Stephen F. Badylak, D.V.M., Ph.D., M.D.

Curriculum Vitae

Personal Information:

Name	Stephen Francis Badylak
Address	University of Pittsburgh Department of Surgery McGowan Institute for Regenerative Medicine 450 Technology Drive, Suite 300 Pittsburgh, PA 15219-3130
Phone	412-624-5253
Fax	412-624-5256
E-mail	badylaks@upmc.edu

Birth	December 22, 1952; Gary, Indiana
Nationality	U.S. Citizen
Education	Purdue University, West Lafayette, IN DVM, May 1976
	Purdue University, West Lafayette, IN MS, Clinical Pathology, May 1978
	Purdue University, West Lafayette, IN PhD, Anatomic Pathology, May 1981
	Indiana University, Indianapolis, IN MD, July 1985

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Professional Academic Experience:

July 2021 – Present	Professor Department of Clinical and Translational Science
September 2007 – Present	Professor Department of Surgery (School of Medicine) Department of Bioengineering (Swanson School of Engineering) Deputy Director- McGowan Institute for Regenerative Medicine Director – McGowan Center for Preclinical Studies University of Pittsburgh, Pittsburgh, PA
January 2003 – Present	Deputy Director- McGowan Institute for Regenerative Medicine Director – McGowan Center for Preclinical Studies University of Pittsburgh, Pittsburgh, PA
January 2003 – March 2007	Professor Department of Surgery (School of Medicine) University of Pittsburgh, Pittsburgh, PA
June 2003 – 2008	Adjunct Professor, Wake Forest University School of Medicine Division of Surgical Sciences Wake Forest Institute for Regenerative Medicine
July 1998 – October 2002	Senior Research Scientist Department of Biomedical Engineering Purdue University, West Lafayette, Indiana
July 1995 – 2002	Adjunct Associate Professor of Pathology & Laboratory Medicine Indiana University School of Medicine Indianapolis, Indiana
June 1995 – 1998	Director, Hillenbrand Biomedical Engineering Center Purdue University, West Lafayette, Indiana
July 1993 – 1996	Associate Professor Department of Veterinary Physiology & Pharmacology Purdue University, West Lafayette, Indiana
July 1993 – 1995	Director of Research Hillenbrand Biomedical Engineering Center Purdue University, West Lafayette, Indiana
May 1987 – 2002	Head Team Physician for Athletic Department Purdue University, West Lafayette, Indiana

August 1986 – 1993	Associate Research Scholar, Hillenbrand Biomedical Engineering Center Purdue University, West Lafayette, Indiana
August 1985 – 1986	Postdoctoral Research Associate, Hillenbrand Biomedical Engineering Center Purdue University, West Lafayette, Indiana
May 1978 – May 1979	Practicing Veterinarian, Small Animal Practice Hobart, Indiana
May 1976 – January 1977	Practicing Veterinarian, Mixed Animal Practice Glenwood, Illinois
January 1982 – 2005	Senior Partner, Director and Pathologist for the Veterinary Professional Laboratory West Lafayette, Indiana

Professional Business Experience:

1995 – 1998	Chair, Scientific Advisory Board, Cook Biotech, Inc. West Lafayette, Indiana
2002 – 2003	Founder/President of ACell, Inc. Columbia, Maryland
2017 – present	Founder/Chief Scientific Officer of ECM-Therapeutics, Inc. Pittsburgh, Pennsylvania

Honors:

Jensen Tissue Engineering Award – 2022

Fellow, Biomaterials Science and Engineering, International Union of Societies for Biomaterials Science and Engineering (IUSBSE) – 2020

TERMIS Lifetime Achievement Award - 2019

BioMed San Antonio Award for Innovation in Healthcare and Bioscience - 2019

National Academy of Inventors Fellow - 2018

Pittsburgh Business Times Healthcare Hero Award, Healthcare Innovation – 2018

Marlin Mickle Outstanding Innovator Award – 2018

Martha & D. Gibson Walton Lectureship Series Award (Houston Methodist) – 2016

Distinguished Fellow, The Kosciuszko Foundation Collegium of Eminent Scientists of Polish Origin and Ancestry – 2016

Founding Fellow of the International Fellows of Tissue Engineering & Regenerative Medicine (FTERM) – 2012

TERMIS (America's Chapter) Senior Scientist Award – 2012

Oscar W. Shalm Lectureship Series Award – 2011

Innovation Award (University of Pittsburgh) – 2008

Inventor of the Year Award (Pittsburgh Intellectual Property Law Association) – 2008

Chancellor's Distinguished Research Award (Senior Scholars category) – 2008

Carnegie Science Center Award for Excellence (Biomaterials) - 2008

Carnegie Science Center Award for Excellence (Research) – 2005

Clemson Award (Society for Biomaterials) – 2005

Sigma Xi (Scientific Research Society – Research Award) – 2002

Memberships in Professional Organizations:

Fellow, American Institute for Medical and Biological Engineering, 1998 – Present

American Society for Matrix Biology, April 2014 – Present

Chair, Founding Fellow of the International Fellows of Tissue Engineering & Regenerative Medicine, 1996 – Present

Member, Society for Biomaterials, 2003 – Present

Tissue Engineering and Regenerative Medicine International Society (TERMIS), Member, 1996 - Present, President, January 2010 – December 2013

National Academy of Inventors, 2018 – Present

Major Research Interests:

Biologic Scaffolds and Extracellular Matrix Biology

Biomaterials and Host-Biomaterial Interactions

Role of Innate Immune Response in Tissue Engineering and Regenerative Medicine

Grants Funded as Principal Investigator

1. Functional Cardiac Assistance. Methodist Hospital of Indianapolis, Inc. June, 1986.

2. Development of a Patentable Device for the Stimulation of Autologously Transplanted Skeletal Muscle to Increase Cardiac Output. The TRASK Fund. 1986.

3. Phase I of Research to Study and to Optimize the Effect of Urokinase and Other Agents upon Thrombolysis is Dog and Rat Models of Arterial Thrombosis. Abbott Laboratories. January, 1987.

4. Continued Studies of Functional Cardiac Assistance. Methodist Hospital of Indianapolis, Inc. April, 1987.

5. Comparison of Temporary Pacemaker Leads. Abbott Laboratories. September, 1987.

6. Addendum to Phase I of Research to Study and to Optimize the Effect of Urokinase and Other Agents upon Thrombolysis is Dog and Rat Models of Arterial Thrombosis. Abbott Laboratories. September, 1987.

7. Autogenous Small Intestine as a Vascular Graft. Methodist Hospital of Indianapolis, Inc. September, 1987.

8. Treatment for Reperfusion Injury in Dogs with Gastric Dilatation-Volvulus. American Veterinary Medical Association Foundation for Research. November, 1987.

9. The Effect of Lazeroids upon Survival in Dogs with Gastric Dilatation-Volvulus. Upjohn Company, Inc. December, 1987.

10. Phase II of Research to Study and to Optimize the Effect of Thrombolytic Agents in Animal Models of Experimentally-Induced Arterial Thrombosis. Abbott Laboratories. March, 1988.

11. Functional Cardiac Assistance with a Skeletal Muscle Pouch. NIH. September, 1988.

12. Prevention of Reperfusion Injury in Canine Gastric Dilatation-Volvulus. Morris Foundation. July, 1988.

13. Research to Optimize the Use of Autogenous Small Intestine as an Arterial and Venous Graft. Methodist Hospital of Indianapolis, Inc. September, 1988.

14. Addendum to A Proposal for Phase Two of Research to Study and to Optimize the Effect of Thrombolytic Agents in Animal Models of Experimentally-Induced Arterial Thrombosis. Abbott Laboratories. December, 1988.

15. A Proposal for Research to Study the Safety of Laser Angioplasty. Vaser, Inc. March, 1989.

16. Phase III of Research to Study and to Optimize the Effect of Thrombolytic Agents in Animal Models of Experimentally-Induced Arterial Thrombosis. Abbott Laboratories. March, 1989.

17. A Proposal for Research to Study and Optimize the Use of Small Intestinal Submucosa as a Vascular Graft. Eli Lilly Laboratories. April, 1989.

18. Electrical Stimulation of Conditioned Skeletal Muscle and Development of a Skeletal Muscle Ventricle Pacemaker. Showalter Foundation. July, 1989.

19. Reduction of GDV Mortality in the Dog. American Veterinary Medical Association Foundation. December, 1989.

20. Phase IV of Research to Study and to Optimize the Effect of Thrombolytic Agents in Animal Models of Experimentally-Induced Arterial Thrombosis. Abbott Laboratories. March, 1990.

21. Preliminary Studies to Evaluate the Analgesic Properties of Butamben in Animal Models. Abbott Laboratories. February, 1990.

22. Fellowship to Support Studies of Small Intestinal Submucosa as a Vascular Graft. Eli Lilly, Inc. January, 1990.

23. Phase II of Research to Develop Small Intestinal Submucosa as a Small Diameter Arterial Graft. Eli Lilly, Inc. July, 1990.

24. Development of Cardiomyoplasty Expertise at Methodist Hospital. Methodist Foundation. August 1, 1990.

25. A Pilot Study to Evaluate the Potential of Devices Intended for Use in Thrombolytic Therapy. Lake Region Manufacturing Co., Inc. July 1, 1990.

26. Fellowship to Support Studies of Small Intestinal Submucosa as a Vascular Graft. Eli Lilly, Inc. January, 1991.

27. A Pilot Study to Evaluate the Effectiveness of β-Galactosidase in the Diet of Dogs. Lactaid, Inc. January, 1991.

28. A Cooperative Agreement for Further Development of SIS Technology. Methodist Hospital of Indianapolis, Inc. February, 1991.

29. A Proposal for Research on Studies to Investigate the Use of SIS as a Renal Dialysis Access Site. Methodist Hospital of Indianapolis, Inc. February, 1991.

30. A Pilot Study to Evaluate the Potential of U74006F for Protection Against Intestinal Reperfusion Injury. Upjohn Co., Inc. February, 1991.

31. Phase V of Research to Study and to Optimize the Effect of Thrombolytic Agents in Animal Models of Experimentally-Induced Arterial Thrombosis. Abbott Laboratories. March, 1991.

32. Phase III of Research to Develop Small Intestinal Submucosa as a Small Diameter Arterial Graft. Eli Lilly, Inc. May, 1991.

33. A Proposal to Build Implantable Stimulators. Philadelphia Heart Institute. April, 1991.

34. The Effect of Lys-Plasminogen upon T-PA Induced Thrombolysis. American Heart Association, Indiana Affiliate. July, 1991.

35. Evaluation of a New Spinal Catheter. Abbott Laboratories. May, 1991.

36. Studies to Evaluate the Effectiveness of β-Galactosidase in the Diet of Dogs. AK Pharma, Inc. May, 1991.

37. Phase II of Studies to Evaluate the Potential of Devices Intended for Use in Thrombolytic Therapy. Lake Region Manufacturing Co., Inc. July, 1991.

38. Fellowship to Support Studies of Small Intestinal Submucosa as a Vascular Graft. Eli Lilly, Inc. January, 1992.

39. Alternative Applications for Small Intestinal Submucosa. Trask Fund. January, 1992.

40. Phase VI of Research to Study and to Optimize the Effect of Thrombolytic Agents in Animal Models of Experimentally-Induced Arterial Thrombosis. Abbott Laboratories. March, 1992.

41. Phase I of Studies to Develop Selected Orthopedic Applications of Small Intestinal Submucosa. DePuy, Inc. March, 1992.

42. The Testing of Anterior Cruciate Ligaments Constructed of Xenogeneic Small Intestinal Submucosa (SIS) in Animal Models. DePuy, Inc. March, 1992.

43. Phase IV of Research to Develop Small Intestinal Submucosa as a Small Diameter Arterial Graft. Eli Lilly, Inc. May, 1992.

44. A Comparative Study to Determine the Usefulness of SIS vs. PTFE as an Arterio-Venous Shunt. Methodist Hospital of Indianapolis, Inc. June, 1992.

45. The Use of a Novel Biomaterial as a Gene Transfer Device. University Of Michigan, Biochemistry Dept. August, 1992.

46. Cardiomyoplasty for Cardiac Assistance. NIH, National Heart, Lung, and Blood Institute. July 1992 – June 1995.

47. Phase II of Use of a Novel Biomaterial as a Gene Transfer Device. University Of Michigan Biochemistry Department. December, 1992.

48. Investigation of Small Intestinal Submucosa as a Culture Template and as a Urologic Device. Indiana University Department of Plastic Surgery. January, 1993.

49. Phase VII of Research to Study and to Optimize the Effect of Thrombolytic Agents in Animal Models of Experimentally-Induced Arterial Thrombosis. Abbott Laboratories. March, 1993.

50. Research and Technology Development of SIS at Purdue University: Mechanism of Action and Other Sources of SIS: New Patents. TRASK Fund. September, 1993.

51. Studies to Evaluate Tissue Engineering as a Treatment Modality for Urinary Sphincter Incontinence. Eli Lilly, Inc. September, 1993.

52. A Biomaterial to Promote Skin and Wound Healing. NIH - National Institute of Child Health and Human Development. January 1994 – December 1996.

53. Testing of a Novel Thrombolytic Device. Lake Region Manufacturing Co., Inc. June 1993 – July 1993.

54. Additional Studies in Phase VII of Research to Study and to Optimize the Effect of Thrombolytic Agents in Animal Models of Experimentally-Induced Arterial Thrombosis. Abbott Laboratories. December, 1993.

55. Phase VIII of Research to Study and to Optimize the Effect of Thrombolytic Agents in Animal Models of Experimentally-Induced Arterial Thrombosis. Abbott Laboratories. March 1994 – February 1995.

56. Development of SIS Biomaterial as a Hernia Repair Device - Phase I. SENMED, Inc. January 1994 – December 1995.

57. Phase II of Studies to Develop Selected Orthopedic Applications of Small Intestinal Submucosa. DePuy, Inc. March 1994 – February 1995.

58. Factors Which Influence Developmental Biology: A Cross-Disciplinary Feasibility Study. Purdue University Development Funds. September, 1994.

59. Testing to Evaluate the Efficacy of Heparin-Coated Wires. Abbott Laboratories. October, 1994.

60. Development of SIS Biomaterial as a Wound Covering in Human Patients. Global Initiatives Travel Grant Program. December, 1994.

61. Mechanism of Action of SIS: Continuation. TRASK Fund. December, 1994.

62. Phase IX of Research to Study and to Optimize the Effect of Thrombolytic Agents in Animal Models of Experimentally-Induced Arterial Thrombosis. Abbott Laboratories. March 1995 – February 1996.

63. The Testing of Anterior Cruciate Ligaments Constructed of Xenogeneic Small Intestinal Submucosa (SIS) in Animal Models. DePuy, Inc. March, 1995.

64. Studies to Investigate Tissue Engineering Aspects of SIS. Cook Biotech, Inc. September, 1995.

65. A Testing Agreement to Conduct Pre-Clinical Studies to Evaluate Butamben. Abbott Laboratories. October, 1995.

66. The Use of SIS as a Patellar Tendon Defect Repair Device. Methodist Sports Medicine Center. July, 1995.

67. Testing of an SIS Hernia Repair Device - Phase II. SenMed, Inc. January, 1996.

68. Phase III of Studies to Develop Selected Orthopedic Applications of Small Intestinal Submucosa. DePuy, Inc. March, 1996.

69. The Testing of Anterior Cruciate Ligaments Constructed of Xenogeneic Small Intestinal Submucosa (SIS) in Animal Models. DePuy, Inc. March, 1996.

70. A Testing Agreement of Studies to Evaluate the Efficacy of ProUrokinase for the Treatment of Immune Mediated Glomerulonephritis in Two Animal Models. Abbott Laboratories. September, 1996.

71. Studies to Investigate Tissue Engineering Aspects of SIS: Phase II. Cook Biotech, Inc. November, 1996.

72. Amendment to Testing of an SIS Hernia Repair Device - Phase II. SenMed, Inc. January, 1997.

73. Development of a New Extracellular Matrix Biomaterial for Tissue Engineering Applications. TRASK Fund. February, 1997.

74. SIS as a Full-thickness Wound Covering in an Animal Model: Comparative Study. Cook Biotech, Inc. June, 1997.

75. Phase IV of Studies to Develop Selected Orthopedic Applications of Small Intestinal Submucosa. DePuy, Inc. March, 1997.

76. The Testing of Anterior Cruciate Ligaments Constructed of Xenogeneic Small Intestinal Submucosa (SIS) in Animal Models. DePuy, Inc. March, 1997.

77. Development of a New Composite Biodegradable Material. Showalter Trust Fund. July, 1997.

78. Evaluation of a New Catheter for Cardiopulmonary Bypass Procedures. Cardiothoracic Systems. September, 1997.

79. An Agreement to Test the Efficacy of SIS in Dermal and Oral Applications of SIS. Cook Biotech, Inc. November, 1997.

80. Studies to Investigate Tissue Engineering Aspects of SIS, Phase III. Cook Biotech, Inc. November, 1997.

81. Studies to Investigate the Anti-angiogenic Properties of Various Test Compounds. Abbott Laboratories. December, 1997.

82. SIS as a Dermal Substitute to Support Split Thickness Skin Autografts (STSG) in a Pig Model. Cook Biotech, Inc. February, 1998.

83. Evaluate the Capillary Filtrate Collector (CFC) and Subcutaneous Infusion Access Device. HemoCleanse, Inc. February, 1998.

84. Phase V of Studies to Develop Selected Orthopedic Applications of Small Intestinal Submucosa. DePuy, Inc. March, 1998.

85. The Testing of Anterior Cruciate Ligaments Constructed of Xenogeneic Small Intestinal Submucosa (SIS) in Animal Models. DePuy, Inc. March, 1998.

86. Studies to Investigate the Anti-Angiogenic Properties of Various Test Compounds. Abbott Laboratories. July, 1998.

87. Immune Responses to Porcine Small Intestinal Submucosa. NIH. July, 1998.

88. DNA-charcoal Plasma Sorption for Treatment of SLE. HemoCleanse, Inc. August, 1998.

89. Studies to Evaluate the Effect of SIS upon Human Microvascular Endothelial Cell. Cook Biotech, Inc. January, 1999.

90. *In Vivo* Degradation of SIS Using ^{14}C-Label. Cook Biotech, Inc. January, 1999.

91. Endothelial Cell Attachment and its Effect upon SIS-Induced Neovascularization. Cook Biotech, Inc. January, 1999.

92. Studies to Investigate the Angiogenic Properties of Various Test Compounds. Abbott Laboratories. January, 1999.

93. Phase V of Studies to Develop Selected Orthopedic Applications of Small Intestinal Submucosa. DePuy, Inc. March, 1999.

94. The Testing of Anterior Cruciate Ligaments Constructed of Xenogeneic Small Intestinal Submucosa (SIS) in Animal Models. DePuy, Inc. March, 1999.

95. A Testing Agreement to Evaluate the Efficacy of Folate Conjugation for Chemotherapeutic Agent Delivery to Tumor Tissue. Endocyte, Inc. May, 1999.

96. Enhancement of Extracellular Matrix Technology for Biomedical Applications. Purdue TRASK Fund. June, 1999.

97. Studies to Investigate the Angiogenic Properties of Various Test Compounds. Abbott Laboratories. July, 1999.

98. Immune Responses to Porcine Small Intestinal Submucosa. NIH – subcontract from Albany Medical Center Hospital. September, 1999.

99. The Testing of a Multilaminate Sheet of UBS-ECM as a Resorbable Scaffold for Vocal Cord Remodeling in a Dog Model. ACell, Inc. October, 1999.

100. Studies to Investigate the Utility of SIS in the Gastrointestinal Tract. Cook Biotech, Inc. February, 2000.

101. Studies to Evaluate Medical Devices in a Rat Subcutaneous Implant Model. Cook Biotech, Inc. February, 2000.

102. Phase VI of Studies to Develop Selected Orthopedic Applications of Small Intestinal Submucosa – Amendment 7. DePuy, Inc. March, 2000.

103. A Testing Agreement to Evaluate the Effect of Orthopedic Applications of SIS *In Vitro* and *In Vivo*. DePuy, Inc. March, 2000.

104. Engineering of Biosystems for the Detection of Listeria Monocytogenes in Foods. USDA. March, 2000.

105. Tissue Engineered Heart Valve. NIH-SBIR award, subcontract from ACell, Inc. July, 2000.

106. An ECM Scaffold for Head and Neck Repair. NIH-SBIR award, subcontract to ACell, Inc. July, 2000.

107. Origin of Cells that Repopulate Resorbable ECM Scaffolds. NIH. July, 2000.

108. Methods to Construct Three-Dimensional Scaffolds from Powdered ECM. Trask Fund. July, 2000.

109. Evaluation of the Efficacy of an ECM Scaffold for Head and Neck Repair. NIH-SBIR award, subcontract from ACell, Inc. July, 2000.

110. ECM Scaffold Development. Cook Biotech, Inc. July, 2000.

111. Body Fluid pH Device. IAMS Company. July, 2000.

112. Testing of Controlled Insulin Infusion System in a Rat Model. HemoCleanse, Inc. October, 2000.

113. Surface Modification of an Arterial Graft Bioscaffold (SIS). Cook Biotech, Inc. January, 2001.

114. Neuronal Differentiation of PC12 Cells Induced by SIS Conditional Media. Cook Biotech, Inc. January, 2001.

115. Studies to Investigate the Angiogenic Properties of Various Test Compounds. Abbott Laboratories. January, 2001.

116. A Testing Agreement to Compare Biomaterials for Use as a Urethral Sling. Boston Scientific Corporation. February, 2001.

117. Phase VII of Studies to Develop Selected Orthopedic Applications of Small Intestinal Submucosa – Amendment 8. DePuy, Inc. March, 2001.

118. A Biomaterial for Esophageal Repair. NIH-SBIR award, subcontract from ACell, Inc. April, 2001.

119. A Testing Agreement to Evaluate the Effect of Orthopedic Applications of SIS *In Vitro* and *In Vivo*. DePuy, Inc. March, 2001.

120. Studies to Investigate the Angiogenic Properties of Various Test Compounds. Abbott Laboratories. July, 2001.

121. ECM Scaffold for Repair of Mucogingival Tissue. NIH-SBIR award, subcontract from ACell, Inc. August, 2001.

122. A Bioscaffold for Repair of Congenital Defects. NIH-SBIR award, subcontract from ACell, Inc. August, 2001.

123. Tissue Engineering Heart Valve. NIH-SBIR award, subcontract from ACell, Inc. October, 2001.

124. A Testing Agreement to Evaluate the Effect of Orthopedic Applications of SIS *In Vitro* and *In Vivo*. Supplement. DePuy, Inc. October, 2001.

125. Studies to Investigate the Angiogenic Properties of Various Test Compounds. Abbott Laboratories. January, 2002.

135. A Testing Agreement to Evaluate the Effect of Orthopedic Applications of SIS *In Vitro* and *In Vivo*. Supplement. DePuy, Inc. March, 2002.

136. Phase VII of Studies to Develop Selected Orthopedic Applications of Small Intestinal Submucosa – Amendment 9. DePuy, Inc. March, 2001.

137. Studies to Investigate the Properties of the Urinary Bladder Matrix Scaffold for Tissue Repair. ACell, Inc. February, 2002.

138. Engineered Tissue Constructs: The Artificial Lymph Node. DARPA, subcontract from Sciperio, Inc. August, 2002.

139. ECM Scaffolds for Esophageal Repair. NIH-SBIR award, subcontract from ACell, Inc. April, 2003

140. ECM Scaffolds for Cardiovascular Tissue Repair. NIH-SBIR award, subcontract from ACell, Inc. July, 2003.

141. Studies to Evaluate the Efficacy of SIS for Orthopaedic Tissue Repair and Replacement. DePuy, Inc. July, 2003.

142. Non-Clinical Laboratory Study to Evaluate a Vascular Occlusion Device in a Rabbit Model. Biomerix, Inc. August, 2003.

143. Pilot Study to Evaluate Rapidgraft™ as a Vascular Substitute in a Sheep Model. Miravant, Inc. August, 2003.

144. Mechanisms of ECM Scaffold Remodeling. NIH. September, 2003

145. Further Testing of a Respiratory Assist Catheter. ALung Technologies, Inc. September, 2003.

146. The Role of the National Tissue Engineering Center Administered for the Department of Defense (DOD) by the Pittsburgh Tissue Engineering Initiative and McGowan Institute for Regenerative Medicine (MIRM) (NTEC II). Department of Defense. October, 2003.

147. The Evaluation of Thrombolytic Agents in the Canine Model of Experimentally Induced Arterial Thrombosis. Vascular Laboratories, Inc. December, 2003

148. Non-Clinical Laboratory Study to Evaluate the Effect of Extracellular Matrix upon the Myocardium following Acute Ischemia. Guidant Corp. December, 2003.

149. A Regenerative Medicine Approach to Esophageal Reconstruction. Commonwealth of PA. January, 2004.

150. Efficacy of SIS for Orthopaedic Tissue Repair and Replacement. DePuy Spine. March, 2004.

151. Studies to Support the Development of a Lymphoid Tissue Equivalent (LTE). Act 77: The Tobacco Settlement Act. May, 2004.

152. Tracheal Reconstruction Using the Principles of Regenerative Medicine. Commonwealth of PA. July, 2004.

153. Three Dimensional ECM Scaffolds for Tissue Engineering. NIH-SBIR award, subcontract from ACell, Inc. September, 2004.

154. Accelerated Vaccine Creation and Testing – The Artificial Lymph Node Project Phase II. DARPA, subcontract from Vax Design Corporation. September, 2004.

155. The Role of the National Tissue Engineering Center Administered for the Department of Defense (DOD) by the Pittsburgh Tissue Engineering Initiative and McGowan Institute for Regenerative Medicine (MIRM) (NTEC III). Department of Defense. October, 2004.

156. In Vitro Cell Growth Assay for ECM Bioscaffolds. ACell, Inc. November, 2004.

157. Evaluation of Novel Vascular Graft Device in a Porcine Model. University of Limerick. January, 2005

158. Study to Evaluate an Articular Cartilage Remodeling with the UBM Bioscaffold in the Mouse Model. ScanVet. January, 2005.

159. Vascularization of Tissue Engineered Lymphoid Structures. DARPA. January, 2005.

160. Extracellular Matrix (ECM) Scaffolds for Beta Cell Regeneration. Juvenile Diabetes Research Foundation. March, 2005.

161. Studies to Evaluate the Efficacy of SIS for Orthopaedic Tissue Repair and Replacement. DePuy Spine, Inc. March, 2005.

162. Chronic Tissue Remodeling with Topical Negative Pressure. Respironics, Inc. June, 2005.

163. Repair and Evaluation of a Polymeric Surgical Mesh for Repair of an Annular Fibrosis Lesion in the Rabbit Model. Biomerix Corporation. July, 2005.

164. In Vivo Evaluation of Biomerix Patch in a Rat Body Wall Model. Biomerix, Inc. July, 2005.

165. Canine Model of Laryngeal Remodeling. Commonwealth of Pennsylvania. July, 2005.

166. Restore™ one Year Shelf Life Study. DePuy Products, Inc. June, 2005.

167. Esophageal Reconstruction with a Regenerative Medicine Approach. The Pittsburgh Foundation. August, 2005.

168. Testing of a Paracorporeal Respiratory Assist Devices in an Ovine Model. ALung Technologies, Inc. November, 2005.

169. Inductive Scaffolds for Tissue Regeneration following Traumatic Injury (NTEC IV). Department of Defense. October, 2005.

170. Ex Vivo Pump-Oxygenator Study. Ension, Inc. December, 2005.

171. Cell-Seeded Scaffolds for Esophageal Reconstruction. Commonwealth of Pennsylvania (Tobacco). January, 2006.

172. Mammalian Limb Restoration. DARPA. March, 2006.

173. Use of Pancreatic ECM to enhance in vitro growth of pancreatic progenitors. Juvenile Diabetes Research Foundation. May, 2006.

174. Further Development of Artificial and Biohybrid Organs and Therapeutic Applications of Regenerative Medicine and Tissue Engineering. Commonwealth of Pennsylvania. July, 2006.

175. Cell Recruitment Induced by ECM Scaffold Degradation. NIH. September 2006 – August 2011.

176. Non-clinical Laboratory Study for the Evaluation of Novel Vascular Graft Devices (Prolong I and II) in an Ovine Model. University of Limerick. August, 2006. .

177. ECM Bioscaffold for ASD Repair. NIH-SBIR award, subcontract from ACell, Inc. September, 2006.

178. Seroma Reduction in Modified Abdominoplasty Model. Cohera Medical, Inc. March, 2007.

179. In vitro Cell Growth Assay for ECM Bioscaffolds III. ACell, Inc. March, 2007.

180. Studies to Support Two Year Shelf Life for Restore™ Device. DePuy Products, Inc. 2008.

181. Cellular Remodeling of ECM Bioscaffolds. NIH. April 2007 – February 2010.

182. UBM Sterilization Study. Kensey Nash. May, 2007.

183. In Vitro Mesotherapy Study. American Network of Lipolysis. May, 2007.

184. Evaluation of the Biologic Response to Porcine Acellular Matrices. Revivicor, Inc. June, 2006.

185. Advanced Regenerative Medicine (ARM 1): Preclinical Studies to Evaluate the Source of Cells Involved in Reconstruction/Extension of Partially Amputated Digits in a Mouse Model. Department of Defense. November, 2006.

186. Advanced Regenerative Medicine (ARM 1): A Bioscaffold for the Repair of Acute Traumatic Musculotendinous Injury. Pittsburgh Tissue Engineering Initiative Department of Defense. June, 2007.

187. *In Vivo* Evaluation of Biomerix Composite Meshes in a Rat Body Wall Model. Biomerix Corporation. October 2007 – December 2010.

188. Evaluation of a Surgical Mesh in a Rabbit Model. Generic Medical. November, 2007.

189. Mitogenic Factors Derived from Extracellular Matrix. Juvenile Diabetes Research Foundation. March, 2008.

190. Use of Autologous Inductive Biologic Scaffold Materials for Treatment of Compartment Syndrome. Armed Forces Institute of Regenerative Medicine (AFIRM). March 10, 2008 – August 2013.

191. Armed Forces Institute of Regenerative Medicine (AFIRM): Blastemal Approach to Digit Reconstruction. USAMRRA. March 10, 2008 – August 2013.

192. Tissue Response and Degradation of Adhesive Formulations. Cohera Medical, Inc. May, 2008 – June 2010.

193. Biologic Scaffold Development. C.R. Bard. May 2008 – December 2013.

194. Regenerative Medicine Approach to Vocal Fold and Temporomandibular Joint (TMJ) Meniscal Reconstruction. Commonwealth of Pennsylvania. July, 2008.

195. Whole Organ Reconstruction: A Bioinductive Regenerative Medicine Approach. Commonwealth of Pennsylvania. July 2008 – July 2009.

196. Pilot Study to Evaluate Urinary Bladder Matrix (ECM) Gel as a Therapeutic Intervention for Myocardial Infarction. Cryolife. August, 2008.

197. Porcine Model of Arterial Venus (AV Shunt) to Evaluate Novel ePTFE Graft Design. University of Limerick. October, 2008.

198. Testing of Paracorporeal Respiratory Assist Devices in an Ovine Model. ALung Technologies, November, 2008.

199. Remodeling of an ECM scaffold in the abdominal wall location in the rat and rabbit model. Cytograft Tissue Engineering. 2008.

200. Armed Forces Institute for Regenerative Medicine (AFIRM): Biologic Scaffold for Functional Muscle Replacement: Evaluation in 10 Patients. Armed Forces Institute for Regenerative Medicine (AFIRM)/Department of Defense (DoD) USAMRAA. March 2009 – August 2011.

201. Advanced Regenerative Medicine (ARM 3): Regenerative Medicine Approach for the Treatment of Peripheral Compartment Syndrome. PTEI via USAMRMC. April 2009 – May 2011.

202. Mechanobiology and Regenerative Medicine. NIH. May 2009 – April 2011.

203. Advanced Regenerative Medicine (ARM 2): Regenerative Medicine for Compartment Syndrome. Pittsburgh Tissue Engineering Initiative Department of Defense. June, 2009.

204. Tissue Specific ECM Scaffold for the Functional Repair of the Vocal Fold Lamina Propria. NIH. June 16, 2009 – May 31, 2012.

205. Efficacy of TetraLogic Test Compound for Preservation of Functional Tissue in a Dog Model of Peripheral Compartment Syndrome. TetraLogics Pharmaceuticals. July 2009 – October 2010.

206. Advanced Regenerative Medicine (ARM 3 Add On): Control of the Microenvironmental Niche to Promote Epimorphic Regeneration in Amputated Digits. PTEI via USAMRMC. September 30, 2009 – July 31, 2012.

207. Neuro-Vascular Regeneration. Baylor College of Medicine. September 2009 – August 2010.

208. TMJ Meniscus Device Support. Corporate Research Agreement with Biomet Microfixation, LLC. November, 2009.

209. Evaluation of ECM Coated Vascular Stent in a Porcine Model. University of Limerick. January, 2010.

210. Conduct Efficacy Studies for Muscle Tissue Regeneration via Biological Scaffolding Composed of Xenogeneic Extracellular Matrix (ECM) (OTT tasks 1a and 1b). Department of Defense. March 5, 2010 – September 30, 2014.

211. Organ Engineering with 3-Dimensional Biologic Scaffolds. Commonwealth of Pennsylvania. July, 2010.

212. Comprehensive Evaluation of Prolapse Meshes by an Interdisciplinary Research Team. NIH. August 2010 – June 2014.

213. SurgiLux ECM Materials and Their Potential for Wound Healing. University of New South Wales. August 15, 2010 – August 31, 2014.

214. Advanced Regenerative Medicine (ARM 4): Matrix Mediated Enhancement of Musculotendinous Tissue Regeneration: Mechanisms and Practical Application. PTEI via USAMRMC. October 2010 – September 2012.

215. In Vitro and In Vivo Evaluation of Decellularized Cardiac Matrix. Miromatrix Medical, Inc. December 2010 – May 2011.

216. Fate of Particulate ECM in a Canine Model of Cartilage Injury. ACell, Inc. February 2011 – January 2012.

217. Studies to Enhance Value of Novel Peptide for Endogenous Stem Cell Recruitment. Office of Technology Management. March 2011 – November 2011.

218. Shelf Life Study. DePuy, Inc. March 2011 – June 2011.

219. The Effect of Nell1 upon Skeletal Muscle Reconstruction Following Experimental Induced Injury in a Rat Model. NellOne Therapeutics, Inc. March 1, 2011 – May 31, 2012.

220. Further Develop Artificial/Biohybrid Organs and Therapeutic Applications: Whole Organ Engineering – Liver. Commonwealth of Pennsylvania. July 1, 2011 – June 30, 2012.

221. Remodeling Potential of a Liver Based Extracellular Matrix Scaffold. Miromatrix Medical, Inc. February 2012 – July 2012.

222. A Regenerative Medicine Approach for Retina Reconstruction Using Biologic Scaffold Materials. Louis J. Fox Center for Vision Restoration. November 1, 2011 – September 30, 2012.

223. Regenerative Medicine Approach for Digit Reconstruction (ARM V Fellowship). PTEI via DOD. October 1, 2011 – September 30, 2013.

224. Injectible ECM Gel for Targeted CNS (Spinal Cord) Therapy. Vertex Pharmaceuticals, Inc. December 15, 2011 – December 14, 2014.

225. Coulter Translational Partnership Award in Biomedical Engineering. Coulter. January 1, 2012 – December 31, 2013.

226. Mechanical loading as a critical determinant for functional skeletal muscle formation with a biological scaffold. CSNSMRC. May 2012 – August 2013.

227. Contamination and Infection Resistance. RTI Biologics, Inc. June 15, 2012 – December 15, 2012.

228. A Regenerative Medicine Approach for TMJ Meniscus Restoration. NIH. July 1, 2012 – June 30, 2017.

229. Whole Organ Engineering – Liver. Commonwealth of Pennsylvania. September 1, 2012 – June 30, 2014.

230. Studies to Evaluate the Effect of Processing Methods upon UBM-ECM. ACell, Inc. January 2013 – February 11, 2016.

231. Optimization of Surgical Mesh Materials. C.R. Bard. January 1, 2013 – December 31, 2016.

232. Whole Organ Engineering – Liver. McCune Foundation. February 2013 – December 2013.

233. Non-Invasive Imaging of the In Situ Restoration of Brain Tissue. NIH. R01. April 2013 – March 2018.

234. Macrophage Polarization and Aging in the Context of Regenerative Medicine. NIH (R03). July 1, 2013 – June 30, 2015.

235. Studies to Evaluate the Effect of Processing Methods upon UBM-ECM, Amendment 1 ACell, Inc. October 1, 2013 – September 30, 2014

236. Regeneration for the Lamellae of the Eyelids. Center for Military Medicine Research (CMMR). November 1, 2013 – October 31, 2014.

237. Armed Forces Institute for Regenerative Medicine (AFIRM II): In Situ Influence of Cell Fate for Functional Soft Tissue Reconstruction. Armed Forces Institute for Regenerative Medicine (AFIRM)/Department of Defense (DoD) USAMRAA. January 1, 2014 – December 31, 2018.

238. 8th Symposium on Biologic Scaffolds for Regenerative Medicine. NIH R13 (NIBIB). April 1, 2014 – March 31, 2015.

239. Tracheal-Genesis via CD47 Blockade. NIH R21. April 1, 2014 – March 31, 2016.

240. Whole-Organ Tissue Engineering for Cardiac Care. McCune Foundation. October 1, 2014 – September 30, 2015.

241. Musculotendinous Tissue Unit Repair and Reinforcement (MTURR) with the Use of Biologic Scaffolds for Patients Suffering from Severe Skeletal Muscle Injury. C. R. Bard. October 1, 2014 – March 31, 2015.

242. Musculotendinous Tissue Unit Repair and Reinforcement (MTURR) with the Use of Biologic Scaffolds for Patients Suffering from Severe Skeletal Muscle Injury. Cook Biomedical. October 1, 2014 – March 31, 2015.

243. Development of Vascular Grafts. C.R. Bard, Peripheral Vascular. October 1, 2014 – December 31, 2015.

244. McGowan Foundation. Pediatric Device Initiative. January 1, 2015 – December 31, 2015.

245. Regenerative ophthalmology: using extracellular matrix technology to promote a positive functional outcome after ocular trauma. Department of Defense – Congressionally Directed Medical Research Programs (DOD – CDMRP). February 1, 2015 – January 31, 2018.

246. Applying Extracellular Matrix Technology to Neuroprotect and to Repair Injured Retina and Optic Nerve. USAMRAA. February 1, 2015 – January 31, 2018.

247. Extracellular Matrix as a Therapy for Inflammatory Bowel Disease. Asana. June 1, 2015 – October 31, 2017.

248. Evaluation of the Effects of Formabone® on Bone Tissue Formation. Formabone. July 6, 2015 – July 5, 2016.

249. Production of ECM Bioscaffold Materials. Neograft Technologies. January 1, 2016 – December 31, 2016.

250. The Effect of Topical Wound Treatments on Skin Flap Healing. Carmell Therapeutics, Inc. September 1, 2016 – August 31, 2017.

251. Optimization of Surgical Mesh Materials. C.R. Bard. January 1, 2017 – December 31, 2019.

252. Surgical Mesh Device Development. ACell, Inc. February 12, 2017 – February 12, 2020. Year 1

253. 3D Bioprinted Human Trachea for Pediatric Patients. National Institutes of Health. March 1, 2017 – February 28, 2019. Year 1

254. 10th Symposium on Biologic Scaffolds for Regenerative Medicine. NIH R13 (NIBIB). February 1, 2018 – December 31, 2018.

255. Surgical Mesh Device Development. ACell, Inc. February 12, 2017 – February 12, 2020. Year 2.

256. Esophogel. Michael G. Wells Student Healthcare Entrepreneurship Competition, University of Pittsburgh Innovation Institute. November 1, 2017 – June 30, 2018.

257. An extracellular-matrix hydrogel for the prevention of esophageal cancer. Chancellor's Innovation Commercialization Funds Award, University of Pittsburgh Innovation Institute. February 1, 2018 – July 31, 2018.

258. Mechanisms of functional skeletal muscle repair: critical role of matrix associated IL-33. National Institutes of Health. April 4, 2018 - January 1, 2023.

259. Matricellular Signaling in Engineered Tracheal Transplantation. National Institutes of Health. April 1, 2018 – March 31, 2023.

260. Extracellular matrix (ECM)-based hydrogels for restoration of functional brain tissue following central nerve system (CNS) injury. Commonwealth of Pennsylvania. July 1, 2017 – December 31, 2018.

261. Optimization of Surgical Mesh Materials. C.R. Bard. Amendment 2 to IPA 20. August 1, 2018 – July 31, 2019.

262. Surgical Mesh Device Development. ACell, Inc. Amendment 2 to IPA 10. August 1, 2018 – July 31,2018.

263. Advanced Manufacturing of Regenerative Extracellular Matrix Scaffolds. Food and Drug Administration. September 20, 2018 – August 31, 2021.

264. Further Develop Artificial/Biohybrid Organs and Therapeutic Application. Commonwealth of Pennsylvania. July 1, 2018 – June 30, 2019.

265. The Effect of DiFusion Technologies Test Articles Upon Macrophage Activation. DiFusion Technologies. September 1, 2018 – February 28, 2019.

266. Determining the efficacy of EsophaLIFT™ as a submucosal dissection device and the mucoadhesive properties of EsophaGard™ in a canine esophagus model. ECM Therapeutics, Inc. October 1, 2018 – March 31, 2019.

267. Comparative Study of ECMH (Hydrogel) Manufactured at the University of Pittsburgh and at Cook Biotech Inc. for Treatment of Ulcerative Colitis in a Rat Model. Regentys. February 1, 2019 – September 30, 2019.

268. A comparability study of EsophaLIFT™ and Eleview™ efficacy and evaluation of the mechanisms by which EsopahGel™ mitigates esophageal stricture. ECM Therapeutics, Inc. February 1, 2019 – January 31, 2020.

269. Evaluating Host Response to Xeltis Polymer. Xeltis. February 1, 2019 – August 31, 2019.

270. Enhanced Biologic Scaffold for Volumetric Muscle Loss. Medical Technology Enterprise Consortium. July 1, 2019 – June 31, 2021.

271. Early Intervention Stem Cell-Based Therapy (EISCBT) for Corneal Burns and Trauma. Department of Defense. April 1, 2019 – March 30, 2021.

272. Determining the macrophage response to biologic vs synthetic pacemaker envelopes. Aziyo. February 1, 2019 – July 31, 2019.

273. REPAIR: Regenerative Electronic Platform through Advanced Intelligent Regulation. Defense Advanced Research Project Agency (DARPA). November 1, 2019 – October 31, 2023.

274. Characterization of Triad Porcine Placental Extracellular Matrix Product. Triad Life Sciences. May 1, 2019 – April 30, 2020.

275. Effect of DiFusion Technologies Test Articles on Osteoblast Differentiation, BMP Production and Macrophage Activation. DiFusion Technologies. July 1, 2019 – January 31, 2020.

276. Large scale manufacturing of extracellular matrix (ECM) hydrogels for regenerative medicine applications. Medical Technology Enterprise Consortium. September 1, 2019 – August 31, 2021.

277. Optimization of Surgical Mesh Materials. C.R. Bard/Becton Dickinson. January 1, 2020 – December 31, 2022.

278. Further Develop Artificial/Biohybrid Organs and Therapeutic Application. Commonwealth of Pennsylvania. July 1, 2019 – June 30, 2020.

279. A comparability study of EsophaLIFT™ and Eleview™ efficacy and evaluation of the mechanisms by which EsophaGel™ mitigates esophageal stricture. Amendment 1. ECM Therapeutics, Inc. February 1, 2020 – January 31, 2021.

280. Effect of DiFusion Technologies Test Articles on Osteoblast Differentiation, BMP Production and Macrophage Activation. DiFusion Technologies. Amendment 1. February 1, 2020 – August 31, 2020.

281. Evaluating Host Response to Xeltis Polymer. Xeltis. Amendment 1. April 1, 2020 – September 30, 2020.

282. A comparability study of EsophaLIFT™ and Eleview™ efficacy and evaluation of the mechanisms by which EsophaGel™ mitigates esophageal stricture. Amendment 2. ECM Therapeutics, Inc. May 1, 2020 – October 31, 2020.

283. Comparative Study of ECMH (Hydrogel) Manufactured at the University of Pittsburgh and at Cook Biotech Inc. for Treatment of Ulcerative Colitis in a Rat Model. Regentys. April 1, 2020 – November 30, 2020.

284. Optimization of Surgical Mesh Materials. Amendment to Individual Project Agreement 23. C.R. Bard/Becton Dickinson. June 1, 2020 – September 30, 2023.

285. Optimization of Surgical Mesh Materials. Amendment to Individual Project Agreement 24. C.R. Bard/Becton Dickinson. June 1, 2020 – September 30, 2023.

286. Intraoptic Nerve Elevated Pressure in Wild and Knockout Mouse Models. Eye and Ear Foundation. January 1, 2020 – December 31, 2021.

287. Evaluation of the host response to wound care products in a chronic wound model. Triad Life Sciences Amendment 1. November 1, 2020 – August 31, 2021.

288. A comparability study of EsophaLIFT™ and Eleview™ efficacy and evaluation of the mechanisms by which EsophaGel™ mitigates esophageal stricture. Amendment 3. ECM Therapeutics, Inc. February 1, 2021 - January 31, 2022.

289. Optimization of Surgical Mesh Materials. Amendment to Individual Project Agreement 25. C.R. Bard/Becton Dickinson. April 1, 2021 – September 30, 2023.

290. Optimization of Surgical Mesh Materials. Amendment to Individual Project Agreement 26. C.R. Bard/Becton Dickinson. April 1, 2021 – September 30, 2023.

291. Enhancing Neurogenesis for Brain Tissue Regeneration. National Institutes of Health. April 1, 2021 – September 30, 2022.

292. MR Imaging of Bioscaffold-Induced Neural Progenitor Migration. National Institutes of Health. July 1, 2021 – June 30, 2026.

293. Evaluating Host Response to Xeltis Polymer. Xeltis. Amendment 3. April 1, 2021 – March 31, 2022.

294. In Vitro Bioactivity Assessment of StemSysBio ECM. StemSysBio. July 1, 2021 – March 31, 2022.

295. Establishing Statin/MBV-based combination therapy for enhancing optic nerve regeneration. Hillman Foundation. January 1, 2022 – December 31, 2023.

296. Characterization of Triad Porcine Placental Extracellular Matrix Product. Amendment 2. Triad Life Sciences. August 1, 2022 – April 30, 2023. $122,358.

297. Studies to Determine the Bioactivity of Matrix Bound Nanovesicles and ECM hydrogel produced by ECM Therapeutics, Inc. Amendment 6. ECM Therapeutics. July 1, 2022 – June 30, 2023. $137,071.

298. Characterization of the cargo and function of EPIFIX-MBV. May 1, 2022 – October 31, 2022. MiMedx. $106,551.

299. Characterization of the cargo and function of EPIFIX-MBV. November 1, 2022 – June 30, 2023. Amendment 2. MiMedx.

300. Characterization of Triad Porcine Placental Extracellular Matrix Product. May 1, 2023 – July 31, 2023. Amendment 3. Triad Life Sciences.

301. Characterization of the cargo and function of EPIFIX-MBV. July 1, 2023 – September 30, 2023. Amendment 3. MiMedx.

302. In-vitro Evaluation of Biomaterials. Agreement 27. October 1, 2023 – September 30, 2026. C.R. BD/Becton Dickinson.

303. In-vivo Evaluation of Biomaterials. Agreement 28. October 1, 2023 – September 30, 2026. C.R. BD/Becton Dickinson.

304. Discovery and Development of Novel Prototypes. Agreement 29. October 1, 2023 – September 30, 2026. C.R. BD/Becton Dickinson.

305. Effect of InnovaMatrix AC Product on Macrophage Phenotype. TBD. ConvaTec.

Gifts:

1. Unrestricted Charitable Grant, Evaluation of SIS as a Wound Repair Material for the Patellar Tendon Defect in ACL Repair. Methodist Sports Medicine Center, Inc. January, 1994.

2. Charitable Grant, Investigation into Tissue Engineering Phenomena. DePuy, Inc. April, 1994

3. Charitable Gift for Tissue Engineering Research. Community Foundation (Munster, IN). May, 1994.

4. Charitable Grant, Tissue Engineering Research in Orthopedics. DePuy, Inc. 1995.

5. Charitable Grant to Study Orthopedic Applications of SIS. Methodist Sports Medicine Center, Inc. March, 1996.

6. Charitable Grant to Study Orthopedic Applications of SIS. Methodist Sports Medicine Center, Inc. December, 1996.

7. Charitable Grant to Study Orthopedic Applications of SIS. Methodist Sports Medicine Center, Inc. January, 1997.

8. Gift to Study Immunology Aspects of SIS. DePuy, Inc. June, 1997.

9. Unrestricted Charitable Grant, Studies to Investigate Tissue Engineering. Cook Biotech, Inc. August, 2001.

10. Charitable Donation. Donohoe. March 26, 2008.

11. Charitable Donation. Cohera Medical. August 14, 2008.

12. Schwab Charitable Fund. Sidney Etkin. November, 26, 2008.

13. Charitable Donation. Cytograft. December 4, 2008.

14. Charitable Donation for 7th Symposium. LifeCell Corporation. July 28, 2009.

15. Charitable Donation. Cytograft Tissue Eng, Inc. August 27, 2009.

16. Schwab Charitable Fund. Sidney Etkin. December 17, 2009.

17. NellOne Charitable Contribution 1st Installment. May 31, 2011.

18. NellOne Charitable Contribution 2nd Installment. July 01, 2011.

19. Charitable Grant . ACell, Inc. April 1, 2012.

20. Charitable Grant. Tissue Source. June 30, 2012.

21. Charitable Donation to advance research. Pezzone Gastroenterology. October 11, 2012.

22. Charitable Grant. ACell, Inc. December 31, 2012.

23. Support of Pioneering Initiatives Charitable Donation. Krishna Narayanan. July 15, 2013.

24. Charitable Grant. ACell, Inc. December 20, 2013.

25. Support of Pioneering Initiatives Charitable Donation. Krishna Narayanan. March 06, 2014.

26. Charitable Grant. Asana Medical, Inc. December 10, 2014.

27. Charitable Grant. ACell, Inc. December 31, 2014.

28. Charitable Grant. ACell, Inc. December 16, 2015.

29. Charitable Grant. Alexander Chang. August 3, 2016.

30. Charitable Grant. Asana Medical, Inc. October 1, 2016.

31. Charitable Grant. Alexander Chang. July 2017.

32. Charitable Grant. Alexander Chang. August 2018.

33. Charitable Grant. StemBioSys, Inc. October 2018.

Patents:

1. The Use of Small Intestinal Submucosa as a Vascular Graft Material - Tissue Graft Composition and Method, Patent 4902508 (U.S. Patent issued on 2/20/90).

2. Tissue Graft Composition and Method, Patent 4956178 (U.S. Patent issued on 9/11/90).

3. Treatment to Reduce Ischemic Tissue Injury, Patent 4978668 (U.S. Patent issued on 12/18/90).

4. Muscle-powered Cardiac Assist Device, Patent 5007927 (U.S. Patent issued on 4/16/91).

5. Fluidized Intestinal Submucosa and Its Use as an Injectable Tissue Graft, Patent 5275826 (U.S. Patent issued on 1/4/94).

6. Graft for Promoting Autogenous Tissue Growth, Patent 5281422 (U.S. Patent issued on 1/25/94).

7. Tissue Graft for Surgical Reconstruction of a Collagenous Meniscus and Method Therefore, Patent 5352463 (U.S. Patent issued on 10/4/94).

8. Device for Oral Administration of Liquids, Patent 5354274 (U.S. Patent issued on 10/11/94).

9. Graft for Promoting Autogenous Tissue Growth, Patent 5372821 (U.S. Patent issued on 12/13/94).

10. Tendon or Ligament Graft for Promoting Autogenous Tissue Growth, Patent 5445833 (U.S. Patent issued on 8/29/95).

11. Fluidized Intestinal Submucosa and Its Use as an Injectable Tissue Graft, Patent 5516533 (U.S. Patent issued on 5/14/96).

12. Urinary Bladder Submucosa Derived Tissue Graft, Patent 5554389 (U.S. Patent issued on 9/10/96).

13. Graft for Promoting Autogenous Tissue Growth, Patent 5573784 (U.S. Patent issued on 11/12/96).

14. Method of Repairing Bone Tissue, Patent 5641518 (U.S. Patent issued on 6/24/97).

15. Tissue Graft and Method for Urinary Urothelium Reconstruction Replacement, Patent 5645860 (U.S. Patent issued on 7/8/97).

16. Submucosa as a Growth Substrate for Islet Cells, Patent 5695998 (U.S. Patent issued on 12/9/97).

17. Large Area Submucosal Tissue Graft Constructs, Patent 5711969 (U.S. Patent issued on 1/27/98).

18. Method for Enhancing Functional Properties of Submucosal Tissue Graft Constructs, Patent 5753267 (U.S. Patent issued on 5/19/98).

19. Perforated Submucosal Tissue Graft Constructs, Patent 5755791 (U.S. Patent issued on 5/26/98).

20. Tissue Graft and Method for Urinary Tract Urothelium Reconstruction and Replacement, Patent 5762966 (U.S. Patent issued on 6/9/98).

21. Submucosa Gel as a Growth Substrate for Cells, Patent 5866414 (U.S. Patent issued on 2/2/99).

22. Large Area Submucosal Tissue Graft Constructs and Method for Making the Same, Patent 5885619 (U.S. Patent issued on 3/23/99).

23. Multilayered Submucosal Graft Constructs and Method for Making Same, Patent 5955110 (U.S. Patent issued on 9/21/99).

24. Method of Repairing Perforated Submucosal Tissue Graft Constructs, Patent 5968096 (U.S. Patent issued on 10/19/99).

25. Perforated Submucosal Tissue Graft Constructs, Patent 5997575 (U.S. Patent issued on 12/7/99).

26. Device and Method for Analyzing Tumor Cell Invasion of an Extracellular Matrix, Patent 6087157 (U.S. Patent issued on 7/11/00).

27. Myocardial graft constructs, Patent 6096347 (U.S. Patent issued on 8/1/00).

28. Stomach Submucosa Derived Tissue Graft, Patent 6099567 (U.S. Patent issued on 8/8/00).

29. Artificial Vascular Valves, Patent 6126686 (U.S. Patent issued on 10/3/00).

30. Tubular Submucosal Graft Constructs, Patent 6187039 (U.S. Patent issued on 2/13/01).

31. Composition and Method for Repairing Neurological Tissue, Patent 6241981 (U.S. Patent issued on 6/5/01).

32. Galactosidase Modified Submucosal Tissues, Patent 6331319 (U.S. Patent issued on 12/18/01).

33. Submucosa Extracts, Patent 6375989 (U.S. Patent issued on 4/23/02).

34. Biomaterial Derived from Vertebrate Liver Tissue, Application 6379710 (U.S. Patent issued on 04/30/2002).

35. Stent with Reduced Thrombogenicity, Patent 6475232 (U.S. Patent issued on 11/05/02).

36. Enhanced Submucosal Tissue Graft Constructs, Patent 6485723 (U.S. Patent issued on 11/26/02).

37. Composition and Method for Production of Transformed Cells, Patent 6653291 (U.S. Patent issued on 11/25/04).

38. Gastric Submucosal Tissue as a Novel Diagnostic Tool, Patent 6696270 (U.S. Patent issued on 2/24/04).

39. Biomaterial Derived from Vertebrate Liver Tissue, Patent 6793939 (U.S. Patent issued on 9/21/04).

40. Method for Vocal Cord Reconstruction, Patent 6918396 (U.S. Patent issued on 7/19/05).

41. Enhanced submucosal tissue graft constructs, Patent 7175841 (U.S. Patent issued on 02/13/2007).

42. Biomaterial Derived from Vertebrate Liver Tissue, Patent Application 7482025 (U.S. Patent issued on 1/27/2009).

43. Enhanced submucosal tissue graft constructs, Patent 7771717 (US patent issued 08/10/2010)

44. Vascularization enhanced graft constructs, Patent 7776596 (U.S. Patent issued on 08/17/2010).

45. Vascularization enhanced graft constructs, Patent 7815686 (U.S. Patent issued on 09/14/2010).

46. Vascularization enhanced graft constructs, Patent 7815686 (U.S. Patent issued on 10/19/2010).

47. Composition and Method for Production of Transformed Cells, Patent 7820634 (U.S. Patent issued 10/26/2010).

48. Biomaterial derived from vertebrate liver tissue, Patent 7919121 8003131 (U.S. Patent issued on 04/05/2011).

49. Biomaterial derived from vertebrate liver tissue, Patent 8003131 (U.S. Patent issued on 08/23/2011).

50. Wound healing polymeric networks, Patent 8029774 (U.S. Patent issued on 10/04/2011).

51. Vascularization enhanced graft constructs, Patent 8084048 (U.S. Patent issued on 12/27/2011).

52. Extracellular matrix-derived gels and related methods, Patent 8361503 (U.S. Patent issued on 01/29/2013).

53. Conditioned decellularized native tissues for tissue restoration, Patent 8409625 (U.S. Patent issued on 04/02/2013).

54. Biohybrid elastomeric scaffolds and methods of use thereof, Patent 8535719 (U.S. Patent issued on 09/17/2013).

55. Gastric submucosal tissue as a novel diagnostic tool, Patent 8647677 (U.S. Patent issued on 02/11/2014).

56. Matricryptic ECM Peptides for Tissue Reconstruction, Patent 8716438 (U.S. Patent issued on 05/06/2014).

57. Extracellular Matrix Based Gastroesophageal Junction Reinforcement Device, Patent 8927003 (U.S. Patent issued on 01/07/2015).

58. Joint Bioscaffolds, Patent 9277999 (U.S. Patent issued on 03/08/2016).

59. Joint Bioscaffolds, Patent 9314340 (U.S. Patent issued on 04/19/2016).

60. Matricryptic ECM Peptides for Tissue Reconstruction, 9340602 (U.S. Patent issued on 05/17/2016).

61. Biohybrid Composite Scaffold, 9421307 (U.S. Patent issued on 08/23/2016).

62. Extracellular Matrix Based Gastroesophageal Junction Reinforcement Device, 9480776 (U.S. Patent issued on 11/1/2016).

63. Decellularized adipose cell growth scaffold, 9814744. (U.S. Patent issued on November 14, 2017).

64. Joint Bioscaffolds, 9848987. (US Patent issued on December 26, 2017).

65. Bone-Derived Extra Cellular Matrix Gel, 9861662. (US Patent issued on January 9, 2018).

66. Extracellular Matrix-Derived Gels and Related Methods, 10004827. (US Patent issued on June 26, 2018.)

67. Biohybrid Composite Scaffold, 10092676. (US Patent issued on October 9, 2018.)

68. Methods for Preparation of a Terminally Sterilized Hydrogel Derived from Extracellular Matrix, 10213526. (US Patent issued on February 26, 2019.)

69. Extracellular Matrix Mesh Coating, 10286119. (US Patent issued on May 14, 2019.)

70. Extracellular Matrix-Derived Gels and Related Methods, 10729813. (US Patent issued on August 4, 2020.)

71. Non-Gelling Soluble Extracellular Matrix with Biological Activity, 10736991. (US Patent issued on August 11, 2020.)

72. ECM Hydrogel for Treating Esophageal Inflammation, 11213545. (US Patent issued on January 4, 2022.)

73. ECM Hydrogel and Soluble Fraction Thereof for the Treatment of Cancer, 11291688. (US Patent issued on April 5, 2022.)

74. Methods for Preparation of a Terminally Sterilized Hydrogel Derived from Extracellular Matrix, 11338066. (US Patent issued on May 24, 2022.).

75. Biodegradable, Porous, Thermally Responsive Injectable Hydrogel as Soft Tissue Defect Filler, Patent 11389569 (US Patent issued on 07/19/2022).

76. Method and Composition for Treating Inflammatory Bowel Disease, Patent 11389566 (US Patent issued on 07/19/2022).

77. Vascular Extracellular Matrix Hydrogel, Patent 11406736 (US Patent Issued on 08/09/2022)

78. Methods for Preparation of a Terminally Sterilized Hydrogel Derived from Extracellular Matrix, Patent 11413375 (US Patent issued on 08/16/2022).

79. ECM Hydrogel for Treating Esophageal Inflammation, Patent 7203428 (US Patent issued on 06/17/2023).

80. Ocular Applications of Matrix Bound Vesicles (MBVS), Patent 11638724 (US Patent issued on 07/02/2023).

81. ECM Hydrogel for Treating Esophageal Inflammation. Patent 11707485 (US Patent issued on 07/25/2023).

82. Methods for Preparation of a Terminally Sterilized Hydrogel Derived from Extracellular Matrix. Patent 12005158 (US Patent issued on 06/11/2024).

83.

Graduate Students (Major Advisor):

1. **Simon Hui**, MS 2000
   Mechanical Engineering.
   "The Evaluation of the Effect of Small Intestinal Submucosa on the Remodeling of Patellar Tendon Donor Sites in a Canine Model"

2. **Donald Freytes**, MS 2003
   University of Pittsburgh, Biomedical Engineering
   "Material Properties of Xenogeneic ECM Scaffolds"

3. **Thomas Gilbert**, PhD 2006

University of Pittsburgh, Biomedical Engineering
"In Vitro Remodeling of ECM Scaffolds by Fibroblasts and the Effect of Mechanical Loading"
Current Position: ACell, Inc.

4. **Donald Freytes**, PhD 2008
University of Pittsburgh, Biomedical Engineering
"ECM gels as Scaffolds for Tissue Engineering"

5. **Tiffany Sellaro**, PhD 2008
University of Pittsburgh, Biomedical Engineering
"Liver-Derived ECM for Hepatic Tissue Engineering"

6. **Jolene Valentin**, PhD 2009
University of Pittsburgh, Biomedical Engineering
"Material and Mechanical Properties of ECM Scaffolds"

7. **Ellen Brennan**, PhD 2009
University of Pittsburgh, Biomedical Engineering.
"Biologically Active Degradation Products of Mammalian Extracellular Matrix"

8. **John Wainwright**, PhD 2010
University of Pittsburgh, Biomedical Engineering
"Cardiac Extracellular Matrix as a Scaffold for Myocardial Repair and Reconstruction"

9. **Bryan Brown**, PhD 2010
University of Pittsburgh, Bioengineering.
"Chitosan and Mammalian Extracellular Matrix as Biologic Scaffolds for Tissue Reconstruction"

10. **Kevin Cordero**, MS 2010
Biomedical Engineering MS student.

11. **Vineet Agrawal**, MD, PhD 2011
University of Pittsburgh, Medical Science Training Program
"ECM Degradation, Matricryptic Peptides, and Stem Cell Recruitment"

12. **Christopher Medberry**, PhD 2013
University of Pittsburgh, Bioengineering
"Central Nervous System Extracellular Matrix as a Therapeutic Bioscaffold for Central Nervous System Injury"

13. **Christopher Arthur Carruthers**, PhD 2013
University of Pittsburgh, Bioengineering
"Tissue and Whole Organ Decellularization: An Evaluation of Cytocompatibility and Mechanics.

14. **Brian M. Sicari**, PhD 2013
University of Pittsburgh, Cellular & Molecular Pathology Graduate Program
"Constructive Tissue Remodeling by Extracellular Matrix Bioscaffolds within the Aging Skeletal Muscle Microenvironment"

15. **Matthew Wolf**, PhD 2013
University of Pittsburgh, Bioengineering
"The Influence of Tissue Specific Cardiac and Skeletal Muscle Extracellular Matrix on Muscle Remodeling"

16. **Ricardo Londono,** PhD 2015
University of Pittsburgh, Medical Science Training Program MD: 2016
"Mechanisms of Biomaterial-Mediated Esophageal Repair"

17. **Denver Faulk**, PhD 2015
University of Pittsburgh, Bioengineering Program
"Engineering Functional Liver Tissue with Three Dimensional Scaffolds Composed of Liver Extracellular Matrix"

18. **Timothy Keane**, PhD 2016
University of Pittsburgh, Bioengineering Program
"Mechanisms of constructive remodeling in the gastrointestinal mucosa"

19. **Jenna Dziki,** PhD 2017
University of Pittsburgh, Bioengineering Program
"Macrophage and progenitor cell involvement in extracellular-matrix bioscaffold mediated skeletal muscle repair"

20. **Yolandi van der Merwe,** PhD 2018
University of Pittsburgh, Bioengineering Program
"Neuroprotective approaches to ocular injury"

21. **Lindsey Saldin**, PhD 2018
University of Pittsburgh, Bioengineering Program
"Inflammatory and Cancerous Tissue Hydrogels"

22. **Catalina Pineda,** PhD 2018
University of Pittsburgh, Bioengineering Program
"Immunomodulation and antimicrobial activity of biologic, biosynthetic, and synthetic scaffold materials"

23. **Mark Murdock** 2022
University of Pittsburgh, Interdisciplinary Biomedical Graduate Program
"Matrisomal Signals Modulate Macrophage Phenotype in Glioma Progression"

24. **Yoojin Lee**

University of Pittsburgh, Bioengineering Program 2020
"Characterization and Functional Analysis of ECM-Embedded Exosomes During Neoplastic Progression"

25. **Madeline Cramer**
University of Pittsburgh, Bioengineering Program PhD Expected Graduation: 2022
"Role of ECM-Associated IL-33 in Functional Cardiac Repair"

26. **Joseph Bartolacci**
University of Pittsburgh, Bioengineering Program 2020
"IL-33: An Extracellular Arbiter of Macrophage Mediated Myogenesis"

27. **Raphael Crum**
University of Pittsburgh, Med. Scientist Training Pgm. 2022
"Matrix-bound Nanovesicles: Next Generation Extracellular Matrix Biomaterials for the Treatment of Rheumatoid Arthritis"

28. **Gabrielle Lorenz**
University of Pittsburgh, Bioengineering Program 2022
TBD

29. **Jiayang (Lydia) Rong**
University of Pittsburgh, Bioengineering Program PhD Expected Graduation: 2026
TBD

30. **Salma El-Mossier**
Cellular Molecular Pathology Graduate Training Program PhD Expected Graduation: 2026
TBD

<u>Graduate Students (Thesis Committee Member):</u>

1. **Paul Arciero**, MS 1987
"Resting Energy Expenditure and Energy Intake in Vegetarians and Nonvegetarian Males".

2. **Melissa Gale Steiner**, PhD 1989
"Development of an Assay for the Detection of Hydroxyl Radicals in Tissue During Reperfusion Injury"

3. **Wolfgang Janas**, MS 1991
"Skeletal Muscle for Cardiac Assistance"

4. **Sherry Voytik**. MS 1989
"A Simple Electrical Model of the Human Circulatory System to Explore Design Parameters for a Skeletal Muscle Ventricle"

5. **Sherry Voytik**, PhD 1992
"Thrombosis and Thrombolysis"

6. **Art Coffey**, MD, MS 1989
"Small Intestinal Submucosa as a Vascular Graft"

7. **Clayton Holmes**, MS 1989
"Rehabilitation After Anterior Cruciate Ligament Reconstruction"

8. **Steven Salaris**, PhD 1991
"Reperfusion Injury in the Liver"

9. **Raj Singh**, MS 1991
"Analysis of Superoxide Scavenging by Manganese Salts and Their Potential Use as Superoxide Dismutase Mimetics.

10. **David Reuter**, PhD 1992
"A New Model of Paraplegia Due to Spinal Cord Ischemia and Its Use to Investigate Iron Chelator Treatment"

11. **Michael Hiles**, PhD 1992
"Biologic and Mechanical Properties of Small Intestinal Submucosa as a Tissue Graft"
Current Position: Director of Research

12. **Brian Ferrand**, MS 1993
"Mechanical Properties of Small Intestinal Submucosa as a Tissue Graft"
Current Position: Director of Research

13. **Robert Tullius**, MS. 1995
"Mechanical Properties of Small Intestinal Submucosa as a Tissue Graft"
Current Position: Director of Research

14. **Jennifer Simon**, MS 1995
"The Suture Retention Strength of Porcine Small-Intestinal Submucosa"

15. **Joe Obermiller**, MS 1996
"Physical and Mechanical Properties of Remodeled Myocardial Tissue Following ECM Scaffold Placement"

16. **Jason Hodde,** MS 1994
"Remodeling Characteristics of the Rabbit Achilles Tendon Complex Following Repair with Small Intestinal Submucosa"

17. **Jason Hodde,** PhD 1997
"Remodeling Characteristics of the Rabbit Achilles Tendon Complex Following Repair with Small Intestinal Submucosa"
Current Position: Director of Research

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18. **Chad MacAlexander**, MS 1997
"Mechanical Properties of Small Intestinal Submucosa: An ECM Scaffold for Tissue Engineering Applications"

19. **Chris O'Keefe**, MS 1998
"The Effect of External Stressors on the Remodeling of an Achilles Tendon Repair Augmented with Small Intestinal Submucosa"

20. **Rick Gemeinhart,** PhD 1999
"Porosity of Polylactic Glycolic Acid Co-Polymers for Therapeutic Applications"

21. **Neelam Paranjpe**, MS 1999
Mechanical Engineering.
"Study of Canine Prostate Vasculature"

22. **Glenn Gaudette**, PhD 2002
Biomedical Engineering
"The Use of Spectral Imaging in Medicine"

23. **Jinhong Zhu**, PhD 2007
"Novel Approaches to Improve Skeletal Muscle Healing through Inhibition of Myostatin or Overexpression of Follistatin"

24. **Noah Pappas**, MS 2007
Biomedical Engineering
"Potential of a Bioscaffold to Enhance the Healing of the MCL Following a Mop-End Tear: An Animal Model Study"

25. **Faisal Shaikh**, MD, PhD 2008
External Assessor - University of Limerick.
"Effects of Physiological Stresses on Tissue-Engineered Vascular Grafts"

26. **Scott Zundel**, MS 2008
Biomedical Engineering

27. **Anthony Callanan**, PhD. 2009

28. **William C.W. Chen** MD / PhD 2012
Bioengineering
"The Role of Human Blood-Vessel-Derived Stem Cells in Tissue Repair and Regeneration"

29. **Hanna Valli**, PhD 2014
University of Pittsburgh, Molecular Genetics and Developmental Biology
"Preserving male fertility with spermatogonial stem cells"

30. **Catherine Hagandora**, PhD 2013
Bioengineering
"Tissue Engineering of the Temporomandibular Joint"

31. **Patrick Boyer**, PhD 2015
Carnegie Mellon University, Chemical Engineering
"Interaction of Single Wall Carbon Nanotubes with Immune Cells"

32. **Jonathon Strauser** 2015
Bioengineering
"Use of Fish Gill as Oxygenator"

33. **Saik-Kia Goh (Kia)** 2016
University of Pittsburgh, Bioengineering
"Decellularized Pancreas Scaffold for Pancreatic Differentiation of hESC"

34. **Katie Farraro** 2015
Bioengineering
"Functional Tissue Engineering of the Anterior Cruciate Ligament Using Bioresorbable Metallic and Extracellular Matrix Bioscaffolds"

35. **Johannes Kutten** 2016
Cellular and Molecular Pathology
"TSP1/CD47 signaling limits tracheal Repair and Regeneration"

36. **Shahab Shaffiey**, MD Masters of Clinical Experience 2015
UPMC General Surgery Resident
"Generation of a tissue-engineered small intestine"

37. **Jonquil Mau** 2017
"Clinical Translation of Resorbable Metallic and Extracellular Matrix Bioscaffolds for Regeneration of the Anterior Cruciate Ligament"

38. **Sam LoPresti** 2018
Bioengineering
"Extracellular matrix as a mechanism of macrophage dysfunction in aged muscle regeneration following injury"

39. **Lina Quijano** 2018
"Comparative *in vitro* model to study early events of epimorphic regeneration"

40. **Joshua Tashman** PhD Expected 2021
CMU and UPitt Medical Scientist Training Program
"3D Printed Collagen Tracheal Scaffolds with Biomimetic Microstructure"

41. **Aysegul Dede** PhD 2021
Eindhoven University of Technology, Netherlands
"Nature-inspired Biomaterials Discovery for Tendon Tissue Engineering"

Visiting Scholars

1. Aditya Joshi. Visiting Scholar.
2. Alejandro Nieponice MD, PhD. Visiting Scholar.
3. Mike Sawkins. Visiting Scholar. November 2010.
4. Abiraman Srinivasan, M. Phil, PhD. Visiting Scholar. April 2012 – February 2013.
5. Kristen Jones, MD/PhD. Visiting Resident. July 2011 – March 2012.
6. Jian (Timothy) Zhang, MD, PhD. Visiting Scholar. February 2012 - February 2012.
7. Yan Jiang. Visiting Scholar. December 2010 – December 2012.
8. Frederik Ceyssens, PhD. Visiting Scholar. January 2013 – March 2013.
9. Sophie Hollands, Visiting Scholar. June 2013 - September 2013.
10. Serhiy Forostyak. Visiting Scholar. April 2013 – April 2013.
11. Sarka Kubinova, PhD. Visiting Scholar. April 2013 – April 2013.
12. Jeremy Gale. Trainee. Visiting Scholar. January 2013 - March 2013.
13. Nyla Niam. Trainee. Visiting Scholar. January 2013 - March 2013.
14. Prishanti Patil. Trainee. Visiting Scholar. September 2013 – December 2013.
15. Mike Calderon. Trainee. Visiting Scholar. January 2014 - March 2014.
16. Lisa White. Visiting Post-Doctoral Fellow. June 2014 – TBD.
17. Mark Murdock. Trainee. Visiting Scholar. September 2014 – December 2014.
18. Maria Cristina Quidgley-Martin. Visiting Scholar. October 2014 – November 2014.
19. Juan Diego Naranjo. Visiting Scholar. March 2015 – June 2015.
20. Shahab Shaffiey. Visiting Resident.
21. Kendra Sayles. Trainee. Visiting Scholar.
22. Colin Beckwitt. Trainee. Visiting Scholar. June – August 2013.
23. Nick Siebenlist. Trainee. Visiting Scholar. June – August 2013.

24. Crisanto Torres. Visiting Scholar. July 2015 – June 2017

25. Kataryzna Nawrotek. Visiting Scholar. 2014 – 2015.

26. Francesca Torri. Visiting Scholar. July 2015 – October 2015.

27. Justin Tay. Trainee. Visiting Scholar. June– August 2014 and August – September 2015.

28. Nick Smith. Trainee. September – December 2015.

29. Urszula Zdanowicz. Visiting Scholar. October 2015.

30. Theresa Rausch. Visiting Scholar. November 2015 – June 2016.

31. Tatiana Vorobyov. Visiting Scholar. August 2016 – March 2017.

32. Jordan Chang. Health Sciences Research Fellow. August 2016 – July 2019.

33. Angela Ramirez. Visiting Scholar. September – December 2016.

34. Tatiana Vorobyov. Health Sciences Research Fellow. May – October 2017.

35. Nazia Mehrban. Visiting Scholar. July – December 2017.

36. Li Xue. Visiting Scholar. September 2017 – September 2019.

37. Neil Khurana. Visiting Scholar. January 2018 -May 2018.

38. Salma El-Mossier. Visiting Scholar. January 2018 – April 2020.

39. Rania Nossair. Visiting Scholar. January 2018 – June 2018.

40. Ahmed Bendari. Visiting Scholar. June 2018 – June 2019.

41. Janani Guru. Visiting Scholar. August 2018 – April 2019.

42. Xiaoxia Sun. Visiting Scholar. January 2019 – May 2019.

43. Paula Vega. Visiting Scholar. January 2019 – May 2019.

44. Maria Sady. Visiting Scholar. June 2019 – September 2019.

45. Gabriela Gajewska. Visiting Scholar. June 2019 – September 2019.

46. Andrew Gutierrez. Health Sciences Research Fellow. August 2019 – December 2020.

47. David Nascari. Health Sciences Research Fellow. April 2020 – June 2021.

48. Kelsey Hall. Health Sciences Research Fellow. April 2020 – October 2021.

49. Remya Kommeri. Visiting Scholar. March 2021 – present.

50. Jordan Chang. November 2021 – present.

51. Vincent Anto. June 2022-present.

52. Runzhi Liao, March 2022 – December 2023.

Postdoctoral Fellows

1. Jack Debes. Director of Research. Mechanical Testing of Biomaterials. 1995.
2. Tim McPherson. December, 1995 – May, 1997.
3. Julie Myers-Irvin. July 2005 – July 2007.
4. Annie Liang. December 1997 – February 1999.
5. Annie Lee. 2005 – 2007.
6. Allison Beattie. November 2006 – November 2008.
7. Alan Boruch. July 2007 – June 2009.
8. Neill Turner. August 2007 – August 2010.
9. Kerry Daly. July 2008 – July 2011.
10. Alex Huber. April 2009 – December 2011.
11. Brandon Reines. June 2009 – June 2010.
12. Peter Crapo. March 2010 – March 2012.
13. Jeremy Kelly. October 2010 – September 2012
14. Christopher Dearth. July 2011 – July 2013.
15. Elizabeth Kollar. October 2011 – June 2013.
16. Marc Hansel. June 2011 – March 2012.

17. Peter F. Slivka. September 2012 – October 2014.

18. Fan-Wei Meng. June 2012 – June 2014.

19. Nicholas Amoroso. July 2013 – April 2014.

20. Alessandra Costa. February 2014 – January 2016.

21. Ilea Swinehart. June 2014 – November 2015.

22. Luai Huleihel. October 2014 – December 2016.

23. George Hussey. February 2015 – July 2016.

24. Michelle Scarritt. June 2015 – May 2017.

25. Juan Diego Naranjo. November 2015 – March 2018.

26. Jonas Eriksson. April 2017 – March 2019.

27. Lina Quijano. May 2018 – April 2020.

28. William D'Angelo. June 2018 – TBD.

29. Catalina Pineda Molina. August 2018 – August 2020.

30. Lindsey Saldin. October 2018 – December 2020.

31. Arthi Shridhar. September 2019 – August 2021.

32. Teresa Anguiano. July 2020 – January 2020.

33. Hector Capella. October 2020 –October 2023.

34. Marley Dewey. July 2021 – August 2023.

35. Daniela Romero. December 2022 – TBD.

Graduate Teaching Activities

- Scaffolds for Regenerative Medicine (BIOENG 3015) 2006-2010.

Service Activities – Editorial

- Editor-in-Chief, *Journal of Immunology and Regenerative Medicine*, September 2016 - Present

- International Editorial Board Member, *Biomaterials*. 2007 – Present
- Editorial Board Member, *International Journal of Artificial Organs*. 2009 – Present
- Editorial Board, *Frontiers in Immunology*. April 2015 – present
- Associate Editor, *Cells, Tissues, Organs*. 2004 – 2013
- Guest Editor, *PNAS*. 2009
- Special Edition Editor, *PNAS*. 2010
- Textbook Editor, *Host Response to Biomaterials*. Oxford: Academic Press (Elsevier), San Diego, CA. 2015.
- Textbook Editor, *Immunomodulatory Biomaterials: Regulating the Immune Response with Biomaterials to Affect Clinical Outcome*. Woodhead Publishing (Elsevier), Cambridge, UK. 2021.

Service Activities – Extramural Review Panel Member

Journal Reviewer:

ACS Applied Material Interfaces
ACS Biomaterials Science & Engineering
Acta Biomaterialia
Advanced Materials
Advanced Science
American Association for the Advancement of Science (AAAS)
Annals of Biomedical Engineering
Annals of Surgery
Annals of the New York Academy of Sciences
Biomacromolecules
Biomaterials
Biomaterials Science
Biomedical Materials
Biotechnology and Bioengineering
Cell Transplantation
Cells
Circulation
European Journal of Immunology
FASEB
Frontiers in Immunology
International Journal of Biological Macromolecules
International Journal of Molecular Medicine
International Journal of Molecular Sciences
Journal of Biomaterials Science

Journal of Biomedical Materials Research
Journal of South African Veterinary Medicine
Journal of Surgical Research
Journal of Tissue Engineering and Regenerative Medicine
Journal of Translational Medicine
Matrix Biology
Nature Biomedical Engineering
Nature Biotechnology
Nature Communications
Nature Materials
Nature Medicine
Nature Nanotechnology
New York Academy of Science
NPJ Regenerative Medicine
Plastic and Reconstructive Surgery
PLOS One
Polymers
Proceedings of the National Academy of Science
Science
Science Translational Medicine
Scientific Reports
Stem Cells
Stem Cells and Development
Stem Cells Research & Therapy
Stem Cells Translational Medicine
The Lancet
Tissue and Cell
Tissue Engineering
Xenotransplantation

Service Activities – NIH Study Section Service

- Member of the first College of Scientific Reviewers (CSR), 2010 – present.
- Special Emphasis Study Sections, ad hoc 2006 – present.
- Participates in approximately 4-6 panel section reviews per year.
- Study Section Member F31/F32, ad hoc 2006, 2007, 2010, 2011, 2012, 2013, 2014.
- Study Section Member, Bioengineering, Technology, and Surgical Sciences (BTSS), 2002 – June 2012.
- Study Section Chairperson, Bioengineering, Technology, and Surgical Sciences (BTSS), July 1, 2004 – June 30, 2006

- Study Section Member, Surgery and Bioengineering, ad hoc 1997-2002.

- Study Section Chairperson, Small Business Innovation Research (SBIR); 1995 – 2002, ad hoc member in 2010.

Service Activities - European Science Foundation

- Member of College of Expert Reviewers, 2018-present

Service Activities – Selected Other Institutes/Entities

- Czech Science Foundation
- Danish Council for Strategic Research
- European Commission
- European Research Council
- European Science Foundation
- Evaluation of Swedish Research in Biomedical Engineering
- Foundation for Polish Science
- French National Research Agency
- Medical Research Council
- National Science Centre, Poland
- National Science Foundation
- Natural Sciences and Engineering Research Council of Canada and the Canadian Institutes of Health Research
- National Institutes of Health
- Ontario Research Fund
- Orthopaedic Research and Education Foundation
- Research Grant Council of Hong Kong
- Romanian Government through the National Research Council
- Science Foundation Ireland
- Swiss National Science Foundation
- UK Regenerative Medicine Platform
- US Army Medical Research and Materiel Command
- Wellcome Trust

Consultant and Scientific Advisory Board Membership

1. Food and Drug Administration – Advisory Board Member for Tissue Engineered Heart Valves; 2003 – 2007.

2. *Scientific Advisory Board Member*:
   ACell, Inc. (2002-2005)
   Asana Medical Inc. (2013 – present)

Biostage (2017 – present)
Carmell Therapeutics Corporation (2009-present)
Cellular Logistics (2017 – present)
Coloplast, Inc, Copenhagen, Norway. 2005 – 2007
Cook Biotech, Inc (1995-1998, Chair 1995-1996)
DePuy, Inc. (1994-2005)
Genesis Orthopaedics (1997 – 1999)
Guidant Corporation (2003 – 2004)
HistoGen (Chair 2007-May 2012)
Humacyte Scientific Advisory Board (2005 – present)
InMotion Musculoskeletal Institute (2006 – 2010)
Neograft (2015 – present)
Methuselah Foundation (2010)
Miromatrix (2015 – present)
Revivicor (2006 – 2008)
Ratner Biomedical (2010)
Sentron Medical Ventures (Chair 1994 – 1997)
South Texas Blood and Tissue (2010-2012)
Tengion (2005 – 2010)
TERMIS – Vienna 2012
The Cure is Now (2011-May 2012)

3. Chair, Purdue University Tissue Engineering Advisory Board, 1997 to 2002

4. Food and Drug Administration – Ad hoc Advisory Board Member for Medical Devices, Metal Implants. 2019.

5. Food and Drug Administration – Voting Member of the Immunology Devices Panel of the Medical Devices Advisory Committee. 2022.

Abstracts and Presentations at Scientific Meetings (Partial List - last 3 years; only 1st author or presenter are listed):

1. 3M Wound Healing Symposium. "Wound Healing: What's Best? What's Next?" Co-presented with Dr. Yoram Vodovotz, PhD. May 10, 2022. (Virtual conference.)

2. British Society for Matrix Biology. "Matrix Bound Nanovesicles: A Tissue Specific Mechanism for Cell:Cell Communication." (Virtual conference.)

3. Symposium on Advanced Wound Care (SAWC). "Biomaterials: What's Best, What's Next." Co-presented with Dr. Yoram Vodovotz, PhD. April 7, 2022. Phoenix, AZ.

4. 2022 Missouri Musculoskeletal Research Symposium. "Acellular Approach toe Skeletal Muscle Regeneration: Clinical Translation." April 1, 2022. (Virtual conference.)

5. Japanese Society for Regenerative Medicine Congress (JSRM). "Factors that Regulate Cell Behavior During Health and Disease." March 16, 2022. (Virtual conference.)

6. Solve FSHD – Muscle Regeneration Thought Leaders Meeting. "Clinical Translation of Regenerative Medicine." February 1, 2022. Providenciales, Turks and Caicos.

7. 2022 Workshop on Advances in Immunoengineering: Fundamentals and Cutting-edge Advances. Johns Hopkins Translational ImmunoEngineering Center. "Immunoengineering… Finally!" January 11, 2022. (Virtual conference.)

8. Innovations in Wound Healing Meeting. "The Wound Microenvironment: Interrogation, Control, and Outcome Management" in *Scientific Session 11: Healing Telemetry for Complex Wounds*. December 12, 2021. Duck Key, FL.

9. University of Wisconsin – Madison, Regenerative Medicine Center Seminar Series. "Stem Cells vs. Immune Cells: The Chicken vs. The Egg." November 30, 2021. Madison, WI.

10. TERMIS 6th World Congress. Frontiers in Immunology Session. "Immunobiology as a Determinant of Successful Regenerative Medicine." November 15, 2021. (Virtual conference.)

11. Louis J. Fox Center for Vision Restoration Workshop. "Immunomodulation as an Ocular Therapy." October 20, 2021. (Virtual conference.)

12. Center for Dental, Oral, & Craniofacial Tissue & Organ Regeneration (C-DOCTOR) 2021 Summer Retreat, Keynote Presentation. "An Acellular Approach to Functional Craniofacial Reconstruction." Monday, June 7, 2021. (Virtual conference.)

13. International Society for the Advancement of Spine Surgery 21st Annual Conference. "Comparative Study of PEEK, Titanium and a PEEK-zeolite Composite for Their Effects on Macrophage Phenotype and Osteoblastic Differentiation." Friday, May 14, 2021. Miami, FL.

14. SAWC-WHS (Symposium on Advanced Wound Care – Wound Healing Society.) "Synthetic and Natural miRNAs for Wound Therapy." Friday, May 14, 2021. (Virtual conference.)

15. Columbia University Department of Biomedical Engineering Tissue Talk. "Mechanisms by which ECM-based bioscaffolds modulate cell behaviour." March 17, 2021. (Virtual lecture series.)

16. TERMIS/AST Webinar with Dr. Giuseppe Orlando. "Clinical Application and Translation of ECM-Based Biologic Scaffolds for Functional Tissue and Organ Replacement." March 16, 2021. (Virtual.)

17. Sechenov International Biomedical Summit 2020. "Biologic Scaffolds Composed of Extracellular Matrix for Regenerative Medicine." November 17, 2020. (Virtual Conference.)

18. Simmons Surgery Research Conference. "Mechanisms by Which ECM-based Surgical Meshes Facilitate Structural and Functional Tissue Repair." November 5, 2020. (Virtual Conference.)

19. The Eye & Ear Foundation of Pittsburgh – Sight + Sound Bites Webinar. "Matrix Bound Nanovesicles Preserve Retinal Ganglion Cell Function Following Acute Injury." September 1, 2020. (Virtual webinar presented with José-Alain Sahel, MD, Jeffrey Gross, PhD, Takaaki Kuwajima, PhD, Kun-Che Chang, PhD and Louis Fox.)

20. SAWC-WHS (Symposium on Advanced Wound Care – Wound Healing Society.) "Optimizing Healing of Chronic and Stalled Wounds: Role of Decellularized Graft Materials and Biofilm Removal." July 26, 2020. (Virtual Conference.)

21. Holy Cross Orthopaedic Spine Symposium. "Biomaterial-induced Immunomodulation and the Relevance to Orthopaedic and Spine Surgery." January 25, 2020. Ft. Lauderdale, FL.

22. Tissue Engineering and Regenerative Medicine International Society (TERMIS) Americas. "Regenerative Rehabilitation: Combining Tissue Engineering and Cellular therapies with Applied Biophysics to Optimize Outcomes". December 4, 2019. Orlando, FL.

23. Louis J. Fox Center for Vision Restoration Workshop. "Matrix Bound Nanovesicles Preserve Retinal Ganglion Cell Function Following Acute Injury." November 7, 2019. Miami, FL.

24. TEDx Fairfield University: Inspiration and Innovation. "Two Steps Forward, One Step Back." October 28, 2019. Fairfield, CT.

25. North American Spine Society 34th Annual Meeting. "The Primary Determinant of Success of Any Biomaterial is the Host Response." September 24, 2019. Chicago, IL.

26. American Society for Histocompatibility & Immunogenetics/BANFF Foundation for Allograft Pathology Joint Scientific Meeting. "Creating a Functional 3-Dimensional Liver." September 23, 2019. Pittsburgh, PA.

27. Joint Annual Conference of the Tissue and Cell Engineering Society (TCES) and UK Society for Biomaterials (UKSB) at the University of Nottingham. "Clinical Translation of an Acellular Therapy for Barrett's Esophagus." June 12, 2019. Nottingham, UK.

28. Sigmund Freud University Med Research Strategy Meeting (Biomedical and Tissue Engineering). Plenary Lecture, "Regenerative Medicine: Past, Present and Future Directions." June 7, 2019. Vienna, Austria.

29. 6th International Symposium on Interface Biology of Implants. "The Host Response to Biomaterials as the Ultimate Determinant of Clinical Outcome." May 10, 2019. Rostock, Germany.

30. Castellvi Spine Symposium. Session 1: Spine Biomechanics & Technology. "OsteoImmunology." April 25, 2019. Key West, FL.

31. Keynote Distinguished Lecture, Spring 2019 Seminar Series – Syracuse University. "The Crossroads of Developmental Biology, Immunology, and Biomedical Engineering Lead to Regenerative Medicine." April 19, 2019. Syracuse, NY.

32. Society for Biomaterials Annual Meeting & Exposition: The Pinnacle of Biomaterials Innovation and Excellence – Thought Leader Session, led by Dr. Jennifer Elisseeff. "Where Biomaterials Meet Biology." April 3, 2019. Seattle, WA.

Symposia:

- Chairman, Biologic Scaffolds for Regenerative Medicine Symposium
    - December 1996
    - December 1998
    - November 2000
    - December 2002
    - February 2008
    - April 2010
    - April 2012
    - April 2014
    - April 2016
    - April 2018
    - May 2021

- Co-Chairman Regenerative Medicine: Innovations for Clinical Applications, Hilton Head, SC, March 2012, March 2013, March 2014.

Textbooks, Book Chapters, Editorials, and Invited Publications:

1. **Badylak, S.F.** Coagulation Disorders and Liver Disease. Veterinary Clinics of North America. Vol. 18:1 (January) 1988, pp. 87-93.

2. **Badylak, S.F.** Small Intestinal Submucosa (SIS): a Smart Tissue Biomaterial Conducive to Remodeling. In *Tissue Engineering: Current Perspectives* Bell E (ed.). Burkhauser Publishers, Cambridge, MA; (April) 1993, pp. 179-189.

3. **Badylak, S.F.** Regenerative Bladder Augmentation: A Review of the Initial Preclinical Studies with Porcine Small Intestinal Submucosa. In *Muscle, Matrix, and Bladder Function*. Zderic S (ed.). Plenum Press, New York, NY, 1995, pp. 229-235.

4. **Badylak, S.F.** Preparation of Collagen-Based Scaffold Materials for Tissue Engineering. In *Methods of Tissue Engineering*. Atala A and Lanza R (eds.). Academic Press, San Diego, CA, 2000; Chapter 42, pp. 505-514.

5. **Badylak, S.F.** The Extracellular Matrix as a Substrate for Stem Cell Growth and Development and Tissue Repair. Burt R (ed.). Landes Bioscience, 2004; Chapter 13, pp 87-91.

6. **Badylak, S.F.** The Extracellular Matrix as a Scaffold for Tissue Reconstruction. Encyclopedia of Biomaterials and Biomedical Engineering. Bowlin G and Wnek G (eds.). Marcel Dekker, New York, NY, 2004; pp. 561-567.

7. **Badylak, S.F.** Regenerative Medicine Approach to Heart Valve Replacement. *Circulation*. 2005. 111(21):2715-6.

8. Freytes, D.O. and **Badylak, S.F.** Sterilization of Biologic Scaffold Materials. In *The Encyclopedia of Medical Devices and Instrumentation*. Webster, J. (ed.). John Wiley & Sons, Inc., Hoboken, NJ, 2006. pp. 273 – 282.

9. **Badylak, S.F.**, Gilbert, T.W., Nieponice, A. Tissue Engineering of the Esophagus. In *The Encyclopedia of Biomaterials and Biomedical Engineering*. Bowlin G and Wnek G (eds.). Marcel Dekker, New York, NY. 2006. pp. 1-6.

10. **Badylak, S. F.**, Gilbert, T. W., Myers-Irvin, J. The Extracellular Matrix as a Biologic Scaffold for Tissue Engineering. In *Tissue Engineering 1st Edition*. van Blitterswijk, Clemens, Thomsen, Peter, Lindahl, Andes, Hubbell, Jeffrey, Williams, David, Cancedda, Ranieri, de Bruijn, Joost, and Sohier, Jerome (eds.). Elsevier, San Diego, CA. 2008. pp. 121-143.

11. **Badylak, S. F.**, Basamania, C. Soft Tissue Reconstruction with Restore™ - A Biologic Scaffold. In *Atlas of Clinical, Imaging, Pathological and Shoulder Rehabilitation.* Idelson-Gnocchi, Naples, Italy, 2006. pp.197-207.

12. **Badylak S.F.** Biologic Scaffold Materials for Orthopaedic Soft Tissue Reconstruction. In Pietrzak WS, Epperly, B. L., ed. *Musculoskeletal Tissue Regeneration: Biological*

Materials and Methods. Pietrzak, William S. (ed.). Humana Press, Totowa, NJ 2008. pp. 443-457.

13. **Badylak, S.F.** Naturally Occurring Scaffold Materials for Regenerative Medicine. In *Principles of Regenerative Medicine.* Atala, A., Lanza, R., Thomson, J.A., Nerem, R.M. Elsevier, San Diego, CA., 2008. pp. 594-603.

14. **Badylak, S.F.**, Myers-Irvin, J.M. The Extracellular Matrix as a Biologic Scaffold for Wound Healing in Veterinary Medicine. In *Equine Wound Management, Second Edition*. Theoret, C.L., Stashak, T.S. (eds.) Blackwell Publishing, Ames, IA. 2008. pp. 161- 174.

15. **Badylak, S.F.**, Russell, A.J. The History of Regenerative Medicine. In *Biomedical Strategies in Regenerative Medicine: from Basic Science to Technology.* Santin, M (ed) Springer, New York, NY. 2009. Pp. 1-13.

16. **Badylak, S.F.** and Gilbert, T.W. Tracheal Replacement with Cryopreserved, Decellularized or Glutaraldehyde Treated Aortic Allografts. (Commentary). *The Annals of Thoracic Surgery*. 2009. 2009 Mar;87(3):868.

17. **Badylak, S. F.**, Ogilvie, J.B., and Gilbert T. W. Functional Tissue Reconstruction with the Use of Biologic Scaffolds. *Stem Cell Therapy for Diabetes.* Ed by S Efrat. New York, Springer. 2010. pp. 223-240.

18. Pavlick, Matthew, D. (Reppas, S.N., Chung, W.L. and **Badylak, S. F**.) The Use of Xenogenic Extracellular Matrix Scaffold for Guided Reconstruction of the Temporomandibular Joint Meniscus in a Canine Model. *AAOMS.* 2009 pp33-34.

19. **Badylak SF,** Brown B. N., & Gilbert T. W. (2013). Tissue engineering with decellularized tissues. In B. D. Ratner, A. S. Hoffman & F. J. Schoen (Eds.), *Biomaterials Science* (pp. 1316–1331). Elsevier Inc., Academic Press.

20. Turner NJ, **Badylak SF**. Advanced wound repair therapies. *Wound Repair and Regeneration.* Woodhead Publishing Limited. (June 2011). *David Farrar* is Science Manager for Biomaterials at the Smith and Nephew Research Centre, York, UK. 2010 pp 463-494.

21. Huber A, **Badylak SF**. Naturally Occurring Scaffold Materials for Regenerative Medicine. *Principles of Regenerative Medicine 2nd Edition.* Atala A, Lanza R, Thomson JA, Nerem RM. Elsevier. San Diego, CA. 2011 pp 623-636.

22. Daly K, Brown B, **Badylak SF**. Regenerative Medicine and the Foreign Body Response. *Tissue Engineering in Regenerative Medicine.* Bernstein HS. Humana Press. New York, NY. 2011 pp 353-375. Doi:10.1007/978-1-61779-3226

23. Sicari BM, Turner NJ, **Badylak SF**. An in vivo model system for evaluation of the host response to biomaterials in *Methods Mol Biol*. 2013;1037:3-25. Wound Regeneration and Repair: Methods and Protocols. Gourdie RG, Myers A. (eds.) Humana Press doi: 10.1007/978-1-62703-505-7_1. PubMed PMID: 24029927.

24. **Badylak SF**, Hirschi KK, Niklason LE. Cardiovascular regenerative biology. *Cells Tissues Organs*. 2012;195(1-2):4. doi: 10.1159/000331947. Epub 2011 Oct 12. PubMed PMID: 22179179.

25. Agrawal V, **Badylak SF**. Biologic Scaffolds for Regenerative Medicine. *Biomaterials and Regenerative Medicine*. Ma, Peter X (ed). Cambridge University Press. 2015: pp 133-150.

26. **Badylak SF**. Invited commentary. *Ann Thorac Surg*, 2012. 93 (4): 1093. PMID: 22450064.

27. Brown BN, **Badylak SF**. The Role of the Host Immune Response in Tissue Engineering and Regenerative Medicine in *Principles of Tissue Engineering, 4th Edition*. Lanza R, Langer R, Vacanti J. (eds.) Elsevier. San Diego, CA. 2013 pp 497-510.

28. Sicari BM, Dearth CL, **Badylak SF**. Tissue engineering and regenerative medicine approaches to enhance the functional response to skeletal muscle injury. *Anat Rec* (Hoboken). 2014 Jan;297(1):51-64. doi: 10.1002/ar.22794. Epub 2013 Dec 2. PubMed PMID: 24293290.

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