Application for Faculty Development Program

PROJECT GRANT

Name: Christine Perdan Curran
Department: Biological Sciences
Office: SC344
Office Phone: 859-572-6914
e-mail address: curranc1@nku.edu

Project Title: Can Exercise Protect the Brain from the Effects of Developmental Neurotoxicants?

Amount requested: $6,000

Short Project Description: Exercise is widely recognized as beneficial for brain function, but little is known about the effect of exercise during pregnancy. There are 6-million pregnancies in the US each year, but only half end with the delivery of a healthy, full-term infant. There are many factors that can affect normal brain development, but our focus is on the interaction of genetic factors that affect susceptibility to widespread pollutants. In this project, we will focus on a large group of chemicals known as polycyclic aromatic hydrocarbons (PAH) which are found in vehicle exhaust, cigarette smoke and grilled food. Urban populations are exposed to high levels of traffic-related air pollution. Rural populations have the highest smoking rates during pregnancy. Grilled food consumption has increased significantly as people reduce the amount of fried and fatty foods in their diet. Therefore, our work has broad applications for a majority of pregnancies. Our previous work using a mouse model identified key genes that make the offspring more susceptible to these pollutants. The goal of this project is to determine if there is a safe level of exercise during pregnancy and early life that can protect these vulnerable individuals from adverse neurological outcomes.

signature*

10-3-2022

date

* By typing your name or pasting your signature in the space provided you are allowing this application to be reviewed by the Faculty Benefits Committee for a possible award. The applicant is also aware that failure to comply with the instructions may result in this proposal not being reviewed.

1. GOALS AND CRITERIA: The goal of this project is to determine what level of exercise can protect the developing brain from the effects of widespread pollutants. Appropriate criteria for measuring the success of the project would cover both areas.

Research

- Presentation of data collected at regional and national scientific conferences (at least one of each)
- Inclusion of data collected in a future external grant application
- Inclusion of data collected in a peer-reviewed publication

Teaching

- Mentoring of undergraduate student researchers

2. DETAILED PROJECT DESCRIPTION:

BACKGROUND: There are 6-million pregnancies in the US each year, but only half end with the delivery of a healthy, full-term infant (CDC 2020). Both genetic and environmental factors can lead to adverse pregnancy outcomes, and our lab previously identified two genes that increase susceptibility to the widespread pollutant benzo[a]pyrene (BaP). BaP is representative of a large class of pollutants known as polycyclic aromatic hydrocarbons which are ranked in the Top Ten on the U.S. Priority Pollutants List (ASTDR 2019). These pollutants are found in vehicle exhaust, grilled foods, wildfires and tobacco smoke. Kentucky has one of the highest rates of smoking in the United States (CDC 2020). The consumption of grilled foods is increasing to reduce consumption of fatty, fried foods. Wildfire smoke from western fires can spread across the United States, and half of those in urban areas are exposed to high levels of traffic-related air pollution. Therefore, the risk to pregnant women and their babies has significantly increased in recent years.

POLLUTANT EFFECTS ON THE DEVELOPING BRAIN: Multiple studies have clearly linked exposure to PAH pollutants and adverse effects on children exposed during pregnancy and early life. Children with high levels of PAHs in their umbilical cord blood had lower levels of a key protein required for normal brain function: brain-derived neurotrophic factor (Perera et al. 2015). Those children also had impaired academic performance and more behavioral issues (Perera et al. 2018, 2016). Associations between TRAP and lowered IQ at school age have been independently replicated in Italy (Porta et al. 2016).

REDUCING THE RISK TO THE DEVELOPING BRAIN: Our preliminary data shows that mice exposed to BaP have lower levels of brain-derived neurotrophic factor (BDNF) (Fig. 1). Exercise is well known to improve brain function by improving blood flow and increasing BDNF levels. This strongly suggests exercise might be protective against pollutant exposure; however, the effect of exercise during pregnancy is not known. Our studies are designed to address that key knowledge gap.

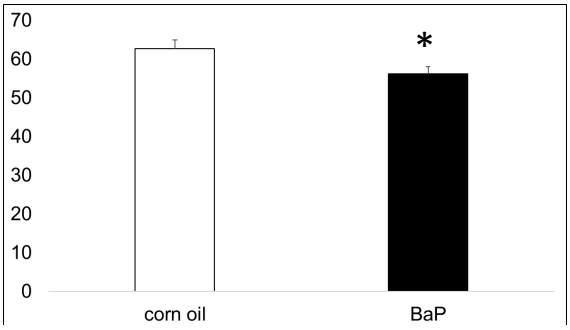

Fig. 1. Mice exposed to benzo[a]pyrene during early brain development had significantly lower levels of BDNF. $P < 0.05$

VALUE OF ANIMAL MODELS: Laboratory mice are the most commonly used animal model for biomedical research, and together mice and rats make up 95% of all lab animals (Hickman et al. 2016). Brain development in mice follows a similar pattern to that in humans, and we have established a model of genetic susceptibility to benzo[a]pyrene-induced neurotoxicity (Honaker et al. 2022). Therefore, our mouse model provides an excellent opportunity to determine if exercise during pregnancy and early life can mitigate the effects of learning, memory, and motor function.

EXPERIMENTAL PROCEDURES:

Treatment: Pregnant mice will be randomly assigned to treatment groups, receiving either 10mg/kg/day of benzo[a]pyrene in corn oil-soaked cereal or corn oil-cereal as a control. Treatment will continue until offspring will be weaned at 25 days of age.

Exercise intervention during pregnancy: Female mice will receive 1h of running wheel exercise per day for two weeks prior to mating until mid-gestation (gestational day 10). Control mice will not exercise.

Exercise intervention during early life. One male and one female per litter will be randomly selected for behavior experiments and receive 1h of running wheel exercise per day from 30-60 days of age. Another male and female will not exercise and serve as controls.

Behavioral testing. We will use standard tests of learning, memory, and motor function to determine if either exercise during pregnancy or early life reverse the deficits seen in our previous studies (Honaker et al. 2022). The Morris water maze (Fig. 2) and Novel object recognition tests are widely used to assess learning and memory. In the water maze, mice learn to use distal cues to navigate to an escape platform hidden.

Fig. 2. Setup for Morris water maze

Fig. 3. Mice being tested on a Rotarod.

We will use the rotarod test to determine if motor coordination and motor memory are impaired. The rotarod increases in speed from 0-20 rpm with a maximum test time of 5 minutes. Mice are acclimated to the equipment, then tested over tested over 5 days to see if their performance improves.

BDNF assay. We will use a standard commercial kit to measure the levels of brain-derived neurotrophic factor in blood and in the brain to determine if exercise returns levels to normal on BaP-treated mice. The kit uses an antibody that is specific to BDNF linked to an enzyme that produces a colored product that is quantified by the amount of light absorbed (Fig. 4).

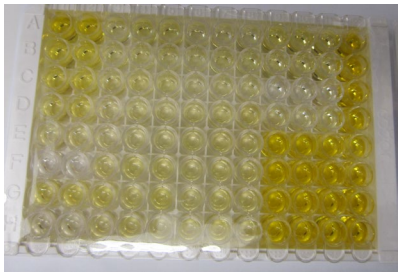

Fig. 4. Example of BDNF assay plate from preliminary experiments.

TIMELINE AND PROJECT LOCATION: All experiments will be conducted in the Founders Hall vivarium and Neuroscience Research Laboratory during Summer and Fall 2023. Cohorts of mice are mated approximately every 3-4 weeks and offspring tested in groups of ~16-24 at a time. Based on past experience, all experiments should be completed by Spring 2024.

URGENCY OF THE PROJECT: The applicant's current funding from the National Institutes of Health and the KY-INBRE network end April 30, 2023. There is a long lag time between applying for these external grants and receiving an award. So, although the applicant is applying for new grants, the funds would not be available in time to continue supporting under-represented students and those with financial needs. The funds would also support a unique mouse colony housed in the NKU vivarium. The genetically modified mice maintained in the applicant's lab are not commercially available, so a key research resource would be lost without stopgap funding.

REFERENCES

ATSDR (Agency for Toxic Substances and Disease Registry). 2019. Substance Priority List. https://www.atsdr.cdc.gov/spl/index.html#2019spl

CDC (Centers for Disease Control and Prevention) 2020. Birth Defects Data and Statistics. https://www.cdc.gov/ncbddd/birthdefects/data.html

Hickman DL, Johnson J, Vemulapali TH, Crisler JR and Shepherd R. 2016. Commonly Used Animal Models. Principles of Animal Research for Graduate and Undergraduate Students. 117–175.

Honaker A, Kyntchev A, Foster E, Clough K, Asiedu E, Feltner M, Ferguson V, Forrest PT, Mullaguru J, Niang MD, Perry C, Sene Y and Curran CP. 2022. The behavioral effects of gestational and lactational benzo[a]pyrene exposure vary by sex and genotype in mice with differences at the *Ahr* and *Cyp1a2* loci. Neurotoxicol Teratol. 2022 Jan-Feb;89:107056. doi: 10.1016/j.ntt.2021.

Perera, F.P., Wheelock, K., Wang, Y., Tang, D., Margolis, A.E., Badia, G., Cowell, W., Miller, R.L., Rauh, V., Wang, S., Herbstman, J.B., 2018. Combined effects of prenatal exposure to polycyclic aromatic hydrocarbons and material hardship on child ADHD behavior problems. Environ Res 160, 506–513.

Perera, F., Phillips, D.H., Wang, Y., Roen, E., Herbstman, J., Rauh, V., Wang, S., Tang, D., 2015. Prenatal exposure to polycyclic aromatic hydrocarbons/aromatics, BDNF and child development. Environ Res 142, 602–608.

Perera, F., Weiland, K., Neidell, M., Wang, S., 2014. Prenatal exposure to airborne polycyclic aromatic hydrocarbons and IQ: estimated benefit of pollution reduction. J Public Health Policy 35, 327–336.

3. VALUE OF THE PROJECT:

A. Value to the applicant's professional growth. The applicant was broadly trained in environmental genetics and molecular toxicology with a focus on developmental neurotoxicology. The experiments proposed here will provide preliminary data for a novel

external grant application to the National Institutes of Health to further explore low-cost interventions that could be readily applied to at-risk populations. This could lead to new collaborations with researchers in Greater Cincinnati who are tracking the impact of traffic-related air pollution on children's health and development.

B. Value to the scholarly community. Although the benefits of exercise on brain health are widely recognized, little is known about the effect of exercise during pregnancy. Information gained in this study will help inform risk reduction strategies as well as expand our understanding of how these pollutants harm the developing brain.

C. Value to the applicant's teaching and students. The greatest benefits of this project will be on NKU students. Undergraduate research is well known as a high-impact practice, and the retention/graduation rate in the applicant's lab is nearly double the national average for STEM students. NKU students participating in this research will be more attractive to future employers and to admissions committees at graduate and professional schools. In addition, all students will gain a greater appreciation for how widespread pollutants affect the nervous system and how ethical animal research is conducted.

D. Value to the University. NKU has established itself as a regional leader in developing the next generation of health professionals, including the establishment of an Institute for Health Innovation and the opening of the Health Innovation Center. Being able to recruit new students into the biological sciences and health professions is a critical component in keeping the university financially strong. Expanding opportunities for undergraduate research is an excellent way to support ongoing recruitment and retention efforts, potentially attracting a more diverse student population. The applicant has mentored numerous under-represented and under-served students and will prioritize offering research positions to those populations.

E. Value to the non-academy community. With the increasing exposure to these neurotoxic pollutants through increased wildfires, high smoking rates in Kentucky, traffic-related air pollution and increase consumption of grill foods, this research is both timely and highly valuable. Finding an effective and low-cost intervention to reduce risk to the next generation is imperative because it is extremely difficult and costly to reduce exposures.

4. BACKGROUND OF APPLICANT RELEVANT TO THIS PROJECT

The applicant earned a master's degree in Biological Sciences from the University of Cincinnati with a thesis project on gene-environment interactions in Alzheimer's disease. Her doctoral studies were in Environmental Genetics and Molecular Toxicology in the Department of Environmental Health in the UC College of Medicine. Her postdoctoral training extended her work in genetics and genomics to occupational health with two projects on industrial neurotoxicants conducted at the National Institute for Occupational Health and Safety. She has published extensively with undergraduate students at Northern Kentucky University and mentored high school students through CINSAM Academies and research experiences.

Since joining the NKU Department of Biological Sciences, the applicant has mentored 95 undergraduate researchers and taught hundreds of future health professionals. Her students have received numerous regional and national awards for their research. She has developed new courses in Evolutionary Neurobiology, Neurosignaling and Environmental Toxicology and led the development of the Neuroscience B.S. program in 2017. She served

as President of the Society for Birth Defects Research and Prevention, President of the Ohio Valley Society of Toxicology, Chair of the Society of Toxicology Undergraduate Educators Committee, was elected Councilor of the Developmental Neurotoxicology Society and the Society of Toxicology. She has authored numerous publications to help the general public understand scientific advancements and their impact on human health in addition to multiple peer-reviewed scientific papers.

Key teaching duties include multiple courses in Neuroscience, Human Anatomy and Physiology, and Environmental Toxicology.

5. OTHER SUPPORT AND COMMITMENTS

The applicant is funded by the National Institute of Environmental Health Sciences AREA-R15 grant for her work on genetic susceptibility to benzo[a]pyrene with additional support from the KY-INBRE network. However, these grants expire early in Spring 2023. The applicant will continue to seek additional external funding, but new preliminary data is needed to support these novel applications.

6. DETAILED BUDGET and **JUSTIFICATION OF BUDGET ITEMS**

Student Stipends: $4000 to support 2 students for Summer and Fall 2023

Animal costs: $700 for food and bedding

BDNF assays: $1300 (2 kits at $650 each)

Budget justification

All equipment needed to conduct the behavioral experiments described are available in the Founders Hall vivarium. The primary expenses are the need to support undergraduate student researchers who will conduct the testing, expenses associated with the care of the research animals, and the commercial kits needed to quantify brain-derived neurotrophic factor.

Part III. Appendix

1. SUPPORTING DOCUMENTATION. N/A

2. **Applicant's Curriculum Vita** (short form attached)

3. Previous FBC Awards (attached)

CHRISTINE PERDAN CURRAN, Ph.D.
OFFICE PHONE: 859-572-6914
E-MAIL: curranc1@nku.edu

Northern Kentucky University (NKU)
Assistant Professor of Biological Sciences (August 2008-July 2014)
Associate Professor of Biological Sciences (August 2014 to August 2018)
Director, Neuroscience Program (August 2017 to present)
Professor of Biological Sciences (August 2018 to present)

University of Cincinnati (UC)
Lecturer on Biology/Adjunct Instructor of Biology (1992-2011)
Visiting Assistant Professor of Biology (2001-2003)

Undergraduate researchers supervised (103 total-current students shown)

Angela Kyntchev January 2020 to present
Connor Perry June 2020 to present
Mickayla Kowalski June 2021 to present
Briannia Quarles June 2022 to present
Kalyani Abbaraju June 2022 to present
India Davis June 2022 to present
Susan Martin June 2022 to present
Duong Pham August 2022 to present
Kayla Wypasek August 2022 to present

EDUCATION

December 2007: University of Cincinnati. Doctor of Philosophy in Environmental Health. **Thesis:** The Role of the Aryl Hydrocarbon Receptor and CYP1A2 in PCB-Induced Developmental Neurotoxicity.

June 1992: University of Cincinnati. Master of Science in Biological Sciences. **Thesis:** The Genetic and Environmental Influences Associated with Alzheimer's Disease: Can They Be Reconciled?

EXTERNAL GRANT FUNDING (truncated)

May 2008: NIOSH. ***Incorporating Genetic Susceptibility into Risk Assessment: A Pilot Project Using DNA Analysis to Assess Manganese Neurotoxicity***. PI. $64,000.

May 2009: Kentucky Biomedical Research Infrastructure Network (KBRIN) Faculty Fellowship. ***Genetic Susceptibility to PCB-induced Developmental Neurotoxicity***. $52,000.

June 2009: National Institute for Occupational Safety and Health (NIOSH). ***Genetic Susceptibility to Manganese-induced Neurotoxicity***. $12,843.

May 2011: Kentucky Biomedical Research Infrastructure Network (KBRIN) ***Genetic Susceptibility to PCB-induced Developmental Neurotoxicity***. $52,000.

June 2012: National Institute of Environmental Health Sciences. ***Genetic Susceptibility to PCB-induced Motor Dysfunction***. $401,775.

May 2013: Kentucky Biomedical Research Infrastructure Network (KBRIN) **Post-doctoral support**. $67,700

July 2014: USEPA P3 (People, Prosperity and the Planet) award. $15,000.

May 2015: Kentucky Biomedical Research Infrastructure Network (KBRIN) ***Bridge Award***. $66,250.

May 2019. National Institute of Environmental Health Sciences AREA-R15. ***Genetic***

Susceptibility to Developmental Benzo[a]pyrene Neurotoxicity. $397,500.

May 2019, 2020, 2021. Kentucky IDeA Networks for Biomedical Research Excellence (KY-INBRE) ***Post-bac technician suppor***t. $75,000 total.

May 2022. Kentucky IDeA Networks for Biomedical Research Excellence (KY-INBRE) ***Bridge Award***. $66,250.

PEER-REVIEWED PUBLICATIONS (truncated) (*denotes undergraduate co-author)

Curran CP, *Altenhofen E, *Ashworth A, *Brown A, Curran MA, *Evans A, *Floyd R, *Fowler JP, *Garber H, *Hays B, *Kamau-Cheggeh C, *Kraemer S, *Lang A, *Mynhier A, *Samuels A and *Strohamier C. 2012. *Ahr^{d}Cyp1a2(-/-)* mice show increased susceptibility to PCB-induced developmental neurotoxicity. *Neurotoxicology*. 33(6):1436-42.

*Ashworth AA, Bardgett ME, *Fowler JP, *Garber H, Griffith M and Curran CP. 2015. Comparison of neurological function in males and females from two substrains of C57BL/6 mice. Toxics 2015, 3, 1-17; doi:10.3390/toxics3010001

*Klinefelter K, *Hooven MK, *Bates C, *Colter BT, *Dailey A, Infante SK, Kania-Korwel I, Lehmler HJ, López-Juárez A, *Ludwig CP, Curran CP. 2017. Genetic differences in the aryl hydrocarbon receptor and CYP1A2 affect sensitivity to developmental polychlorinated biphenyl exposure in mice: relevance to studies of human neurological disorders. Mamm Genome.doi: 10.1007/s00335-017-9728-1.

Curran CP and Marczinski CA. 2017. Taurine, caffeine, and energy drinks: Reviewing the risks to the adolescent brain. Birth Defects Res.109(20):1640-1648.

*Colter BT, *Garber HF, Fleming SM, *Fowler JF, *Harding GD, *Hooven MK, *Howes AA, Infante SK, *Lang AL, MacDougall MC, *Stegman M, *Taylor KR, and Curran CP. 2018. Ahr and Cyp1a2 genotypes both affect susceptibility to motor deficits following gestational and lactational exposure to polychlorinated biphenyls. NeuroToxicology. Mar;65:125-134. doi: 10.1016/j.neuro.2018.01.008.

Gray JP, Curran CP, Fitsanakis VA, Ray SD, Stine KE and Eidemiller BJ. 2019. Society of Toxicology develops learning framework for undergraduate toxicology courses following the vision and change core concepts model. Toxicological Sciences. 170(1):20–24. https://doi.org/10.1093/toxsci/kfz090

*Brown J, Villalona Y, Weimer J, Ludwig CP, Colter BH, Marczinski CA and Curran CP. High-dose taurine consumption during adolescence and early adulthood has sex-specific effects on cognition, behavior and neurotransmitter levels in C57BL/6J mice. Neurotoxicology and Teratology. May-Jun 2020;79:106883.

*Honaker A, *Kyntchev A, Foster E, *Clough K, Hawk G, *Asiedu E, *DeBurger E, *Feltner M, *Ferguson V, *Forrest PT, *Jenkins K, *Massie L, *Mullaguru J, *Niang MD, *Perry C, *Sene Y and Curran CP. The behavioral effects of gestational and lactational benzo[a]pyrene exposure vary by sex and genotype in mice with differences at the *Ahr* and *Cyp1a2* loci. Neurotoxicol Teratol. 2022 Jan-Feb;89:107056. doi: 10.1016/j.ntt.2021.

STUDENT PRESENTATIONS (selected list from national conferences)

Society of Toxicology Annual Meeting (March 2021)

Foster E, *Clough K, *Massie L and Curran CP. Using high performance liquid chromatography to assess genetic susceptibility to gestational and lactational benzo[a]pyrene exposure. **(3rd Place Best Poster Neurotoxicology Specialty Section)**

*Clough, K, Foster E, *Mullaguru J, *Perry C, *Honaker A, *Kyntchev A, *Niang MD, *Berling K, *Feltner M, *Patel S, *Towell A and Curran CP. Assessing adult learning and memory in three genotypes of mice exposed to benzo[a]pyrene during early brain development. **(Student Undergraduate Research Award.)**

Developmental Neurotoxicology Society Annual Meeting, Virtual (May 2021)
Foster E, *Clough K, *Massie L and Curran CP. Aryl hydrocarbon receptor mediated disruption of dopaminergic and serotonergic signaling in the hippocampus and prefrontal cortex of mice exposed to benzo[a]pyrene during development. **(Best Student Presentation Award).**

Society for Birth Defects Research and Prevention Annual Meeting, Virtual (June 2021)
*Clough, K, Foster E, *Mullaguru J, *Perry C, *Honaker A, *Kyntchev A, *Niang MD, *Berling K, *Feltner M, *Patel S, *Towell A and Curran CP. Assessing adult learning and memory in three genotypes of mice exposed to benzo[a]pyrene during early brain development. **(James C. Bradford Presentation Award)**

*Perry C, *Niang, MD, Foster EG, *Clough K, *Mullaguru J, *DeBurger E, *Jenkins K, *Ferguson V, *Forrest PT, and Curran CP. Assessing adult motor function in three genotypes of mice exposed to benzo[a]pyrene during early brain development.

*Honaker A, Perry C and Curran CP. Measures of anxiety in mice vary by genotype, but not treatment following developmental exposure to benzo[a]pyrene.

Society of Toxicology Annual Meeting, Virtual (March 2022)
*Kyntchev A, Foster E, *Clough K, *Towell A, *Perry C, *Honaker A, *Wical E, *Kowalski M and Curran CP. Differential susceptibility to developmental benzo[a]pyrene exposure in *Cyp1a1(+/+)* wildtype and *Cyp1a1(-/-)* knockout mice.

*Clough K, *Creech H, *Kyntchev A, Foster E, *Berling K, *Perry C, *Feltner M, *Towell A, *Shumate T, and Curran CP. Gut microbiome changes in mice exposed to benzo[a]pyrene during early brain development dependent on *Cyp1a1* genotype.

Developmental Neurotoxicology Society Annual Meeting (June 2022)
*Berling K, *Clough K, *Kyntchev A, *Perry C, *Shumate T and Curran CP. The effect of developmental benzo[a]pyrene exposure on brain-derived neurotrophic factor.

*Kowalski M, *Truitt M, *Towell A, *Niemeier T, *Kyntchev A, *Perry C, *Shumate T and Curran CP. The effect of benzo[a]pyrene on learning and memory in *Cyp1a1(-/-)* knockout and wild type mice.

*Feltner M, Foster E, *Clough K and Curran CP. dopamine and serotonin signaling following developmental benzo[a]pyrene exposure in *Cyp1a1 (-/-)* knockout and wild type mice.

SERVICE & LEADERSHIP (truncated)

2021-present: Associate Editor, NeuroToxicology
2021- present: Councilor for the Society of Toxicology
2020-present: Councilor for the Developmental Neurotoxicology Society
2016-2021: Board Member and Executive Committee member for the Federation of American Societies for Experimental Biology
2019-2020: Society for Birth Defects Research and Prevention President.

3. PREVIOUS FBC AWARDS:

2009 Project Grant: Genetic Susceptibility to PCB-induced Developmental Neurotoxicity

This project was an extension of the applicant's prior work into genetic susceptibility to polychlorinated biphenyls (PCBs) which were widely used industrial chemicals banned in the 1970s and 1980s because of their toxicity. The funds were used to purchase standard neurobehavior testing equipment and the associated software and hardware to assess locomotor activity. This equipment was used to collect data for two publications with more than 15 undergraduate researchers as co-authors. We are currently preparing three additional manuscripts based on data collected. The equipment has also been used in six upper division biology lab courses and demonstrated during lab tours for science outreach.

2010 Project Grant: Assessing anxiety in PCB-treated mice differing at the Ahr and Cyp1a2 loci

This grant directly supported the research of four students in the Curran lab who are using a mouse model that mirrors human variation in the AHR and CYP1A2 genes. The video equipment purchased with grant funds to monitor animal behavior has been used by more than 35 undergraduate researchers, six upper division biology courses, and most recently at the 2014 Kentucky Science Summit outreach event. The data collected was a major part of a manuscript published in the journal Neurotoxicology in 2011. The equipment continues to be used for research, education, and science outreach.

2011 Summer Fellowship: Video analysis and production to improve research and teaching in Biological Sciences

Digital video and multimedia media editing equipment were purchased and installed in the Department of Biological Sciences Behavior and Environmental Research and Teaching Laboratory (Founders 103) during the 2009-10 academic year (See previous Project Grant). With the assistance of several NKU undergraduate researchers and Interactive Multimedia capstone students from UC Clermont College, multiple videos were recorded of neurobehavioral studies, lab safety procedures, animal care, and physical therapy sessions. These videos are routinely updated and used for training new undergraduate researchers and students taking part in animal research as part of their undergraduate laboratory coursework.

2015 Sabbatical: Incorporation of RNAseq technology into studies of gene-environment interactions

This project included completion of a workshop on Next Generation Sequencing technology at the University of Kentucky sponsored by the Kentucky Biomedical Research Infrastructure Network and an extended research collaboration at Vanderbilt University in the laboratory of Dr. Aaron Bowman to develop skills and knowledge in the use of induced pluripotent stem cells (iPSCs) in neurotoxicology research. Pilot studies were completed using cortical neurons derived from human iPSCs. Information was shared in an open brownbag forum with STEM faculty at NKU.

2018 Project Grant: Neurochemical and Toxicological Analyses Following Prenatal and Early Life Exposure to Traffic-Related Air Pollution

This Project Grant supported three undergraduate researchers in the Department of Biological Sciences and collected preliminary data for a grant application to the National

Institutes of Health (NIH). Student success was exemplified by First Place and Second Place Best Undergraduate Poster Awards to Ashley and Taylor Parton at the 2019 Ohio Valley Society of Toxicology Annual Meeting and acceptance of an abstract by Taylor Parton for presentation at the 2020 Society of Toxicology Annual Meeting (cancelled due to COVID-19). The NIH grant application was funded with a percentile score in the Top 10% of all applications in that category) as well as three Society of Toxicology grants to support 8 other undergraduate researchers and a KBRIN post-baccalaureate technician award.

2020 Sabbatical: Incorporation of Optogenetics and Invertebrate Models into Undergraduate Neuroscience Teaching and Research

This sabbatical project is scheduled for Spring 2022 and will provide intensive training in Optogenetics with a collaborator at the University of Cincinnati. Optogenetics is an emerging technology with wide application in neuroscience research.

2021 Project Grant: Acquisition of automated blood pressure monitoring system for laboratory mice

This Project Grant was combined with additional internal funding (CAS Collaborative Faculty-Student Project Award) to purchase equipment which allows blood pressure to be monitored non-invasively in rodents. The equipment was installed in Spring 2022 and incorporated into research projects in Summer 2022 and into laboratory courses (NEU 302L) in Fall 2022. Two high school students and four undergraduates were involved in the research project on pollutants that harm the heart, and an abstract was accepted for presentation at the 2022 Ohio Valley Society of Toxicology Annual Meeting. An abstract will also be submitted for presentation at the national Society of Toxicology meeting in March 2023.

FDA Project Grant Evaluation Form for Chairs

***Instructions**: Please print or type in the following form. Comment length is limited to this page. Forward a copy to Faculty Senate Benefits Committee c/o Grace Hiles hilesg1@nku.edu*

Faculty applicant name: Dr. Christine Curran

Evaluations are based on criteria as defined in the Faculty Handbook **11. FACULTY DEVELOPMENT PROGRAMS** sections 11.1 through 11.4

This individual qualifies for the proposed project (tenured/t-track, not on terminal contract):
Yes X No _____

Has applicant asked if Department funds are available to support the project? Yes X No ____

Are Department funds available to support this project? Yes____ No ____ Not sure X

If yes, how much may be used to defray the costs? Unsure in current budget situation

Indicate your assessment of the following items from very low to very high:

	Very low	Low	Neutral	High	Very high
Overall quality of proposal					X
Ability of applicant to carry out project					X
Overall value of project					X
Value to the department					X
Value to student learning					X
Value to the field of study					X

General Comments:

Dr. Curran has a longstanding record of prolific grant writing, manuscript publication, and mentoring of undergraduate research students. Her proposal to study genetic factors affecting susceptibility to pollutants and whether exercise during pregnancy or early in life can be protective against neurological issues, is a clear progression on her previous research questions. Dr. Curran has a clear and well-defined experimental procedure outlined and has designed her set-up to be able to determine statistical differences. Dr. Curran's lab has been well funded (over $1 million in external dollars), but the project grant funds are sought to cover a time period without grant coverage to keep research progressing and students in experiential learning situations. Funds will go predominantly towards student stipends with the remaining spent on supplies.

Specific comments on any category ranked neutral, low, or very low:

Erin D Strome
Name (typed or signed)

10/5/2022
Date

Department: Biological Sciences