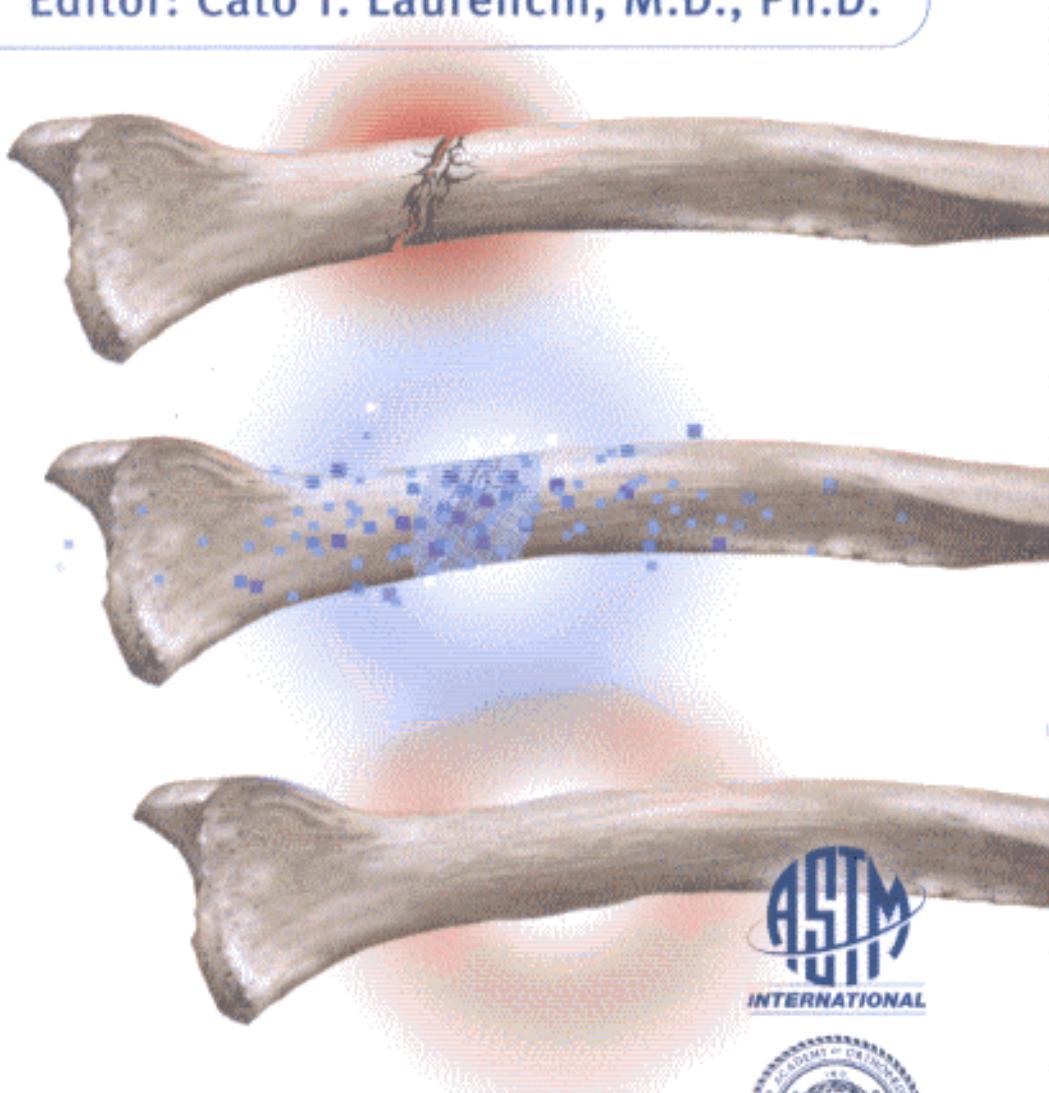


Bone Graft Substitutes

Editor: Cato T. Laurencin, M.D., Ph.D.



ASTM
INTERNATIONAL



Contents

Dedication	iii
List of Contributors	v
Foreword <i>Joshua Jacobs, M.D. and Jack Lemons, Ph.D.</i>	ix
Preface <i>Cato T. Laurencin, M.D., Ph.D.</i>	xiii
Chapter 1—Bone Grafts and Bone Graft Substitutes: A Brief History <i>By Cato T. Laurencin, M.D., Ph.D. and Yusuf Khan, M.S.</i>	3
SECTION I: ALLOGRAFT-BASED BONE GRAFT SUBSTITUTES	
Section Leader: William W. Tomford, M.D.	
Section Overview	11
Chapter 2—Review of the State of the Art: Allograft-Based Systems for Use as Bone Graft Substitutes <i>By Ashley R. Poynton, M.D., F.R.C.S.I., F.R.C.S. (Tr & Orth) and Joseph M. Lane, M.D.</i>	13
Chapter 3—Musculoskeletal Allograft Tissue Banking and Safety <i>By Michael J. Joyce, M.D. and David M. Joyce, B.S.</i>	30
Chapter 4—Clinical Perspectives on the Use of Bone Graft Based on Allografts <i>By Scott Hofer, D.O., Seth S. Leopold, M.D., and Joshua Jacobs, M.D.</i>	68
Chapter 5—The Development of Bone Graft Materials Using Various Formulations of Demineralized Bone Matrix <i>By Mark D. Borden, Ph.D.</i>	96
Chapter 6—Standards Development Perspectives on the Use of Bone Graft Substitutes Based Upon Allografts <i>By John S. Kirkpatrick, M.D.</i>	113
SECTION II: CELLULAR SYSTEMS AND GROWTH FACTOR-BASED SYSTEMS FOR USE AS BONE GRAFT SUBSTITUTES	
Section Leaders: Mohamed Attawia, M.B.B.Ch. and Randy Rosier, M.D., Ph.D.	
Section Overview	123

xii CONTENTS

Chapter 7—Cell-Based Approaches for Bone Graft Substitutes	126
<i>By Mohammed Attawia, M.B.B.Ch., Sudha Kadiyala, Ph.D., Kim Fitzgerald, B.S., Karl H. Kraus, D.V.M., and Scott P. Bruder, Ph.D.</i>	
Chapter 8—Clinical Issues in the Development of Cellular Systems for Use as Bone Graft Substitutes	142
<i>By Peter G. Whang, M.D. and Jay R. Lieberman, M.D.</i>	
Chapter 9—Preclinical, Clinical, and Regulatory Issues in Cell-Based Therapies	164
<i>By Treena Livingston Arinze, Ph.D.</i>	
Chapter 10—Review of State of the Art: Growth Factor-Based Systems For Use as Bone Graft Substitutes	174
<i>By Emilie V. Cheung, M.D., Dhirendra S. Katti, Ph.D., Randy N. Rosier, M.D., Ph.D., and Cato T. Laurencin, M.D., Ph.D.</i>	
Chapter 11—Bone Morphogenetic Protein (BMP) Implants as Bone Graft Substitutes—Promises and Challenges	194
<i>By T. Kuber Sampath, Ph.D. and A. Hari Reddi, Ph.D.</i>	
Chapter 12—Bone Graft Substitutes: A Regulatory Perspective	214
<i>By Sergio J. Gadaleta, Ph.D.</i>	
 SECTION III: POLYMERS, CERAMICS, AND OTHER SYNTHETIC MATERIALS FOR BONE GRAFT SUBSTITUTES	
Section Leaders: Mauli Agrawal, Ph.D., P.E. and Dhirendra S. Katti, Ph.D.	
Section Overview	229
Chapter 13—Bone Graft Substitutes: Basic Information for Successful Clinical Use With Special Focus on Synthetic Graft Substitutes	231
<i>By Barbara Boyan, Ph.D., Jacquelyn McMillan, M.B.Ch.B., F.R.C.S.Ed., F.R.C.S. (Tr & Orth), Christoph H. Lohmann, M.D., Don M. Ranly, D.D.S., Ph.D., and Zvi Schwartz, D.M.D., Ph.D.</i>	
Chapter 14—Calcium Sulfate-Based Bone Void Substitutes	260
<i>By Warren O. Haggard, Ph.D., Kelly C. Richelsoph, M.S., and Jack E. Parr, Ph.D.</i>	
Chapter 15—The Development of Coralline Porous Ceramic Bone Graft Substitutes	271
<i>By Edwin C. Shors, Ph.D.</i>	
Chapter 16—Clinical Issues in the Development of Bone Graft Substitutes in Orthopedic Trauma Care	289
<i>By Robert W. Bucholz, M.D.</i>	
Chapter 17—Issues Involving Standards Development for Synthetic Material Bone Graft Substitutes	298
<i>By Marc Long, Ph.D., Robert Talac, M.D., Ph.D., and Michael J. Yaszemski, M.D., Ph.D.</i>	
Index	309