

# Summer M. Raines, Ph.D.

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## EDUCATION

### Doctor of Philosophy in Biochemistry

University of Wisconsin-Madison; Madison, WI

Department of Biochemistry

Graduation date: July 2010

Advisor: Alan D. Attie, Ph.D.

Dissertation title: "The role of PDGF-B and SorCS1 in vascular integrity and maintenance of peripheral insulin sensitivity"

### Bachelor of Science in Biochemistry

State University of New York at Geneseo; Geneseo, NY

Department of Biochemistry

Graduation date: May 2003, *summa cum laude*

## TEACHING AND MENTORING EXPERIENCE

### Biology 121 and 121L, General Biology for Non-majors with Lab, *spring 2012* (Instructor)

Southwestern Indian Polytechnic Institute; Albuquerque, NM

Co-instructors: Leyma De Haro, Ph.D.; Olivia George, Ph.D.; Salina Torres, Ph.D.; Gloriana Trujillo, Ph.D.

- Co-designed and taught the General Biology for Non-majors lecture and lab curriculum at the local Native American community college, emphasizing student-focused learning that is active and inquiry-driven.

### Undergraduate Student Research Mentoring, *summer 2011-present* (Mentor)

University of New Mexico; Albuquerque, NM

- Mentored a Native American undergraduate student (Jennifer Anderson) from the UNM Undergraduate Pipeline Network (UPN). Jenny designed and performed a guided research project and presented her findings at an end-of-summer poster session.
- Currently mentoring Jessica Binder, a UNM undergraduate student in a guided honors research project that includes weekly lab meetings, poster presentations twice yearly, and a dissertation defense in May 2013.

### Biochemistry 660, Biochemical Techniques, *fall semesters 2005-2009* (Lecturer and assistant instructor)

University of Wisconsin-Madison; Madison, WI

Instructor: Marvin P. Wickens, Ph.D.

- Designed and taught three lectures on the theory and practical use of immunological methods, flow cytometry, and model organisms to first-year graduate students.
- Wrote and graded problem sets for each lecture.
- As assistant instructor (2009), helped to design an introductory overview to the course and a model organisms faculty forum. Functioned as a point-person when instructor was unavailable and provided post-lecture feedback to other lecturers.

### Biochemistry 550, Topics In Medical Biochemistry, *spring semesters 2006-2008* (Teaching assistant)

University of Wisconsin-Madison; Madison, WI

Instructor: Colleen E. Hayes, Ph.D.

- Designed and taught monthly review sessions on the biochemistry of cancer, atherosclerosis, and HIV to undergraduate students; taught lectures when instructor was unavailable.
- Designed, proctored, and graded problem sets and exams.
- Designed and taught a lecture on Metabolic Syndrome.

**Biochemistry 508, General Biochemistry II, *spring 2005* (Teaching assistant)**

University of Wisconsin-Madison; Madison, WI

Instructors: David L. Nelson, Ph.D.; Michael M. Cox, Ph.D.; Sebastian Y. Bednarek, Ph.D.

- Designed and taught twice-weekly review sessions on nucleic acids, protein biochemistry, and metabolism to undergraduate Biochemistry majors.
- Proctored and graded exams.

**Undergraduate Student Research Mentoring, *September 2004-May 2009* (Mentor)**

University of Wisconsin-Madison; Madison, WI

- Mentored two undergraduate students, Si Hui Tan and Kristen Boltstad, in independent research projects that included semi-annual lab reports. Si is now at Stanford graduate school and Kristen is a production specialist at Cellular Dynamics International.

**Chemistry 302 and 304, Biochemistry I and II, *September 2002-May 2003* (Teaching assistant)**

State University of New York at Geneseo; Geneseo, NY

Instructor: Wendy K. Pogozelski, Ph.D.

- Held weekly office hours and graded exams for a year-long class for undergraduate Biochemistry majors.
- Oversaw weekly labs, including preparing experiments, designing and delivering pre-lab discussions, illustrating use of equipment, and grading lab reports.

**Chemistry 116 and 118, Chemistry I and II, *September 2000-May 2003* (Teaching assistant)**

State University of New York at Geneseo; Geneseo, NY

Instructor: John L. Deutsch, Ph.D.

- Held weekly office hours, twice-weekly review sessions, and graded exams for a year-long class for first-year undergraduate Biology and Chemistry majors.
- Oversaw weekly labs, including preparing experiments, designing and delivering pre-lab discussions, illustrating use of equipment, and grading lab reports.

**RESEARCH EXPERIENCE****Postdoctoral Fellow, *September 2010-present***

University of New Mexico; Albuquerque, NM

Department of Biochemistry and Molecular Biology, ASERT-IRACDA fellowship program

Advisor: Karlett J. Parra, Ph.D.

Co-advisor: Samuel A. Lee, M.D., Ph.D

- Determined the requirement for V-ATPase in the pathogenic fungus *Candida albicans* using yeast genetics, enzymatic assays, and fungal virulence studies. Demonstrated that loss of V-ATPase activity leads to defects in fungal virulence, and that the extent of these defects depends on the sub-cellular localization of V-ATPase.
- Currently determining the mechanisms by which V-ATPase contributes to *C. albicans* virulence.

**Graduate Research Assistant, *August 2003-August 2010***

University of Wisconsin-Madison; Madison, WI

Department of Biochemistry, Molecular Bioscience training grant program

Advisor: Alan D. Attie, Ph.D.

- Characterized the PDGF-B<sup>ret/ret</sup> mouse strain, which expresses a hypofunctional version of the angiogenic growth factor PDGF-B, using mouse genetics, physiology, and protein biochemistry. Demonstrated that livers of PDGF-B<sup>ret/ret</sup> mice display increased vascular leakage, leading to rapid insulin delivery and signaling and ultimately to reduced hepatic glucose output and increased hepatic glucose uptake. This enhanced insulin sensitivity results in dramatically reduced insulin levels without elevated hyperglycemia in obese PDGF-B<sup>ret/ret</sup> mice. This was the first evidence that PDGF-B functions in insulin delivery and that reduced PDGF-B signaling ameliorates obesity-induced type 2 diabetes.
- Aided in the discovery that allelic variations in *Sorcs1*, a PDGF-B binding protein, are linked to reduced insulin secretion in obese mice. Characterized whole-body *Sorcs1* knockout mice using mouse genetics, physiology, and protein biochemistry. Demonstrated that these mice are hyperinsulinemic with reduced whole-body insulin sensitivity, particularly under conditions of obesity.

**Undergraduate Research Intern, summer 2002**

Oxford University; Oxford, UK  
 Dyson Perrins Laboratory in Organic Chemistry  
 Advisor: Ben G. Davis, Ph.D.

- Expressed and purified three mutant versions of  $\beta$ -glycosidase using large-scale bacterial expression and nickel-affinity chromatography. The introduced mutations broaden the substrate capacity of the enzyme to allow for synthesis of novel carbohydrate-drug conjugates for use in cancer therapeutics.

**Undergraduate Research Assistant, September 2001-May 2003**

State University of New York at Geneseo; Geneseo, NY  
 Department of Biochemistry  
 Advisor: Wendy K. Pogozelski, Ph.D.

- Studied the effects of ionizing radiation on the "5 kilobase common deletion", a mitochondrial deletion that correlates with aging, Kearns-Sayre Disease, and Pearson Syndrome. Used quantitative Real Time-PCR to demonstrate that the frequency of the common deletion positively correlates with increased radiation dose.

**COMPETITIVE GRANTSMANSHIP**

- ASERT-IRACDA postdoctoral training grant (NIH: K12GM088021)**, University of New Mexico (2010-present)
- FIRST IV postdoctoral development fellowship (NSF: 0817224 DUE)**, Michigan State University (2011-present)
- Molecular Biosciences training grant (NIH: T32GM07215)**, University of Wisconsin-Madison (2003-2006)
- Geneseo Foundation Undergraduate Research Grant**, State University of New York at Geneseo (2001)

**PUBLICATIONS**

**Raines SM**, Rane H, Bernardo SM, Binder JL, Lee SA, and Parra KJ. The  $V_o$ a isoforms of V-ATPase contribute differentially to *C. albicans* virulence and clarify the role of vacuolar pH in fungal pathogenesis. *In preparation* (manuscript available upon request).

Bernardo SM, **Raines SM**, Rane H, Binder JL, Parra KJ, and Lee SA. The  $V_o$ c subunit of V-ATPase is critical for *C. albicans* virulence. *In preparation* (manuscript available upon request).

**Raines SM\***, Bernardo SM\*, Rane H, Binder JL, Parra KJ, and Lee SA. The  $V_1$ B subunit of V-ATPase is critical for *C. albicans* virulence. *In preparation* (manuscript available upon request) (\*Denotes equal contribution).

Chan C-Y\*, Prudom C\*, **Raines SM**, Charkhzarrin S, Melman SD, De Haro LP, Allen C, Lee SA, Sklar LA, and Parra KJ. Inhibitors of V-ATPase proton transport reveal uncoupling functions of the tether linking cytosolic and membrane domains of the  $V_o$  subunit a (Vph1p) (2012) *Journal of Biological Chemistry*, 287(13): 10236-50. PMID: 22215674 (\*Denotes equal contribution).

**Raines SM**, Richards OC, Schneider LR, Schueler KL, Rabaglia ME, Oler AT, Stapleton DS, Genové G, Dawson JA, Betsholtz C, and Attie AD. Loss of PDGF-B activity increases hepatic vascular permeability and enhances insulin sensitivity. (2011) *AJP-Endocrinology and Metabolism*, 301(3): E517-E526. PMID: 21673305.

Lane RF\*, **Raines SM\***, Steele JW, Ehrlich MA, Lah JA, Small SA, Tanzi RE, Attie AD, and Gandy S. Diabetes-associated SorCS1 regulates Alzheimer's amyloid- $\beta$  metabolism: evidence for involvement of SorL1 and the retromer complex. (2010) *Journal of Neuroscience*, 30(39): 13110-13115. PMID: 20881129 (\*Denotes equal contribution).

Richards OC, **Raines SM**, and Attie AD. The role of blood vessels, endothelial cells, and vascular pericytes in insulin secretion and peripheral insulin action. (2010) *Endocrine Reviews*, 31(3): 343-363. PMID: 20164242.

Clee SM, Yandell BS, Schueler KL, Rabaglia ME, Richards OC, **Raines SM**, Kabara EA, Klass DM, Mui ET, Stapleton DS, Gray-Keller MP, Young MB, Stoehr JP, Lan H, Boronenkov I, Raess PW, Flowers MT, and Attie AD. Positional Cloning of *Sorcs1*, a type 2 diabetes quantitative trait locus. (2006) *Nature Genetics*, 38(6): 688-693. PMID: 16682971.

## PROFESSIONAL PRESENTATIONS

**Raines SM**, Rane H, Binder JL, Bernardo SM, Lee SA, and Parra KJ. *The  $V_o$  complex of V-ATPase is critical for C. albicans virulence.* Poster presented at the Transport ATPases FASEB Conference (Snow Mass, CO; June 2012) and at the National IRACDA Conference (Philadelphia, PA; June 2012).

**Raines SM**, Bernardo SM, Lee SA, and Parra KJ. *V-ATPase subunits Stv1p and Vph1p affect C. albicans virulence.* Oral presentation at the South/Central Medical Mycology Group Annual Meeting (Albuquerque, NM; November 2011) and poster presented at the NM-INBRE Annual Symposium (Santa Fe, NM; March 2012).

**Raines SM**, De Haro L\*, George O\*, Torres S\*, Trujillo G\*, Ebert-May D, Rogers S, and Wandinger-Ness A. *IRACDA-ASERT and FIRST-IV Postdoctoral Training: Approaches for Non-Majors Biology Curriculum Redesign at a NM Tribal College.* Poster presented at the 2011 CIRT Forum (Madison, WI; October 2011) and at the Success in the Classroom: Sharing Practices that Work Conference (Albuquerque, NM; February 2012) (\*Denotes equal contribution).

**Raines SM**, Bernardo SM, Manifold-Wheeler BC, Lee SA, and Parra KJ. *The role of V-ATPase subunits Stv1p and Vph1p in C. albicans virulence.* Poster presented at the National IRACDA Conference (Houston, TX; June 2011). Poster presented and selected for an oral presentation at the Bioenergetics Gordon Conference (Andover, NH; June 2011).

Chan C, De Haro LP, **Raines SM**, Charkharrin S, Melman S, Prudom C, Sklar L, and Parra KJ. *Characterization of Novel V-ATPase Inhibitors Identified in a High Throughput Screen of the Prestwick Library of FDA Approved Compounds.* Poster presented at the NM-INBRE Annual Symposium (Santa Fe, NM; March 2011).

**Raines SM\***, Richards OC\*, Schueler KL, and Attie AD. *PDGF-B Deficiency Increases Insulin Delivery and Prevents Hyperinsulinemia in ob/ob Mice.* Poster presented at the American Diabetes Association 69<sup>th</sup> Scientific Sessions (New Orleans, LA; June 2009) (\*Denotes equal contribution).

**Raines SM\***, Richards OC\*, Clee SM, and Attie AD. *Vascular Defects in Type 2 Diabetes: the Role of SorCS1.* Poster presented and selected for an oral presentation at the Technology Forum during the Wisconsin Symposium on Human Biology (Madison, WI; May 2006). Poster presented and won a prize at the 1<sup>st</sup> Annual Chicago Diabetes Day/Midwest Islet Conference (Chicago, IL; June 2006). Poster presented at the Endothelial Cell Phenotypes in Health and Disease Gordon Conference (Biddeford, ME; August 2006) (\*Denotes equal contribution).

**Raines SM**, Hancock S, McDonald R, and Davis BG. *Purification of Mutant  $\beta$ -Glycosidases.* Poster presented at the 5<sup>th</sup> annual Undergraduate Research Symposium in the Chemical and Biological Sciences (Baltimore, MD; October 2002).

## ACADEMIC AND PROFESSIONAL HONORS

- **Featured in "The Roots of Success: Geneseo's Goldwater Scholars"**, Geneseo Scene Magazine (2011)
- **Department of Biochemistry Travel Award**, University of Wisconsin-Madison (2005, 2009)
- **Jackson-Ulmer Award for Excellence in Biochemistry**, State University of New York at Geneseo (2003)
- **SUNY Chancellor's Award for Student Excellence**, State University of New York at Geneseo (2003)
- **Barry M. Goldwater Scholarship**, State University of New York at Geneseo (2002)
- **Geneseo Foundation Honors Scholarship**, State University of New York at Geneseo (2000-2003)
- **Deutsch Award for Outstanding Achievement in Chemistry**, State University of New York at Geneseo (2000)
- **New York State Scholarship for Academic Excellence**, State University of New York at Geneseo (1999-2003)

## PROFESSIONAL DEVELOPMENT

### Academic Science Education and Research Training (ASERT) program, September 2010-present (Fellow)

University of New Mexico; Albuquerque, NM

ASERT Directors: Angela Wandinger-Ness, Ph.D. and Sherry Rogers, Ph.D.

Southwestern Indian Polytechnic Institute (SIPI); Albuquerque, NM

SIPI Education mentors: Nader Vadiie, Ph.D. and William Adams

- Three-year NIH IRACDA postdoctoral training fellowship designed to prepare trainees for an academic career involving both a strong research and teaching component.
- Designed and taught General Biology for Non-majors curriculum at SIPI (a community college for Native American students), integrating real-world research science and active learning into a minority classroom.
- Took courses/workshops in lab management, curriculum development, problem-based learning, and designing effective lectures. Participated in educational research seminars, journal clubs, and conferences.

### **Faculty Institutes for Reforming Science Teaching (FIRST) IV program, June 2011-present (Fellow)**

Michigan State University; East Lansing, MI

Director: Diane Ebert-May, Ph.D

- NSF postdoctoral development program to reform undergraduate science education.
- Designed an active, inquiry-based, student-centered undergraduate biology curriculum during a June 2011 workshop and throughout the fall 2011 semester. Taught this course at SIPI during the spring 2012 semester in conjunction with the ASERT program. Assessed the success of the course during a second FIRST IV workshop in June 2012. Will teach this course a second time at SIPI during the fall 2012 semester.

### **Delta Program, 2007-2010 (Participant)**

University of Wisconsin-Madison; Madison, WI

- Attended monthly roundtable dinners to discuss problems and solutions in college-level teaching.
- Participated in teaching philosophy and teaching portfolio workshops.

## **PROFESSIONAL SERVICE**

### **Rio Rancho Senior Research Expo, January 2011 and 2012 (Judge)**

Rio Rancho High School; Rio Rancho, NM

- Judged posters in the biology and biochemistry categories at a local high school science fair.

### **South/Central Medical Mycology (SCMM) Meeting, November 2010-November 2011 (Organizer)**

University of New Mexico; Albuquerque, NM

- Planned annual meeting, including hotel accommodations, travel arrangements, and dining and entertainment options for approximately 50 attendees.
- Procured biotechnology and local business sponsorship for the meeting.

### **Biology Outreach Club, 2007-2010 (Member)**

University of Wisconsin-Madison; Madison, WI

- Designed and performed science experiments with children at the Madison Parental Stress Center.
- Presented current diabetes research to retired people during the 2007 PLATO continuing education program.
- Designed and presented a station on bacterial biochemistry for Expand Your Horizons 2008, a program introducing teenage girls to careers in science
- Designed and presented an "Inside your Body" exhibit at the 2008 Science Expeditions science fair and at the 2009 Explorando las Ciencias science fair for the local Hispanic community.
- Presented a booth on careers in biological sciences at the 2010 Parkview Jr/Sr High Career Day.

### **Molecular Biosciences Training Grant Steering Committee, fall 2006-spring 2007 (Student representative)**

University of Wisconsin-Madison; Madison, WI

- Evaluated incoming graduate student applications for admission to the training grant program.
- Planned training grant events, including mixers, retreats, and information sessions.

### **Student-Faculty Liaison Committee, fall 2005-spring 2006 (Recruiting chair)**

University of Wisconsin-Madison; Madison, WI

Integrated Program in Biochemistry (IPiB) graduate program

- Designed four recruitment weekends and recruited current graduate student liaisons to lead each weekend.
- Acted as liaison for one weekend and as general point-person for all other weekends.