

Evaluation of a Summer Undergraduate Fellowship in Toxicology and Environmental Health Sciences: Self-Assessment of Research Competencies

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ABSTRACT

Rutgers University has developed a summer research fellowship program to promote pharmacology, toxicology and environmental health sciences as careers in biomedical research. The program consists of a 10-week basic science and translational research experience for undergraduates and was also designed to include weekly events including laboratory safety and responsible conduct of research training, a field trip to a pharmaceutical company, career development and research seminars and student presentations. To assess the improvement of participants in key areas, students completed an adapted version of the Undergraduate Research Student Self-Assessment survey from the University of Colorado at the beginning and the end of the 10-week fellowship. The response rates for the pre- and post-program surveys were 100% and 71%, respectively. The survey captured changes in three key areas: Application of Knowledge to Research (data analysis, problem solving), Scientific Abilities (daily independent and group activities), and Research Abilities (laboratory and presentation activities). A 7-point scale was used by participants to assess their level of confidence on 27 competencies. Significant improvement was observed in 15 of 27 competencies (55%). The greatest advancements were made in the ability of students to identify experimental limitations (31%), to determine the next step in a research project (26%) and to understand the connections between scientific disciplines (25%). A summer research program engages undergraduate students in full-time research experiences and provides unique opportunities to promote toxicology and environmental sciences as research areas for the next generation of scientists and enhances career development skills.

2013 SUMMER RESEARCH PROGRAM

Figure 1. Application of Knowledge to Research

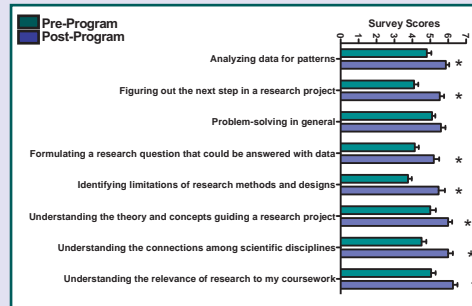


Figure 2. Scientific Abilities

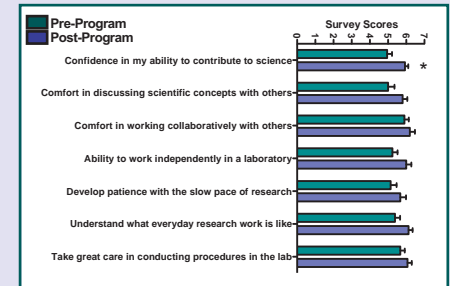
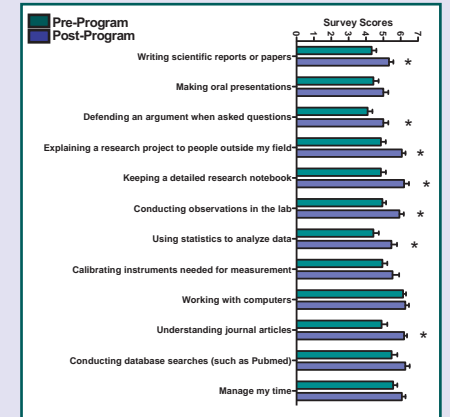


Figure 3. Research Abilities



Figures 1 to 3. Participants were invited to perform pre- and post-program assessments of their skills and knowledge. Rate-based questions for knowledge and skills were as follows: 1, No confidence 2, 3, 4, moderate confidence, 5, 6, 7, complete confidence. The pre-program survey was completed by 21 students and the post-program survey was completed by 15 students. Data are presented as mean \pm SE. T-test analysis was performed using Prism v6.0. * p < 0.05 compared to pre-program survey results.

ORGANIZATION OF THE SUMMER PROGRAM

Objective

Promote toxicology and environmental health sciences as careers in biomedical research to undergraduate students

Funding

Institutional

- Department Support
- Dean of School of Pharmacy
- Graduate School

Societies

- Society of Toxicology (SOT)
- American Society for Pharmacology and Experimental Therapeutics (ASPET)

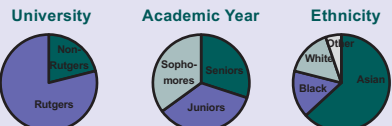
Extramural

- NIH R25 Summer Training Grant
- NIEHS Center Community Outreach and Education Core (COEC)

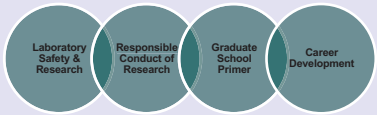
Weekly Meeting Schedule

Week	Event	Week	Event
1	Laboratory safety training and welcome session	6	Toxicology in the News and Networking event
2	Dr. Michael Gallo, Toxicology Research	7	Field Trip to Bristol-Myers Squibb
3	Dr. Howard Kipen, Occupational and Environmental Health Research	8	Research Symposium
4	Career Development and Networking	9	Final Oral Presentations
5	Responsible Conduct of Research training	10	Final Oral Presentations

Participants



Training



Outcomes

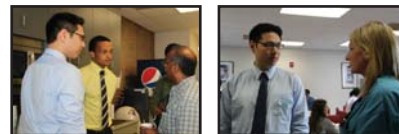
Internships	Graduate School	Awards	National Meetings	Publications
• Bristol-Myers Squibb Summer Interns	• 4 students in joint Pharm.D./Ph.D. program and 1 student in Ph.D. program	• SOT Pfizer Awards (2012) • SOT Minority Award (2013) • Aresty Grants	• Society of Toxicology (2012) • ASPET • New York Academy of Sciences	• 3-4 students with publications

LinkedIn group is used to monitor long-term outcomes

Field Trip to Bristol-Myers Squibb



Discussions and tours with scientists were centered on General Toxicology, Operations, Veterinary Sciences, Histopathology, Clinical Pathology, Immunotoxicology, Reproductive Toxicology, and Genetic Toxicology



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Students	Research Area	Topic
Alfred Ahmad	Pharmacology	Pediatric Nanoparticles vs Free Pedicatin A in Vivo Cytotoxicity Study
Breana Blado	Toxicology	Hydrogen Peroxide Detection Using Iron(III) Tetrafluoroborate
Lauren DeBogues	Toxicology	Effects of Pesticides DDT/DEA on the Metabolism and Toxicity of Alzheimer's Amyloid Precipitates
Daniel Fort	Toxicology	Synergism of Surface Damage in an Ocular Injury: The Effect of Silica Nanoparticles on Bacterial Peptide Based Alternative of Polyethylene Glycol for Efficient Sealing of Nanoparticles
Ryan Hu	Chemical Biology	General Toxicology in EpH4/KO Mice
Qian Jin	Toxicology	Effect of Chronic Acid Overexposure on PK Activation in Mouse Liver and Brain
Jan Won Lewis, Jon	Toxicology	Consequences of the Loss of Cellpaxin in Bone
In Heon Lee	Pharmacology	Synthesis of CCR6 Targeted Peptide Carrier
Jabon Liu	Toxicology	Activation of Macrophages by Parathyroid Peptides
Chris Liu	Chemistry	Biomedical Speed Drug Delivery
Alex Lo	Chemical Biology	Identifying DNA Methylation Changes in the PMP22 ^{0/0} Murine Model of Charcot-Marie-Tooth
Matt Lynch	Toxicology	Hepatotoxicity: Acetaminophen Induced Injury
Garrett Thomas	Toxicology	Activation of NF- κ B Signaling by the Inflammatory Stimulus in Cultured Human Kidney Cells
Kristen Trapani	Toxicology	Study of Nitrogen Mustard-Induced Injury in Mouse Keratinocytes Using the Scratch Wound Model
Brittany Valamanchi	Toxicology	Treating Mustard Injury in Skin
David Vana	Pharmacology	Calpain and Formin2 in Chemoprotection