

CURRICULUM VITAE

Hwang, Hyun Seok, PhD

Department of Nutrition, Food and Exercise Science
Florida State University
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Tallahassee, FL 32306
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Research Interest:

“Exercise-induced cardiac sudden death” - Ca regulation in oxidative stress-induced arrhythmogenesis and contraction dysfunction in chronic heart disease.

Education:

Vanderbilt University , Nashville, TN	Post-doc	2007– 2012	Clinical Pharmacology <u>“Exercise-induced cardiac arrhythmias and cardiac sudden death”</u>
The University of Michigan , Ann Arbor, MI	PhD	2007	Kinesiology <u>“The effects of aldosterone antagonism and hawthorn on pathological remodeling of the heart”</u>
The University of Texas , Austin, TX	M.S	2002	Kinesiology <u>“The Interaction of Heavy Resistance Training and IGF-I Over Expression upon Muscle Fiber Type Distribution”</u>
Seoul National University , Seoul, Korea	M.Ed.	1997	Physical Education <u>“The Effect of Dehydration on the Prolonged Time of Exercise and Cardiorespiratory Function”</u>
Seoul National University , Seoul, Korea	B.S.	1995	Physical Education

Academic Appointments:

Florida State University

Assistant Professor

July, 2015 - Present

Vanderbilt University

Research Instructor
Department of Medicine

July, 2012 – June, 2015

Research Fellow
Department of Medicine

July, 2007 – June, 2012

The University of Michigan

Graduate Student Research Assistant

2006

Graduate Student Instructor

2002 – 2006

Exercise Physiology Laboratory, Division of Kinesiology

The University of Texas at Austin

Teaching Assistant

2002

Molecules to Organism, Department of Biological Science

Grading Assistant 2000 – 2001

Molecular Biology, Department of Biological Science

The Seoul National University, Seoul, Korea

Teaching assistant 1995 – 1997

The Department of Physical Education

Lecturer 1998 – 1999

The Department of Physical Education

Employment:

The Seoul National University, Seoul, Korea

The Department of Physical Education

Administrative assistant (National officer) 1997 – 1998

The College of Education

Professional Activities:

American College of Sports Medicine (ACSM) 2003 – 2006

Biophysical Society 2007 – present

American Heart Association 2008 - present

Cardiac Muscle Society 2010 – present

Korean United States Applied Physiology Society

Board Member 2005 - present

Research Programs:

1. 'Role of highly reactive lipid aldehyde in arrhythmia susceptibility after acute myocardial infarction'. 12SDG12050597 (American Heart Association), **PI: Hwnag, Hyun Seok**, 07/2012-06/2016.
2. Quantification of γ KA-protein and γ KA-PE adducts in human ischemic heart. VICTR (Vanderbilt University), **PI: Hwang, Hyun Seok**, 09/2012 – 03/2013.
3. 'Role of γ -ketoaldehydes in oxidant-induced sarcoplasmic reticulum Ca^{2+} leak'. 09POST2240022 AHA Postdoctoral fellowship (American Heart Association), **PI: Hwang, Hyun Seok**, 07/2009-06/2011.
4. 'Mechanisms of hawthorn-induced alterations in LV remodeling during pressure overload-induced heart failure', Rackham Graduate Student Research Grant (The University of Michigan), **PI: Hwang, Hyun Seok**, 01/2007 -04/2007.
5. 'mTOR signaling in cardiac hypertrophy' Doctoral student research grants (American College of Sport Medicine/NASA), **PI: Hwang, Hyun Seok**, 10/2004 – 04/2006.

Publications and Presentations:

Articles in refereed journals:

1. **Hwang HS**, Kryshtal DO, Feaster TK, Sánchez-Freire V, Zhang J, Kamp TJ, Hong CC, Wu JC, Knollmann BC. Comparable calcium handling of human iPSC-derived cardiomyocytes generated by multiple laboratories. *J Mol Cell Cardiol.* 2015 May 14;85:79-88.
2. Park H, Park H, Hwang HJ, **Hwang HS**, Kim H, Choi BR, Pak HN, Lee MH, Chung JH, Joung B. Alpha B-crystallin prevents ventricular arrhythmia by attenuating inflammation and oxidative stress in rat with autoimmune myocarditis. *Int J Cardiol.* 2014 Dec 30;182C:399-402.
3. **Hwang HS**, Nitu FR, Yang Y, Walweel K, Pereira L, Johnson CN, Faggioni M, Chazin WJ, Laver DR, George A Jr, Cornea RL, Bers DM, Knollmann BC. Divergent Regulation of RyR2 Calcium Release Channels by Arrhythmogenic Human Calmodulin Missense Mutants. *Circ Res.* 2014 Feb 21; 114(7): 1114-24.
4. Faggioni M, Savio-Galimberti E, Venkataraman R, **Hwang HS**, Kannankeril PJ, Darbar D, Knollmann BC. Suppression of Spontaneous Ca Elevations Prevents Atrial Fibrillation in Casq2 Null Hearts. *Circ Arrhythm Electrophysiol.* 2014 Feb 3; 7(2): 313-20.
5. Venkataraman R, Baldo MP, **Hwang HS**, Veltri T, Pinto JR, Baudenbacher FJ, Knollmann BC. Myofilament calcium de-sensitization and contractile uncoupling prevent pause-triggered ventricular tachycardia in mouse hearts with chronic myocardial infarction. *J Mol Cell Cardiol.* 2013 Jul;60:8-15.
6. Huke SS, Venkataraman R, Faggioni M, Bennuri SC, **Hwang HS**, Baudenbacher FJ, Knollmann BC. Focal Energy Deprivation Underlies Arrhythmia Susceptibility in Mice with Calcium-Sensitized Myofilaments. *Circ Res.* 2013 May 10;112(10):1334-44.
7. Steele DS, **Hwang HS**, Knollmann BC. Triple mode of action of flecainide in Catecholaminergic Polymorphic Ventricular Tachycardia. *Cardiovasc Res.* 2013 May 1;98(2):326-7. Commentary Review.
8. Lee, YS, Liu OZ, **Hwang HS**, Knollmann BC, Sobie EA. Parameter Sensitivity Analysis of Stochastic Models Provides Insights into Cardiac Calcium Sparks. *Biophys J.* 2013 Mar 5; 104(5): 1142-50.
9. Faggioni M, **Hwang HS**, van der Werf C, Nederend I, Kannankeril PJ, Wilde AA, Knollmann BC. Accelerated Sinus Rhythm Prevents Catecholaminergic Polymorphic Ventricular Tachycardia in Mice and in Patients. *Circ Res.* 2013 Feb. 15; 112(4):689-97.
10. Feng W, **Hwang HS***, Kryshtal DO, Yang T, Padilla IT, Tiwary AK, Puschner B, Pessah IN, Knollmann BC. Coordinated regulation of murine cardiomyocyte contractility by nanomolar (-)-epigallocatechin-3-gallate, the major green tea catechin. *Mol Pharmacol.* 2012 Nov;82(5):993-1000., *Co-first author.

11. Mezu UL, Singh P, Shusterman V, **Hwang HS**, Knollmann BC, Némec J. Accelerated junctional rhythm and nonalternans repolarization lability precede ventricular tachycardia in *casq2*^{-/-} mice. *J Cardiovasc Electrophysiol.* 2012 Dec 23 (12):1355-63.
12. Schober T, Huke S, Venkataraman R, Gryshchenko O, Kryshtal D, **Hwang HS**, Baudenbacher FJ, Knollmann BC. Myofilament Ca²⁺ sensitization increases cytosolic Ca²⁺ binding affinity, alters intracellular Ca²⁺ homeostasis and causes pause-dependent Ca²⁺ triggered arrhythmia. *Circ Res.* 2012 Jul 6; 111(2):170-9.
13. Lee YS, Maruyama M, Chang PC, Park HW, Rhee KS, Hsieh YC, Hsueh CH, Shen C, Lin SF, **Hwang HS**, Yin H, Knollmann BC, Chen PS. Ryanodine receptor inhibition potentiates the activity of Na channel blockers against spontaneous calcium elevations and delayed afterdepolarizations in Langendorff-perfused rabbit ventricles. *Heart Rhythm.* 2012 Jul;9(7):1125-32.
14. Kalyanasundaram A, Viatchenko-Karpinski S, Belevych A, Lacombe VA, **Hwang HS**, Knollmann BC, Gyorke S, Periasamy M. Functional Consequences of Stably Expressing a Mutant Calsequestrin (CASQ2D307H) in the CASQ2 Null Background. *Am J Physiol Heart Circ Physiol.* 2012 Jan;302(1):H253-61.
15. Nelson MJ, Harris MB, Boluyt MO, **Hwang HS**, Starnes JW. Effect of N-2-mercaptopropionyl glycine (MPG) on exercise-induced cardiac adaptations. *Am J Physiol Regul Integr Comp Physiol.* 2011 Apr;300(4):R993-R1000.
16. **Hwang HS**, Hasdemir C, Laver D, Mehra D, Turhan K, Faggioni M, Yin H, Knollmann BC. Inhibition of Cardiac Ca²⁺ Release Channels (RyR2) Determines Efficacy of Class I Antiarrhythmic Drugs in Catecholaminergic Polymorphic Ventricular Tachycardia. *Circ Arrhythm Electrophysiol.* 2011 Apr 1;4(2):128-35.
17. Watanabe H, Chopra N, Laver D, **Hwang HS**, Davies SS, Roden DM, Wilde AAM, Knollmann BC, Flecainide Prevents Catecholaminergic Polymorphic Ventricular Tachycardia in Mice and Humans. *Nat Med.* 2009 Apr;15(4):380-3. PMID: PMC2904954.
18. **Hwang HS**, Boluyt MO, Converso K, Russell MW, Bleske BE. Effects of hawthorn on the progression of heart failure in a rat model of aortic constriction. *Pharmacotherapy.* 2009 Jun;29(6):639-48.
19. **Hwang HS**, Bleske BE, Ghannam MM, Converso K, Russell MW, Hunter JC, Boluyt MO. Effects of Hawthorn on Cardiac Remodeling and Left Ventricular Dysfunction after 1 Month of Pressure Overload-induced Cardiac Hypertrophy in Rats. *Cardiovasc Drugs Ther.* 2008 Feb;22(1):19-28.
20. Bleske BE, Zineh I, **Hwang HS**, Welder GJ, Ghannam MM, Boluyt MO. Evaluation of hawthorn extract on immunomodulatory biomarkers in a pressure overload model of heart failure. *Med Sci Monit.* 2007 Dec;13(12):BR255-258.
21. **Hwang HS**, Thomas DP, McCormick R, Cirrincione G, Boluyt MO. Aldosterone antagonism fails to attenuate age-associated left ventricular fibrosis. *J Gerontol A Biol Sci Med Sci.* 2007 Apr;62(4):382-8.

22. Bleske BE, Zineh I, **Hwang HS**, Boluyt MO. Evaluation of Immunomodulatory Biomarkers in a Pressure Overload Model of Heart Failure. *Pharmacotherapy*. 2007 Apr;27(4):504-9.
23. Cirrincione GM, **Hwang HS**, Bleske BE, Boluyt MO. 3-Hydroxy-3-Methyl-Glytaryl Coenzyme A Reductase Inhibition and Extracellular Matrix Gene Expression in the Pressure-Overloaded Rat Heart. *J Cardiovasc Pharmacol*. 2006 Apr;47(4):521-30.
24. Boluyt MO, Converso K, **Hwang HS**, Mikkor A, Russell MW., Echocardiographic assessment of age-associated changes in systolic and diastolic function of the female F344 rat heart. *J Appl Physiol*. 96(2): 822-8, 2004.

Abstracts Presentations at Scientific meetings:

1. **Hwang HS**, Kryshtal DO, Sánchez-Freire V, Wu JC, Knollmann BC. iPSC-derived Cardiomyocytes From a Patient With Hypertropic Cardiomyopathy Exhibit Impaired SR Ca Handling but No Change in Cytosolic Buffering Properties. *AHA Scientific Sessions 2014*.
2. Kryshtal D, **Hwang HS**, Johnson C, Chazin W, George Jr. AL, Knollmann BC. Calmodulin Mutation (CALM-F90L) Associated With Familial Idiopathic Ventricular Fibrillation Disrupts L-type Ca Channel Inactivation and Activates Sarcoplasmic Reticulum Ca Release in Ventricular Myocytes. *AHA Scientific Sessions 2014*.
3. Stroud DM, Hall L, **Hwang HS**, Baudenbacher F, Knollmann BC, Roden DM. Cellular and Functional Defects Contributing to Dilated Cardiomyopathy in SCN5A D1275N Mice. *AHA Scientific Sessions 2014*.
4. **Hwang HS**, Xiao L, Gnecco JS, Faggioni M, Harrison DG, Knollmann BC. Renal Denervation Suppresses Catecholaminergic Polymorphic Ventricular Tachycardia in Casq2 Null Mice. *Heart Rhythm Society's 35th Annual Scientific Sessions 2014*.
5. Turna RS, Weller RS, **Hwang HS**, Dweck D, Ahmad F, Huke S, Knollmann BC, Pinto JR. Crossing Mice Carrying TnT Disease Mutations with Opposite Effects on the Myofilament Calcium Sensitivity Partially Normalizes Myofilament Function and Ameliorates Cardiomyopathy Phenotypes. *Biophysical Journal* 106(2) pp. 345a, 2014.
6. Kryshtal D, **Hwang HS**, Sánchez-Freire V, Wu JC, Knollmann BC. Cytosolic Ca Buffering of Human Induced Pluripotent Stem Cell-Derived Cardiomyocytes and Adult Rabbit Ventricular Cardiomyocytes *Biophysical Journal*. 106(2) pp. 730a, 2014.
7. **Hwang HS**, Nitu FR, Yang Y, Johnson CN, Faggioni M, Chazin WJ, George Jr. AL, Cornea RL, Bers DM, Knollmann BC. Calmodulin Mutations In Human Genetic Arrhythmia Disorders Exhibit Divergent Functional Effects On Ryanodine Receptor Ca Release Channels. *Circulation* 2013.
8. **Hwang HS**, Kryshtal DO, Sánchez-Freire V, Feaster TK, Zhang J, Kamp TJ, Hong CC, Wu JC, Knollmann BC. Human Cardiomyocytes Generated from Multiple iPS Cell Lines Exhibit Mature Calcium Handling, *Circulation* 2013.

9. **Hwang HS**, Davies SS, Knollmann BC. Highly-reactive lipid aldehydes are downstream mediators of oxidant-induced spontaneous Ca waves. *Circ Res* 2013;113:A045.
10. Baldo MP, Venkataraman R, **Hwang HS**, Baudenbacher FJ, Knollmann BC. Myofilament Calcium Sensitization Causes Pause-Dependent Ventricular Ectopy in Mouse Hearts with Acute and Chronic Myocardial Infarction. *Biophys J* 104(2), 2013.
11. **Hwang HS**, Baldo MP, Faggioni M, Knollmann BC. Flecainide's anti-arrhythmic efficacy in CPVT mice is mutation-independent but reduced by calcium overload, *Circulation* 126:A17971, 2012.
12. Faggioni M, **Hwang HS**, van der Werf C, Nederend I, AM Wilde A, Knollmann BC. Accelerated intrinsic sinus rate protects against CPVT in humans and mice. *Heart Rhythm Society*, 2012.
13. **Hwang HS**, Knollmann BC. Calcium Overload Reduces Flecainide Efficacy Against Spontaneous Calcium Release. *Biophysical Society* 2012.
14. **Hwang HS**, Matafonova E, Amarnath V, Davies SS, Knollmann BC. Scavengers Of Hyper-reactive Oxidized Lipid Aldehydes Prevent Abnormal Calcium Handling Of Ventricular Myocytes After Myocardial Infarction. *Circulation* Suppl. 2011.
15. Venkataraman R, Faggioni M, **Hwang HS**, Bennuri SC, Baudenbacher FJ, Knollmann BC, Huke S, Tachycardia Rapidly Induces Regional Changes In Gap Junctions And Generates A Substrate For Re-entry Arrhythmias In Myofilament Ca²⁺ Sensitized Hearts. *Circulation* Suppl. 2011.
16. Faggioni M, **Hwang HS**, van der Werf C, Knollmann BC. Vagolytic Therapy Prevents CPVT Induction In Casq2-KO Mice. *Circulation* Suppl. 2011.
17. Mezu U, Shusterman V, **Hwang HS**, Knollmann BC, Nemec J., Heart rate increase and repolarization lability precede onset of ventricular arrhythmia in Casq2^{-/-} mice *Circulation* Suppl. 2011.
18. Shusterman V, Nemec J, Mezu U, Knollmann BC, **Hwang HS**, McTiernan CF, Troy WC, London B. Accentuated circadian pattern to ventricular arrhythmias in Calsequestrin-2 Knockout Mice. *Circulation* Suppl. 2011.
19. **Hwang HS**, Galimberti ES, Knollmann BC. Slow diffusion across cell membrane delays onset of RyR2-channel block and Ca wave suppression by flecainide in intact myocytes. *Biophysical Society* 2011.
20. Faggione M, **Hwang HS**, Knollmann BC. Stereoselectivity of propafenone RyR2 channel block and prevention of ventricular arrhythmia in vivo. *Biophysical Society* 2011.
21. **Hwang HS**, Hasdemir C, Laver D, Mehra D, Turhan K, Faggioni M, Yin H, Knollmann BC. Inhibition of Cardiac Ca²⁺ Release Channels (RyR2) Determines Efficacy of Class I Antiarrhythmic Drugs in Catecholaminergic Polymorphic Ventricular Tachycardia, *Circulation* 122(21) supplement 2010.
22. Knollmann BC, **Hwang HS**, Kim SI, Yin H, Mehra D, Laver D. Propafenone Inhibits RyR2 Ca²⁺ Release Channels And Prevents Catecholaminergic Polymorphic Ventricular Tachycardia In Mice. *Heart Rhythm Society*, 2010.

23. **Hwang HS**, Gryshchenko O, Davies SS, Knollmann BC Effects of ~~K~~etoaldehydes on Ca²⁺ current induced SR Ca²⁺ release in ventricular myocytes, *Biophysical Society* 2010.
24. **Hwang HS**, Feng W, Yang T, Pessah IN, Knollmann BC Effect of (-)-Epigallocatechin Gallate (EGCG), a green tea extract, on excitation-contraction coupling of murine cardiomyocytes. *Biophysical Society*, 2009.
25. **Hwang HS**, Davies SS, Hill M, Pessah I, Allen PD, Roberts LJ, Knollmann BC, Role of Ketoaldehyde Protein Adducts in Ischemic Cardiomyopathy, *Circulation* 118(18) supplement. 2008.
26. Watanabe H, Tao Yang, Chopra N, Atack TC, **Hwang HS**, Leake B, Kupersmidt S, Knollmann BC, Roden DM. Sodium Channel Mutation Associated with Heart Failure, Arrhythmias, and Reduced Sodium Current. *Circulation* 118(18) supplement. 2008.
27. Chopra N, Watanabe H, Laver D, **Hwang HS**, Roden DM, Knollmann BC. Flecainide Blocks Cardiac Ryanodine Channels and Prevents Catecholaminergic Ventricular Tachycardia in Cardiac Calsequestrin Null Mice, *Circulation* 118(18) supplement. 2008.
28. **Hwang HS**, Allen PD, Knollmann BC Phenotype of transgenic mice with deletion of both cardiac calsequestrin and triadin-1., *Biophysical Society*, 2008.
29. Ghannam MM, **Hwang HS**, Converso K, Russell MW, Bleske BE, Boluyt MO. Hawthorn induces favorable changes in remodeling and gene expression in a rat model of heart failure: 1697: *Med Sci Sports Exerc*. 2007 May;39(5 Suppl):S274-5.
30. **Hwang HS**, Ghannam MJ, Boluyt MO, Converso K, Russell MW, Bleske BE. Hawthorn alters remodeling and ameliorates LV dysfunction in pressure overload-induced cardiac hypertrophy. *FASEB*, 2007.
31. **Hwang HS**, Cirrincione GM, Converso K, Russell MW, Mikkor A, and Boluyt MO. Effects of Age, Pressure Overload, and Spironolactone on Heart Collagen. *Med Sci Sports Exerc*. 2005, 37(5), S94.
32. **Hwang HS**, Converso K, Mikkor A, Russell MW., Boluyt MO. Effects of Age, Pressure Overload, and Spironolactone on Heart Function. *FASEB* 2004, 18(5), A1303.
33. **Hwang HS**, Boluyt MO. Age-Associated Decrease in the Capacity to Generate Pressure in the Left Ventricle of the Female F344 Rat Heart. *Med Sci Sports Exerc*. 2004, 36(5), S157.
34. Lee SH, **Hwang HS**, Lee YI, Farrar RP. The Effect of Resistance Training and Detraining on Skeletal Muscle Mass and Function. *FASEB*, 2002.

Invited Seminars:

1. **Hwang, Hyun Seok**, Exercise-induced Arrhythmias and Sudden Cardiac Death Korean United States Applied Physiology Society, Orlando, FL. May 2014
2. **Hwang, Hyun Seok** Exercise-induced Arrhythmias and Sudden Cardiac Death Department of Physical Education, Chung-Ang University, Seoul, Korea, April 2014

3. **Hwang, Hyun Seok** Mechanism and treatment of calcium triggered arrhythmia – a bench to bedside story, Department of Physiology, Seoul National University School of Medicine, April 2014
4. **Hwang, Hyun Seok** Mechanism and treatment of calcium triggered arrhythmia Department of Internal Cardiology, Yonsei University School of Medicine, April 2014.
5. **Hwang, Hyun Seok** Role of gamma-ketoaldehyde in oxidant-induced sarcoplasmic reticulum calcium leak Clinical Pharmacology, Vanderbilt University School of Medicine, October 2011.