Adam Z. Higgins

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EDUCATION

Ph.D. Bioengineering, Georgia Institute of Technology, 2008
B.S. Bioengineering, Oregon State University, 2002
B.A. International Studies, Oregon State University, 2002

ACADEMIC POSITIONS

Assistant Professor, Oregon State University, 2008-present

FIELDS OF SPECIALIZATION

Cryobiology, biopreservation, microfluidics, tissue engineering

PUBLICATIONS

Journal and Refereed Publications (reverse chronological order)

6. Higgins, AZ, Cullen DK, LaPlaca, ML, Karlsson, JOM. "Cryopreservation of rat embryonic neural cells using dimethyl sulfoxide and a two-step freezing protocol." *Journal of Neuroscience Methods*, in review.
5. Higgins, AZ, Karlsson, JOM. "Analysis of solution exchange in flow chambers with applications to cell membrane permeability measurement." *Cellular and Molecular Bioengineering*, 3(3): 269-285, 2010.
4. Higgins, AZ, Karlsson, JOM. "Curve fitting approach for measurement of cellular osmotic properties by the electrical sensing zone method. II. Membrane water permeability." *Cryobiology*, 60: 117-128, 2010.
3. Higgins, AZ, Karlsson, JOM. "Curve fitting approach for measurement of cellular osmotic properties by the electrical sensing zone method. I. Osmotically inactive volume." *Cryobiology*, 57: 223-233, 2008.
2. Higgins, AZ, Karlsson, JOM. "Coincidence error during measurement of cellular osmotic properties by the electrical sensing zone method." *Cryo-Letters*, 29(6): 447-461, 2008
1. Bower, CK, Parker, JE, Higgins, AZ, Oest, ME, Wilson, JT, Valentine, BA, Bothwell, MK, McGuire, J. "Protein antimicrobial barriers to bacterial adhesion: *in vitro* and *in vivo* evaluation of nisin-treated implantable materials." *Colloids and Surfaces B: Biointerfaces.* 25: 81-90, 2002.

Non-Refereed Publications (Conference Proceedings, Reports, Articles)

9. Higgins, AZ. "Mathematical minimization of toxicity during addition and removal of cryoprotectants." *Cryobiology*. 61(3): 371, 2010.
8. Lusianti, RE, Jovanovic, GN, Higgins, AZ. "Cryoprotectant removal using a microscale dialysis device." *Cryobiology*. 61(3): 372, 2010.

7. Fry, AK, Wilson, J, Higgins, AZ. "Cryoprotectant permeability and osmotic tolerance limits of adherent neuronal cells." *Cryobiology*. 61(3): 390-391, 2010.
6. Fry, AK, Higgins, AZ. "Determination of cryoprotectant permeability properties in monolayers of bovine endothelial cells using an in situ fluorescence quenching technique." *Cryobiology*. 59(3): 382, 2009.
5. Higgins, AZ, Karlsson, JOM. "Effect of Hold Temperature and Cooling Rate on Intracellular Ice Formation in Micropatterned Tissue Constructs." *Cryobiology*. 57(3): 326, 2008.
4. Higgins, AZ, Karlsson, JOM. "Effect of Intercellular Junction Protein Expression on Intracellular Ice Formation in Genetically Modified Pancreatic Beta-Cells." *Cryobiology*. 55(3): 330, 2007.
3. Higgins, AZ, Karlsson, JOM. "Comparison of Membrane Permeability Properties in Monolayers and Suspensions of Bovine Endothelial Cells." *Cryobiology*. 55(3): 375, 2007.
2. Higgins, AZ, Stott, SL, Karlsson, JOM. "Effect of Instrument Dynamic Range on the Estimation of Osmotic Properties Using Electronic Cell Sizing Techniques." *Cryobiology*. 53(3): 444-445, 2006.
1. Higgins, AZ, Karlsson, JOM. "Quantification of Tissue Dehydration by Measurement of Fluorescence Quenching." *Cryobiology*. 51(3): 413, 2005.

PRESENTATIONS

Invited and Peer-Selected Conference Oral Presentations

8. Fry, AK, Wilson, JL, Higgins, AZ. "Cryoprotectant permeability and osmotic tolerance limits of adherent neuronal cells." Annual Meeting of the Society for Cryobiology, Bristol, England. July 17-20, 2010.
7. Lusianti, RE, Jovanovic, GN, Higgins, AZ. "Cryoprotectant removal using a microscale dialysis device." Annual Meeting of the Society for Cryobiology, Bristol, England. July 17-20, 2010.
6. Higgins, AZ. "Mathematical minimization of toxicity during addition and removal of cryoprotectants." Annual Meeting of the Society for Cryobiology, Bristol, England. July 17-20, 2010.
5. Fry, AK, Houran, N, Rondema, A, Higgins, AZ. "Cell membrane permeability properties for endothelial tissue and computer-aided optimization of cryoprotectant addition and dilution procedures." AIChE Annual Meeting, Nashville, TN. November 8-13, 2009.
4. Fry, AK, Higgins, AZ. "Determination of cryoprotectant permeability properties in monolayers of bovine endothelial cells using an in situ fluorescence quenching technique." Annual Meeting of the Society for Cryobiology, Sapporo, Japan. July 19-23, 2009.
3. Higgins, AZ, Karlsson, JOM. "Effect of Hold Temperature and Cooling Rate on Intracellular Ice Formation in Micropatterned Tissue Constructs." Annual Meeting of the Society for Cryobiology, Charlotte, NC. July 20-23, 2008.
2. Higgins, AZ, Karlsson, JOM. "Effect of Intercellular Junction Protein Expression on Intracellular Ice Formation in Genetically Modified Pancreatic Beta-Cells." Annual Meeting of the Society for Cryobiology, Lake Louise, Canada. July 29-Aug 1, 2007.
1. Higgins, AZ, Karlsson, JOM. "Kinetics of Membrane Water Transport in Pancreatic Tissue." Regenerate International Conference and Exposition. Atlanta, GA. June 2-3, 2005.

Conference Poster Presentations

13. Benson, JD, Kearsley, AK, Higgins, AZ. "Identification and Minimization of a Toxicity Cost Functional for the Optimal Addition and Removal of Cryoprotectants." 18th Annual NIST Sigma Xi Postdoctoral Poster Session, Gaithersburg, MD, Feb. 16, 2011.
12. Glasscock, C, Fry A, Higgins, AZ. "Osmotic Tolerance Limits of Cultured Endothelial Cells." Undergraduate Student Poster Competition, AIChE Annual Meeting, Salt Lake City, Utah, Nov. 7-12, 2010.

11. Fry, A, Elder, R, Lowery, N, Higgins, AZ. "In Situ Measurement of Cryoprotectant Permeability in Cultured Endothelial Cells and Applications to Cryopreservation." Annual Meeting of the Biomedical Engineering Society, Pittsburgh, PA. October 7-10, 2009.
10. Higgins, AZ, Karlsson, JOM. "Comparison of Membrane Permeability Properties in Monolayers and Suspensions of Bovine Endothelial Cells." Annual Meeting of the Society for Cryobiology, Lake Louise, Canada. July 29-Aug 1, 2007.
9. Higgins, AZ, Stott, SL, Karlsson, JOM. "Effect of Instrument Dynamic Range on the Estimation of Osmotic Properties Using Electronic Cell Sizing Techniques." Annual Meeting of the Society for Cryobiology, Hamburg, Germany. July 24-27, 2006.
8. Higgins, AZ, Karlsson, JOM. "Quantification of Tissue Dehydration by Measurement of Fluorescence Quenching." Annual Meeting of the Society for Cryobiology, Minneapolis, MN. July 24-27, 2005.
7. Higgins, AZ, Karlsson, JOM. "Cell Membrane Water Permeability and Activation Energy in Hepatic Tissue." Hilton Head Engineering Tissues Workshop, Hilton Head, SC. March 9-13, 2005.
6. Higgins, AZ, Karlsson, JOM. "Factors Affecting the Viability of Neural Tissue After Cryopreservation." Tissue Engineering Society International Annual Meeting, Lausanne, Switzerland. October 10-13, 2004.
5. Higgins, AZ, Karlsson, JOM. "Fluorescence Self-Quenching Technique to Quantify Tissue Dehydration During Cryopreservation." Tissue Engineering Society International Annual Meeting, Lausanne, Switzerland. October 10-13, 2004.
4. Higgins, AZ, Karlsson, JOM. "Fluorescence Quenching Technique for Measurement of Mass Transport During Tissue Preservation." Georgia Tech Emory Center for the Engineering of Living Tissues Educational Partners Symposium. Atlanta, GA. October 5-6, 2004.
3. Higgins, AZ, Karlsson, JOM. "Measurement of Water Transport in Cell Monolayers Using Calcein Self-Quenching." Georgia Tech Emory Center for the Engineering of Living Tissues NSF Site Visit Meeting. Atlanta, GA. April 13-15 2004.
2. Higgins, AZ, Karlsson, JOM. "Cryopreservation of Primary Cortical Neurons." Georgia Tech Emory Center for the Engineering of Living Tissues Educational Partners Symposium. Atlanta, GA. October 19-21, 2003.
1. Bower, CK, Parker, JE, Higgins, AZ, Oest, ME, Wilson, JT, Valentine, BA, Bothwell, MK, McGuire, J. "Protein antimicrobial barriers to bacterial adhesion: *in vitro* and *in vivo* evaluation of nisin-treated implantable materials." American Chemical Society National Meeting. Orlando, FL. April 7-11, 2002.

Invited Seminars (non Conference**)**

8. "Cryopreservation of cell-based biosensors." US Army Center for Environmental Health Research, Fort Detrick, MD. Feb. 11, 2011
7. "Minimization of toxicity during cryopreservation." Division of Reproductive Medicine Seminar Series, Oregon National Primate Research Center, Beaverton, Oregon. Sept. 23, 2010.
6. "Minimization of toxicity during vitrification: optimal CPA addition and removal." 21st Century Medicine, Inc. Fontana, CA. Feb. 1, 2010.
5. "Strategies for cryopreservation of complex cellular systems." Life Technologies, Inc. Eugene, Oregon. Dec. 16, 2009.
4. "Long-term stabilization of living cells and tissues by cryopreservation." Oregon State University, Materials Science Program Seminar Series, Corvallis, OR, April 30, 2009.
3. "Factors affecting intracellular ice formation during tissue cryopreservation." Oregon Health and Science University, Biomedical Engineering Seminar Series, Portland, OR, Jan. 9, 2009.

2. "Measurement of cellular osmotic properties by the Coulter counter method and applications to cryopreservation." The Coulter Principle: Foundations and Advanced Applications. Harvard University, Boston, MA, Oct. 15, 2008.
1. "High-speed imaging of biological samples." Bioengineering and Biosciences Unified Graduate Student Technique Symposium, Atlanta, GA, June 26-28, 2006.

Other Presentations (Panels, etc.**)**

1. Panel member, "The Medical Field: Not Just for Doctors." Sponsored by the mentors/mentees in the women and minorities in engineering program, Oregon State University, Corvallis, OR, April 22, 2010.

GRANTS AND CONTRACTS

Competitive & External Grant Awards

1. Good Samaritan Hospital Foundation, Erkkila Endowment for Health and Human Performance, $14,950. AZ Higgins, PI, Cell Surface Engineering to Control Cell-Ice Interactions During Cryopreservation. June 2008-2009.
2. Medical Research Foundation of Oregon, $40,000. AZ Higgins, PI, Optimal Loading of Cryoprotectant Additives for Vitrification of Cells and Tissues. June 2009-2010.

OSU Internal Awards for Research

1. OSU URISC, $1500, Undergraduate Research, Winter-Spring 2010
2. OSU URISC, $997, Undergraduate Research, Fall 2009.
3. OSU HHMI, $7600, Undergraduate Research, Summer 2009.
4. OSU General Research Fund, $10,000. AZ Higgins, PI. Biopreservation of Cell-Based Devices. April 2009-2010.
5. OSU HHMI, $3800, Undergraduate Research, Summer 2008.
6. OSU Research Equipment Reserves Fund (RERF), $29,000 (exludes 61% match). AZ Higgins, PI. High-Speed Video Thermal Microscopy System. June 2008.

PROFESSIONAL SERVICE

Conference Leadership

1. Conference co-chair, 48th Annual Meeting of the Society for Cryobiology, to be held in Corvallis, OR July 24-27, 2011.
2. Judge, Best Student Poster Award, Annual Meeting of the Society for Cryobiology, Bristol, England. July 17-20, 2010.
3. Judge, Crystal Award and Best Student Poster Award, Annual Meeting of the Society for Cryobiology, Sapporo, Japan. July 19-23, 2009.
4. Judge, Best Student Poster Award, Annual Meeting of the Society for Cryobiology, Charlotte, NC. July 20-23, 2008.

External Peer Review: Journals and Proposals

Manuscript Review: Cryobiology Journal.

Panel & Site Review

1. NSF CBET BME Program, Unsolicited Proposals, June 10-11, 2010.
2. NSF CBET BME Program, CAREER Proposals, Oct. 20-21, 2010.

Professional Society Memberships (past and present)

Cryobiology Society (2003-present), International Cryobiology Young Researchers Group (2003-present), Biomedical Engineering Society (2009-present).

Professional Society Leadership

Board of Governors, International Cryobiology Young Researchers Group, 2009-present.

Consulting Assignments

1. CytoDome, Inc., Atlanta, GA, 2007

UNIVERSITY SERVICE

Undergraduate Advising

Currently advisor for 40 undergraduate students

School of Chemical, Biological and Environmental Engineering (CBEE)

Committees
Member, CBEE Scholarship Committee, 2008-present
Member, CBEE Undergraduate Curriculum Committee, 2008-2009, 2010-present
Member, CBEE Computer and Facilities Committee, 2008-2009
Member, CBEE Marketing and Recruitment Committee, 2009-present
Co-Organizer, CBEE Seminar, Spring 2010 (co-organizer with Jeff Nason)
Organizer, Chemical Engineering Seminar, Spring 2008, Spring 2009
BIOE Faculty Advisor, CBEE Student Club, 2008-present

Outreach

- Mentor, Summer Experience in Science and Engineering (SESEY), Summer 2000, Summer 2009, Summer 2010.
- Presentation about bioengineering, Crescent Valley High School, November 26, 2008.
- Mentor, Oregon Academy of Science and Engineering, Summer 2008.
- Presenter, Buzz on Biotechnology High School Open House, Fall 2003, Fall 2004, Fall 2005.

AWARDS

1. *National Science Foundation Graduate Fellowship*, 2005-2008
2. *Howard Hughes Medical Institute Graduate Fellowship*, 2003-2005
3. *Medtronic Fellowship*, Georgia Institute of Technology, 2004-2005
4. *George Family Foundation Fellowship*, Georgia Institute of Technology, 2006-2008
5. *Whitaker Foundation Fellowship Offer*, 2003*
6. *National Defense Science & Engineering Fellowship Offer*, 2003*

*Unable to accept offer because funding from other sources exceeded the salary cap.

GRADUATE STUDENTS

Current Graduate Students (2 Ph.D)

Name & Degree		Thesis Topic & Tentative Thesis Title	Completion Date
1. Allyson Fry	Ph.D.	Mathematical optimization of cryoprotectant addition and removal procedures for vitrification of cells and tissues.	3/12
2. Ratih Lusianti	Ph.D.	Separation of cryoprotectant chemicals from cryopreserved cells using microchannel dialysis	6/13

Former Graduate Students (1 M.S.)

Name & Degree		Thesis Title	Completion Date
1. Ratih Lusianti	M.S.	Removal of cryoprotectant with the use of a microseparation device	9/10

Revised 02/25/10