

BIOGRAPHICAL SKETCH

Provide the following information for the key personnel and other significant contributors in the order listed on Form Page 2.
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NAME Martha Meaney Murray	POSITION TITLE Assistant Professor in Orthopaedic Surgery		
eRA COMMONS USER NAME (credential, e.g., agency login) MMURRAY			
EDUCATION/TRAINING <i>(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)</i>			
INSTITUTION AND LOCATION	DEGREE <i>(if applicable)</i>	YEAR(s)	FIELD OF STUDY
University of Delaware, Newark, DE	B.M.E.	1987	Mechanical Engineering
Stanford University, Stanford, CA	M. S.	1990	Mat'l Sci and Eng'g
University of Pennsylvania, Philadelphia, PA	M. D.	1994	Medicine
Massachusetts General Hospital, Boston, MA		1995	Gen Surg Internship
Harvard Combined Orthopaedic Residency Program		1999	Orthopaedic Surgery

A. Positions and Honors

Positions

1994-1999	Orthopaedic Surgery Resident, Harvard Combined Orthopaedic Residency Program
2000	Trauma Fellow, Brigham and Women's Hospital
1999-2002	Associate Orthopaedic Surgeon, Brigham and Women's Hospital
2001-2002	Fellow, Pediatric and Adult Sports Medicine
2000-2002	Instructor in Orthopaedic Research, Harvard Medical School
2003-2006	Instructor in Orthopaedic Surgery, Children's Hospital of Boston
2006-Present	Assistant Professor in Orthopaedic Surgery, Children's Hospital, Boston

Honors

1987	First Prize, Senior Mechanical Engineering Design Competition, Univ of Delaware
1987	Univ of Delaware Mechanical Engineering Faculty Award for contribution to class
1993	NCMPA Nomination as one of top two students in Internal Medicine at Univ of Penn
1994	Alpha Omega Alpha Election
1999	AOA-Zimmer Travel Award for Resident Research
2000	Charles H. Herndon Residency Research Award (sponsored by the Orthopaedic Research and Education Foundation and Musculoskeletal Transplant Foundation)
2001	Cabaud Award for Orthopaedic Sports Medicine Research (AOSSM)
2001	Harvard Medical School 50 th Anniversary Scholar in Medicine
2002	Kilfoyle Award, New England Orthopaedic Society
2004	Basic Science Poster Prize, German Academy of Orthopaedic Surgeons.
2006	ACL Study Group Traveling Scientist
2008	University of Delaware Distinguished Alumni Award

Professional Societies

1996	American Academy of Orthopaedic Surgeons	Member
1999	Ruth Jackson Orthopaedic Society	Member
2001	Orthopaedic Research Society	Member
2002	American College of Sports Medicine	Member
2002	FORUM Study Group	Member
2005	Multicenter Orthopaedic Outcomes Network	Member
2005	Pediatric Orthopaedic Society of N. America	Member
2005	Anterior Cruciate Ligament Study Group	Member
2006	American Orthopaedic Society for Sports Medicine	Member

B. Publications

1. **Murray, M. M.**, Spector, M. Fibroblast distribution in the anteromedial bundle of the human anterior cruciate ligament: The presence of α -smooth muscle actin-positive cells. *J Orthop Res* 1999; 17:18-26.
2. **Murray, M.M.**, Martin, S. D., and Spector, M. The migration of cells from human anterior cruciate ligament explants into three dimensional collagen-glycosaminoglycan scaffolds *in vitro*. *J Orthop Res* 2000; 18: 557-64.
3. **Murray, M. M.**, Martin, S. D., Martin, T. L., and Spector, M. Histologic changes in the human anterior cruciate ligament after rupture. *J Bone Joint Surg* 2000; 82A:1387-1397.
4. Qiu, W., **Murray, M. M.**, Shortkroff, S., Lee, C. R., Martin, S. D., and Spector, M. Outgrowth of chondrocytes from human articular cartilage explants and expression of α -smooth muscle actin. *Wound Repair and Regeneration* 2000; 18:383-391.
5. Premdas, J., Tang, J.-B., Warner, J. P., **Murray, M.M.**, and Spector, M. The presence of smooth muscle actin in fibroblasts in the torn human rotator cuff. *J Orthop Res*, 2000; 19(2): 221-228.
6. Ahluwalia S., Fehm M., **Murray M. M.**, Martin S.D., and Spector, M. Distribution of Smooth Muscle Actin-Containing Cells in the Human Meniscus. *Orthop Res*, 2000; 19(4): 649-654.
7. **Murray, M. M.** and Spector, M. The migration of cells from the ruptured human anterior cruciate ligament into collagen-glycosaminoglycan regeneration templates *in vitro*. *Biomaterials* 2001; 22:2393-2402.
8. **Murray, M. M.**, Bennett, R. L., and Spector, M. S. Cell Outgrowth from the human ACL *in vitro*: Regional variation and response to TGF- β 1. *J Orthop Res* 2002; 20:875-880.
9. Spindler, K. P., **Murray, M. M.**, Detwiler, K. B., Tarter, J. T., Dawson, J. M., Davidson, J. M., Nanney, L. B., The biomechanical response to doses of TGF- β 2 in the healing rabbit medial collateral ligament. *J Orthop Res*, 2002; 21(2): 245-249.
10. **Murray, M. M.**, Zurakowski, D., Vrahas, M. S., The death of articular chondrocytes after intra-articular fracture in humans. *Journal of Trauma*, 2004; 56: 128-131.
11. Kolker D, **Murray, M. M**, Wilson M. Osteochondral defects of the talus treated with autologous bone grafting. *J Bone Joint Surg Br*, 2004; 86(4): 521-526.
12. Pascher A., Steinert A. F., Palmer G. D., Betz O., Gouze J.N., Gouze E., Pilapil C., Ghivizzani S.C., Evans C.H., **Murray M.M.** Enhanced Repair of the Anterior Cruciate Ligament by *in Situ* Gene Transfer: Evaluation in an *in Vitro* Model. *Molecular Therapy* 2004; 10(2): 327-336.
13. **Murray, M. M.**, Weiler A., Spindler K. P. Interspecies Variation in the Fibroblast Distribution of the Anterior Cruciate Ligament. *Am. J. Sports Med.* 2004.
14. Steinert A.F., Chen F., Evans C.H., **Murray, M.M.**, Novel Biological Approaches to Enhance Primary Repair of the Anterior Cruciate Ligament. *Harvard Orthopaedic Journal* 2004; 81-83.
15. **Murray, M. M.**, Spindler, K. P., Anterior Cruciate Ligament Healing and Primary Repair, *Sports Medicine and Arthroscopy Review*, 2005; 13(3), 151-6.
16. **Murray, M. M.**, Forsythe B, Chen F, Lee S. J., Yoo, J. J., Atala A, Steinert A. The Effect of thrombin on ACL fibroblast interactions with collagen hydrogels. *J Orthop Res* 2006; 24:508-515.
17. Spindler, K. P., **Murray, M. M.**, Devin D, Nanney, L. B., Davidson, J. M. The central ACL defect as a model for failure of intra-articular healing. *J Orthop Res* 2006; 24:401-406.
18. **Murray, M. M.**, Spindler, K. P., Devin C, Snyder, B. D., Muller J, Ballard P, Nanney, L. B., Zurakowski D. Use of a collagen-platelet rich plasma scaffold to stimulate healing of the ACL. *J Orthop Res* 2006, 24:820-830.
19. Mahan, S., **Murray, M.M.**, Woolf, A., Kasser, J. Increased Blood Lead Levels in an Adolescent Girl from a Retained Bullet: A Case Report. *J Bone Joint Surg.* 2006 88(12):2726-9.
20. **Murray, M.M.**, Spindler, K.P., Abreu, E., Muller, J., Nedder, A., Kelly, M., Frino, J., Zurakowski, D., Valenza, M., Snyder, B.D. and Connolly, S.A. Collagen-Platelet Rich Plasma Hydrogel Enhances Primary Repair of the Porcine Anterior Cruciate Ligament. *J Orthop Res.* 2007 25(1):81-91.
21. Mesiha, M., Zurakowski, D., Soriano, J., Nielson, J. H., Zarins, B., **Murray, M.M.** Pathology of the Torn Human Meniscus. *Am. J. Sports Med.* 2007;35(1):103-12.
22. **Murray, M. M.**, Spindler, K.P., Ballard, P., Welch, T., Nanney, L.B. Enhanced Histologic Repair in a Central Defect in the ACL with a Collagen-PRP Scaffold. *J Orthop Res*, 2007;25(8):1007-17..
23. Kocher MS, Kasser JR, Waters PM, Bae D, Snyder BD, Hresko MT, Hedequist D, Karlin I, Kim Y-J, **Murray MM**, Millis MB, Emans JB, Dichtel L, Matheney T, Lee B. Lateral entry compared with medial and

- lateral entry pin fixation for completely displaced supracondylar humeral fractures in children. A randomized clinical trial. *Journal of Bone and Joint Surgery Am* 2007; 89:706-712.
24. Fufa, D., Shealy, B., Jacobson, M., Kevy, S., **Murray, M. M.** Activation of platelet-rich plasma using soluble type I collagen. *Journal of Oral and Maxillofacial Surgery*, 2008; Apr 66(4):684-90.
 25. Steiner, ME, **Murray, M.M.** and Rodeo, S.A. Strategies to Improve Anterior Cruciate Ligament Healing and Graft Placement, *American Journal of Sports Medicine*, 2008; Jan;36(1):176-89.
 26. Steinert, A.F., Weber, M., Kunz, M. Palmer, G.D., Noth, U., Evans, C.H., **Murray, M.M.** In situ IGF-1 gene delivery to cells emerging from the injured anterior cruciate ligament, *Journal of Biomaterials*, 2008; 29(7):904-16.
 27. Jacobson, M., Fufa, D., Abreu, E., Kevy, S., **Murray, M. M.** Platelets, but not erythrocytes, significantly affect cytokine release and scaffold contraction in a provisional scaffold model. *Wound Repair and Regeneration*, 2008; May-Jun;16(3):370-8.
 28. Fleming, B. C., Carey, J., Spindler, K.P., **Murray, M. M.** Can Suture Repair of ACL Transection Restore Normal Anteroposterior Laxity of the Knee? An Ex Vivo Study. *J Orthop Res.* 2008 Nov;26(11):1500-5.
 29. Kurt P. Spindler, MD, **Martha M. Murray, MD**, James L. Carey, MD, David Zurakowski, PhD, Braden C. Fleming, PhD. The Use of Platelets to Affect Functional Healing of an Anterior Cruciate Ligament (ACL) Autograft in a Caprine ACL Reconstruction Model. In press, *J Orthop Res.*
 30. Butler, DL, Lewis, JL, Frank, CB, Banes, AJ, Caplan AI, DeDeyne, PG, Dowling, M, Fleming BC, Glowacki, J, Guldbery, RE, Johnstone, B, Kaplan DL, Levenston, ME, Lotz, JC, Lu, EY, Lumelsky, N, Mao, JJ, Mauck, RL, McDevitt, CA, Mejia, LC, **Murray, MM**, Ratcliffe, A, Spindler KP, Tashman, S, Wagner, CT, Weisberg, EM, Williams, C, Zhang, R. Evaluation Criteria for Musculoskeletal and Craniofacial Tissue Engineering Constructs: A Conference Report. *Tissue Engineering*, accepted for publication, 2008.
 31. Richard V. Pearse II, Diana Eshaki, Clifford J. Tabin, **Martha M. Murray**. Genome-wide expression analysis of intra- and extra-articular connective tissue. *J Orthop Research*, in press.
 32. **Martha M. Murray**, Matthew Palmer, Eduardo Abreu, David Zurakowski, Kurt P. Spindler, and Braden C. Fleming. PLATELET-RICH PLASMA ALONE IS NOT SUFFICIENT TO ENHANCE SUTURE REPAIR OF THE ACL: AN IN VIVO STUDY. In press, *J Orthop Res.*
 33. Matthew Palmer, Eduardo Abreu, Ashley Mastrangelo and **Martha M. Murray**, Injection Temperature Significantly Affects In Vitro and In Vivo Performance of Collagen-Platelet Scaffolds, *Journal of Orthopaedic Research*, in press.
 34. **Martha M. Murray**, Current Status and Future Potential of Primary ACL Repair, *Clinics in Sports Medicine*, in press.

C. Research Support

ACTIVE

R01 AR052772 (PI: Murray)

9/1/07 – 8/31/11

NIAMS/NIH

A Novel Mechanism for Intra-articular Non-Union

This grant examines the effect of platelet concentration in the wound site on the functional healing of ligaments.

Role: Principal Investigator

R01 AR054099 (PI: Murray)

7/1/06 – 6/30/09

NIH/NIAMS

The Effect of Age on Functional ACL Healing.

This grant examines the effect of skeletal maturity on the functional healing of ligaments.

Role: Principal Investigator

R01 AR053684 (PI: Spindler, Murray PI on CHB subcontract)

12/1/2006-11/30/2010

NIH/NIAMS

PROGNOSIS AND PREDICTORS OF ACL RECONSTRUCTION: A MULTICENTER COHORT STUDY

The goals of this study are to determine the effect of modifiable risk factors on knee function, osteoarthritis and re-rupture of the ACL after ACL reconstruction.

Role: PI on CHB subcontract

R01 AR 052809 (PI: Evans, Murray PI on CHB subcontract) 12/1/2006-11/30/2010

NIH/NIAMS

A Biologic Basis for ACL Repair

To evaluate the mechanical strength for ACL repair using a gene-laden reinforced hydrogel.

Role: PI on Children's Hospital Subcontract

K02 AR049346 4/1/2004 – 3/31/2009

National Institutes of Health/NIAMS

Enhanced Primary Healing of the ACL

This is a K02 Career Development Award that provides salary support for Dr. Murray to support her research work in determining the differences in intra-articular and extra-articular ligament healing.

CIMIT Application Development Award 10/1/2006 – 12/31/2008

Center for Innovative and Minimally Invasive Technology

ARTHROSCOPIC JOINT REPAIR SYSTEM

The goals of this study are to perform validation studies in our large animal model demonstrating both safety and efficacy of the current collagen-PRP gel and delivery system and to characterize the current collagen-PRP hydrogel.

Role: Principal Investigator

SELECTED RECENTLY COMPLETED RESEARCH SUPPORT

Research Grant 7/1/2005-6/30/2007

Orthopaedic Research and Education Foundation

Enhanced Anterior Cruciate Ligament Repair Using Collagen-PRP Scaffolds

This project focuses on evaluating collagen-PRP scaffolds biomechanically and histologically in the central defect ACL model. Role: Principal Investigator

Research Grant 12/31/2004 – 6/30/2006

National Football League Medical Charities

Stimulation of Intra-articular Defect Healing

This work focused on in vivo study of the repair response for soft tissue injuries in the joint. This project resulted in development and validation of a large animal model of ligament injury and three publications.

Role: Principal Investigator

National Football League Medical Charities 2002-2004

Growth Factor Delivery Systems for Stimulation of ACL Healing

Role: Principal Investigator

R03 AR 46356 1999-2002

NIAMS

Scaffold Optimization for Healing of the Ruptured Human ACL

The goals of this project were to determine the effects of growth factor addition to collagen scaffolds on ACL cell proliferation, migration and collagen production.

Role: Principal Investigator

Research Grant 1/1/2007 – 12/31/2007

Musculoskeletal Transplant Foundation

The effect of Storage Conditions on the Collagen Composition of Soft Tissue Allografts

To study the effects of tendon storage on the biologic effectiveness of collagen hydrogels prepared from tendon. Effective conversion of allograft tendon into collagen hydrogels could significantly increase the indications for allograft use.

Role: Principal Investigator