Program Description

UAB Training Program in Neurodegeneration, T32NS095775

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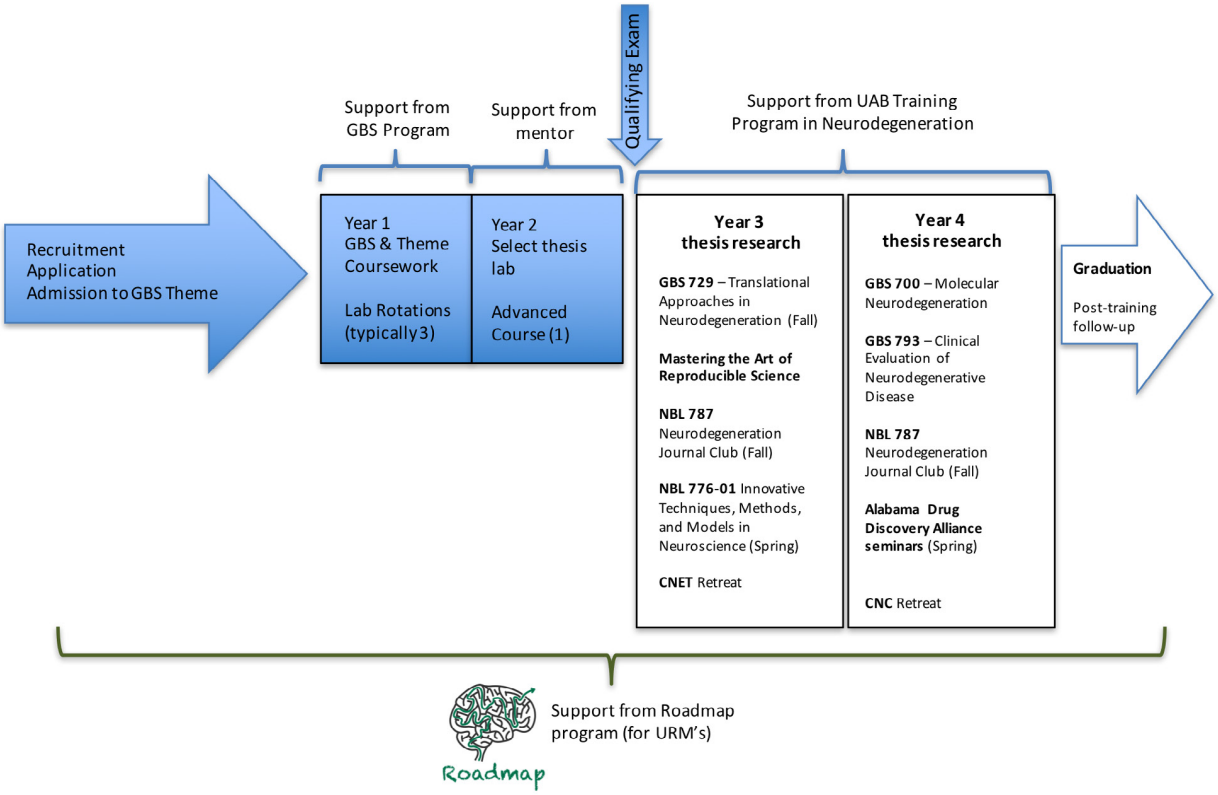
Program overview: This is a focused program for predoctoral students in basic and translational approaches to neurodegenerative disease. A primary goal is to expose students to biological mechanisms and research approaches used across neurodegenerative disease, rather than single-disease training. Our core philosophy is to provide a robust training pathway in translational research to enable the discovery of cures of neurodegenerative diseases. This unique emphasis will enable our students to take leading roles in therapeutic discovery across the spectrum of different skill sets and enterprises which are required to deliver the vitally needed treatments of the future.

Program Synopsis: This is a 2-year program with doctoral students enrolling at the beginning of their third or fourth year of training in their graduate programs (current second or third year students at the time of application). The program incorporates required didactic course work in neurodegeneration, a newly developed formal course in experimental rigor, training in new tools and technologies, instruction in the translational pathway and drug development, a journal club focused on neurodegeneration research, an annual retreat, and mentor and outcomes evaluations. All students appointed to the training program are expected to complete the full course of study requirements.

Support: Support will be provided for stipend (in accordance with current NIH predoctoral stipend levels), tuition and fees (60%), and health insurance during their 3rd/4th years in the graduate program, plus funds for travel.

Overview of the UAB Training Program in Neurodegeneration



Program requirements:

1. Core Didactics

The core didactic elements are two courses and a journal club that present the essential elements of neurodegeneration science and translational research approaches, including discussion of model systems and drug discovery. Each of these is cross-cutting in nature, emphasizing the connections between work being done in different disease areas and commonalities and differences in hypotheses and experimental approaches. They are taught in alternating years, so that students will be able to take both during their research training. In addition, both courses satisfy the GBS advanced course requirement for graduation. The journal club is offered every year in the fall semester.

- **GBS 729** – Translational Approaches in Neurodegeneration. Andy West, Director. This course uses the field of neurodegeneration as a vehicle for conceptualizing the failures, current challenges, and successes of different translational approaches. This course emphasizes active learning principles by placing students into scenarios of direct relevance to a career in science (e.g., emulation of study section discourse, formal critical debate that happens at international symposia, and informal discussions between colleagues). Offered in spring of even-numbered years.
- **GBS 700** – Molecular Neurodegeneration. Erik Roberson, Director. This advanced course covers several of the most important molecules involved in neurodegenerative disease, including Aβ, tau, apoE, TDP-43, α-synuclein, LRRK2, prion protein, and huntingtin. The goal is to develop a deeper understanding of each protein's normal structure/function, how these are altered in neurodegenerative disease, the related cell biological mechanisms involved, and the cutting-edge questions and approaches being used in each area. Offered in spring of odd-numbered years.
- **NBL 787** – Neurodegenerative Diseases Journal Club: Talene Yacoubian and Michelle Gray, Co-Directors. This course is a journal club-style course in which graduate students discuss recent papers on neurodegeneration. This course meets weekly for 75 minutes during the fall. Syllabus is provided in the Appendix. Students have given high evaluation marks, with scores on each evaluated course aspect averaging from 7.5 to 8.5 (on scale from 1-9).

2. Training in Experimental Rigor

Training in experimental rigor is increasing recognized as critical for the translational enterprise. Studies which are not rigorously conducted are unlikely to be translated in to new therapies. To address this, all trainees will be required to take a new course which has been developed to address these issues.

- **Mastering the Art of Reproducible Science:** this is a new course developed by Dr. Bradley Yoder, PhD, Interim Chair of Cell, Developmental and Integrative Biology. The course was established through an administrative supplement award from NIGMS and participants will include trainees supported by NIH T32 and other training awards. It is structured around four modules using a team-based learning strategy with limited didactic lectures. Each module will have assigned reading materials, web-based videos (including resources from NIGMS Clearinghouse for Training Modules to Enhance Data Reproducibility), and exercises that will be completed outside of the classroom. In class, students will complete an Individual Readiness Assurance Test (iRAT) and Team Readiness Assurance Test (tRAT) based on a series of questions related to the assigned material on reproducibility in science. Then, student teams will work through a series of application exercises which will involve scenarios that impact reproducibility. Each module will consist of four 1-week blocks. The first block will include independent reading, research, and preparation. Blocks 2-4 will each involve two hours of in-class time each week. The final block will consist of a question and answer panel composed of journal editors/associate editors who are part of the UAB faculty. The module topics include Reproducibility issues associated with tools, reagents, and research approaches; pressure, bias, and data analysis and presentation; preclinical testing and failure in clinical studies; and gender, race, age, and health disparities.

3. Tools & Technology

Training in CNET and the associated laboratories of the mentors provides many opportunities to access a wide range of advanced technologies. We have created a journal club for trainees specifically oriented around new tools and technologies taught by Dr. Ashley Harms and Dr. Karen Jaunarajs in the Spring semester. Trainees will participate in this for at least one semester:

- **NBL 776-01** – Innovative Techniques, Methods, and Models in Neuroscience: This is a Journal Club style course that will consist of topics related to innovative methods in neuroscience. Students will read and discuss papers on groundbreaking techniques, such as CRISPR/Cas9 systems, optogenetics,

CLARITY, flow cytometry and DREADDs. Each week one student will be responsible for presenting the seminal paper discussing the novel technique, providing advantages, disadvantages and limitations of the technique. The class as a whole will then discuss a paper in which the novel technique was applied. The goal of this course is to equip the next generation of neuroscientists to understand the next generation of neuroscience techniques.

4. Bridging the gap between basic and clinical science

A key advantage of UAB as a training site in neurodegenerative disease is that we are closely integrated within a busy medical center, and this provides an opportunity to educate trainees about the clinical aspects of neurodegenerative disorders. In addition to informal interactions with clinicians, all trainees will participate in a formal one-semester course:

- **GBS 793** – Clinical Evaluation of Neurodegenerative Disease. Erik Roberson, Director. This course provides graduate students with clinical exposure to the evaluation and care of patients with neurodegenerative disease through a combination of didactic sessions and practicum visits. Students will shadow physicians seeing patients in the Memory Disorders clinic (AD, FTD, and other dementias), Movement Disorders clinic (PD, PSP, CBD, and related disorders), Neuromuscular Clinic (ALS), and our HD Clinic.

5. Responsible Conduct of Research

UAB provides a variety of resources for training in the responsible conduct of research, Specific requirements for Training Program participants will include:

- Agreement in writing to the UAB Research Code of Conduct, once during their tenure as a graduate student.
- Education during orientation about requirements to complete human subjects and animal use and care training programs; completion of requisite training is arranged and documented by their specific graduate program (GBS, MSTP, or other). All requisite training and annual updates must be completed in order for final Graduate School acceptance of the PhD thesis.
- **GRD 717** – Principles of Scientific Integrity. Lisa Schwiebert, Director. This course blends on-line training and in-person discussion on topics related to the responsible conduct of research (RCR). Specifically, the on-line training component includes completion of all RCR-related CITI Program modules, covering the Belmont Report, basic IRB regulations, informed consent, records-based and genetic research, vulnerable subjects, FDA-regulated research, HIPAA and other topics. Participants are required to successfully complete each of these modules, achieving a score of 80% or better. Once completed, participants then attend an in-person discussion session that consists of an all-day Saturday workshop facilitated by training program directors, preceptors, and administrators. Three Saturday sessions are offered so that participants and facilitators have the opportunity to select a date that best fits their schedules. These sessions debate case-studies in a team-based learning format as well as allow for additional RCR-related activities, such as panel discussions with faculty and administrators regarding 'real-world' RCR examples and role-playing RCR scenarios.
- All participants will view the video "In the Lab: Mentors and Students Behind the Scenes." Funded by a grant from the Office of Research Integrity (ORI) for the Department of Health and Human Services and produced at UAB, the video focuses on issues of mentoring, student conduct, and scientific integrity. The video contains nine complex vignettes and extensive round table interviews of local experts in mentoring and leading research.
- For students using vertebrate animals in their research program, training in ethical use of laboratory animals offered by the UAB Animal Resources Program will be required.
- Mentors are expected to engage in ongoing one-on-one discussions of ethical issues, and this well be assessed through the periodic program evaluations.

6. Additional activities

- **Alabama Drug Discovery Alliance lecture series** – To enhance understanding of the pathway of translation, trainees in the Training Program in Neurodegeneration will be required to participate for at least one semester in the Alabama Drug Discovery Alliance (ADDA) lecture series, held in the Spring of each year. This year, topics included "Introduction to Drug Discovery," "What makes a target druggable and validated," "Assay development in drug discovery," "High throughput screening," "Intellectual property," "PK and ADME," "Medicinal chemistry: hit to lead," "How to submit an IND," "Toxicology in support of drug development."

- **Big Data orientation** - Our goal for this training program is to provide all participants with an opening orientation to "Big Data" and the tools available to work with it. This will consist of a half day with lectures on Big Data applications in the neurosciences, including brain imaging and genetics applications. In addition to discussing general Neuroscience applications, the orientation will discuss utilization of various tools including MapReduce, Hadoop, Pig, and Spark and why scientists need to understand these new computing technologies. There will also be an orientation to clinical informatics, and approaches to extracting data from clinical data resources.
- **Neurobiology/CNET seminar series** – As part of a weekly Neurobiology/CNET seminar series, CNET invites eminent visiting scientists from across the country to visit, lecture, and spend the day meeting with faculty and trainees.
- **CNET joint lab meeting** – Attend the monthly joint CNET lab meetings, where trainees (both pre- and post-doctoral) are expected to present their work to the group as a whole.
- **CNET retreat** – Attend the annual CNET retreat, usually at a site near but not on campus, where all trainees are expected to present a poster or talk.
- **Other activities** – Trainees are also strongly encouraged to participate in campus-wide opportunities to present their work and hone their presentation skills, including the annual Neuroscience Retreat, sponsored by the CNC (recent program is in the Appendix), and Medical Student Research Day for the MSTP students.

7. Other expectations and requirements
   - Trainees will be required to complete their qualifying exam by the end of their first year of support. Students who have not completed their qualifying exam will not be eligible for a second year of T32 support.
   - Trainees must submit an NIH F31 or F30 fellowship grant during the first year of support to qualify for a second year of T32 support.
   - Trainees will create or update their Individual Development Plans (IDP) with their mentors. The IDP must be reviewed and approved by the training program Steering Committee before a student can be appointed to the training program, and updated before reappointment for a second year of support.
   - Trainees and mentors will complete program evaluation forms annually.