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13. ABSTRACT (Maximum 200 Words) The Summer Undergraduate Breast Cancer Research Program (SUBCRP) at the Univ. of Missouri-Columbia (MU) supported 6 students in 2002. These students participated in faculty-mentored research projects for eight weeks and participated in seminars, brown-bag lunches, and specialty discussions on research, clinical trials, career opportunities, preparing for graduate school, and ethics. The 6 SUBCRP students joined the activities of the MU's Life Sciences Undergraduate Research Opportunities Program, including 70 other students involved in a wide variety of research experiences. The SUBCRP students included one Hispanic and 5 females. Faculty from Biochem., Bio. Sciences, Chemistry, Molecular Micro. & Immunology, and Nutritional Sci. served as mentors. Research projects included: 1) Preliminary studies in the synthesis of novel radiotherapeutic agents; 2) Effects of soy phytoestrogens on mammary tumor cell proliferation; 3) Investigations into regulatory and attendant proteins of type one phosphatase during mitosis; 4) Analyzing the role of Sds22 in relation to Glc7; 5) Improving sample preparation for proteomic analysis by removing highly abundant proteins; and 6) Purification of the N-terminal and C-terminal fragments of Human Tid-1, an Hsp40 chaperone that interacts with E7 from the human papillomavirus. Seven other summer interns participated in cancer related research in 2002.				
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INTRODUCTION

The Summer Undergraduate Breast Cancer Research Program (SUBCRP) at the University of Missouri-Columbia (MU) supported six juniors and seniors in 2002. These students participated in faculty-mentored research projects for eight weeks and participated in seminars, brown-bag lunches, and specialty discussions on research, clinical trials, career opportunities, preparing for graduate school, communication skills, and ethics. The six SUBCRP students joined the activities of the University's Life Sciences Undergraduate Research Opportunity Program, including over 50 students from across the country involved in a wide variety of research experiences. Seven of these students also conducted cancer-related research projects; however, received support from five other funding sources.

BODY

Recruitment and student selection

Information on the 2002 summer program was mailed to biology departments in Missouri and surrounding states, as well as other institutions that have a summer intern partnership with MU. In addition, Program Coordinator Linda Blockus distributed information at the annual Biomedical Research Conference for Minority Students in Orlando, Florida in the fall of 2001. Student applicants were asked to provide a transcript, personal statement, resume and letter of recommendation. Applications were reviewed by a four person committee and then top applications were discussed by the Project Director and Program Coordinator for final selection/mentor placement. University of Missouri-Columbia students applied for funding through the Life Sciences Undergraduate Research Opportunity Program (LS UROP). Their application included a transcript, two letters of recommendation, personal statement and a project proposal prepared with the guidance of their faculty mentor. Students were selected by faculty members of the LS UROP Advisory Committee.

A total of six students were selected and funded by this grant in 2002, including one Hispanic female, four white females, and one white male. These students worked with five faculty members from five departments (Biochemistry, Biological Sciences, Chemistry, Molecular Microbiology & Immunology, and Nutritional Sciences). The seven other students also conducting cancer research (funded from other sources) included three African American females, two African American males, one Hispanic female, and one white female.

Research projects

Students worked in their research labs on a full-time basis for 8 weeks (June 10 - August 2, 2002) and received a scholarship. MU students received an amount consistent with the other LS UROP interns (\$2400). Non-MU students received additional funding to off-set their living expenses. The student interns participated in weekly lab group meetings with their faculty mentor and other lab team members. On August 1, 2002, the 6 students funded by this grant participated in the Thirteenth Annual MU Undergraduate Research Science Symposium and Luncheon. These students, along with over 80 other summer science interns, displayed posters describing their research projects, and received certificates at the awards luncheon. Invited guests included faculty mentors, lab members, campus administration, and the local media. Complete descriptions of the 2002 projects can be found in the abstract booklet for the Undergraduate Research Science Symposium. A list of the 2002 students funded on this grant, their home institutions, majors, hometowns, faculty mentors (and academic departments), and the research topics appear below.

Catalina Arbalaez, College of St. Elizabeth (NJ), Chemistry major from Kearny, New Jersey
Mentor: Dr. Susan Lever (Chemistry)

Preliminary studies in the synthesis of novel radiotherapeutic agents

Mona M. Hdeib, University of Missouri-Columbia, Biology major from Columbia, Missouri
Mentor: Dr. Ruth MacDonald (Nutritional Sciences)
Effects of soy phytoestrogens on mammary tumor cell proliferation

Benjamin W. Leacock, Maryville University (MO), Biology major from St. Louis, Missouri
Mentor: Dr. John Cannon (Molecular Microbiology & Immunology)
Investigations into regulatory and attendant proteins of type one phosphatase during mitosis

Cheryl Silverstein, University of Missouri-Columbia, Biology major from St. Charles, Missouri
Mentor: Dr. John Cannon (Molecular Microbiology & Immunology)
Analyzing the role of Sds22 in relation to Glc7

Jeanne Speichinger, University of Missouri-Columbia, Biology major from Columbia, Missouri
Mentor: Dr. Stephen Alexander (Biological Sciences)
Improving sample preparation for proteomic analysis by removing highly abundant proteins

Kelly Tomaszkeski, College of St. Elizabeth (NJ), Biology major from Bernardsville, New Jersey
Mentor: Dr. Steven Van Doren (Biochemistry)
Purification of the N-terminal and C-terminal fragments of Human Tid-1, an Hsp40 chaperone that interacts with E7 from the human papillomavirus

Seven other summer interns participated in cancer related research in 2002:

Wilma Avniel, University of Missouri-Columbia, Nursing major from Hailey, Idaho
Mentor: Dr. Jane Armer, Nursing
The problem of lymphedema following breast cancer treatment: Prevalence, symptoms, and self-management
Funded by the Sinclair School of Nursing Research Fellowship

Nicole Croley, Florida A&M University, Biology major from Jacksonville, Florida
Mentor: Dr. Thomas E. Phillips, Biological Sciences
Vitamin-A analog AM580 inhibits differentiation of a human tumor cell line
Funded by the NSF Research Experiences for Undergraduates

Claudia Espinosa-Nicholas, University of Missouri-Columbia, Biology major from Torreon, Mexico
Mentor: Dr. Dennis B. Lubahn, Biochemistry/Child Health
Estrogenic regulation of the antioxidant response element is tissue specific
Funded by the Endocrine Society Summer Research Fellowship

Michael J. Hudson, University of Maryland Baltimore County, Biology major from Fredrick, Maryland
Mentor: Dr. Michael R. Lewis, Veterinary Medicine & Surgery/Radiology
Comparison of lutetium-177 radiopharmaceuticals for conventional and pretargeted radioimmunotherapy
Funded by the MU Molecular Biology Program

Roshenia Johnson, Alcorn State University, Biochemistry major from Fayette, Mississippi
Mentor: Dr. Susan Lever (Chemistry)
Cargo Delivery – an approach with potential for radio diagnostic and radio therapeutic agents
Funded by the NSF Louis Stokes Heartland Alliance for Minority Participation

Rose B. Sylvestre, Florida A&M University, Biology major from Immokalee, Florida
Mentor: Dr. Dennis B. Lubahn, Biochemistry/Child Health
Analysis of alternate splice forms of estrogen receptor alpha in estrogen receptor alpha knockout mice

Funded by the NSF Research Experiences for Undergraduates

Brandon Marcus Tilghman, University of Missouri-Columbia, Chemistry major from St. Peters, Missouri

Mentor: Dr. Silvia S. Jurisson (Chemistry)
Ligand labeling in therapeutic radionuclides

Funded by the NSF Louis Stokes Heartland Alliance for Minority Participation

Educational/Career Activities and Workshops

In addition to their research projects, interns participated in a variety of enrichment and social activities as part of the summer undergraduate research community at MU. The activities were organized and hosted by Dr. Joel Maruniak, Associate Professor of Biological Sciences, and Program Coordinator Dr. Linda Blockus. In addition to the 6 Breast Cancer interns, we had 24 MU students supported on University Funds, 10 students participating in the Plant Genomics Internship Program, and 9 NSF-REU interns that were regular participants in our educational and career activities. Our activities for 2002 included:

- * Staff from the campus Environmental Health and Safety Office presented special workshops on lab safety, hazardous materials, and radioactive materials. Students also could sign up for optional Saturday training in first aid and CPR.
- * Non-MU students were given a special tour of the main library by a science reference librarian.
- * Three brown bag lunches provided an informal opportunity for students to present their projects in small groups to other science interns.
- * Students were offered an opportunity to participate in a scientific field trips to Monsanto's Plant and Biotechnology Research campus and the Danforth Plant Sciences Center in St. Louis.

Evening seminars and brown bag lunches included a number of topics on science, careers, resources, and ethics. Our topics for 2001 were:

'Finding your right livelihood' - Joel Maruniak, Biological Sciences

'Scientific Essentials for Research Students' - Karen Cone, Biological Sciences

'Medical School Admissions' - Judy Nolke, MU School of Medicine

'The science of telomeres and life extension: The fountain of youth?' - Joel Maruniak, Biological Sciences

'Practicing science in for-profit and international arenas' - Jake Halliday, President & CEO of ABC Laboratories

'Balancing families and careers in science' – Cathy Krull, Biological Sciences & Mark Milanick, Physiology

'Applying to graduate programs in the life sciences' – Mannie Liscum, Biological Sciences & Dave Emerich, Biochemistry

' My trip from MU to MD: Life as a perinatal researcher' – Rachel Glidden Humphreys, Barnes/Jewish Hospital, Washington University, St. Louis

'Being a scientist in the 21st century and public vs. private research' – Paul Trainor, Stowers Medical Institute, Kansas City

'A biased random walk through science' – Lin Randall, Biochemistry and member of the National Academy of Science

'Preparing your Abstract and Research Poster' – Joel Maruniak, Biological Sciences & Linda Blockus, LS UROP office

' Improving writing skills/writing for publication' – Von Pittman, Center for Distance Learning

'Endocrine disruptors – Science research and public policy' - Fred vomSaal, Biological Sciences

'A fish tale: From pre-med to professor' – Kevin Fritsche, Animal Sciences/Nutritional Sciences

' Scientific ethics overview' – Charlotte Phillips, Biochemistry & Child Health

' Bedside to benchside and back: What is translational research?' – Bernie Maria, Pediatrics/Neuro-oncology

In 2002 we repeated our Friday activity of specialty discussions or field trips organized by the Plant Genomic Internship program faculty (PGI) and the Breast Cancer program faculty (SUBCRP). Although organized for interns in those programs, attendance was open to all summer interns. Specialty discussion topics in 2002 included:

'Genetic engineering in crops: The GMO debate' - Georgia Davis, Agronomy and Karen Cone, Biological Sciences

'Clinic research trials for breast cancer' - Lisa Jacobs, Surgical Oncology

' The Arabidopsis 2010 Project: Discovering plant gene function' – Mannie Liscum, Biological Sciences

' Cancer treatment survivorship issues: Post-breast cancer lymphedema' – Jane Armer, Nursing/Ellis Fischel Cancer Center

' Repetitive/Junk DNA' – Joe Polacco, Biochemistry

Assessment and Evaluation

Summer interns and faculty participated in the on-going efforts of the LS UROP office to determine the impact of summer research internships and activities and to improve faculty mentoring skills. Students were asked to complete two "critical incident reports" to provide insight into what events during the program have been most important to their consideration of a career in science. Coding of the open-ended responses indicates that there are both negative and positive events, and that speakers and the poster session play an important role along with the actual laboratory experience. Data is currently being analyzed to determine if pre-graduate students differ from pre-medical students in the types of events that have the most impact. Summer interns are asked to complete the "Confidence in Inquiry-related Skills" survey at the

beginning and end of the summer program. In addition to comparing the pre/post scores of intern confidence on 20 scientific research skills, intern scores are also compared with their faculty mentor's assessment for each skill at the end of the program. Preliminary analysis of data collected in 2001 and 2002 indicate some interesting results. Data will be collected again in 2003. Surveys administered at the end of the summer to interns and faculty mentors request information on the quality, quantity, content and method of communication that the student has with the mentor and others in his/her lab. This data will be linked to items in the "Confidence in Inquiry-related Skills" and used to provide faculty mentors as a group with feedback. LS UROP also maintains a student database of previous interns (currently over 900 students since 1989) with educational and career information for longitudinal tracking. The database also contains information on student publications and poster presentations. Alumni are contacted periodically to update their file with graduate degrees earned and career information.

KEY RESEARCH ACCOMPLISHMENTS

The primary purpose of this project is to provide a research experience for undergraduates. As such, any significant results of their research projects would be incorporated as preliminary data into the on-going activities of their faculty mentor's laboratory.

REPORTABLE OUTCOMES

- 1) Data collected from students and faculty as part of the larger LS UROP assessment and evaluation project is still being analyzed for results and eventual publication.
- 2) We will be contacting the Summer 2002 interns this summer to determine if they have completed their bachelor's degree, entered graduate/professional school, and co-authored any additional publications or presentations.
- 3) Of our 13 summer interns from 2000 and 2001, nine have graduated with their bachelor's degrees in science and four are still in college. Ben Leacock and Israel Collier will enter medical school this fall. Jarron Tilghman has been accepted into the pre-med post-bac program at Southern Illinois. Mona Hdeib has elected to take a year off before beginning medical school and will continue working with her research mentor. Scott Dusold has a staff research position with his mentor Dr. Jane Armer. Julie Dusold spent nine months as a research assistant at the M.D. Anderson Cancer Center and has returned to Missouri to pursue a degree in nursing and continue to work with Dr. Armer in her study of lymphedema. Michelle Harwerth began employment as a lab technician at Southern Illinois and has plans to earn a masters degree in biomedical sciences. Johanna Ortiz is working as a technician with Organon in New Jersey and plans to begin a masters program in biotechnology or biomedicine. We have been unable to confirm the post-graduation plans of Karyn Pleasant from Florida A&M; however, we suspect she will attend medical school.

CONCLUSIONS

We continue to be pleased with the student participation and faculty mentoring for our second year of the Summer Undergraduate Breast Cancer Research Program. Because of the increased visibility of breast cancer undergraduate research opportunities on campus due to the U.S. Army program, additional students are conducting cancer-related research and are being funded through other sources.

REFERENCES

None.

APPENDICES

One copy of the abstract book for the 13th Annual Undergraduate Research Science Symposium has been sent along with this annual report.