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Translational Research in NeuroAIDS: A Neuroimmune Pharmacology-Related Course

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Abstract

Neuroimmune pharmacology (NIP) can be considered a multidisciplinary science where areas of neuroscience, immunology, and pharmacology intersect in neurological disorders. The R25 training program titled "Translational Research in NeuroAIDS and Mental Health (TR-NAMH): An innovative mentoring program to promote diversity in NeuroAIDS Research (R25 MH080661)" at the Johns Hopkins University is a web-based interactive course with the goal to improve the capacity of high quality research by developing mentoring programs for (1) doctoral and postdoctoral candidates and junior faculty from racial and ethnic minorities and (2) non-minority individuals at the same levels, whose research focuses on NeuroAIDS disparity issues such as HIV-associated neurocognitive disorders (HAND). This web-based interactive course overcomes the limitations of traditional education such as access to expert faculty and financial burden of scientists from racial and ethnic minority groups in the field of NeuroAIDS research and NIP and identifies rich nurturing environments for investigators to support their careers. The TR-NAMH program identifies a cadre of talented students and investigators eager to commit to innovative educational and training sessions in NeuroAIDS and NIP. The interplay between NIP changes precipitated by HIV infection in the brain makes the study of HAND an outstanding way to integrate important concepts from these two fields. The course includes activities besides those related to didactic learning such as research training and long-term mentoring; hence, the newly learned topics in NIP are continually reinforced and implemented in real-time experiences. We describe how NIP is integrated in the TR-NAMH program in the context of HAND.

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Keywords

HAND; neuroimmune pharmacology (NIP); training course; web-based; web-interactive; NeuroAIDS course

Brief overview of the topic

Neuroimmune pharmacology (NIP) can be considered a multidisciplinary science where areas of neuroscience, immunology, and pharmacology intersect in neurological disorders (Ikezu and Gendelman 2008). The aim of the *Journal of Neuroimmune Pharmacology*, as well as the *Society on Neuroimmune Pharmacology*, is to increase the fundamental understanding of neurologic and neuropsychiatric disorders affected by the immune system or vice versa and to advance the elucidation of pharmacologic measures that lead either to a better understanding of disease mechanisms or to improvement of disease outcomes (http://www.springer.com/biomed/neuroscience/journal/11481; http://www.s-nip.org).

Avindra Nath, MD, Professor, is the principal investigator and director of the R25 training course titled “Translational Research in NeuroAIDS and Mental Health (TR-NAMH): An innovative mentoring program to promote diversity in NeuroAIDS Research (R25 MH080661)” at the Johns Hopkins University (JHU). The TR-NAMH course began on August 2007 and has been offered every year since then. The goals of the course is to improve the capacity for high quality research by developing mentoring programs for (1) doctoral candidates and postdoctoral fellows and junior faculty from racial and ethnic minorities and (2) non-minority individuals at the same levels, whose research focuses on NeuroAIDS disparity issues. The TR-NAMH course has enrolled 88 students with a 100% retention in completing the course.

Most of the topics in the TR-NAMH course relate to HIV-associated neurocognitive disorders (HAND). HAND occurs as a result of the interplay of neuroimmune pharmacologic changes precipitated by HIV infection in the brain. Therefore, the TR-NAMH course on HAND represents an outstanding forum that integrates learning and understanding of NIP. The course emphasizes the translation of basic science to clinical findings related to HAND through an interdisciplinary approach. It is designed so that students are first exposed to basic findings such as a description of HIV-1 and its effects on in vitro and ex vivo experiments. The course moves on to more advanced topics such as understanding the clinical presentation of HAND including neurological exam, neuropsychological performance, neuroimaging findings, and pathology. Other topics integrated into the course include the role of race and ethnicity in designing culturally sensitive scales, research ethics, and the role of genetic factors related to HAND.

We describe how NIP is integrated in the TR-NAMH course in the context of HAND. In-depth discussions take place between students and faculty about the interrelated effects of HIV infection in the central nervous system (CNS), alteration of the immune function of the brain, and the effects of the immune-precipitated secretions such as cytokines/chemokines, the neurotoxic substrates such as viral products, and oxidative stress, all of which are a significant component of the didactic portion of the course. Also included are topics covering the effects of combined antiretroviral treatment (cART) as well as drugs of abuse.

The uniqueness of the TR-NAMH course is that it is web-based and web-interactive. The value of this approach is that the course can effectively reach several institutions with minority populations and investigators without the financial burden that would be incurred through travel. With the new advances in technology and the accessibility of the Internet, new web-based interactive courses are replacing traditional training. Recent studies

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demonstrate that distance learning, such as web-based education, has great advantages, such as reaching students at distant sites, accommodating multiple learning styles, overcoming barriers of institutional limitations in faculty expertise, and providing flexibility (Curran et al. 2006; Fordis et al. 2005; Wutoh et al. 2004). Long-distance learning is as effective as traditional courses in the learning process (Wutoh et al. 2004) and long-term learning (Woods and Kemper 2009; Curran et al. 2006; Fordis et al. 2005).

We present how NIP as it relates to HAND is taught in a web-based interactive course.

Implementation of the course

The partnership of Johns Hopkins NeuroAIDS faculty with the University of Hawaii at Manoa (UHM) and the University of Puerto Rico Medical Sciences Campus (UPR MSC) was a natural extension of the previously established collaborations through programs such as the Specialized Neuroscience Research Program (SNRP) on Health Disparity (RFA NS-01-009). Through such collaborative efforts, we are able to harness a breadth of expertise of NeuroAIDS faculty who also work in diverse environments that often have unique cultural implications. The main goal of the course is to provide the fundamental knowledge and skills for minority investigators and others to work with minority populations in developing a career or research interest in NeuroAIDS. The course offers in-depth discussion of all aspects of NeuroAIDS with emphasis on clinical, pathophysiologic, and translational themes including the integration of NIP (see syllabus in Table 1).

Interestingly, through its inherent design, the TR-NAMH course serves as a venue for collaborations and the exchange of advice with experienced scientists in NeuroAIDS. Interactions throughout the course facilitate networking and collaborations between racial and ethnic minority scientists and non-minority disparities-focused scientists with other racial and ethnic minority investigators with similar interests.

The TR-NAMH course has three major components: (1) didactic instruction in NeuroAIDS research, (2) research training, and (3) long-term mentoring. The 1.5 credit course is registered through the Johns Hopkins School of Medicine. Students at outside universities register and matriculate as special students. If desired and set up in advance, students can receive credit for the course at their home institutions. Faculty and postdoctoral fellows of JHU can use tuition remission to pay the course fee; the R25 grant funding mechanism provides tuition coverage for the special-status students.

The course runs once a week for a total of 12 weeks. Each lecture emphasizes issues related to co-morbidities associated with NeuroAIDS such as mental illness, hepatitis C infection (HCV), drug and alcohol abuse, as well as issues that may be most relevant to underrepresented minorities.

A web-based interactive format is used for didactic instruction and exchange. The lectures are pre-taped using the Adobe Breeze program, which records the PowerPoint slides and voice of the presenter. These lectures are made available to registered students through a website and software program called Blackboard. At the Blackboard site, the student will find the course schedule, faculty contact information, and research interests, objectives, lectures, assignments, and Internet links to funding opportunities and grantsmanship, among others. A list of the members of the external advisors and reviewers of pilot projects will be posted in Blackboard.

The students have 1 week to review the taped lecture and any assigned journal articles before the live virtual journal club meeting the following week. Depending on the topic of discussion, the journal club is hosted by one or two NeuroAIDS faculty. The Blackboard

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program is being increasingly used at JHU and many other universities nationwide because of key features that include the ability to archive lectures, reading material, and online communication between the students and the faculty in a secure manner and the incorporation of evaluation tools. Updating lectures is also easier with the Blackboard software. During the first 2 years of this course, we used a classroom format for the discussion of the lectures and the journal club which was video-conferenced to UHM and UPR MSC; however, due to the expansion of the course to several other sites, a web-based interactive format for the lecture discussions and the journal club was employed. A dial-in option for question and answer exchange is provided to achieve 100% participation. While the advantages of the current format include ease of expanding the course to more sites and the efficiency of participating from any virtual site (office, home, or workplace), the technology remains limited by the lack of the interpersonal dynamics of a classroom discussion. We have thus maintained the classroom format as an option that is available at limited sites. This year, UHM provided access to computers in a classroom, and the students seemed to like that since after each session, they had their own group discussion at their site. At JHU, a similar setup is being implemented for the future. As new technology evolves and improvements in the systems are upgraded, we anticipate the format of the course will change accordingly to improve the ease and quality of teaching. Because the course is registered through the School of Medicine at JHU, access to all the educational technology and facilities at the School are available for use by the students and faculty.

The scientific lectures are followed by a series of career-building lectures that focus on issues that may be unique to minority students such as mentoring, career decisions, training, balanced career, and recruitment. The informal live interactive web-based lectures/ discussion cover topics on mentoring for life, the challenge of balance in professional and personal lives, grant writing for NeuroAIDS, and financial aid for minority researchers.

While the lecture format has been effective in the previous years with emphasis on research skill development, the backgrounds and experiences of students and mentees have widely varied, which speaks to the attractiveness of the program and the diversity of students interested in NeuroAIDS. Thus, the program addressed the challenges in meeting the needs of the students through being flexible in its offerings while maintaining its mission and vision. The program provides for the substitution of clinical lectures for basic science lectures if needed, and vice versa, as well as the incorporation of other topics as needed or requested.

To complement the distance learning process, outreach and networking events were coordinated at the 2009 International Society for Neurovirology (ISNV) Conference held in Miami, FL, USA. During the meeting, a poster presentation of the R25 TR-NAMH program was provided along with information detailing the didactic and research components of the program. A program co-director was available to promote the program, recruit interested students and possible faculty members, and answer questions. As part of this outreach endeavor, potential new faculty mentors and trainees with a strong interest in NeuroAIDS research were invited to attend a networking dinner at which previous course participants were present. The event provided an initial face-to-face convening of trainees from different sites and an opportunity for them to interact with mentors from JHU. A total of 22 trainees and seven mentors participated, representing the universities of Hawaii, Puerto Rico, Drexel, Boston College, Temple, del Valle, Colombia, and Johns Hopkins. These networking efforts led to the recruitment of three new institutions—Washington University in St. Louis, MO, USA; Universidad Central del Caribe, PR, USA; and Boston College, MA, USA—to participate as faculty members or students in the web-based interactive course.

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In-depth description of current coursework

Didactic activities

All lectures are "state-of-the-art" peer-reviewed lectures using advance presentation technology. The faculty prepares their lectures 1 month ahead of presentation to allow time for feedback and assistance, as needed, from the medical illustrator and Director(s) of the program. The medical illustrator helps with slide preparation and presentation, providing advice on the design of the slides, such as use of color and formatting. All slides for each lecture are e-mailed as a PDF file to each student enrolled in the course 2–3 days before the lecture and are posted on Blackboard. Each week, students are expected to review the assigned lecture slides. Some of the uploaded presentations are the scheduled lectures, whereas other presentations are intended to supplement the learning materials. Supporting the web-based interactive sessions are the active journal club discussions that take place. Each week, two journal articles pertaining to the lecture are assigned. During the weekly interactive web-based meetings, students and faculty actively participate through the Backboard or the interactive web-based sessions in the lectures, forum discussions, and journal club.

NIP is an essential part of the didactic course, which integrates a variety of topics related to NeuroAIDS and mental health, such as the treatment of the neuroimmune consequences of HIV infection in the brain. The course includes in-depth discussions of the effects of HIV infection on cytokine and chemokine production, immunosuppression, oxidative stress, and pathophysiology. It examines the effects of drugs of abuse and treatment response of the diseased brain. To further understand HAND, the course also covers topics related to viral persistence, neuroprotection, and drug discovery. The syllabus (Table 1) shows how NIP is integrated in the didactic component of the course.

Research training

Each mentee selects an area of research and a mentor, either by directly approaching the potential mentor or by requesting guidance from the Director(s) of the program to identify an appropriate mentor on the basis of research interests and availability. Following one-on-one sessions, the mentee and mentor propose a brief experimental plan to be conducted over a period of up to 6 months to generate preliminary data for submission of an NIH grant (F, K, or R type). Each proposal is evaluated and approved by an executive committee. The criteria for evaluation include the scientific merit of the proposal (innovation and experimental approach) and the relationship of the project to issues related to the health of racial and ethnic minorities as it relates to NeuroAIDS. Once the proposal is accepted, the student is required to visit the mentor's facilities at JHU to learn new research skills for a period of 3 to 6 months.

This mechanism ensures an individualized long-term research mentoring relationship. The concept of co-mentors has also been encouraged to promote interdisciplinary programs and help train junior mentors in the art of mentoring. Trainees from outside of JHU are eager to identify appropriate mentors at their home institutions to ensure a long-term commitment to the continued success of their research interests. The dual mentorship concept allows for a "distant" mentor located at JHU and a "local" mentor at the home institution. Mentors identified at JHU will continue to assist mentees as their research careers evolve. Thus, the relationship between the mentors and mentees extends beyond the 6-month research experience, and the mentors at JHU assume the dual role of (1) "distant" mentors for the mentees and (2) collaborators for the mentors at UHM or UPR MSC.

Although this model has worked well in the past years, programmatic changes have recently been proposed for future mentorships. NIMH through the office of Dr. David Stoff is in the

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process establishing a network of mentors across the country. This new network would expand the areas of expertise of mentors beyond that of the participating institutions.

One challenge of the current research component of the program was accommodating qualified students with other personal obligations and time constraints. The program worked with highly qualified students on scheduling research training time with mentors. To meet the needs of promising young scientists, scheduled training periods were worked out with mentors. A new feature of the program will be regular online web-based laboratory meetings with the distance mentors for continued interactions, which are critical for a successful training program.

Pilot grant program

From the beginning, it was apparent that the research scholars were in need of funds, independent of those provided by their host mentor, in order to generate sufficient data for a competitive grant application. With approval from the Program Director, funds were directed towards a pilot grant program, administered through the Johns Hopkins NIMH Center for Cognitive Disorders and Novel Therapeutics, encouraging highly competitive proposals. A formal call for a letter of intent was made, followed by an invitation for submission of a full-length grant. The pilot grant program was well received since there were a large number of applicants. An external review panel consisting of national NeuroAIDS researchers scored the letters of intent and the full applications. In years 2 and 3, five grants of $20,000 each were awarded to one graduate student and four early career trainees (refer to course assessment in “Course assessment” below).

NIP is reinforced in the research training and pilot grants since students need to apply what they have learned about interactions of NIP and NeuroAIDS.

Course assessment

Didactic activities

The students are graded according to their performance in background class presentation (25%), in class discussion (25%), and on a final take-home essay test (50%). Students are required to pass the didactic activities evaluation to be eligible for the research training phase.

TR-NAMH course has enrolled 88 students, 40 M.D./Ph.D. candidates, 22 postdoctoral fellows, and 26 junior faculty with a 100% retention in completing the course (Table 2). All students are encouaged to fill the evaluation of the course. Among the changes projected for the course is the creation of an icon at Blackboard for the anonymous evaluation of the students. The majority of the students identified the effectiveness of the course in terms of its impact on their career development. The general perception of the students is summarized in the following quoted statements: “This course did a good job of presenting some of the issues important in studying a complicated topic such as NeuroAIDS. This topic involves not only the pathophysiology of the disease. There are many aspects such as pharmacotherapy and imaging that need to be considered. And, all of this needs to be approached carefully with respect to the social and ethical implications” and “This course provided a successful in-depth coverage of NeuroAIDS in a very short time. Also, it has allowed me to interact with leading experts in the field. I believe this exposure can only have positive and significant impact on my career as it develops in this area.”

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Research training

The research training component evaluation consists of a series of guided questions (Table 3). Although a candid open discussion is encouraged, in the future, students will be able to respond to questions anonymously via Blackboard.

The evolving course development is reflected in the ongoing evaluation and implementation of feedback provided by students, faculty, and external evaluators. This dynamic process offers opportunities to make changes in the course curriculum and delivery according to the changing needs of the course, students, and faculty. There are advisory committees composed of individuals internationally recognized for their contributions to research and the training of researchers at all levels, the students, and the faculty who provide evaluations and recommendations. The advisory committees evaluate the entire program, recruitment strategies, and quality of training. The students answer a comprehensive survey to assess their perceptions of the quality of and satisfaction with (1) didactic course, (2) mentorship received, (3) the research experience, (4) formal meetings such as journal club and the mentoring seminar, and (5) information day. Additional questions address an assessment of their career plans and interest in pursuing an academic career in NeuroAIDS related to minority health issues.

Input from the faculty is provided through formal and informal evaluations. Informal feedback is received during daily interactions, whereas formal evaluations of the program occur at the conclusion of the summer and at the end of the research project, when the preceptors receive an evaluation form to address any concerns or offer suggestions for improving the training process.

The course is also evaluated on the basis of student recruitment and outcomes related to grants funded, publications, presentations, and percentage of students pursuing a career or research related to NeuroAIDS. To date, the average number of students enrolled each year is 30, far exceeding the anticipated number of ten students per year. Most students are from minority backgrounds, particularly African American and Hispanic. In the first 2 years of the course, 20 students received research funds, eight from NIH; there were 56 publications by mentees and mentors, 42 related to NeuroAIDS; and 81% of the students continued pursuing a career or doing research in NeuroAIDS (Table 2). The success of completed projects and mentorships of participants was reflected in the number of presentations at national or international NIP and NeuroAIDS scientific meetings. Financial support was critically important for participants. In some cases, their costs were offset by travel awards, which were given to new investigators by the national and international scientific organizations.

Outcome measures

The outcome measures of the program are directed to fulfill the goals of the course, to improve the capacity for high quality research by developing mentoring programs for (1) doctoral candidates and postdoctoral fellows and junior faculty from racial and ethnic minorities and (2) non-minority individuals at the same levels, whose research focuses on NeuroAIDS disparity issues. Therefore, our outcome assessment is based in the number of students enrolled, number of students that complete the course's three components, number of grants awarded, number of publications, and the number of students that purse a career/ research in NeuroAIDS (summarized in Table 2).

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Conclusion—what we hope to accomplish to prepare students in NIP

Through participation in the R25 course, students from JHU, UHM, and the UPR MSC, who represent varied backgrounds, share a common venue where they can advance their educational experiences and career goals. We hope to accomplish the following goals in preparing students in NIP and NeuroAIDS:

1. Long-term learning: Students enrolled in the R25 course have opportunities through innovative and flexible program-sponsored entities to participate in NIP-related and NeuroAIDS-related activities. As envisioned and designed, this course brings together faculty with unique expertise from JHU to mentor participants from UHM and UPR MSC to study in-depth a variety of topics in NeuroAIDS, including NIP.

   Using a web-based interactive course, geographic limitations are overcome in efforts to enhance the teaching by experts in the field of mentees from minority institutions who have geographic, economic, and personal issues that could potentially limit their participation at formal traditional training sessions. Web-based training overcomes such limitations with the advantage of providing long-term learning (Woods and Kemper 2009; Curran et al. 2006; Fordis et al. 2005) and, in the context of this course, long-term mentoring and research. This approach also provides the opportunity to make the didactic component available to trainees at other institutions anywhere is the world.

   NIP is integrated in an interdisciplinary manner among all activities of the course. Mainly in the didactic courses, there is a continuum of learning about NIP from the clinical, pathophysiologic, and translational aspects of HIV infection as it involves the brain and is manifested as HAND. The students have the opportunity to learn about interactions between HAND and the immune system, the CNS, and possible treatments of HIV infection. They also learn about treatment mechanisms and possible drug discoveries to complete their overview of translational research, from bedside to clinic to community. Since the course includes other activities besides those related to the didactic component, such as research training and long-term mentoring, the newly learned topics in NIP are reinforced continually.

2. Foster mentees to pursue a career or research in NeuroAIDS: Focusing on the impact of HIV infection on the brain is an ideal way to teach NIP. Trainees in this NeuroAIDS course attain knowledge that well positions them to become mentors in the field and to apply NIP to the evaluation and treatment of HAND. Moreover, the pilot grants allow trainees to obtain the preliminary data necessary for the submission of a successful competitive grant application, thus fostering a career in NeuroAIDS research.

3. Encourage and facilitate networking and collaboration in NeuroAIDS: Developing a web-based interactive course focused on NeuroAIDS and HAND in minority populations is enhanced by collaborations with institutions such as JUH, UHM, and UPR MSC. Several issues provided challenges, such as different time zones, technologic difficulties, and coordinating faculty from different institutions to avoid topic repetitions, and re-enforcing the learning process. The diversity of students and investigators from these institutions enriched the experiences of each participant.

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Table 1

Syllabus of the translational research in NeuroAIDS and mental health (TR-NAMH) course

Week	Title	Faculty	Description	Neuroimmune pharmacology (NIP) integration
1	Course introduction	Richard Johnson and Avindra Nath	Discuss the goals of the program, history, and epidemiology of NeuroAIDS. It will also address the challenges of research in special populations such as stigma, accessibility to medical care including diagnostic evaluation and treatment, education status, co-morbidities, genetics, and cultural issues	Addresses the challenges of research in special populations such as treatment, co-morbidities, and genetics issues
Theme 1: clinical research				
2	Clinical research techniques and cultural competence	Justin McArthur, Ned Sacktor, and Bruce Shiramizu	Discuss the epidemiology with emphasis on racial and geographical differences and develop culturally appropriate and population-specific measures and methods. Application of ethical principles and cultural competence in the design and conduct of clinical research, especially with minority populations	Role of host genetic factors in development of HAND and in treatment response. The role of genetic factors in the immune system, pathophysiology of HAND, biomarkers, and treatment response
3	Cultural sensitivity in neuropsychological scales for HAND	Ola Seines and Valerie Wojna	Discuss the pros and cons of the existing scales and need for culturally sensitive measures and how to validate the scales. Includes scales for monitoring psychiatric and behavioral manifestations	Validation of these scales in different populations and their use for monitoring effects of various pharmacological interventions
4	Statistical issues in NeuroAIDS research	Richard Skolasky	Discuss database management and techniques for analysis with emphasis on NeuroAIDS	Biostatistical analysis in HAND including clinical variables such as cytokines, chemokines, drug abuse, and others
5	Imaging techniques in NeuroAIDS	Martin Pomper, Linda Chang, and Beau Ances	PET- and MRI-based techniques. MR-based techniques such as DTI and MTR will be emphasized and how they can be exploited to study neurological complications of HIV infection	Use of novel PET ligands to measure neurotransmitter systems and inflammation and microglial activation. Ligands relevant to drug-abusing HIV-infected populations will be emphasized
Theme II: pathophysiology				
6	Pathology of NeuroAIDS	Carlos Pardo, M. Christine Zink	Methods of doing autopsy, collection, and handling of specimens from HIV-infected patients	Quantitative immunohistochemistry
7	Pathophysiology of neurodegeneration with HIV infection and immune reconstitution syndrome	Avindra Nath and Joseph Mankowski	Discuss the mechanisms of glial cell activation and neurodegeneration with HIV infection	Differences in HIV clades, effects of drugs of abuse, and the effect of antiretroviral therapy
Theme III: translational research				
8	Surrogate and host genetic markers	Norman Haughey, Loyda Melendez, and Robert Cotter	Discuss the role of host genetic factors that may account for racial differences in development of HAND. Use of an “omics” approach for development of biomarkers	The influence of host genetic factor on cytokines, chemokines, oxidative stress markers. Use of mass spectrometry and luminex systems

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Week	Title	Faculty	Description	Neuroimmune pharmacology (NIP) integration
9	Animal models for HAND and drug abuse	Joseph Mankowski and Janice Clements	Discuss rodent and simian models of HAND and effects of drugs of abuse. Emphasis will be given to behavior and cognitive measurement techniques	The rodent and simian models of HAND and effects of drugs of abuse
10	HCV, viral genetics, and reservoirs	Amanda Brown and Janice Clements	Discuss mechanism of HIV replication and persistence in brain	The role of HCV co-infection in the brain and interactions between HIV and HCV and differences in HIV clades and their effects on the brain
11	Drug development for HAND	Joseph Steiner and Justin McArthur	Discuss drug development for affecting HIV reservoirs and neuroprotection starting with drug screening in vitro, developing high throughput assays, compound libraries, structure activity relationship, assessment of toxicology, and conducting clinical trials	Special emphasis will be given to assessment and drug development with CNS penetration and monitoring of drug adherence and pharmacogenomics
12	Ethics in NeuroAIDS research in minority populations	Richard Johnson	Discuss bioethics unique to NeuroAIDS research, such as consenting cognitively impaired patients, conducting autopsies when next of kin is not available	

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Table 2

Outcomes of the course (years1 and 2)

	Total numbers	
Students enrolled		
Students category		Students that completed the course (%)
MD/PhD candidates	40	100%
Postdoctoral fellows	22	100%
Junior faculty	26	100%
Total of students	88	100%
Funded grants		
Source of funding		Type of funds (no.)
NIH funds	9	R21(1), F31(3), K23(1), K08(1), K25(1), P41(1), P20(1)
Pilot grant funds		
R25 JHU[a]	5	$20,000–25,000 each
RCMI CRC UPR MSC[b]	2	
Publications		
		Related to NeuroAIDS
Peer-reviewed manuscripts between mentees and mentors	56	42 (partial list at the references section (Garcia et al. 2009; Laspiur et al. 2007; Luciano-Montalvo and Melendez 2009; Luciano-Montalvo et al. 2008; McArthur et al. 2005; McMurtray et al. 2008; Munsaka et al. 2009; Nieves et al. 2007; Noel et al. 2008; Perez-Casanova et al. 2008; Rivera-Amill et al. 2009a, b; Rozek et al. 2007; Sacktor 2002; Shiramizu et al. 2009; Simioni et al. 2009; Sithinamsuwan et al. 2008; Toro-Nieves et al. 2009; Valcour et al. 2008a, b; Valcour et al. 2009a, b; Velazquez et al. 2009; Wojna and Nath 2006; Wojna et al. 2007a, b; Woods and Kemper 2009; Wutoh et al. 2004; Yanagihara et al. 2009; Chow et al. 2008; Ernst et al. 2009)
Pursuing a career/research in NeuroAIDS		
Percentage of students		81%

[a] R25 JHU, Translational Research in NeuroAIDS and Mental Health (TR-NAMH): an innovative mentoring program to promote diversity in NeuroAIDS Research, Johns Hopkins University (R25 080661)

[b] RCMI CRC UPR MSC, Research Center of Minority Institutions, Clinical Research Center, University of Puerto Rico Medical Sciences Campus (P20RR11126)

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Table 3

Research training evaluation: series of guided questions

Guided question	For the trainee	For the mentor
What is expected at the beginning of training?	Identify and write down your short-term and long-term career goals	Help trainee identify short-term and long-term career goals
	Develop your short-term and long-term research goals	Help trainee develop short-term and long-term research goals
	Develop an action plan including time points for review with mentor	Help trainee develop an action plan including time points for review with mentor
	Develop a realistic timeline for achieving these goals	Help trainee develop a realistic timeline for achieving these goals
	Identify the resources needed to accomplish these goals	Help trainee identify the resources needed to accomplish these goals
	Set dates for research rotation at JHU	Set dates for research training rotation at JHU
	Set schedule of meetings with NeuroAIDS researchers at JHU and date for seminar	Set schedule of meetings with NeuroAIDS researchers at JHU and date for seminar
	Prepare brief summary at end of rotation	Prepare brief summary at end of rotation
What is expected during follow-up to training?	Meet by webinar or at a conference with mentor to review goals and timeline at least twice a year. For webinar meeting contact the course co-director	Meet by webinar or at a conference with trainee to review goals and timeline at least twice a year
	Inform mentor and course co-director of any abstract, manuscript, poster, invited talks, or grant submissions and awards	