 2022 European Tissue Engineering Market Share (%) in Other Applications by Region – France, Germany, United Kingdom and Rest of Europe..... 229

**France ..... 237**

Chart 90: French Tissue Engineering Market Analysis (2012-2022) by Technology – Cell Culture, Immunomodulation and Stem Cell in USD Million ..... 237

Chart 91: Glance at 2012, 2017 and 2022 French Tissue Engineering Market Share (%) by Technology – Cell Culture, Immunomodulation and Stem Cell ..... 238

Chart 92: French Tissue Engineering Market Analysis (2012-2022) by Application – Cardiovascular, Dental/Oral, Neurological, Oncology, Orthopedic, Skin/Integumentary and Other Applications in USD Million ..... 239

Chart 93: Glance at 2012, 2017 and 2022 French Tissue Engineering Market Share (%) by Application – Cardiovascular, Dental/Oral, Neurological, Oncology, Orthopedic, Skin/Integumentary and Other Applications ..... 240

**Germany ..... 241**

Chart 94: German Tissue Engineering Market Analysis (2012-2022) by Technology – Cell Culture, Immunomodulation and Stem Cell in USD Million ..... 241

Chart 95: Glance at 2012, 2017 and 2022 German Tissue Engineering Market Share (%) by Technology – Cell Culture, Immunomodulation and Stem Cell ..... 242

Chart 96: German Tissue Engineering Market Analysis (2012-2022) by Application – Cardiovascular, Dental/Oral, Neurological, Oncology, Orthopedic, Skin/Integumentary and Other Applications in USD Million ..... 243

Chart 97: Glance at 2012, 2017 and 2022 German Tissue Engineering Market Share (%) by Application – Cardiovascular, Dental/Oral, Neurological, Oncology, Orthopedic, Skin/Integumentary and Other Applications ..... 244

**The United Kingdom ..... 245**

Chart 98: United Kingdom Tissue Engineering Market Analysis (2012-2022) by Technology – Cell Culture, Immunomodulation and Stem Cell in USD Million ..... 245

Chart 99: Glance at 2012, 2017 and 2022 United Kingdom Tissue Engineering Market Share (%) by Technology – Cell Culture, Immunomodulation and Stem Cell ..... 246

Chart 100: United Kingdom Tissue Engineering Market Analysis (2012-2022) by Application – Cardiovascular, Dental/Oral, Neurological, Oncology, Orthopedic, Skin/Integumentary and Other Applications in USD Million ..... 247

Chart 101: Glance at 2012, 2017 and 2022 United Kingdom Tissue Engineering Market Share (%) by Application – Cardiovascular, Dental/Oral, Neurological, Oncology, Orthopedic, Skin/Integumentary and Other Applications .... 248

**Rest of Europe ..... 249**

Chart 102: Rest of Europe Tissue Engineering Market Analysis (2012-2022) by Technology – Cell Culture, Immunomodulation and Stem Cell in USD Million ..... 249

Chart 103: Glance at 2012, 2017 and 2022 Rest of Europe Tissue Engineering Market Share (%) by Technology – Cell Culture, Immunomodulation and Stem Cell ..... 250

Chart 104: Rest of Europe Tissue Engineering Market Analysis (2012-2022) by Application – Cardiovascular, Dental/Oral, Neurological, Oncology, Orthopedic, Skin/Integumentary and Other Applications in USD Million ..... 251

Chart 105: Glance at 2012, 2017 and 2022 Rest of Europe Tissue Engineering Market Share (%) by Application – Cardiovascular, Dental/Oral, Neurological, Oncology, Orthopedic, Skin/Integumentary and Other Applications .... 252

**ASIA-PACIFIC ..... 253**

Chart 106: Asia-Pacific Tissue Engineering Market Analysis (2012-2022) by Technology – Cell Culture, Immunomodulation and Stem Cell in USD Million ..... 253

Chart 107: Glance at 2012, 2017 and 2022 Asia-Pacific Tissue Engineering Market Share (%) by Technology – Cell Culture, Immunomodulation and Stem Cell ..... 254

Chart 108: Asia-Pacific Tissue Engineering Market Analysis (2012-2022) by Application – Cardiovascular, Dental/Oral, Neurological, Oncology, Orthopedic, Skin/Integumentary and Other Applications in USD Million ..... 255

Chart 109: Glance at 2012, 2017 and 2022 Asia-Pacific Tissue Engineering Market Share (%) by Application – Cardiovascular, Dental/Oral, Neurological, Oncology, Orthopedic, Skin/Integumentary and Other Applications ..... 256

**REST OF WORLD ..... 260**

Chart 110: Rest of World Tissue Engineering Market Analysis (2012-2022) by Technology – Cell Culture, Immunomodulation and Stem Cell in USD Million ..... 260

Chart 111: Glance at 2012, 2017 and 2022 Rest of World Tissue Engineering Market Share (%) by Technology – Cell Culture, Immunomodulation and Stem Cell ..... 261

Chart 112: Rest of World Tissue Engineering Market Analysis (2012-2022) by Application – Cardiovascular, Dental/Oral, Neurological, Oncology, Orthopedic, Skin/Integumentary and Other Applications in USD Million ..... 262

Chart 113: Glance at 2012, 2017 and 2022 Rest of World Tissue Engineering Market Share (%) by Application – Cardiovascular, Dental/Oral, Neurological, Oncology, Orthopedic, Skin/Integumentary and Other Applications ..... 263

**TABLES:**

Table 1: Scaffold Biomaterials and Stem Cells Currently Used in Tissue Engineering..... 13

Table 2: The Positives and Negatives of Prominent Approaches to Cardiac Tissue Engineering ..... 17

## About Industry Experts

Industry Experts values the most updated and accurate market research and industry analysis to provide unique market research reports for a broad range of industry verticals including Automotive, Transportation, Healthcare, Pharmaceuticals, Food & Beverages, Chemicals, Plastics, Materials, Consumer Goods, Retail, Biotechnology, Construction, Manufacturing and Other industries. Our research reports help our clients to identify and resolve topical issues by providing a complete picture of the market in their respective industry sectors. The Company's rich collection of market research reports enable the companies to explore market drivers; forecast the future market; and to formulate the right strategies at the right time.

Industry Experts' leading edge publications makes the life easy for corporate strategists, investors, analysts and researchers, start ups, consultants, financial and banking executives, academicians and many more. The company also provides customized research reports to cater the needs of the industry.

[More about Industry Experts](#)



### INDUSTRY EXPERTS

1-7-19/C, Street No. 8, Habsiguda

Hyderabad – 500007, India

Phone: +91-40-4018-1314

Fax: +91-40-4027-2381

[info@industry-experts.com](mailto:info@industry-experts.com)

[industry-experts.com](http://industry-experts.com)