

OKLAHOMA LOUIS STOKES AMP

Oklahoma Louis Stokes Alliance for Minority Participation in
Science ↔ Technology ↔ Engineering ↔ Mathematics



2007

"PERFORMANCE EFFECTIVENESS" REVIEW (P.E.R.)

Submitted to
The National Science Foundation
4201 Wilson Boulevard
Room 815
Arlington, VA 22230

Earl D. Mitchell, Jr.
Principal Investigator/Program Director

Date _____

Stephen W. S. McKeever
Vice President, Research & Technology Transfer

Date _____

Fall 2007

2007

PERFORMANCE EFFECTIVENESS REVIEW

Oklahoma Louis Stokes Alliance for Minority Participation in
Science, Technology, Engineering, and Mathematics
(OK-LSAMP STEM)

TABLE OF CONTENTS

Section	Page
Key Project Personnel.....	1
Organizational Partners	2
Activities and Findings.....	2
Major Research and Educational Activities	4
Program Component One.....	4
Program Component Two	7
Program Component Three	8
Value-Added Inter- and Intra-Institutional Programming and Coherence	8
Common Components.....	9
Shared Resources	9
Coherence of Program.....	9
Evidence of Institutionalization	10
Articulation Agreements with Community Colleges	11
Publications	11
Bridge to Doctorate Phase III Supplement	11
Oklahoma State University Bridge to Doctorate Students.....	11
University of Oklahoma Bridge to Doctorate Students	15
Major Findings	17
OK-LSAMP Program Phase III Evaluation	19
Alliance-Wide Goals	19
Alliance Overall Goal Achieved.....	19
Examination of OK-LSAMP Retention and Graduation Rates	20

Section	Page
Demographics	20
Overall Freshman Enrollment.....	20
Underrepresented Minority STEM Majors.....	21
Gender and STEM Majors.....	21
STEM Graduation.....	21
Retention Rates	23
Summary	25
Appendix	27

LIST OF FIGURES

Figure	Page
1. Graduates with a Bachelor of Science Degree in STEM Areas	3
2. Ethnic Distribution of Graduates in STEM Fields -- 2006-2007	3

LIST OF TABLES

Table	Page
1. Six-Year Graduate Rates for URM STEM Majors Within STEM Fields.....	21
2. 2000 Freshman Cohort Six-Year Graduation Rates of Underrepresented Minority Students Who Began as STEM Majors and Continued In ANY MAJOR or Continued Within A STEM Major At Institution	23
3. 2 nd Year Continuation Rates of URM STEM Majors Continuing in STEM Fields.....	24
4. 2004 Freshman Cohort 2 nd Year Continuation Rates of Underrepresented Minority Students Who Began as STEM Majors and Continued in Either ANY MAJOR or in a STEM Major At Institution.....	25

Key Project Personnel

The Oklahoma Louis Stokes Alliance is comprised of the following key personnel:

Earl D. Mitchell, Jr., Ph.D.
Principal Investigator
Oklahoma State University
Stillwater, OK 74078

Valerie Shangreaux, Ph.D.
Grant Manager
Oklahoma State University
Stillwater, OK 74078

Yousif Sherif, Ph.D.
Data Manager/Campus Coordinator
Oklahoma State University
Stillwater, OK 74078

Carl Rutledge, Ph.D.
Co-Principal Investigator
East Central University
Ada, OK 74820

Myron Cherry, Ph.D.
Campus Coordinator
Northeastern Oklahoma State University
Tahlequah, OK 74464

Timothy Maharry, Ph.D.
Campus Coordinator
Northwestern Oklahoma State University
Alva, OK 73717

Ted Snider, Ph.D.
Campus Coordinator
Cameron University
Lawton, OK 73505

Rosemary Q. Hayes, Ph.D.
Evaluator
University of Oklahoma
Norman, OK 73072

J. C. Diaz, Ph.D.
Co-Principal Investigator
University of Tulsa
Tulsa, OK 74112

Simon Pulat, Ph.D.
Co-Principal Investigator
University of Oklahoma
Norman, OK 73072

Brian Campbell, Ph.D.
Campus Coordinator
Southwestern Oklahoma State University
Weatherford, OK 73096

Sharon Lewis, Ph.D.
Campus Coordinator
Langston University
Langston, OK 73050

Tim Patton, Ph.D.
Campus Coordinator
Southeastern Oklahoma State University
Durant, OK 74071

Greg Wilson, Ph.D.
Campus Coordinator
University of Central Oklahoma
Edmond, OK 73034

Organizational Partners

The Oklahoma LSAMP has joined in a number of partnerships that enhance the ability to serve more students and to use NSF funds strategically. Partnerships include, but are not limited to:

Oklahoma State University - Oklahoma City (OSU-OKC) – For the past several years, OSU-OKC has offered OK-LSAMP scholars the opportunity to register for an on-line GRE Preparation class at a reduced cost. Each Partner institution pays for tuition and text costs.

Oklahoma State University Graduate College, Stillwater Campus – The OSU Graduate College continues to invite OK-LSAMP scholars to participate in the OSU Research Symposium and to provide graduate school preparation and effective research presentation workshops to the Oklahoma LSAMP Program.

Robert S. Kerr Environmental Research Laboratory – The Robert S. Kerr Environmental Research Laboratory, located in Ada, Oklahoma, continues to be instrumental in providing research mentors and a research site to East Central University (ECU) participants.

Farrell-Cooper Mining Company – Jennifer Fuentes (Maples), Northeastern Oklahoma State University co-opted with the Farrell-Cooper Mining Company, located in Ft. Smith, Arkansas, this past summer. She investigated geological studies in the Illinois River Basin.

McNair Scholars Programs – Partner Institutions continue to actively collaborate with the McNair Scholars Program and Student Support Services Program where they exist to identify and recruit students to the Alliance, provide academic services and research activities, and opportunities to visit graduate schools.

Native Americans in the Biological Sciences (NABS) – The Oklahoma State University NABS program collaborated with OK-LSAMP in recruiting participants.

Activities and Findings

Between 1994 and 2006, annual STEM graduation rates from under-represented populations increased significantly. However, in 2006-2007 the under-represented population of Bachelor of Science degree graduates showed a downward trend to 338. This number may be attributed to an overall decline in enrollment and graduation in all academic areas. Regardless, the 338 Bachelor of Science degree STEM graduates remain an excellent baseline for a critical mass of graduate students.

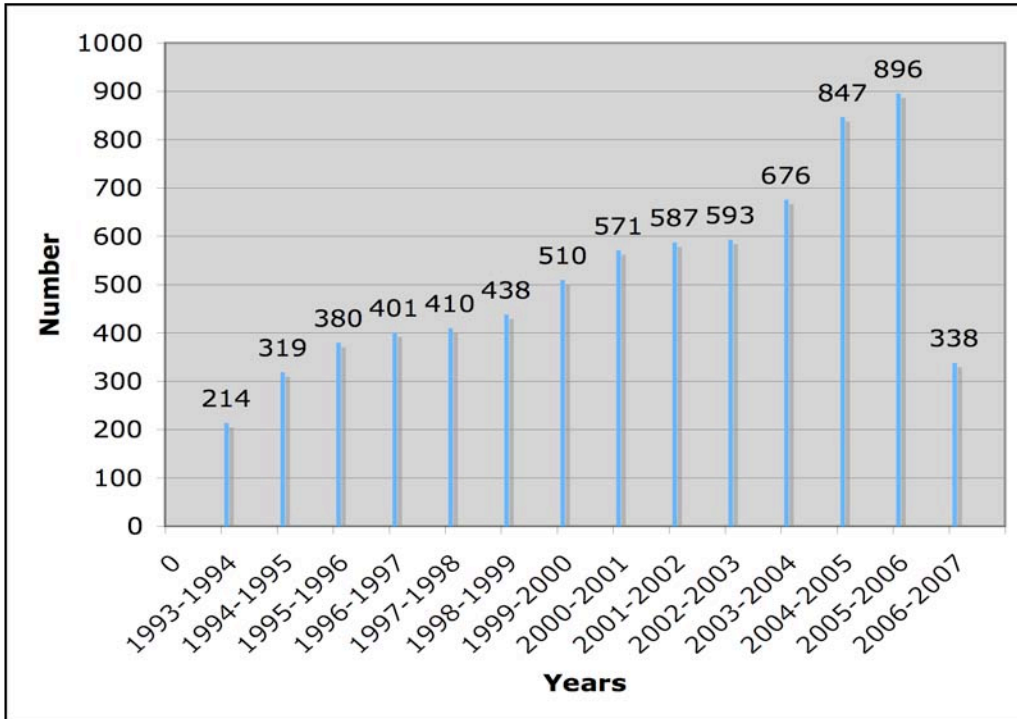


Figure 1. Graduates with a Bachelor of Science Degree in STEM Areas
 (The annual number of graduates establishes a critical mass for potential graduate students.)

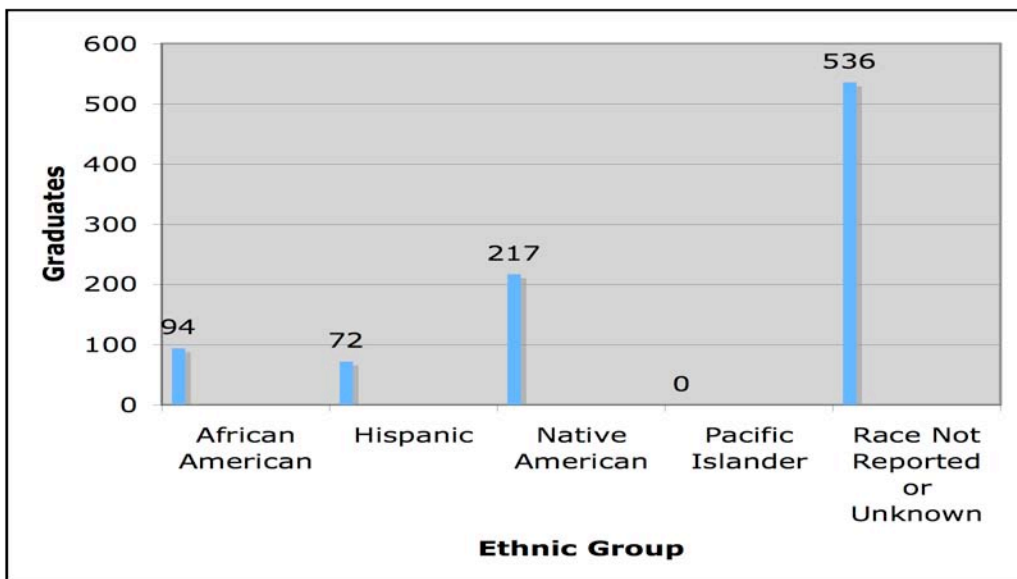


Figure 2. Ethnic Distribution of Graduates in STEM Fields -- 2006-2007
 (Oklahoma graduates more Native Americans in science than any other state.)

Major Research and Educational Activities

The Oklahoma LSAMP's stated goal in Phase III is to significantly increase the number of targeted students pursuing entry into graduate programs, preferably to earn the doctorate over the next five years. Toward meeting this shared goal, three main program components have been developed and implemented Alliance-wide. The following section discusses each of these components in detail.

Program Component One

Formation of a strong research experience in their last two undergraduate years, two full summers of research and two academic years of research activities

The undergraduate research experience is the key OK-LSAMP activity in which all students must participate. OK-LSAMP believes this is the most practical and effective way to provide value-added graduate school and career preparation. The Oklahoma Alliance offers scholars opportunities for research training, including both academic year and summer research, and to attend and present their research at local, regional, and national conferences.

Semester Research Mentoring Component. All of the Partner Institutions in the Alliance offer the Research Mentoring Component. Students are required to identify a faculty mentor, develop an approved research project, and to spend time conducting research during the academic year.

Activities/Research Internships. During the summer semester, students have the opportunity to expand their academic year research experience. All Partner Institutions in the Alliance offer Summer Research Internship Programs. Each Partner is funded to offer summer internship opportunities on their campus. Stipends up to the amount of \$3,500.00 are offered for two months of full-time research. Students may conduct research on their home campus as well as on any of the Alliance Partner campuses. Listed below are selected examples of the activities OK-LSAMP scholars conducted:

- Quincy Anderson, Jon Walker, Aaron Washington, and Nathan Williams, Langston University, completed degree requirements in May 2007.
- Dominic Barrett, Oklahoma State University Bridge to Doctorate Fellow presented "*Spatiotemporal Age Structures of Expanding River Otter Populations*" at the 87th Meeting of the American Society of the Mammalogists, Museum of Southwestern Biology, Albuquerque, New Mexico.
- Leethaniel Brumfield, Langston University, received the UNCF/Merck Undergraduate Science Research Award for 2007-2008.

- Brett Cowan, Oklahoma State University Bridge to Doctorate Fellow, received his Ph.D. in Civil Engineering, May 2007.
- Greg Falling, Northeastern State University, continued his two-year investigation, *Engineering Robotics*, under the direction of Dr. Calvin Cole. In the Fall 2007, Greg will enter graduate school in Engineering Physics at the University of Arkansas.
- Jennifer Fuentes, Northeastern State University, Tahlequah, Oklahoma, interned with Farrell-Cooper Mining Company, Fort Smith, Arkansas, in the Summer of 2007 in an investigation of *Sediment Studies of the Illinois River Basin*. She will continue this work during the 2007-2008 academic year under the direction of faculty member, Mr. John Simms.
- Michael Henry and Laticia Rivera, Oklahoma State University and Tomica Blocker, Langston University, presented research at the 2007 National Conference for Undergraduate Research hosted by Dominican University of California, San Rafael, California.
- Marty Heppler, Bridge to Doctorate Fellow, Oklahoma State University, discovered a new organism.
- Brad Holland and Dustin Little, Northeastern State University, Tahlequah, Oklahoma, conducted research on microwave polymerization reactions under the mentorship of Dr. Spence Pilcher, Chemistry Department, Northeastern State University.
- Miranda Knight, Northeastern State University, under the direction of Dr. Cindy Cisar, continued to study *Antibiotic Resistance in Coliforms*. Miranda began this project in the Fall 2006 semester
- Richardo Lemus, Southeastern Oklahoma State University, received his Bachelor of Science degree in May 2007 and was accepted in the graduate program at Jackson State University in Jackson, Mississippi.
- Waylon Marler, Northeastern State University, entered the graduate program at the University of Alaska.
- James Morel, Southeastern Oklahoma State University, presented “*Recovery of a Fish Community Following a Golden Algae Kill in Lebanon Pool, Lake Texoma, Oklahoma*” at the 2007 New Mexico Louis Stokes Alliance for Minority Participation Annual Conference, Las Cruces, New Mexico.
- Kariel Ross, Langston University, presented a poster at the 13th Annual Research Symposium, Oklahoma State University, Stillwater, Oklahoma.
- Valentin Sanchez, Oklahoma State University, Stillwater, Oklahoma, Interned with Dr. Andrew Arena, Maciula Professor in Engineering, School of Mechanical and Aerospace Engineering, Oklahoma State University, advisor for

international award winning aircraft design teams, 1999, 2000, 2001. The focus of the research is the development of an unmanned aerial vehicle using a hydrogen fuel cell for power. The new airplane the “*Pterosoar*” has broken an FAI world record in a point and return range mission. The previous record was set in 2006 in Estonia and was 80.43 kilometers. The new record of 128 kilometers was set in Lancaster, California. This flight was considered a “shakedown” test, and the actual range capability of the airplane is over 500 kilometers.

Additional information: <http://picasaweb.google.com/dustin.e.gamble/PterosoarPics>.

- David Supeck, Southwestern Oklahoma State University, presented research at each of the following: 2006 Annual Oklahoma Research Day hosted by the University of Central Oklahoma, Edmond, Oklahoma; Southwestern Oklahoma State University Research Fair; Corn Bible Academy, Corn, Oklahoma; and the American Chemical Society (ACS) National Meeting, New Orleans, Louisiana. David’s research topics include: “*The Effects of Shets on Ovarian Cancer, Specifically Quench Flourescenes Titrations;*” “*Gene Mutations in Bateriophage T4;*” and “*The Effects of Nutria on Oklahoma.*”
- Cammi Valdez, Southwestern Oklahoma State University, made five poster presentations and seven oral presentations, including but not limited to, the Society for Advancement of Chicanos and Native Americans, Kansas City, Missouri; Summer Honors Undergraduate Research Program, Harvard University, Cambridge, Massachusetts; New Mexico AMP Student Research Conference, New Mexico State University, Las Cruces, New Mexico, Oklahoma State University, University of Central Oklahoma, University of Oklahoma, and Southwestern Oklahoma State University.
- Uduack Williams, University of Central Oklahoma, presented research at the 2006 Annual Oklahoma Research Day hosted by the University of Central Oklahoma, Edmond, Oklahoma.
- Forty-Five OK-LSAMP scholars from across the state attended the 13th Annual Research Symposium hosted by Oklahoma State University, Stillwater, Oklahoma, September 15, 2007

OK-LSAMP Scholars were also encouraged to participate in Research Experiences for Undergraduates (REUs) or similar programs at other institutions, as well as conduct internships in national labs, corporations and with state and federal agencies. The following scholars conducted research and/or internships in sites beyond the Alliance:

- Quincy Anderson, Leethaniel Brumfield (UNICEF/Merck Recipient), Jason Chandler, and Charles Loftis, Langston University, participated in the George Washington Carver Research Program and conducted summer research internships at the University of Arkansas.
- Derek Blyth, Langston University, was accepted into the Ph.D. Statistics graduate program at Iowa State University.

- Ralph Culver, III, Langston University, was accepted into the Ph.D. Statistics graduate program at Iowa State University.
- Rosa Madrid, Oklahoma State University, interned with Spirit Aerosystems, Tulsa, Oklahoma. Cynthia Isaacs, Manager of Industrial Engineering, served as mentor.
- Contessa Majors, Langston University, accepted a Bridge to Doctorate Fellowship at the University of Alabama at Tuscaloosa starting August, 2007.
- James Morel, Southeastern Oklahoma State University, completed requirements for the Bachelor of Science degree and was accepted into the graduate program and the LS-AMP Bridge to Doctorate program at New Mexico State University. He will begin course work in January 2008 following a research expedition with Dr. Tim Patton, Mentor at Southeastern Oklahoma State University, in the Rio Grande River on the Texas-Mexico border.
- Cammi Valdez, Southwestern Oklahoma State University, conducted research entitled, *Effects of Flex-Hets on Ovarian Cancer Cell Metabolism: Evaluating the Mechanism of NADH-Ubiquinone Oxidoreductase Inhibition;*” attended the Summer Honors Undergraduate Research Program at Harvard Medical School, Cambridge, Massachusetts; and undergraduate research IDeA Network Biomedical Research Excellence, University of Oklahoma, Norman, Oklahoma.

Program Component Two

Full participation in graduate school preparation.

Focal points on graduate school preparation included participation in the Graduate Preparation component of the program, interaction with matriculating graduate students, the application process, and research experiences.

- Graduate school preparation modules are listed on the OK-LSAMP website (OK-LSAMP.okstate.edu) for all Partner Institution use.
- Scholars continue to take advantage of the on-line Graduate Record Examination (GRE) preparation course offered at a reduced cost to the Alliance through Oklahoma State University-OKC. The modules have been developed to provide learning activities to assist students in acquiring knowledge, practicing skills and completing steps necessary to gain admission to graduate school with successful completion. The modules focus on (1) what is the GRE, why it should be taken, how to prepare, contents and format, (2) test-taking skills relevant to computer aided test format, (3) practice tests, (4) scoring, and (5) average score requirements for specific fields of study.

- Scholar meetings implemented throughout the Alliance offered a forum for educational speakers and workshops focused on graduate school preparation and career development.

Program Component Three

Institutionalization of a graduate education culture within the undergraduate group culture and environment.

Participants from each Alliance Partner Institution must take an active part in activities that enhance and assess academic performance, arouse accountability consciousness, and provide other experiences that lend to graduate school and workforce preparation.

- Felix de laCruz, Steven Harris, Desmond Harvey, Jacob Henderson, Quintin Hughes, Kevin James, Shawn McCarroll, Marshall McCutchin, Isreal Osisanya, Marquita Rowland, and T'Aire Wallace, University of Oklahoma Bridge to Doctorate Fellows, attended the National Science Foundation Joint Annual Meeting (JAM) August 15, 2007 in Washington, D.C.
- The Oklahoma State University Annual Research Symposium offered workshops focusing specifically on Graduate Education.
- The opening session of the Annual Research Symposium addressed Scientific Integrity and Ethics. Dr. Earl Mitchell, Jr., OK-LSAMP Program Director has consistently offered the opening remarks addressing these issues. Invited workshop speakers also addressed these issues.
- Partner Institution Scholars are provided opportunities to attend lectures on Ethics during monthly Scholar's meetings.
- Scholars throughout the Alliance continue to be encouraged and supported in traveling to visit graduate schools.

Value-Added Inter- and Intra-Institutional Programming and Coherence

Common program components, shared resources and coherence among Partner Institutions provide "value-added" inter- and intra-institutional programming and coherence" to the Oklahoma LSAMP.

Common Components

The inter-institutional collaboration among the 11 Partner Institutions continues to serve as the catalyst for establishing comprehensive and coherent programming aimed at enhancing the academic preparedness of targeted undergraduate students for graduate studies.

- All Partner Institutions offer Scholars Programs including financial and academic support, academic year Research Mentoring Components and a Summer Research Internship Program. Across the Alliance, these programs focus on retention, high academic achievement and graduate school preparation.
- Tutoring is available for students experiencing difficulty with coursework and is strongly encouraged to make this known to the Campus Coordinator as early as possible. The program provides compensation to the tutor.
- Scholars throughout the Alliance continue to take advantage of the on-line GRE Preparation course offered at a reduced cost to the Alliance through OSU-OKC

Shared Resources

Inter-institutional collaboration - each summer a number of students conduct their internships at Partner Institutions. Each Partner is funded to offer summer internship opportunities on their campus, but, because of inter-institutional collaboration, scholars may also conduct research on Alliance Partner campuses.

- *Cherie Ognibene and Via'Ney Price*, Langston University, conducted internships with the NIH Institutional Development Award (IDeA) Program to develop an IDeA Network of Biomedical Research Excellence (INBRE) at Oklahoma State University.
- *Cammi Valdez*, Southwestern Oklahoma State University, conducted research with the Stephenson Research and Technology Center, University of Oklahoma, Norman, Oklahoma.
- Graduate School preparation information workshops for OK-LSAMP students are available to the Alliance through the Oklahoma State University Graduate College.

Coherence of Program

- Quarterly Alliance meetings, held at the Oklahoma State Regents for Higher Education (OSRHE) office in Oklahoma City, are a forum for ongoing communication on overall program operation and specific program implementations on each campus.

- Program newsletters and other program publications enhance communications between Partner Institutions and maintain the coherence of the program.
- Unitized data system.

Evidence of Institutionalization

Institutionalization is being achieved in several areas; examples for this process are listed below:

- East Central University (ECU) Vice President of Academic Affairs has made college work-study funds available to all eligible ECU OK-LSAMP scholars. Several Scholars take advantage of this each semester to conduct research. In this way, ECU is able to support more students to conduct research.

Other programs that have research components and faculty on campuses with research projects are now seeking OK-LSAMP scholars. Specific examples of requests include:

- Oklahoma Experimental Program to Stimulate Competitive Research (EPSCoR) collaborates with OK-LSAMP to identify undergraduate research scholars.
- Satish Bukkapatnam, Associate Professor, School of Industrial Engineering & Management, Oklahoma State University has an NSF REU program and mentored two OK-LSAMP scholars.
- The Campus Coordinator at Southwestern Oklahoma State University reported receiving several requests from research faculty for OK-LSAMP students to work with on-going research projects.
- The Program Manager position at OSU is an institutional position.
- The University of Oklahoma hosted a Summer Bridge program for Engineering students. Support for this program was provided by private and state funds. Two Bridge to Doctorate students participated as mentors.
- For the last three years, Dr. Sharon Lewis, Campus Coordinator, Langston University, has hosted two to six high school students in her lab during the month of June in cooperation with the Research and Engineering Apprenticeship Program (REAP). The students conduct research in bio-informatics, molecular biology, and asphalt chemistry.

Articulation Agreements with Community Colleges

Oklahoma State Regents for Higher Education articulation agreement and policy “guarantees transferring students successfully completing Associate of Science or Associate in Arts degrees that the lower division general education course requirements are satisfied.” Oklahoma State University has the Northeastern State University at Oklahoma State University Gateway Program (NOC-OSU) located at NOC’s Stillwater campus. Students who have applied for freshman admission to OSU, but do not meet current admission requirements do qualify for admission to the NOC-OSU Gateway Program. Gateway courses transfer as equivalent to specific OSU courses and meet general education requirements, just as they would if taken at OSU.

Publications

Wang, H., Zhou, Q., Kesinger, J., Norris, C., and **Valdez, C.** (2007). Heme regulates exocrine peptidase precursor genes in zebrafish. *Experimental Biology and Medicine*, Vol. 232, pp. 1170-1180 (see Appendix for Abstract).

Bridge to Doctorate Phase III Supplement

In July 2004, the Oklahoma Louis Stokes Alliance received funding for a Bridge to Doctorate program at Oklahoma State University. Currently there are 12 participants. The following year, the University of Oklahoma became the second BD site in the Oklahoma Alliance.

Oklahoma State University Bridge to Doctorate Students

Dominic Barrett, Master of Science student Zoology, Fisheries and Wildlife Ecology has completed his Plan of Study and to date has completed the appropriate coursework as outlined with a 3.700 GPA. His research proposal has been submitted to the committee and he is involved in rigorous field study. Accomplishments include, but are not limited to:

- Presentation: *River Otter Lontra Canadenis Distribution and Current Research in Oklahoma* at the 94th Annual Technical Meeting of the Oklahoma Academy of Science, Oklahoma City University, Oklahoma City Oklahoma, November 5, 2005.
- River otter research efforts focused on the entire eastern portion of Oklahoma. To gather age data and examine relative densities river otters were trapped at, 1) Baron Fork near Tahlequah, 2) Sequoyah National Wildlife Refuge near

Sallisaw, 3) Red Slough Wildlife Management Area near Idabel. Surveys were conducted in rivers/streams from Pawhuska to about Ardmore. Over 400 sites were visited across eastern Oklahoma.

- Received the Graduate Student Fisheries Involvement Award, January 2005.

Brett Cowan, Bridge to Doctorate student in Civil Engineering, completed requirements for the Ph.D. degree in May 2007 with a GPA of 3.808. Currently Brett is employed as a Civil Engineer with the U.S. Corp of Engineers in Tulsa, Oklahoma.

Cara Cowan-Watts, Bridge to Doctorate student in Biosystems and Agricultural Engineering, has completed 37 hours of coursework with an overall GPA of 3.479 and is making progress toward completion of her thesis. Accomplishments include, but are not limited to:

- Non-technical poster and presentation: Oklahoma Water Symposium.
- Member: American Indian Science and Engineering Society.
- Legislator: 2003-2011, Cherokee Nation District 7, Rogers County, Oklahoma.
- Parliamentarian: 2007, Oklahoma Professional Chapter of American Indian Science and Engineering Society; member and officer since 1999.

Marty Heppler, Master of Science student in Entomology and Plant Pathology, completed requirements for the Master of Science degree in Summer 2007 with a 3.727 GPA. Marty has accepted employment with the USDA Agricultural Research Services in California. Accomplishments include, but are not limited to:

- Discovered a new species of organism. After polymerase chain reactions, sequencing, and using a Basic Local Alignment Search Tool, Marty came to the conclusion that the *typanosomatid* in the Squash Bug, *Anasa tristis* is a new species.
- Presentation: *Role of Glandular-haired Trichomes in Resistance of Alfalfa to the Potato Leafhopper*, Integrated Pest Management Student Symposium, Oklahoma State University, Stillwater, Oklahoma, April 25, 2006.
- Participant: Annual meeting of the Southwestern Branch of the Entomological Society of America (SWBESA), Austin, Texas, February 27-March 2, 2006.

- Poster Presentation: *Mortality to Aphids Fed Serratia marcescens, the Causal Agent of Cucurbit Yellow Vine Disease* at the Entomological Society, Fort Lauderdale, Florida, November 5-10, 2005.
- Member: APS Joint Committee of Women in Plant Pathology & Cultural Diversity, Fall 2005-2008
- Treasurer: OSU Sanborn Entomology Club.

Jacob Manjarrez, Bridge to Doctorate student in Biochemistry and Molecular Biology, has completed department requirements and is currently working on his research project. Jacob maintains a 3.886 GPA. Accomplishments include, but are not limited to:

- President: Biochemistry and Molecular Biology Graduate Student Association (BMBGSA).
- Provided training and oversight of two undergraduate interns during the Summer 2006.

Thomas Patten, Bridge to Doctorate student in Electrical Engineering, has completed coursework as outlined in his Plan of Study and is currently working on his research. Thomas maintains a 3.237 GPA.

Lila Peal, Master of Science student in Biochemistry and Molecular Genetics, is working toward completing courses outlined on her Plan of Study with a 3.031 GPA. Her anticipated graduation date is December 2008. Accomplishments include, but are not limited to:

- Poster Presentation: 2007 Biochemistry and Molecular Biology Research Symposium, Oklahoma State University, Stillwater, Oklahoma.
- Treasurer: Biochemistry and Molecular Biology Graduate Student Association (BMBGSA).

Loretta Rush, Master of Science student in Plant Pathology, continues to complete course requirements with a 3.676 GPA. Currently she is employed by Seminole Junior College, Seminole, Oklahoma as an Instructor. Accomplishments include, but are not limited to:

- Presentation: *Bridges to Roots: Fire on the Prairie*, East Central University, Ada, Oklahoma, February 2006.

- Presentation: *Role of the Mi Gene in Conferring Resistance to the Root-knot Nematode in Tomato Cultivars*, Integrated Pest Management Student Symposium, Department of Entomology and Plant Pathology, Oklahoma State University, Stillwater, Oklahoma, April 25, 2006.
- Participant: NSF Grant Writing Workshop in Ardmore, Oklahoma, September 2005.

Adrian Sherman, Master of Science student in Biosystems and Agricultural Engineering, completed his second year of coursework with a GPA of 3.500, selected a graduate committee and is working on a Plan of Study and a Prospectus for his research.

Nicole Singleton, Master of Science student in Physiological Sciences (Toxicology), is completing course requirements and thesis research. Nicole maintains a 3.250 GPA. Accomplishments include, but are not limited to:

- Presentation: *Effects of Intracerebroventricular Infusion of a Muscarinic M2 Agonist on Organophosphate Toxicity in Rats*, Phi Zeta Research Symposium, Veterinary Health Sciences Center, Oklahoma State University, Stillwater, Oklahoma, March 31, 2006 in conjunction with her adviser and mentor, Dr. Carey Pope.

Brek Wilkins, Doctoral student in Biomedical Sciences, Oklahoma State University Center for Health Sciences, Tulsa, Oklahoma has formed his committee and completed an approved Plan of Study. Brek continues to work on his research and maintains a 3.627 GPA. Accomplishments include, but are not limited to:

- Poster Presentation: *Early Detection of Diabetic Neuropathy in Native Americans* at the National Science Foundation Joint Alliance Meeting, Washington, D.C.

Christee Wright, Master of Science student in Microbiology and Molecular Genetics, completed degree requirements in July 2007 with a GPA of 3.898. Accomplishments include, but are not limited to:

- Presentation: *Isolation and Expression of a Putative FMN-Dependent NAD(P)H Azoreductase in Clostridium Perfringens*, American Society of Microbiology, Orlando, Florida, May 2006.

University of Oklahoma Bridge to Doctorate Students

Felix delaCruz, Ph.D. student in Mechanical Engineering, is currently working on his course requirements and research project. Felix maintains a 2.999 GPA. Accomplishments include, but are not limited to:

- Presentation: *The Effects of Moisture Absorption on a Polymer Composite Laminate Comprised of Natural Montmorillonite Clay (Na*) and a Water-borne Polymer Solution*, OU Research Day and McNair National Conference.
- Participant: LS-AMP Research Symposium, Oklahoma State University, Stillwater, Oklahoma, September 15, 2007.
- Participant: National Science Foundation HRD Joint Annual Meeting (JAM), Washington, D.C., August 15, 2007.

Steven Harris, Ph.D. student in Biochemistry, is currently working on his course requirements and research project with a 3.75 GPA. Accomplishments include, but are not limited to:

- Participant: LS-AMP Research Symposium, Oklahoma State University, Stillwater, Oklahoma, September 15, 2007.
- Participant: National Science Foundation HRD Joint Annual Meeting (JAM), Washington, D.C., August 15, 2007.

Desmond Harvey, Master of Science student in Industrial Engineering with a 3.877 GPA, is currently completing course requirements and thesis research. Accomplishments include, but are not limited to:

- Participant: American Society for Engineering Education (ASEE) National Conference, Honolulu, Hawaii, June 24-27, 2007.

Jacob Henderson, Master of Science student in Electrical and Computer Engineering with a 3.59 GPA, is currently completing course requirements and thesis research. Accomplishments include, but are not limited to:

- Participant: National Science Foundation HRD Joint Annual Meeting (JAM), Washington, D.C., August 15, 2007.

Quintin Hughes, Master of Science student in Industrial Engineering with a 3.00 GPA, is currently completing course requirements and thesis research with an anticipated graduation date of December 2007 and continuation into the Ph.D. program at the University of Oklahoma. Accomplishments include, but are not limited to:

- Presentation: *Thesis Research*, Oklahoma State University LS-AMP Research Day, September 15, 2007.

Kevin James, Master of Science student in Computer Engineering with a 3.15 GPA, is currently completing course requirements and thesis research. Accomplishments include, but are not limited to:

- Participant: National Science Foundation HRD Joint Annual Meeting (JAM), Washington, D.C., August 15, 2007.
- Participant: Oklahoma State University LS-AMP Research Day, September 15, 2007.

Shawn McCarroll, Master of Science student in Computer Science with a 3.61 GPA, is currently completing course requirements and thesis research. Accomplishments include, but are not limited to:

- Participant: American Indian Science and Engineering Society (AISES) Conference in Detroit, Michigan, November 2, 2006.
- Participant: National Science Foundation HRD Joint Annual Meeting (JAM), Washington, D.C., August 15, 2007.

Marshall McCutchin, Master of Science student in Physics with a 3.75 GPA, is currently completing course requirements and thesis research.

Isreal Osisanya, Master of Science student in Petroleum Engineering with a 3.00 GPA is currently completing course requirements and thesis research.

Marquita Rowland, Ph.D. student in Microbiology with a 3.417 GPA is currently completing course requirements and thesis research. Accomplishments include, but are not limited to:

- Participant: National Science Foundation HRD Joint Annual Meeting (JAM), Washington, D.C., August 15, 2007.

- Participant: Oklahoma State University LS-AMP Research Day, September 15, 2007.

William (Joey) Vazquez, Master of Science student in Mathematics with a 3.64 GPA, is currently completing course requirements and thesis research.

T'Aire Wallace, Master of Science Student in Microbiology with a 3.300 GPA, is currently completing course requirements and thesis research. Accomplishments include, but are not limited to:

- Participant: National Science Foundation HRD Joint Annual Meeting (JAM), Washington, D.C., August 15, 2007.

Major Findings

Dr. Rosemary Q. Hayes, University of Oklahoma, and Program Evaluator for the Oklahoma Louis Stokes Alliance for Minority Participation in Science, Technology, Engineering and Mathematics presents the following information.

The University of Oklahoma

CENTER FOR INSTITUTIONAL DATA EXCHANGE AND ANALYSIS (C-IDEA)
Consortium for Student Retention Data Exchange (CSRDE)

August 29, 2007

Dr. Earl Mitchell
Program Director, OK-LSAMP
Oklahoma State University
408 Whitehurst
Stillwater, OK 74078

Dear Dr. Mitchell,

Congratulations on another successful year. My analysis shows that based on the most currently available data approximately 55% of the Phase III graduates in this evaluation period have been accepted to graduate school. ***The goal of the Alliance is to have a minimum of 10% of the available baccalaureate degree graduates over the five year program to be eligible for graduate school for admission and subsequent enrollment. The OK-LSAMP Alliance is certainly meeting this goal.***

Enclosed please find your copy of the OK-LSAMP Program Evaluation. This evaluation covered the period of Fall 2006 through Summer 2007. This evaluation document has been prepared exclusively for you.

The attached narrative draws some comparisons between the OK-LSAMP institutions and the overall results of our most recent STEM survey of 1990 institutions. The comparisons look at the period of 1999-2005. Two tables that examine the most recently available 6-year graduation rates (2000 cohorts) and 2nd-year continuation rates (2005 cohorts) for underrepresented minority students are provided. These tables compare the individual OK-LSAMP partner institutions with the STEM institutions with similar admission selectivity requirements. In addition, I have also included two tables that provide a historical view of both 6-year graduation rates and 2-year continuation rates of underrepresented minority STEM students. You will be pleased to learn that URM students from the OK-LSAMP Alliance on the whole are outperforming the national average:

- Almost 50% of the underrepresented minority (URM) STEM majors from the Fall Cohort of 2000 graduated from college in any major (including STEM) in six years. The national average for these students is approximately 47%.
- More importantly for the OK-LSAMP Alliance, almost 33%, (one third) of the Fall 2000 cohort of URM STEM majors cohort actually stayed in STEM fields and graduated in STEM. The national average for URM students actually graduating within STEM in six years is around 28%. Keep in mind that these figures describe the overall performance of institutions rather than the OK-LSAMP program. When we look at just the students in Phase III the rates are much higher. However, I believe it is reasonable to assume that the OK-LSAMP programs are impacting the culture of the partner institutions.

I am also enclosing an electronic copy of the OK-LSAMP Retention Study. This report has gone to the publisher and I will send hardcopies out once they are returned from the printer. This report provides a more detailed year-by-year look at the enrollment, retention, and graduation of students in all majors by race, ethnicity and gender. And, importantly, it tracks these issues for students that begin as STEM majors.

The OK-LSAMP Retention Study will provide you with a number of ways to look at the progress being made and areas that need addressing. In the back of the report you will find year-by-year retention data broken down by race, ethnicity, and gender for each of the OK-LSAMP institutions. This will allow you and the partners to look more in-depth at the changes in retention and graduation rates among the URM and female STEM students.

There is more work to be done with the partners in terms of tracking program activity. The hurdles that this program has faced this year have been incredible. Despite late funding and early reporting requirements, the OK-LSAMP program survives and thrives. This is a testament to your leadership.

Thank you for the trust you have placed in me during this evaluation process. I would enjoy the opportunity to discuss the evaluation in more detail.

Warm regards,

Rosemary Hayes, Ph.D.
NSF Program Evaluator

OK-LSAMP Program Phase III Evaluation

Rosemary Hayes, Ph.D.
The University of Oklahoma
NSF OK-LSAMP Program Evaluator

The following section of the report addresses the goals and outcomes reported by the OK-LSAMP partners.

Alliance-Wide Goals

The OK-LSAMP program proposes to significantly increase the number of targeted students entering into graduate programs over the next five years, preferably to earn doctorates. To this end, the goal of the Alliance is to have a minimum of 10% of the available baccalaureate degree graduates over the next five years eligible for graduate school for admission and subsequently enrollment.

Graduate School eligibility has been defined as:

- Min 3.0 GPA
- Two full summer internships
- Annual presentation of research
- Taken GRE by fall of Senior Year
- Minimum 3 applications to graduate school

Alliance Overall Goal Achieved

The goal of the Alliance is to have a minimum of 10% of the available baccalaureate degree graduates over the next five years eligible for graduate school for admission and subsequently enrollment. Given the GPAs and research experience of the group, many students have the potential to move on to graduate STEM work. The most currently available data shows that **55% of participating OK-LSAMP students were identified as having been admitted to graduate school.** In addition, as will be shown later in this summary, the overall six-year graduation rate (both in any major and specifically in a STEM major) for first-time full-time underrepresented minority freshmen who start off as STEM majors within the OK-LSAMP Alliance is higher than the national average for URM STEM students.

Examination of OK-LSAMP Retention

and Graduation Rates

In August 2007, the Center for Institutional Data Exchange and Analysis at the University of Oklahoma Outreach published the seventh annual national STEM retention study: the *2006-07 STEM Retention Report*. This report was based on data collected from 190 colleges and universities, including all ten of the OK-LSAMP public universities. The retention data for nine of the ten institutions was provided by Assistant Director of State System Research Laura Tyree at the Office of the Oklahoma State Regents for Higher Education. That data addressed the progress of cohorts through the fall of 2006, with updated information on cohorts as of 2007 not being available for the Oklahoma institutions. In this study estimates based on previous year data have been used for those missing data. The data for Oklahoma State University was provided directly from its Institutional Research Office. The University of Tulsa, which participates in the OK-LSAMP program does not make its institutional data available and is therefore not included in the report of retention and graduation rates.

The *2006-07 STEM Retention Report* focused on retention and graduation data for freshman cohorts from 1999 through 2005 that indicated the intent to major in Science, Technology, Engineering, and Mathematic fields. The study is designed to determine what percentage of the original cohorts graduate specifically in STEM fields, what percentage graduate from their institutions in any field, and what percentage of students seem to switch majors from STEM to non-STEM fields.

The executive summary information below addresses the issues related to gender and the status of underrepresented STEM students from the 190 institutions from this study and compares and contrasts them with the cohorts of STEM majors from the ten public Oklahoma universities.

Demographics

Overall Freshman Enrollment

Overall enrollment grew at all institutions from 1999-2005. During the survey period 1999-2005, underrepresented minority students (URM) comprised 21.5% as compared to 18.6% of the enrollments across all of the STEM survey institutions. Among STEM survey institutions, Hispanics accounted for 7.9% of the freshman enrollments during this period, American Indian students accounted for 1.0% and Blacks for 9.7%. In contrast, at OK-LSAMP institutions the percentage of first-time full-time Hispanic and Black students were somewhat less of the total freshman enrollment; 3.0% and 6.9 % respectively. Not surprisingly, American Indian students accounted for 11.4% of the freshman enrollments in the OK-LSAMP institutions.

Underrepresented Minority STEM Majors

In the 2006-07 STEM survey, we found that approximately 24% of the over 2.4 million first-time freshman enrolled in 190 public colleges and universities from 1999-2005 intended to pursue STEM majors. Within the ten Oklahoma public institutions participating in the OK-LSAMP study, 17.6% of the 83,000 first-time full-time freshman intended to be STEM majors.

Gender and STEM Majors

Women comprised a majority of the first-time, full-time freshman cohorts of both the OK-LSAMP institutions (53.4%) and the STEM survey institutions (54.1%). However, women made up a smaller percentage of the freshman cohorts who intended to major in a STEM field at both OK-LSAMP and the STEM survey institutions (37.6% and 36.7% respectively).

STEM Graduation

Historically, as shown in Table 1, the 6-year graduation rates of URM STEM majors who begin in STEM and graduated within STEM while attending the OK-LSAMP public institutions have been greater than or equal to the national 6-year graduation rates observed in the CSRDE STEM studies for the URM cohorts of 1994 through 2000, except for 1997 when it was slightly lower. The figures below are rounded.

Table 1

Six-Year Graduation Rates for URM STEM Majors Within STEM Fields

	All STEM Participant Institutions	OK-LSAMP Institutions
1994	24%	24%
1995	25%	27%
1996	24%	27%
1997	24%	23%
1998	26%	26%
1999	26%	30%
2000	28%	33%

Table 2 examines the six-year graduation rates of URM first-time full-time STEM majors in the cohort of 2000. Graduation rates in this table are reviewed in two ways.

- Any Major –Any Major identifies the percent of URM students who began as freshman STEM majors and graduated within six years in any major at their institution.
- STEM Major- The STEM Major column identifies the percent of the URM students who began as freshman STEM majors and graduated specifically within a STEM field.

Table 2 benchmarks the six year graduation rate of underrepresented minority STEM majors attending OK-LSAMP institutions against that of institutions from the national STEM survey with similar admission test score requirements (Selectivity). It then compares the overall graduation rate for the OK-LSAMP cohort of 2000 against the overall six year graduation rate of the STEM survey participants.

Also, as in Table 2, four of the ten OK-LSAMP public institutions had higher six-year graduation rates for the 2000 cohort of URM STEM majors who remained in STEM than did all other institutions participating in the CSRDE STEM study with similar selectivity. These institutions included The University of Oklahoma, Oklahoma State University, Langston University, and Cameron University.

Overall, a higher percentage of the underrepresented minority STEM majors entering OK-LSAMP Alliance institutions in 2000 graduated from college both in any major (49.9%) and specifically in STEM fields (32.6%) than those students who attended other institutions in the national STEM survey.

Table 2

2000 Freshman Cohort Six-Year Graduation Rates of Underrepresented Minority Students Who Began As STEM Majors and Continued In ANY MAJOR or Continued Within A STEM Major At Institution

Comparison of OK-LSAMP institutions with overall STEM rates by selectivity		
	Any major	STEM major
Highly Selective STEM Institutions		
University of Oklahoma	57.1%	35.7%
Oklahoma State U	55.0%	37.9%
	51.6%	36.3%
Moderately Selective STEM Institutions		
Southwestern Oklahoma State U	40.1%	20.9%
University of Central Oklahoma	55.0%	13.3%
	60.4%	6.5%
Less Selective STEM Institutions		
Cameron U	26.9%	24.5%
East Central U	44.3%	35.2%
Langston U	32.8%	16.4%
Northeastern State University	61.0%	52.2%
Northwestern Oklahoma State U	*	*
Southeastern Oklahoma State U	*	*
	27.0%	19.3%
Overall 2000 STEM institutions	46.6%	28.1%
OK-LSAMP institutions	49.9%	32.6%

- Cohort size less than 5.

Suppressed for confidentiality but included in overall OK-LSAMP Rates

Retention Rates

The on-going challenge faced by the OK-LSAMP institutions has been retention. The OK-LSAMP institutions historically show lower retention of URM students within the STEM fields when compared with all other STEM participating institutions, as can be seen in Table 3. However, while the rates for the entire group of STEM participating institutions have gone down slightly over time, the OK-LSAMP institutions have improved from a low of 49% first year retention of URM students within STEM to 55.6% first-year retention over the course of 1997-2005. This is significant improvement overtime.

Table 3

2nd Year Continuation Rates of URM STEM Majors
Continuing in STEM Fields

	All STEM Participant Institutions	OK-LSAMP Institutions
1997	65.1%	49.0%
1998	64.8%	54.6%
1999	64.2%	56.7%
2000	64.7%	55.2%
2001	63.0%	57.0%
2002	62.9%	50.5%
2003	63.9%	63.5%
2004	63.5%	57.1%
2005	65.4%	55.6%

Table 4 examines the retention of URM first-time full-time STEM majors in the cohort of 2005. Retention in this table is reviewed in two ways.

- Any Major – Any Major identifies the percent of URM students who began as freshman STEM majors and continued to the second academic year, regardless of their major.
- STEM Major – The STEM Major column identifies the percent of the URM students who began as freshman STEM majors and remained specifically in STEM fields as they moved into the second year.

As can be seen in Table 4, the most recent retention rates indicate that many OK-LSAMP institutions lag behind the other STEM survey institutions both in retention of initial STEM majors in any field and of particular interest to this project, in retention with STEM fields. Retention is a necessary building block towards increased graduation. There is however clear evidence of positive progress being made by a number of the partners in this area.

Table 4

2004 Freshman Cohort 2nd Year Continuation Rates of Underrepresented Minority Students Who Began as STEM Majors and Continued in Either ANY MAJOR or In A STEM Major At Institution

Comparison of OK-LSAMP institutions with overall STEM rates by selectivity		
	Any Major	STEM major
Highly Selective STEM Institutions	84.5%	70.9%
University of Oklahoma	87.9%	64.2%
Oklahoma State U	78.5%	61.9%
<hr/>		
<i>Moderately Selective STEM Institutions</i>	74.5%	61.0%
Southwestern Oklahoma State U	42.8%	21.4%
University of Central Oklahoma	65.2%	52.1%
<hr/>		
Less Selective STEM Institutions	72.1%	61.4%
Cameron U	42.2%	36.3%
East Central U	71.8%	53.8%
Langston U	75.9%	60.0%
Northeastern State U	75.0%	75.0%
Northwestern Oklahoma State U	80.0%	60.0%
Southeastern Oklahoma State U	61.7%	32.3%
<hr/>		
Overall 2005 STEM institutions	78.2%	65.4%
OK-LSAMP institutions	74.2%	55.6%

Summary

The OK-LSAMP Alliance continues to demonstrate success in developing graduate school ready underrepresented minority STEM students (URM STEM). The OK-LSAMP Alliance six year graduation rate for URM STEM majors both in any major and specifically within STEM fields are higher than the national average for URM STEM majors according to the latest 2006-07 CSRDE study on STEM retention and graduation.

The first-year retention rate of URM students within STEM fields attending OK-LSAMP schools has risen, improved from a low of 49% for the cohort of 1997 to 55.6% for the cohort of 2005. This places the OK-LSAMP institutions within reach of the overall average first year retention of all CSRDE STEM participants. It also represents an almost 16% increase over nine years while the national two-year within STEM retention rate has remained stagnant; hovering around an average 64%.

APPENDIX

ABSTRACT

Experimental Biology and Medicine 232:1170-1180 (2007)
doi: 10.3181/0703-RM-77

© 2007 Society for Experimental Biology and Medicine
ORIGINAL RESEARCH ARTICLE

Heme Regulates Exocrine Peptidase Precursor Genes in Zebrafish
Han Wang¹, Qingchun Zhou, Jason W. Kesinger, Chad Norris and **Cammi Valdez**

Department of Zoology and Stephenson Research & Technology Center, University of Oklahoma, Norman, Oklahoma 73019

We previously determined that *yquem* harbors a mutation in the gene encoding uroporphyrinogen decarboxylase (UROD), the fifth enzyme in heme biosynthesis, and established zebrafish *yquem* (*yqetp61*) as a vertebrate model for human hepatoerythropoietic porphyria (HEP). Here we report that six exocrine peptidase precursor genes, carboxypeptidase A, trypsin precursor, trypsin like, chymotrypsinogen B1, chymotrypsinogen 1-like, and elastase 2 like, are downregulated in *yquem/urod* (*-/-*), identified initially by microarray analysis of *yquem/urod* zebrafish and, subsequently, confirmed by in situ hybridization. We then determined downregulation of these six zymogens specifically in the exocrine pancreas of *sauternes* (*sautb223*) larvae, carrying a mutation in the gene encoding δ -amino-levulinate synthase (ALAS2), the first enzyme in heme biosynthesis. We also found that *ptf1a*, a transcription factor regulating exocrine zymogens, is downregulated in both *yquem/urod* (*-/-*) and *sau/alas2* (*-/-*) larvae. Further, hemin treatment rescues expression of *ptf1a* and these six zymogens in both *yquem/urod* (*-/-*) and *sauternes/alas2* (*-/-*) larvae. Thus, it appears that heme deficiency downregulates *ptf1a*, which, in turn, leads to downregulation of exocrine zymogens. Our findings provide a better understanding of heme deficiency pathogenesis and enhance our ability to diagnose and treat patients with porphyria or pancreatic diseases.