

# **Edward P. Debold, PhD**

*Assistant Professor  
Departments of Kinesiology  
School of Public Health and Health Sciences  
University of Massachusetts, Amherst*

## **Education and training**

### **Post-Doc University of Vermont College of Medicine**

Dept. of Molecular Physiology and Biophysics  
Concentration: Single molecule biophysics

### **Ph. D Marquette University**

Dept. of Biological Sciences  
Concentration: Muscle Biology

### **M.S. University of Massachusetts Amherst**

Dept. of Kinesiology  
Concentration: Exercise Physiology

### **B.S.E. Seton Hall University**

Dept. of Education  
Concentration: Physical Education

## **Professional Positions**

Principal Investigator, Muscle Biophysics Lab University of Massachusetts Departments of Kinesiology and Molecular and Cellular Biology Focus: Molecular basis of heart disease & muscular fatigue	<b>2008 - present</b>
Post-doctoral Fellow, University of Vermont Department of Molecular Physiology & Biophysics Mentor: David M. Warshaw, PhD Focus: Single molecule biophysics of genetic cardiomyopathies	<b>2002 - 2008</b>
Research Assistant, Marquette University Department of Biological Sciences Advisor: Robert H. Fitts, PhD Focus: Muscle Biology	<b>1998 - 2002</b>
Research Assistant, University of Massachusetts Department of Kinesiology Advisor: Patty S. Freedson, PhD Focus: Exercise Physiology	<b>1994 - 1997</b>

## Peer-reviewed publications

- Walcott, S. D.M. Warshaw and **E.P. Debold**. Mechanical Coupling between Myosin Molecules Causes Differences between Ensemble and Single-Molecule Measurements. *Biophysical Journal* August 103:501-510, 2012.
- Debold, E.P.**, Recent insights into the molecular basis of muscular fatigue. Invited Review, *Medicine and Science in Sports and Exercise*. 2012 Aug;44(8):1440-52.
- Debold, E.P.**, Recent insights into muscle fatigue at the cross-bridge level. *Frontiers in Skeletal Muscle Physiology*. 2012;3:151. Epub 2012 Jun 1
- Debold, E.P.**, M. Turner, J.C. Stout and S. Walcott. Phosphate enhances myosin-powered actin filament velocity under acidic conditions in a motility assay. *American Journal of Physiology (Regul. Integr. & Comp.)*300:R1401-R1408, 2011.
- Debold, E.P.**, Saber, W., Cheema, Y, Bookwalter, C., Trybus, K., Warshaw, D., VanBuren, P. Human actin mutations associated with hypertrophic and dilated cardiomyopathies demonstrate distinct thin filament regulatory properties *in vitro*. *Journal of Molecular and Cellular Cardiology*, 48(2):286-292, 2010.
- Debold, E.P.**, S.E. Beck and David Warshaw. Effect of low pH on single skeletal muscle myosin mechanics and kinetics. *American Journal of Physiology (Cell. Physiol.)*295:C173-179, 2008.
- Debold, E.P.**, Amy Armstrong, Andrea Federico, J.G. Seidman, David Warshaw. Hypertrophic and dilated cardiomyopathy myosin mutations studied using a novel load-clamped laser trap assay. *American Journal of Physiology (Heart Circ. Physiol.)* 293:H284-291, 2007.
- Schmitt Joachim P., **Debold, E.P.(co-first author)**, Ferhaan Ahmad, Amy Armstrong, Andrea Federico, David A. Conner, Ulrike Mende, Martin J. Lohse, David Warshaw, Christine E. Seidman, and J. G. Seidman. Cardiac myosin missense mutations cause dilated cardiomyopathy in mouse models and depress molecular motor function. *Proceedings of the National Academy of Science* 103:14525-14530, 2006.
- Debold, E.P.**, Romatowski, J., and R. Fitts. The depressive effect of  $P_i$  on the force-calcium relationship in skinned single muscle fibers is temperature dependent. *American Journal of Physiology (Cell Physiol.)* 290:C1041-50, 2006.
- Debold, E.P.**, J. B. Patlak, D. M. Warshaw. Slip sliding away: load dependence of velocity generated by skeletal muscle myosin molecules in the laser trap. *Biophysical Journal* 89: L34-6, 2005.
- Debold, E.P.**, Dave, H. and Fitts, R.H. Fiber type and temperature dependence of inorganic phosphate: implications for fatigue. *American Journal of Physiology (Cell Physiol.)*: 287:C673-C681, 2004.
- Hendelman, D., Miller, K., Baggett, C., **Debold, E.**, Freedson, P. Validity of accelerometry for the assessment of moderate intensity physical activity in the field. *Medicine and Science in Sports Exercise*. Sep;32(9 Suppl):S442-9, 2000.
- Hendelman, D.L., K. Ornstein, **E.P. Debold**, S.L. Volpe and P.S. Freedson. Pre-exercise feeding in adolescent boys: effects on responses to endurance exercise and performance. *International Journal of Sports Nutrition* 7:207-218, 1997.
- Melanson, E.L., P.S. Freedson, D.L. Hendelman and **E.P. Debold**. Reliability and validity of a portable metabolic measurement system. *Canadian Journal of Applied Physiology*. 21(2): 109-119, 1996

## Scientific Presentations at International Meetings

- Walcott, S. and **E.P. Debold**. Ensemble myosin behaviour emerges from single molecule properties. *Multiscale Methods and Evaluation in Medicine and Biology I: Biomechanics and Mechanobiology*. San Francisco CA February 2012
- Debold, E.P.**, M. Turner, J.C. Stout and S. Walcott. Phosphate Speeds Actin Filament Velocity at Low

- pH in an In Vitro Motility Assay and is Explained Using a Detachment-limited Model of Motility. *Gordon Research Conference on Muscle and Molecular Motors*, New London, NH, July 2011
- Kobayashi, M., **E.P. Debold**, M.A. Turner R. Adikes and T. Kobayashi. Cardiac muscle activation blunted by a mutation to the regulatory component, troponin T. 25<sup>th</sup> Anniversary Symposium of the Protein Society, Boston MA July 2011.
- Debold, E.P.**, M. Turner, J.C. Stout and S. Walcott. Phosphate Enhances Actin Filament Velocity at Low pH in an In Vitro Motility Assay. *Biophysical Society Annual Meeting*, Baltimore, MD, 2011.
- Stout, J.C., A. Guha, J. Harkey and **E.P. Debold**. Elevated levels of phosphate enhance myosin driven actin filament velocity under acidic conditions. *Experimental Biology*. Anaheim, CA. 2010.
- Debold, E.P.**, C. Bookwalter, S. Beck, W. Saber, K. Trybus, P. VanBuren, D. Warshaw. Actin mutations associated with genetic cardiomyopathies affect thin filament regulation in the laser trap assay. *Thick and Thin Filament Regulation in Striated Muscle*. Madison WI, 2008.
- Debold, E.P.**, S. Beck, D. Warshaw. Acidosis affects the kinetics of single skeletal muscle myosin molecules in the laser trap. *Biophysical Society Annual Meeting*, Long Beach, CA, 2008.
- Debold, E.P.**, S. Beck, D. Warshaw. Acidosis affects myosin's ability to move actin in a single molecule laser trap assay. *American College of Sports Medicine*. 54<sup>th</sup> Annual Meeting. New Orleans, LA 2007
- Debold, E.P.**, C. Bookwalter, S. Beck, W. Saber, K. Trybus, P. VanBuren, D. Warshaw. The E99K actin mutation affects the degree of thin filament regulation in a single molecule optical trapping assay. *Biophysical Society Annual Meeting*, Baltimore, MD, 2007.
- Debold, E.P.**, S. Beck, D. Warshaw. Acidosis affects myosin's ability to move actin in a single molecule laser trap assay. *American College of Sports Medicine*. 54<sup>th</sup> Annual Meeting. New Orleans, LA 2007
- Debold, E.P.**, C. Bookwalter, S. Beck, W. Saber, K. Trybus, P. VanBuren, D. Warshaw. The E99K actin mutation affects the degree of thin filament regulation in a single molecule optical trapping assay. *Biophysical Society Annual Meeting*, Baltimore, MD, 2007.
- Debold, E.P.**, J.B. Patlak, S. Beck, M. Maida, J.G. Seidman, J. Schmitt, C.E. Seidman, D.M. Warshaw. The force-velocity relationship of mutant myosin from mouse hypertrophic and dilated cardiomyopathy models using a load-clamp laser trap assay. *Biophysical Society Annual Meeting*, Salt Lake City, UT, 2006.
- Debold, E.P.**, J.B. Patlak, A. Armstrong, S. Beck, D.M. Warshaw. The force-velocity relationship of skeletal muscle myosin studied using a load-clamped laser trap assay. *Biophysical Society Annual Meeting*, Long Beach, CA, 2005.
- Debold, E.P.** A.L. Armstrong, A.C. Federico, J.P. Schmitt, C.E. Seidman, J.G. Seidman, D.M. Warshaw. Molecular characterization of a murine model of dilated cardiomyopathy. 2<sup>nd</sup> annual symposium of the American Heart Association Council on basic cardiovascular sciences-targeting heart failure. Keystone, CO 2005.
- Debold, E.P.**, Armstrong, A.L., Federico, A.C., Schmitt, J.P., Seidman, C.E., Seidman, J.G. and D.M. Warshaw. Molecular characterization of mutant cardiac myosin from a mouse model of dilated cardiomyopathy. *Biophysical Society Annual Meeting*, Baltimore, MD, 2004
- Debold, E.P.** and R.H. Fitts. The effect of temperature and elevated levels of  $P_i$  and  $H^+$  on skinned single fiber function. *Biophysical Society Annual Meeting*, San Antonio, TX, 2003
- Debold, E.P.** and R.H. Fitts. The effect of temperature and phosphate on the force-calcium relationship in skinned single fibers. *Annual Experimental Biology Meeting*. New Orleans, LA, 2002.
- Debold, E.P.** and R.H. Fitts. The effect of temperature and inorganic phosphate on single fiber contractile properties. *Biophysical Society Annual Meeting*, New Orleans, 2000.
- LaRoche, D.P., **E.P. Debold**, J.R. Sirard, D.L. Hendelman, P.S. Freedson. Prediction of oxygen consumption during treadmill exercise in children and adolescents. *American College of Sports Medicine Annual Meeting*, Orlando, FL, 1998.
- Debold, E.P.**, D. Heil, P.S. Freedson. Examining the effect of body mass on uphill cycling performance using allometric scaling. *American College of Sports Medicine Annual Meeting*, Denver CO, 1997.
- Freedson, P.S., J. Sirard, **E. Debold**, R. Pate, M. Dowda and J. Sallis. Validity of two physical activity

- monitors in children and adolescents. Symposium XIX of the European Group of Pediatric Work Physiology. September 1997.
- Freedson, P.S., J. Sirard, **E.P. Debold**, R. Pate, M. Dowda, S. Trost, J. Sallis. Calibration of the Computer Science and Applications INC. (CSA) accelerometer. American College of Sports Medicine Annual Meeting, Denver, CO, 1997.
- Pfitzinger, P., E.L. Melanson, **E.P. Debold**, R. Pate, P.S. Freedson. Comparison of walking economy in children and youth: effects of gender and age. American College of Sports Medicine Annual Meeting, Denver, CO, 1997.
- Heil, D.P. and **E.P. Debold**. Body mass scaling of frontal area in cyclists. American College of Sports Medicine Annual Meeting, Denver, CO, 1997.

## Scientific Presentations at National Meetings

- Hendelman, D.L., **E.P. Debold** and P.S. Freedson. A new protocol to evaluate cycle ergometer performance. New England College of Sports Medicine Annual Meeting, Boxboro, MA, November 1996.
- Debold, E.P.**, D. Heil, D.L. Hendelman and P.S. Freedson. Prediction of uphill cycling performance. American College of Sports Medicine Annual Meeting, Cincinnati, OH, 1996.
- Heil, D.P., **E.P. Debold** and D.L. Hendelman. A questionnaire-based comparison of level and uphill running performance as a function of body mass. New England College of Sports Medicine Annual Meeting, Boxboro, MA, November 1995.

## Undergraduate Presentations

- Williams, E. Stout, J.C., A. Guha, J. Harkey and **E.P. Debold**. The effect of  $P_i$  and pH on muscle myosin's duty cycle. Mount Holyoke College Senior Research Seminar Series, South Hadley, MA. April 16 2010.
- Harkey, J., Stout, J.C., A. Guha and **E.P. Debold**. The effect of phosphate and acidosis on the velocity of myosin driven actin filament motion in a motility assay. University of Massachusetts undergraduate research conference. Amherst, MA. April 23, 2010.

## Invited Lectures

- "The molecular basis of muscle regulation and its role in cardiomyopathy" Rensselaer Polytechnic Institute, Department of Biology, October 17<sup>th</sup> 2011, Troy Ny
- "Phosphate enhances myosin-powered actin filament velocity under acidic conditions in a motility assay" Highlighted presentation in the Motility Subgroup at the Annual Meeting of the Biophysical Society, March 2011, Baltimore, MD
- "Examining muscle function and dysfunction using in vitro methods" Annual Meeting of the New England Chapter of the American College of Sports Medicine. November 2009.
- "Single molecule approaches to understanding the effects of acidosis and regulation on myosin function" Fall 2008 Seminar series. University of Illinois, Department of Molecular Physiology and Biophysics, School of Medicine. Chicago, IL.
- "Cellular mechanisms of muscular fatigue resulting from intense contractile activity" Spring 2004 Graduate Seminar Series, University of Delaware Department of Health, Nutrition, and Exercise Sciences, Newark, DE
- "Why Can't I Sprint Forever?" Spring 2003 Undergraduate Seminar Series, Department of Exercise Science, Johnson State College, Johnson, VT

“Simulating Fatigue in Single Muscle Fibers: The role of inorganic phosphate & hydrogen ions” Fall 2002 Graduate Seminar Series, University of Massachusetts, Department of Exercise Science Amherst, MA

## **Grant Support**

### **Active projects:**

Title: The molecular basis of depressed cardiac contractility during acute myocardial ischemia

Principle Investigator: Edward P. Debold

Agency: American Heart Association (National Affiliate),

Type: Scientist Development Grant

Period: 7/01/09-6/30/13

Total Amount: \$308,000

### **Completed projects:**

Title: The molecular mechanisms of compromised heart function during acute ischemic heart disease

Principle Investigator: Edward P. Debold

Agency: University of Massachusetts, Faculty Research Grant

Period: 6/01/09-5/30/10

Total Amount: \$30,000

Title: The Effect of Phosphate and Hydrogen Ions in Muscular Fatigue

Principle Investigator: Edward P. Debold

Agency: American Heart Association, Pre-doctoral Fellowship (Northland Affiliate)

Period: 6/01/00-7/1/02

Total Amount: \$28,514

### **Submissions not funded**

Title: The molecular mechanisms of compromised heart function during acute myocardial ischemia

Principle Investigator: Edward P. Debold

Agency: National Institute of Health

Type: RO1

Period: 5 years

Total Direct Costs \$1,250,000

Title: The role of phosphate in the loss of contractility during acute myocardial ischemia

Principle Investigator: Edward P. Debold

Agency: Smith Family Foundation Award for Biomedicine

Type: Program for Excellence in Biomedical Research

Period: 3 years

Total Amount: \$300,000

Title: Troponin T and Ca<sup>2+</sup> activation of striated muscle

Principle Investigator: Tomoyoshi Kobayashi

Agency: National Science Foundation

Type: Standard Grant

Period: 3 years

Total Direct Costs: \$676,806 (154,216 UMass total amount)

Title: The molecular basis of depressed cardiac contractility during acute myocardial ischemia

Principle Investigator: Edward P. Debold

Agency: American Heart Association (Founder's Affiliate),

Type: Scientist Development Grant

Period: 7/01/09-6/30/12

Total Amount: \$198,000 (awarded but declined in favor of National Award)

Title: The effect of acidic pH on the molecular mechanics and kinetics of cardiac myosin studied using the optical trap

Principle Investigator: Edward P. Debold

Agency: American Heart Association (Founder's Affiliate),

Type: Scientist Development Grant

Period: 3 years

Total Amount: \$198,000

Title: The molecular basis of postcardiac arrest myocardial dysfunction

Principle Investigators: Edward P. Debold, PhD and Tim Mader MD

Agency: Pioneer Valley Life Sciences Institute

Type: CBR

Period: 1 year

Total Amount: \$25,000

### **Pending Submissions**

Title: The Role of Troponin T in Heart Failure

Principle Investigator: Tomoyoshi Kobayashi, Co-investigator: Edward P. Debold

Agency: National Institutes of Health

Type: RO1

Period: 5 years

Total Amount: \$766,616 (My Total costs)

### **Awards & honors**

American Heart Association Scientist Development Award (National Affiliate)

American Heart Association Scientist Development Award (Founders Affiliate)

Smith Family Foundation Proposal (University of Massachusetts)

Faculty Research Award (University of Massachusetts)

American Heart Association Pre-Doctoral Fellowship (Midwest Affiliate)

Outstanding Student Presentation: Muscle Biology Group FASEB 2002 Annual Meeting

Richard W. Jobling Fellowship, Marquette University

Marquette University Fellowship

### **Teaching**

*University of Massachusetts, Amherst*

Human Anatomy and Physiology I (KIN 270): An undergraduate level introduction to the fundamental concepts of the structure and function of the human body. A systems based approach to understanding musculoskeletal, nervous and sensory physiology.

**Human Anatomy and Physiology II (KIN 272):** An undergraduate level introduction to the fundamental concepts of the structure and function of the human body. A systems based approach to cardiovascular, respiratory, renal, digestive, and urinary physiology.

**Exercise Physiology (KIN 470):** A senior-level in depth examination of the physiological responses to exercise. Provides the students with a thorough analysis of the both acute and chronic physiological responses and adaptations that occur with exercise training.

**Molecular Mechanisms of Muscle Contraction and Molecular Motors (KIN 597N):** A graduate level that uses the primary literature to provide an in depth understanding of the molecular basis of muscular contraction and unconventional molecular motors. We progress from the sliding filament theory of contraction to the latest crystallographic and single molecule data to explore the fundamental basis of molecular motions. In the later half we use the knowledge gained from muscle to explore the structure and function of unconventional molecular motors, careful to include the relevance to cellular function.

**Fundamentals of Cellular Engineering-Cytoskeleton and Associated Molecular Motors (Chem-ENG 697).** A graduate level course that examines the molecular basis of myosin function and the *in vitro* techniques used to A team-taught course in which I present *in vitro* methods used to characterize the structure and function of muscle and myosin II.

**Cytoskeleton Dynamics and Molecular Motors (KIN 697MM):** A graduate level course that discusses the latest research and technological advances in the fields of cellular biophysics and molecular motors.

## **Mentored Students**

### **Undergraduate**

Jennifer Harkey  
Ebony Williams  
Rebecca Adikes  
Roberta DeSouza  
Mike Woodward

### **Graduate**

Arunima Guha  
Thomas Longyear  
Mike Woodward (MCB student)  
Michael Greenberg (Boston University, Dept. of Molecular Physiology and Biophysics)

### **Membership on Thesis Committees of Doctoral Students**

Ryan Larsen  
Robert Hyldahl  
Steve Foulis  
Kevin O'Fallon  
Sai Keshavan Balchand (MCB student)  
Damien Callahan

## **Service**

### **Scientific**

**Ad-Hoc Reviews**

Biophysical Journal  
American Journal of Physiology  
Muscle and Nerve  
Physiological Genomics  
Cardiology

**Ad-Hoc member of NIH Study Section Review Panel**

Musculoskeletal and Rehabilitation Sciences

**Professional Society Memberships**

American Heart Association  
Biophysical Society  
American Physiological Society  
American College of Sports Medicine

**University service**

Member of Molecular and Cellular Biology Program  
Molecular and Cellular Biology Program Research Day, Faculty advisor and judge of student presentations

**Departmental Service**

Departmental Personal Committee  
Undergraduate Curriculum Committee  
Faculty Search Committee