

Chad C. Carroll, PhD

800 W. Stadium Ave
West Lafayette, IN 47907-2046
Office: (765) 496-6002
email: carrol71@purdue.edu

Assistant Professor, Department of Health and Kinesiology, Purdue University
Faculty Associate, Center on Aging and the Life Course, Purdue University, West Lafayette, IN
Faculty, Interdepartmental Nutrition Program, Purdue University, West Lafayette, IN
Adjunct Faculty Member, Indiana School of Medicine, West Lafayette
Adjunct Faculty Member, Arizona State University, Tempe, AZ
Member, Mechanobiology and Muscle Bone Crosstalk Research Team, Indiana Center for Musculoskeletal Health,
Indiana University School of Medicine

Summary

The long-term goal of my research is to contribute to the development of effective treatments for tendon pathologies especially in diabetic individuals. Tendon complaints are one of the most common musculoskeletal disorders. This places a large burden on the United States healthcare system. Painful tendinopathies reduce the quality of life of afflicted individuals and limit their ability to complete activities of daily living. Little in vivo data exist to aid in the treatment or prevention of painful tendinopathies. I am interested in filling these knowledge gaps. My laboratory uses both human and rodent models to address our research goals in a bench-to-bedside manner. I have a broad understanding of human physiology including extensive knowledge of endocrine, musculoskeletal, and cardiovascular physiology. I have ten years of medical school and undergraduate teaching experience. I also have strong understanding of tendon and ligament biology and healing.

Education

2004, Ph.D., Physiology & Biophysics, University of Arkansas for Medical Sciences, Little Rock
2001, M. S., Exercise Physiology, Ball State University, Muncie, IN
1999, B. S., Exercise Science, Lake Superior State University, Sault Ste. Marie, MI

Professional Experience

2016-present, Assistant Professor, Department of Health and Kinesiology, Purdue University, West Lafayette, IN

-Courses Taught,
Purdue University: HK590: Musculoskeletal Adaptations; HK468: Advanced Exercise Physiology
IU Medical School: Tendon Physiology/Pathophysiology, Endocrine Physiology

**2012-2016, Associate Professor of Physiology with Tenure
Midwestern University, Glendale, AZ**

-Chair, Midwestern University Institutional Review Board, 2013-2016
-Course Director for Human Physiology (320+ students seeking professional degrees in medicine, 2 quarters per year).
-Provided lectures in endocrinology, skeletal muscle physiology, and cardiovascular physiology

**2008-2012, Assistant Professor of Physiology
Midwestern University, Glendale, AZ**

**2004-2008, Post-Doctoral Fellow, Human Performance Laboratory
Ball State University, Muncie, IN**

-Oversaw the completion of a multi-year, double-blind, placebo-controlled clinical trial in elderly subjects consisting of exercise training and daily drug consumption

-Established novel techniques in the laboratory to non-invasively measure patellar tendon mechanical properties in humans using ultrasound and MRI

2001-2004, Research Assistant and Doctoral Student

Nutrition, Metabolism, and Exercise Laboratory, Donald W. Reynolds Center on Aging, Department of Geriatrics, University of Arkansas for Medical Sciences, Little Rock

-Dissertation: Human Soleus and Vastus Lateralis Muscle Protein Metabolism with an Amino Acid Infusion

-Utilized stable isotope tracer and muscle biopsies to monitor skeletal muscle protein synthesis after intravenous administration of amino acids.

1999-2001, Research Assistant, Masters Candidate

Human Performance Laboratory, Ball State University, Muncie, IN

-Thesis: Skeletal Muscle Characteristics of Individuals with Multiple Sclerosis

Peer-Reviewed Publications: Google Scholar, Citations: 1276, h-index: 17, i10-index: 23

1. Williamson, D.L., Gallagher, P.M., **Carroll, C.C.**, Raue, U., and Trappe, S.W. Reduction in hybrid single muscle fiber proportions with resistance training in humans. *J Appl Physiol.* 91(5): 1955-61, 2001.
2. Trappe, S., Godard, M., Gallagher, P., **Carroll, C.C.**, Rowden, G., and Porter, D. Resistance training improves single muscle fiber contractile function in older women. *Am J Physiol Cell Physiol.* 281(2): C398-406, 2001.
3. **Carroll, C.C.**, Carrithers, J.A., and Trappe, T.A. Contractile protein concentrations in human single muscle fibers. *J Muscle Res Cell Motil.* 25: 55-59, 2004.
4. Dennis, R.A., Trappe, T.A., Simpson, P., **Carroll, C.C.**, Huang, B.E., Nagarajan, R., Bearden, E., Gurley, C., Duff, G.W., Evans, W.J., Kornman, K., and Peterson, C.A. Interleukin-1 single nucleotide polymorphisms are associated with the inflammatory response in muscle to acute resistance exercise in young men. *J Physiol.* 560(Pt 3): 617-26, 2004.
5. **Carroll, C.C.**, Fluckey, J.D., Williams, R.H., Sullivan, D.H., and Trappe, T.A. Human Soleus and Vastus Lateralis Muscle Protein Metabolism with an Amino Acid Infusion. *Am J Physiol Endocrinol Metab.* 288(3): E479-85, 2005.
6. **Carroll, C.C.**, Gallagher, P.M., Seidle, M.E., and Trappe, S.W. Skeletal muscle characteristics of individuals with multiple sclerosis. *Arch Phys Med Rehabil.* 86(2): 224-9, 2005.
7. **Carroll, C.C.** and Trappe, T.A. Personal digital video: a method to monitor drug regimen adherence during human clinical investigations. *Clin Exp Pharmacol Physiol.* 33(12): 1125-7, 2006.
8. Haus, J., Miller, B., **Carroll, C.C.**, Weinheimer, E., Trappe, T. The effect of strenuous aerobic exercise on skeletal muscle myofibrillar proteolysis in humans. *Scand J Med Sci Sports.* 17(3): 260-6, 2007.
9. Carrithers, J.A., **Carroll, C.C.**, Coker, R.H., Sullivan, D.H., and Trappe, T.A. Concurrent aerobic and resistance exercise does not reduce the anabolic response to resistance exercise: implications for exercise countermeasures for space crews. *Aviat Space Environ Med.* 78(5): 457-62, 2007.
10. Weinheimer, E.M., Jemiolo, B., **Carroll, C.C.**, Harber, M. P., Haus, J.M., Burd, N.A., LeMoine, J.K., Trappe, S.W., and Trappe, T.A. Resistance exercise and cyclooxygenase (COX) expression in human skeletal muscle: implications for COX-inhibiting drugs and protein synthesis. *Am J Physiol Regul Integr Comp Physiol.* 292: R2241-48, 2007.
11. Haus, J.M., Carrithers, J.A., **Carroll, C.C.**, Tesch, P.A., and Trappe, T.A. Contractile and connective tissue protein content in human skeletal muscle: Effects of 35 and 90 days of simulated microgravity and exercise countermeasures. *Am J Physiol Regul Integr Comp Physiol.* 293: R1722-7, 2007.
12. Trappe, T.A., **Carroll, C.C.**, Jemiolo, B., Trappe, S.W., Dossing, S., Kjaer, M., and Magnusson, S. P. Cyclooxygenase mRNA expression in human patellar tendon at rest and after exercise. *Am J Physiol Regul Integr Comp Physiol.* 294(1): R192-9, 2008.
13. **Carroll, C.C.**, Dickinson, J.M., Haus, J.M., Lee, G.A., Hollon, C.J., Aagaard, P., Magnusson, S.P., and Trappe, T.A. The influence of aging on the in vivo properties of human patellar tendon. *J Appl Physiol.* 105(6): 1907-1915, 2008.

14. Sullivan, B.E., **Carroll, C.C.**, Jemiolo, B., Trappe, S.W., Magnusson, S.P., Døssing, S., Kjær, M., and Trappe, T.A. Influence of resistance exercise on human patellar tendon structural and regulatory gene expression. *J Appl Physiol*, 106(2): 468-475, 2009.
15. Burd, N.A., Dickinson, J.M., LeMoine, J.K., **Carroll, C.C.**, Haus, J.M., Jemiolo, B., Trappe, S.W., Hughes, G.M., Sanders Jr., C.E., and Trappe, T.A. Influence of cyclooxygenase-2 inhibitor on muscle protein synthesis and cyclooxygenase mRNA expression after resistance exercise in humans. *Am J Physiol*, 298: E354-E361, 2010.
16. Trappe, T.A., **Carroll, C.C.**, Dickinson, J.M., LeMoine, J.K., Haus, J.M., Weinheimer, E.M., and Hollon, C.J. Influence of acetaminophen and ibuprofen on skeletal muscle adaptations to resistance exercise in older adults. *Am J Physiol Regul Integr Comp Physiol* 300: R655-R662, 2011.
17. **Carroll, C.C.**, Dickinson, J.M., LeMoine, J.K., Haus, J.M., Weinheimer, E.M., Hollon, C.J., Aagaard, P., Magnusson, S.P., and Trappe, T.A. Influence of acetaminophen and ibuprofen on in vivo patellar tendon adaptations to knee extensor resistance exercise in older adults. *J Appl Physiol* 111(2): 508-15, 2011.
18. **Carroll, C.C.**, Whitt, J.A, Peterson, A., Gump, B., Tedeschi, J, and Broderick, T.L. The influence of acetaminophen and exercise on rat Achilles tendon structural properties. *Am J Physiol Regul Integr Comp Physiol* 302(8): R990-5, 2012. PMID: 22357807.
19. Ramos, J.E., Al-Nakkash, L., Peterson, A., Gump, B., Djandjoulia, T., Moore, S., Broderick, T., and **Carroll, C.C.** The soy isoflavone genistein inhibits the reduction in Achilles tendon collagen content induced by ovariectomy in rats. *Scand J Med Sci Sports*. 22(5): e108-14, 2012. PMID: 22852581
20. Biwer, L. Broderick, T., Xu, H., **Carroll, C.C.**, and Hale, T. L-NAME induced cardiac dysfunction persists even after cessation of angiotensin converting enzyme inhibitor treatment. *Acta Physiol (Oxf)*. 207(1): 156-65, 2013. PMID: 22834875.
21. Trappe, T.A., Standley, R.A., Jemiolo, B., **Carroll, C.C.**, and Trappe S.W. Prostaglandin and myokine involvement in the cyclooxygenase-inhibiting drug enhancement of skeletal muscle adaptations to resistance exercise in older adults. *Am J Physiol Regul Integr Comp Physiol*. 304(3): R198-205, 2013. PMC3567351.
22. **Carroll, C.C.**, O'Conner, D.T., Steinmeyer, R., Del Mundo, J.D., McMullan, D.R., Whitt, J.A., Ramos, J.E., and Gonzales, R.J. The influence of acute resistance exercise on human skeletal muscle cyclooxygenase activity and protein content. *Am J Physiol Regul Integr Comp Physiol*. 305(1): R24-30, 2013. PMID: 23637134.
23. Gump, B.S., McMullan, D.R., Cauthon, D.J., Whitt, J.A., Del Mundo, J.D., Letham, T., Kim, P.J., Friedlander, G., Pingel, J., Langberg, H., and **Carroll, C.C.** Short-term acetaminophen consumption enhances the increase in Achilles peritendinous IL-6 production after treadmill exercise in humans. *J Appl Physiol*. 115: 929-936, 2013. Highlighted Topic: **Role of Inflammation in Skeletal Muscle, Connective Tissue, and Exertional Injuries: To Block or Not to Block?** PMID: 23743397.
24. **Carroll C.C.**, Martineau, K., Corbell, K., Huynh, R.T., Volper, B.D., and Broderick, T.L Tissue specific effects of exercise training and acetaminophen on collagen and cross-linking in the rat. *Am J Physiol Regul Integr Comp Physiol*. 308: R294-R299, 2015. PMID: 25540102.
25. Everman, S., Meyer, C., Mandarino, L.J., **Carroll, C.C.**, and Katsanos, C.S. Acute exposure to increased plasma branched-chain amino acids does not alter the sensitivity to insulin-stimulated plasma glucose disposal in young healthy subjects. *PLOS ONE*. 10(3): e0120049, 2015. PMID: 25781654.
26. Volper, B.D., Huynh, R.T., Arthur, K.A., Noone, J., Gordon, B.D., Zacherle, E.W., Munoz, E., Sorensen, M.A, Broderick, T.L., Magnusson, S.P., Howden, R., Hale T.M., and **Carroll, C.C.** The influence of acute and chronic streptozotocin-induced diabetes on rat tendon extracellular matrix and mechanical properties. *Am J Physiol Regul Integr Comp Physiol*. 309(9): R1135-43, 2015. PMID: 26310937.
27. **Carroll, C.C.** Analgesic drugs alter connective tissue remodeling and mechanical properties. *Exerc Sport Sci Rev*. Invited Review. 44(1):29-36, 2016. PMID: 26509485.
28. Trappe, TA, Ratchford, SM, Brower, BE, Liu, SZ, Lavin, KM, **Carroll, CC**, Jemiolo, B and Trappe, SW. COX inhibitor influence on skeletal muscle fiber size and metabolic adaptations to resistance exercise in older adults. *J Gerontol A Biol Sci Med Sci*. 2016 Jan 26. pii: glv231. PMID: 26817469.

29. Everman, S., Meyer, C., Tran, L., Hoffman, N., **Carroll, C.C.**, Dedmon, W.L., and Katsanos, C.S. Insulin does not Stimulate Muscle Protein Synthesis during Increased Plasma Branched-chain Amino Acids Alone but Decreases Whole-body Proteolysis in Humans. *Am J Physiol Endocrinol Metab.* 2016 Oct 1;311(4): E671-E677. PMID:27530230.
30. Tran, L., Hanavan, P.D., Campbell, L.E., De Filippis, E., Lake, D.F., Coletta, D.K., Roust, L.R., Mandarino, L.J., **Carroll, C.C.**, Katsanos, C.S. Prolonged Exposure of Primary Human Muscle Cells to Plasma Fatty Acids Associated with Obese Phenotype Induces Persistent Suppression of Muscle Mitochondrial ATP Synthase β Subunit. *PLoS One.* 2016 Aug 17;11(8): e0160057. doi: 10.1371/journal.pone.0160057. eCollection 2016. PMID: 27532680.
31. Potter, RM, Huynh, RT, Volper, BD, Arthur, KA D'Lugos, A., Sørensen, MA, Magnusson, SP, Dickinson, JM, Hale, TM, and **Carroll, CC.** The impact of TGF- β inhibition during acute exercise on Achilles tendon extracellular matrix. *Am J Physiol Regul Integr Comp Physiol.* 2017 Jan 1;312(1):R157-R164. doi: 10.1152/ajpregu.00439.2016. PMID: 27927626.
32. Astill, BD, Katsma, MS, Cauthon, DJ, Greenlee, J, Murphy, M, Curtis, D, and **Carroll, CC.** Sex-based difference in Achilles tendon release of matrix metalloproteinases and growth factors after acute resistance exercise. *J Appl Physiol (1985).* 2017 Feb 1;122(2):361-367. doi: 10.1152/jappphysiol.00878.2016. Epub 2016 Nov 23. PMID: 27881671.
33. Katsma, MS, Patel, SH, Eldon, ER, Arthur, KA, Shimkus, KL, Fluckey, JD., and **Carroll, CC.** The influence of chronic IL-6 exposure, *in vivo*, on rat Achilles tendon extracellular matrix. *Cytokine,* 2017 May;93:10-14. doi: 10.1016/j.cyto.2017.04.011. Epub 2017 Apr 13. PMID: 28412025.
34. Patel, SH, D'Lugos, AC, Eldon, ER, Curtis, D, Dickinson, JM, and **Carroll, CC.** Impact of acetaminophen consumption and resistance exercise on extracellular matrix gene expression in human skeletal muscle. *Am J Physiol Regul Integr Comp Physiol.* 2017 Jul 1;313(1):R44-R50. doi: 10.1152/ajpregu.00019.2017. Epub 2017 May 17. PMID: 28515079.
35. Dickinson, JM, D'Lugos, AC, Mahmood, TM, Ormsby, J, Salvo, L, Dedmon, WL, Patel, SH, Katsma, MS, Gonzales, RJ, Hale, TM, **Carroll, CC***, Angadi, SS*. Exercise protects skeletal muscle during chronic doxorubicin administration. *Denotes equal contribution of authors. *Med Sci Sport Exerc.* 2017 Dec;49(12):2394-2403. PMID:28767526
36. Kras, KA, Hoffman, N, Roust, LR, Patel, SH, **Carroll, CC,** and Katsanos, CS. Elevated Plasma Amino Acids Increase Uncoupled Respiration of Muscle Subsarcolemmal Mitochondria in Lean but not Obese Subjects. *J Clin Endocrinol Metab.* 2017 Dec 1;102(12):4515-4525. doi: 10.1210/jc.2017-01201. PMID: 29029131.
37. D'Lugos, AC, Patel, SH, Ormsby, JC, Curtis, DP, Fry, CS, **Carroll, CC,** and Dickinson, JM. Prior acetaminophen (paracetamol) consumption delays the early anabolic response of human skeletal muscle to resistance exercise. *J Appl Physiol, J Appl Physiol (1985).* 2018 Jan 11. doi: 10.1152/jappphysiol.00922.2017. PMID: 29357482.
38. Dickinson, JM, D'Lugos, AC, Naymik, M, De Both, M, Siniard, A, Wolfe, A, Curtis, D, Gaesser, GA, Huentelman, MJ, and **Carroll, CC.** Transcriptional signatures of human skeletal muscle in response to aerobic and resistance exercise. *J Appl Physiol (1985).* 2018 Mar 15. doi: 10.1152/jappphysiol.00014.2018. PMID: 29543133.
39. Patel, SH, Sabbaghi, A, and **Carroll CC.** Streptozotocin-induced diabetes alters mRNA expression of ECM regulators in rat patellar tendon. *Connect Tissue Res.* 2018 May 10:1-11. doi: 10.1080/03008207.2018.1470168. PMID: 29745261.
40. Tran, L, Kras, KA, Hoffman, N, Ravichandran, J., Dickinson, JM, D'Lugos, AC, **Carroll, CC,** Patel, SH, Mandarino, LJ, Roust, L, and Katsanos, CS. Lower fasted-state but greater change in plasma amino acid-induced rise in muscle protein synthesis in people with obesity. *Obesity (Silver Spring).* 2018 Jul;26(7):1179-1187. doi: 10.1002/oby.22213. Epub 2018 Jun 12. PMID: 29896930
41. Shimkus KL, Shirazi-Fard Y, Wiggs MP, Ullah ST, Pohlenz C, Gatlin III DM, **Carroll CC,** Hogan HA, and Fluckey JD. Muscle plasticity and repeatability to alterations in mechanical loading conditions. *J Appl Physiol.* 2018 Aug 9. doi: 10.1152/jappphysiol.00736.2017. [Epub ahead of print]

In Review

D'Lugos, AC, Fry, CS, Ormsby, JS, Sweeney, KR, Hale, TM, Gonzales, RJ, Angadi, SS, **Carroll, CC,** Dickinson, JM. Reduced satellite cell and capillary abundance in rat skeletal muscle following chronic doxorubicin administration. *Physiol Reports*

Carroll, CC, Patel, SH, Simmons, J, Gorden, B, Olson, JF, Chemelewski, K, Saw, SK, Hale, TM, Howden, R, Sabbaghi, A. Impact of genistein supplementation on tendon functional properties and gene expression in estrogen deficient rats. *Journal of Nutrition*.

Patel, SH, Yue, F, Saw, SK, Fogith, R, Cannon, JR, Shannahan, J, Kuang, S, Sabbaghi, A, and **Carroll, CC**. Advanced Glycation End-Products Modulate Mitochondrial Function and Proliferative Capacity in Tendon Derived Fibroblasts. *J Ortho Res*.

In Preparation

Jarrett CL, D'Lugos AC, Mahmood T, Gonzales RJ, Hale TM, **Carroll CC**, Dickinson JM, and Angadi SS Effect of high intensity exercise preconditioning and training on antioxidant enzymes in cardiomyocytes during doxorubicin treatment.

Kovacevic, D., Suriani, RJ, Saad, MA, Patel, SH, Tommasini, SM, Mendias, CL, **Carroll, CC**, and Blaine, TA. Human Amniotic Membrane Improves Healing in a Chronic, Massive Rotator Cuff Repair Model.

Book Chapters

Carroll, C.C. and Lambert, C.P. Multiple Sclerosis. In: *Clinical Exercise Physiology* (2nd Ed.), Edited by: Ehrman, J.K., Gordon, P.M., Visich, P.S., and Keteyian, S.J. Human Kinetics, 2009, p. 543-554.

Professional Presentations (Past 5 Years Only)

Poster

1. Martineau, K., Corbell, K., Broderick, T.L., Al-Nakkash, L., and **Carroll, C.C.** Achilles tendon estrogen receptor signaling after ovariectomy and genistein treatment in rats. American Osteopathic Academy of Orthopedics, Annual Meeting, 2013. Second Place Poster Presentation.
2. Martineau, K., Corbell, K., Volper, B., Huynh, R. Broderick, T.L., and **Carroll, C.C.** Tissue specific effects of 8-weeks of daily treadmill exercise on collagen and cross-linking in male Wistar rats. American Osteopathic Academy of Orthopedics, Annual Meeting, 2013. First Place Poster Presentation.
3. Corbell, K., Martineau, K., Broderick, T.L., Al-Nakkash, L. and **Carroll, C.C.** The influence of ovariectomy and genistein on estrogen receptor content and activation in rat achilles tendon. Annual Meeting Arizona Physiological Society, 2013.
4. Greenlee, J. Murphy, M., Corbell, K. Langberg, H. **Carroll, C.C.** Acetaminophen and exercise increase matrix metalloproteinase levels in Achilles peritendinous tissue in humans. Annual Meeting Arizona Physiological Society, 2013.
5. Huynh, R., Volper, B., Corbell, K., Martineau, K., Broderick, T.L. and **Carroll, C.C.** Differences in collagen formation and anabolic signaling in tendon and skeletal muscle after chronic exercise training in the rat. Annual Meeting Arizona Physiological Society, 2013.
6. Graham, Z., **Carroll, C.C.**, Broderick, T.L., Gallagher, P. Increases in protein expression of the alpha7beta1 integrin pathway following 8 weeks of acetaminophen administration in the rat soleus. Experimental Biology, 2014.
7. Potter, R., Desai, P., Nielsen, C., Corbell, K., Mellon, C. Danishyar, A., Gatti, F., Grinberg, A., Kumar, R., **Carroll, C.C.**, Carlson, C.G. Short and long term effects of ActRIIB receptor ligand trapping agents on muscle mass and downstream signaling in dystrophic (mdx) limb and respiratory musculature. Experimental Biology, 2014.
8. Ratchford, S., Brower, B., Liu, S., **Carroll, C.**, Trappe, S., Trappe, T. Fiber-type specific COX-inhibiting drug enhancement of skeletal muscle hypertrophy with resistance training in older individuals. ACSM Integrative Physiology of Exercise, 2014.
9. Huynh, R.T., Volper, B.D., Corbell, K.A., Hale, T.M. and **Carroll, C.C.** The effect of TGF- β receptor inhibition and acute exercise on rat Achilles tendon structural properties. ACSM Integrative Physiology of Exercise, 2014.
10. Katsma, M.S., Corbell, K.A., and **Carroll, C.C.** The effect of chronic IL-6 exposure on rat tendon structural properties, in vivo. ACSM Integrative Physiology of Exercise, 2014.

11. **Carroll, C.C.**, Katsma, M.S., Corbell, K.A., and Cauthon, D.J. Influence of resistance exercise on human Achilles tendon release of matrix metalloproteinases and growth factors. ACSM Integrative Physiology of Exercise, 2014.
12. Jeganathan, J.R. Thangiah, G., **Carroll, C.C.**, Broderick, T.L. TrkA receptor in streptozotocin-induced diabetic rat brain. American Diabetes Association, Annual Meeting, 2015.
13. Gonzales, R.J., Raman, P., Vijayavel, N., Kerrigan, C., Echeverria, J., Dickinson, J.M., Hale, T.M. **Carroll, C.C.** and Angadi, S. Doxorubicin Reduces Proinflammatory Mediator Expression in Brain and Pial Arteries from Ovariectomized Female Rats. American Physiological Society: Cardiovascular, Renal and Metabolic Diseases: Physiology and Gender, 2015.
14. **Carroll, C.C.**, Astill, B.D., Arthur, K.A., Katsma, M.S., and Curtis, D. Sex-based differences in Achilles tendon release of matrix metalloproteinases and growth factors after acute resistance exercise. Advances in tendon research: from bench to bedside, London, England, September, 2015.
15. O'Neill L, Jarrett CL, Crawford M, **Carroll CC**, Hale T, Dickinson JM, Angadi SS, Sweazea KL. Evaluation Of The Vasoprotective Effects Of High-Intensity Exercise Prior To Anthracycline Chemotherapy. Arizona Physiological Society Annual Meeting, 2015.
16. T Mahmood, AC D'Lugos, C Cosgrave, WL Dedmon, BD Astill, S Patel, M Katsma, R Gonzalez, T Hale, **CC Carroll**, SS Angadi, and JM Dickinson. Exercise Preconditioning As A Strategy To Protect Skeletal Muscle From Complications Of Doxorubicin Treatment. Arizona Physiological Society Annual Meeting, 2015.
17. Hoffman N., Tran L., **Carroll CC.**, Patel S., Eldon, E., Katsanos CS. Plasma Free Fatty Acid and Amino Acid Responses To Glucose-Induced Insulinemia In Insulin-Resistant Subjects. Arizona Physiological Society Annual Meeting, 2015.
18. Katsanos CS., Tran L., Hoffman N., Dedmon, WL., **Carroll CC.** Effects of Increased Plasma Branched-Chain Amino Acids And Insulin On Muscle Protein Metabolism. Arizona Physiological Society Annual Meeting, 2015.
19. De Leon, N., Tran, L., **Carroll, C.C.**, Hoffman, N., Katsanos, CS. Does an Increase In Plasma Amino Acid Concentrations Stimulate Skeletal Muscle Protein Synthesis In Obese Humans? Arizona Physiological Society Annual Meeting, 2015.
20. Vijayavel, N., Raman, P., Kerrigan, C., Echeverria, J., Dickinson, J.M., Hale, T.M., **Carroll, C.C.**, Angadi, S.S., Gonzales. Doxorubicin Reduces Proinflammatory Mediator Expression In Brain And Pial Arteries From Ovariectomized Female Rats. Arizona Physiological Society Annual Meeting, 2015.
21. D'Lugos, AC, Patel, S., Eldon, E., **Carroll, C.C.**, and Dickinson, J.M. The impact of acetaminophen consumption prior to resistance exercise on the initial myogenic gene response in human skeletal muscle. Experimental Biology, 2016.
22. O'Neill LM, Jarrett CL, Crawford M, **Carroll CC**, Hale TM, Dickinson JM, Angadi SS, Sweazea KL. High-intensity Preliminary Training to Mitigate Cardiovascular Damage Caused by the Chemotherapeutic Agent Doxorubicin. Experimental Biology, 2016.
23. Jarrett CL, D'Lugos AC, Mahmood T, Gonzales RJ, Hale TM, **Carroll CC**, Dickinson JM, Angadi SS. Effect of high intensity exercise preconditioning and training on antioxidant enzymes in cardiomyocytes during doxorubicin treatment. Experimental Biology, 2016.
24. Tran, L., Langlais, P., De Filippis, E.A., Benjamin, T.R., Roust, L.R., **Carroll, C.C.**, Mandarino, L.J., and Katsanos, C. Multifactorial Regulation of Skeletal Muscle β -F1-ATPase in Human Obesity. American Diabetes Association, 2016
25. Khokar B, Perez O, D'Lugos AC, **Carroll CC**, Gonzales RJ, Sweazea KL, Dickinson JM, Angadi SS, Hale TM. Impact of High Intensity Interval Training on Doxorubicin-Induced Pathological Cardiac Remodeling in Female Sprague Dawley Rats. Arizona Physiological Society Annual Meeting, 2016.
26. I Awwad, AC D'Lugos, **CC Carroll**, RJ Gonzales, KL Sweazea, JM Dickinson, SS Angadi, TM Hale. Exercise Preconditioning As A Means To Protect Against Doxorubicin-Induced Renal Injury. Arizona Physiological Society Annual Meeting, 2016.

27. Perez O¹, Khokar B¹, Abidali H¹, D'Lugos A², Dickinson J², Angadi S², **Carroll CC**, Hale TM. Impact of High Intensity Interval Training on Doxorubicin-Induced Cardiotoxicity in Female Sprague Dawley Rats. Arizona Physiological Society Annual Meeting, 2016.
28. O'Neill LM, Mayek RE, Jarrett CL, Crawford M, D'Lugos A, **Carroll CC**, Angadi SS, Gonzales R, Hale TM, Dickinson JM, and Sweazea KL. High-Intensity Exercise Preconditioning Prevents Downregulation Of Enos Expression In The Aorta Following Doxorubicin Treatment. Arizona Physiological Society Annual Meeting, 2016.
29. AC D'Lugos, C Cosgrave, WL Dedmon, BD Astill, SH Patel, MS Katsma, RJ Gonzales, TM Hale, **CC Carroll**, SS Angadi, and JM Dickinson. High Intensity Exercise Preserves Myocellular Size Throughout Doxorubicin. Integrative Biology of Exercise, Phoenix, AZ, 2016.
30. JM Dickinson, AC D'Lugos, TN Mahmood, L Salvo, C Cosgrave, WL Dedmon, BD Astill, S Patel, M Katsma, RJ Gonzales, TM Hale, SS Angadi, **CC Carroll**. High Intensity Exercise Preserves Skeletal Muscle mTOR Signaling During Doxorubicin Treatment in Ovariectomized Female Rats. Integrative Biology of Exercise, Phoenix, AZ, 2016.
31. Patel, SH, D'Lugos, AC, Eldon, ER, Curtis, D, Dickinson, JM, and **Carroll, CC**. Impact of acetaminophen consumption and resistance exercise on extracellular matrix gene expression in human skeletal muscle. Integrative Biology of Exercise, Phoenix, AZ, 2016.
32. Jarrett, CL, D'Lugos, AC, Mahmood, T., Gonzales, RJ, Hale, TM, **Carroll, CC**, Dickinson, JM, and Angadi, SS. Associations Between Antioxidant Enzymes in Cardiomyocytes and Skeletal Muscle During Doxorubicin Treatment. Integrative Biology of Exercise, Phoenix, AZ, 2016.
33. Vijayavel, N, Raman, P., So, M., Dickinson, JM, **Carroll, CC**, Angadi, S, and Gonzales, R. Doxorubicin Attenuates Proinflammatory Mediator Expression in Brain and Pial Arteries from Ovariectomized Female Rats Following High Intensity Exercise. Integrative Biology of Exercise, Phoenix, AZ, 2016.
34. D'Lugos, AC, Patel, SH, Ormsby, JC, Mahmood, TN, Curtis, DP, Fry, CS, Gasser, GA, **Carroll, CC.**, and Dickinson, JM. The Impact of Acetaminophen Consumption on mTOR Signaling in Human Skeletal Muscle Following Resistance Exercise. American College of Sports Medicine Annual Meeting, Denver, CO, 2017.
35. Dickinson, JM., D'Lugos, AC, Naymik, M., De Both, M., Siniard, A., Wolfe, A., Curtis, D., Gasser, GA., Huentelman, MJ, and **Carroll, CC**. Transcriptional Signatures of Human Skeletal Muscle in Response to Aerobic and Resistance Exercise. American College of Sports Medicine Annual Meeting, Denver, CO, 2017.
36. Kovacevic, D., Suriani, RJ, Saad, MA, Patel, SH, Tommasini, SM, Mendias, CL, **Carroll, CC**, and Blaine, TA. Human Amniotic Membrane Improves Healing in a Chronic, Massive Rotator Cuff Repair Model. Orthopaedic Research Society Annual Meeting, New Orleans, LA.
37. Patel, SH, Olson, JF, Gordon, BDH, Howden, R, **Carroll, CC**. Genistein treatment alters Achilles tendon collagen gene expression and improves tail fascicle mechanical properties in estrogen deficient rats. Orthopaedic Research Society Annual Meeting, New Orleans, LA, 2017.
38. Patel, SH, Sabbaghi, A, **Carroll CC**. Streptozotocin-Induced Diabetes Disrupts mRNA Expression of Tendon Regulators but Minimally Alters COX-2 Related mRNA Expression in Rat Patellar Tendon. Orthopaedic Research Society Annual Meeting, New Orleans, LA, 2017.
39. Serrano, N, D'Lugos, AC, Ormsby, JC, Thomas, MT, Marvasti, FF, Carroll, CC, Gaesser, GA, and Dickinson, JM. Relationships among skeletal muscle satellite cells, capillarization, and VO_{2peak} in older adults. Arizona Physiological Society Annual Meeting and Southwest ACSM Annual Meeting, 2019.

Oral Presentations

1. **Carroll CC**. Invited Symposium. Reducing Tendon Problems with Aging. Southwest ACSM Annual Meeting. October 2014. Costa Mesa, CA.
2. **Carroll, C.C.** and Kovacevic, D. Evaluation of an amniotic fluid-derived human allograft for rotator cuff repair augmentation in a chronic, massive rotator cuff tear model. American Orthopaedic Society for Sports Medicine, Orlando, FL, July, 2015.

3. **Carroll, C.C.**, Huynh, R.T., Volper, B.D., Arthur, K.A., Sorensen, M.A, Magnusson, S.P., Hale, T.M. The effect of TGF- β receptor inhibition and acute exercise on rat Achilles tendon structural properties. Advances in tendon research: from bench to bedside, London, England, September, 2015.
4. D'Lugos, A.C., Mahmood, T. Cosgrave, C., Dedmon, W.L., Astill, B.D., Patel, S., Katsma, M., Gonzales, R., Hale, T.M., **Carroll, C.C.**, Angadi, S.S., and Dickinson, J.M. High intensity exercise preserves myocellular size throughout doxorubicin treatment. Arizona Physiological Society Annual Meeting, 2015.
5. **Carroll, CC.** Invited Symposium. Molecular Adaptation of Tendon to Exercise and Chronic Disease. American College of Sports Medicine, Annual Meeting, Boston, MA, 2016.
6. **Carroll, CC.** Invited Symposium. Can Nutritional Interventions Impact Tendon Health? American College of Sports Medicine, Annual Meeting, Minneapolis, MN, 2018.
7. Patel, SH, Hettinger, ZR, Foguth, R, Yue, F, Kuang, S, Cannon, JR, Shannahan, J, and **Carroll, CC.** Advanced Glycation End-Product Induced Mitochondrial Dysfunction in Tenocytes. International Scientific Tendinopathy Symposium, Groningen, Netherlands, 2018.
8. **Carroll, C.C.** Studies regarding the impact of analgesics, estrogen-deficiency, and diabetes on tendon outcomes. Ground Rounds, Hospital of Special Surgery, New York, NY. October 9th, 2018
9. **Carroll, CC.** Nutrition and Tendon Health, Invited Lecture, Purdue University, Department of Nutrition Seminar Series, January, 2019.

Current Funding

Indiana CTSI Project Development Team Pilot Award
 Period: 07/15/2018-07/14/2019

Previous Extramural Funding

Evaluation of an amniotic fluid-derived allograft for rotator cuff repair augmentation in a chronic, massive rotator cuff tear model in rats

Role: Co-Investigator/Consultant
 Agency: American Shoulder and Elbow Surgeons
 Total Costs: \$20,000
 01/01/2016-12/31/2016

Novel effects of genistein on tendon remodeling in a model of estrogen-deficiency

Role: Principal Investigator (20% effort)
 Agency: NIH 1R15AT008605-01A1
 Total Costs: \$468,639
 12/01/2015 – 04/01/2016
 Status: Grant would not transfer to Purdue University, Grant closed after four months

The Physiological Response to Surgical Microdebridement in Patients with Achilles Tendinopathy

Principal Investigator: P. J. Kim, DPM, AACFAS
 Co-Investigators: **C. C. Carroll, Ph.D.**, S. P. Magnusson, PT, DSc, H. Langberg, Ph.D., and G. N. Friedlander, DPM, FACFAS
 Agency: American College of Foot and Ankle Surgeons
 Type: 2008 Clinical and Scientific Research Grant Application
 Amount: \$19,400

The influence of acetaminophen on tendon metabolism at rest and after exercise in humans

Principal Investigator: D.J. Cauthon

Agency: American Podiatric Medical Students' Association

Research Mentor: Chad C. Carroll, Ph.D.

Type: 2009 American Podiatric Medical Students' Association Research Grant Program

Amount: \$1000

Analgesics, Exercise & Tendon Adaptations in the Elderly

Principal Investigator: **C. C. Carroll**, Mentors: T. A. Trappe and S. P. Magnusson

Agency: American Physiological Society

Type: Postdoctoral Initiative Award

Period: 10/01/07-9/30/08

Amount: \$42,000

This award was part of the American Physiological Society Postdoctoral Fellowship Initiative to fund NRSA awards that received highly meritorious scores but due to budget limitations did not receive funding.

Mentoring

***Committee Chair**

Midwestern University

Osteopathic Medicine, Summer Research Fellows

2009: Jahir E. Ramos, DO

2010: M. Scoot Moore, DO

2011: Karl Martineau, DO

2012: Jason Greenlee, DO

2012: Mark Murphy, DO

2013: Mark Katsma, DO

2015: Erica Eldon, DO

Podiatric Medicine, Research Fellows

2009-2011: David Cauthon, DPM

Masters of Biomedical Sciences

2010: David McMullan, DDS*

2010: Jamie Whitt, DO*

2010: Jon Del Mundo

2011: Brian Gump, DO*

2012: David Wilson, DO

2014: Richard Huynh*

2014: Brent Volper*

2014: Korie Brust, PA

2015: Broc D. Astil, MS*

2015: W. Logan Dedmon, MS*

2016: Shivam H. Patel, MS*

2017: Jay F. Olson, MS*

PA Research Fellows

2009: Tanya Letham, PA

Purdue University

Masters of Exercise Physiology

2017: Brian Sullivan

2017: Sheelagh Evans

2018: Chris Kargel

2018: Zach Hettinger

2019 (anticipated): Jessica Simmons*

PhD Exercise Physiology

2019 (anticipated): Raymond Kim

2020 (anticipated): Shivam H. Patel*

Professional Awards and Honors

- NIH Loan Repayment Recipient, 2010-2015.
- Experimental Biology Abstract selected for National Press Release
 - Ibuprofen and acetaminophen promote muscle hypertrophy and strength gains during resistance exercise in the elderly. *FASEB J.* 22: 753.31, 2008.

Professional Society Memberships

- Member, American College of Sports Medicine, 1998-2018 (Student Member, 1998-2004)
- Member, American Physiological Society, 2000-present (Student Member, 2000-2004)
- Member, Arizona Physiological Society, 2009-present
- Orthopedic Research Society, 2016-present

Recent Volunteer/Service Work

- Poster Judge Purdue University Undergraduate Research Day, 2017
- Den Leader Cub Scout Day Camp, July 25-28th, 2017.
- Faculty Mentor Boiler Gold Rush, 2017
- Horizon Mentor, 2016-present
- Abstract Reviewer, Orthopaedic Research Society, 2018 and 2019 Annual Meetings
- Chair, Exercise Physiology Search Committee, Purdue University Health and Kinesiology, 2017-2018
- Grant Reviewer Murdock Foundation
- Reviewer for Aging Cell, Cytokine, Medicine Science in Sports and Exercise, Exercise and Sport Sciences Reviews, Journal of Applied Physiology, Scandinavian Journal of Medicine and Science in Sports, Journal of Anatomy, Experimental Physiology, Diabetes, Metabolism, Connective Tissue Research, Journal of Exercise Physiology, Scientific Reports, International Journal of Sport Nutrition & Exercise Metabolism, and Clinical Reviews in Bone and Mineral Metabolism
- Forest Ridge HOA Vice President, 2017-2018, President, 2018-present