January 2021

Ongoing news about MEHARRY RESEARCH

The Research Digest

ADVANCING RESEARCH AND INNOVATION · Writer/editor: Sheila T. Yong, Ph.D.

From the Meharry Medical College Office for Research and Innovation

ANNOUNCEMENTS

Upcoming/ongoing events:

- The new Meharry Research **Website** is here!
- The **Novavax COVID-19 vaccine trial** has begun at Meharry! To participate, click **here** to register.
- Meharry plans to nominate **two Ph.D. students and two postdocs** for the **9th Annual Regeneron Prize for Creative Innovation**.

  Internal selection deadline: **Feb 8, 2021**

  Click **here** for complete submission guidelines.

  Submit your complete applications to VP-Research@mmc.edu and copy **Mr. Jared Elzey** at jelzey@mmc.edu
- **A. Cherrie Epps, Ph.D. 7th Annual School of Medicine Education Symposium** is planned for **Apr 20–21, 2021.**

  Abstract deadline: **Feb 26, 2021**

  Click **here** for details and submission guidelines.
- The **GENEWIZ** drop box has come to West Basic Sciences! It is located in the CRISALIS, **WBS room 4003**.

  Sample pickup: By request, Mon–Fri, by 1 p.m.

  Click **here** for sample submission details.
- The **RHDR@MMC Investigator Development Core** pilot awards program seeks new applications.

  Those who indicated their plan to apply:

  Have you completed your **studio review**?

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THE VP'S CORNER

Dear Meharrians:

Welcome to 2021!

In 2020, we encountered the greatest challenge of our lifetime and confronted uncertainty with an innovative spirit, urgent sense of purpose, and unrelenting drive. Amidst these unprecedented times, we have so much to be thankful for. Specifically, I am blessed to work closely with such stellar individuals as all of you. I value your support, involvement, and feedback. I want to tell each of you that I truly appreciate your contribution, advice, and words of wisdom. Without your efforts, we would not be able to accomplish Meharry's mission in research and innovation. Here are just a few examples of what we have accomplished thus far:

- Ensured the health of our lab personnel and students by developing and enforcing guidelines for COVID-19 lab safety. Campus-wide lab inspections and enhanced cleaning practices have also been implemented.
- Made essential equipment repairs and replacements to enhance research infrastructure.
- Accomplished COVID-19 testing and vaccine trial milestones, such as preparing the Operation Warp Speed Novavax vaccine trial site and launching the ThermoFisher/Gates HBCU COVID-19 testing hub.
- Overhauled regulatory affairs committees for efficient review of research protocols. Specifically, we developed a leadership succession plan, appointed 22 new members, and streamlined the eProtocol platform at no additional cost.
- Reduced the turnaround time for MTA and DTA signing to less than 12 hours and that for contract signing to under 48 hours to expedite Meharry's growth.
- Organized workshops, chalk talks, and one-on-one discussions with researchers to support their research endeavors that led to submission of multiple MPI NIH R01 applications.
- Facilitated the launch and review of student and faculty collaborative research awards under the new Meharry and UNC-Eshelman partnership. At this time, the student awards have been announced. Seventeen Meharry faculty members applied for the faculty awards, for which review is in progress. Details on other collaborative partnerships in the pipeline are forthcoming.
- Developed a **new website** for Meharry's Research and Innovation.
- Launched *The Research Digest* newsletter to highlight Meharry's research endeavors and achievements. The first issue was published in December 2020.

Once again, I thank you all for making these accomplishments and many more a reality. None of this would have been possible without your commitment and dedication. With our continued efforts, I am confident that we can accomplish even more in 2021.

Let us work together towards a brighter future for Meharry.

With gratitude and hope,

Anil Shanker, M.S., Ph. D.
Interim Vice President for Research and Innovation
Professor of Biochemistry, Cancer Biology, Neuroscience and Pharmacology

Application deadline: **Feb 26, 2021**

For more information, please contact Dr. Fernando Villalta or Ms. Denise Holland.

- "Chalk-talk" sessions for grant development available for junior investigators to help develop their specific aims. Send your request to: VP-Research@mmc.edu
- COVID-19 lab safety guidelines

Past events:

- **Dec 23, 2020:** President Hildreth discussed the science behind COVID-19 and vaccines in a Facebook live event sponsored by Meharry, Scarritt Bennett Center, and Center for the Study of Social Determinants of Health. Watch the recording **here**.
- **Dec 14, 2020:** Dr. Anil Shanker discussed measures to fight COVID-19, particularly in communities of color, on the Black Love of Cultural Knowledge (**B.L.O.C.K.**) Sports show. Watch the recording **here**.
- **Dec 5, 2020:** MSCC members Dr. Maria del Pilar Aguinaga (Director) and Dr. Richard Martin (Medical Director) participated in **"Sickle Cell Disease: A Community Conversation"**. The event is organized by the Engagement HEAL Collaborative (Atlanta, GA), Mt. Zion Baptist Church (Nashville, TN), and The Sickle Cell Foundation of Tennessee (Memphis, TN). Watch the recording **here**.
- **Dec 3, 2020:** Immigration law seminar by immigration attorney Terry Olsen. Title: **Current & Future Immigration—Work & Travel—Policies: What to Expect for 2021?** For the PowerPoint presentation, click **here**. Please email **Mr. Olsen** if you have any questions.

SPOTLIGHT

Meharry medical student receives UNC Eshelman Institute for Innovation Student Award

Medical student Chinomunso Ahanotu, Class of 2024 (pictured), is the first student from Meharry Medical College to receive a 2021 Student Award from the Eshelman Institute for Innovation (EII) at the University of North Carolina (UNC) Eshelman School of Pharmacy (ESOP). He and fellow awardee Dr. Lida Ghanzanfari, an ESOP scientist, will receive about $25000 to create, implement, and translate their research into solutions that benefit society. They must complete their project within one year.

The team is developing a novel strategy for delivering gene therapy to solid tumors and their surrounding environment. This strategy involves the use of chimeric antigen receptors (CARs) engineered to target specific cancer cells. CARs are a vital component of CAR-T cells, which the FDA has recently approved for use in cancer immunotherapy.

In this new approach, Ahanotu and Ghanzanfari use macrophages instead of T cells because macrophages can better penetrate the environment of solid tumors. These macrophages express CARs that guide them to their target cells. These CAR-expressing macrophages will carry short interfering RNAs (siRNAs) and deliver them to the tumor cells and cells in their environment. Once there, these siRNAs serve to silence the expression of genes that promote tumor growth. Consequently, the silencing of these genes will inhibit tumor growth and, in some cases, result in tumor cell death.

Ahanotu's fascination with gene editing and delivery led him to start an organization called Independent Research Project (IRP) while an undergraduate at the University of Georgia. He constantly discussed topics related to gene editing and delivery with fellow members, many of whom went on to post-graduate studies and careers in the pharmaceutical industry. Still in contact with them, Ahanotu was able to consult them while developing his proposal to apply for the EII award.

At Meharry, Ahanotu will execute this new project under the mentorship of Dr. Amosy M'Koma, Associate Professor of Surgery, Pathology, and Cancer Biology in the School of Medicine. He is responsible for generating CAR-expressing macrophages and determining their cytotoxicity in their target cells. "In a way, this new project is an extension of the project I started years ago," he said, referring to his time at IRP. As a medical student at Meharry, Ahanotu brings his perspectives on human biology and pathology to the new project. An avid writer and a creative thinker, he also contributed significantly to the writing of the EII award proposal. These attributes will prove crucial when the team communicates its findings and strategizes its steps forward.

In addition to the EII Award, Ahanotu and Dr. Ghanzanfari also received the EII Rankin Innovator Award. This award grants them $5,000 each for use toward an entrepreneurial program, certificate, or mentorship in the year following the conclusion of their EII award. This innovator award will bolster their effort in pursuing intellectual property protection for their work and commercializing their research.

For Ahanotu, the experience of writing a research proposal and winning his first research grant has been educational. "More than anything, it has encouraged me to attempt new things outside my comfort zone," he said. "Despite the uncertainty I faced during the writing process, I was content with the fact that I was doing my best." He admits that as a first-year medical student, he still has much to learn. Nonetheless, he is hopeful for a bright future in medical research.

Click here to learn more about the EII at the UNC ESOP.

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MORE INFORMATION?

You can find it here:

NEW! Meharry Research Website

Meharry's research history

OfRI Services and Support Unit

ResearchPoint

Yammer

Meharry graduate student innovators gain acceptance into prestigious NSF I-Corps Program

Portia Thomas, Zerick Dunbar, and James Mungin became the first students from Meharry Medical College to gain acceptance into the highly competitive National Science Foundation (NSF) Innovation Corps (I-Corps) Teams Program. The program aims to educate researchers about entrepreneurship and how to start a business, as well as industry requirement and challenges. This honor comes with a grant of $50,000 for their innovation, the Vagiome health education platform.

"The Vagiome platform aims to engage, equip, educate, and empower individuals of all ethnicities and genders to advocate for vaginal health," the team explained. Their innovative platform uses a multi-system approach aimed at personalizing vaginal health for the user. True to Meharry's mission, Vagiome prioritizes underserved populations in the United States by offering an accessible, user-friendly, and gender-inclusive service. In other words, it offers the comprehensiveness and inclusivity that are absent from existing platforms and products.

The Meharry NSF I-Corps team. *Top to bottom:* Portia Thomas, Zerick Dunbar, and James Mungin.

Thomas, proper pronouns she/her, is an M.D./Ph.D. student in the Department of Physiology, Microbiology, and Immunology. She performs her dissertation research in the laboratory of Dr. Christine Lovly at Vanderbilt University Medical Center. As a Black woman and an aspiring physician-scientist, Thomas is passionate about vaginal health and addressing racial disparities in healthcare. One aspect of her doctoral research highlights racial disparities that affect the clinical care of patients with lung cancer. Her work in health disparities was recently published in *Cancer Discovery*, a world-renowned science journal. Thomas is also a recipient of the Women's Business Enterprise National Council (WBENC) Cummins Grant for Black Student Female Founders, earning the team $2,000 to invest in Vagiome.

Dunbar, proper pronouns he/him, is a fourth-year Ph.D. student in the Department of Physiology, Microbiology, and Immunology. He conducts his research in the laboratory of Dr. Anil Shanker at Meharry Medical College. Dunbar's research involves assessing the functional profiles of natural killer cells in solid tumors. A budding immunologist, Dunbar capitalizes on his scientific expertise to strengthen the value of Vagiome. Dunbar is also no stranger to entrepreneurship. Since 2019, he has been the owner of Carr Choice Properties, LLC, a company that focuses on real estate development and property management solutions.

Mungin, proper pronouns they/them, is a senior Ph.D. student in the Department of Physiology, Microbiology, and Immunology. Mungin conducts their research in the laboratory of Dr. Bindong Liu at Meharry Medical College. As a Black, queer, and non-binary individual, their passion and experience in microbiology and reproductive health drive them to solve vaginal health issues in a manner that is inclusive of LGBTQIA+ and gender-expansive people. Their doctoral research focuses on the molecular mechanism of Zika virus infection in vaginal epithelium. Their work has been featured in several news and research journals including *Zika News* and *Federation of American Societies for Experimental Biology* (FASEB). Outside the lab, Mungin has been an active community leader and organizer for several advocacy groups that focus on gender equality and reproductive health since 2017.

The collective passion, entrepreneurial prowess, and research expertise of this Meharry team constitute a powerful force for addressing vaginal health issues. After individually completing the Entrepreneurship for Biomedicine course offered by Washington University in St. Louis, Thomas, Dunbar, and Mungin formed a team in the fall of 2020 to participate in Ideator, a five-week NSF I-Corps site program, at Vanderbilt University. Upon completing the program, the team received a microgrant of $2,300. After refining their idea for Vagiome in Ideator based on customer feedback, the team applied to the NSF I-Corps Program. Their acceptance into the program requires them to participate in the I-Corps Curriculum in the spring of 2021. This curriculum will equip the team with hands-on experience in translating knowledge and discovery into products and processes that benefit society. The team will also acquire skills in communication and negotiation by engaging with

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industry experts, potential customers, partners, and competitors. These activities will allow the team members to experience the uncertainty and excitement of commercializing and marketing their innovation, beyond the walls of their university laboratories.

Thomas, Dunbar, and Mungin plan to use the grants from Ideator and WBENC for the online launch and continual development of Vagiome prior to entering the I-Corps Program. This progress is pivotal because it will bring Vagiome one step closer to commercialization. Through participation in the NSF I-Corps Program, the team members hope to refine their commercialization approach by expanding their customer discovery efforts. They also aim to learn more about customer needs so that they can optimize product delivery and end-user experience.

PUBLICATION HIGHLIGHTS

Want your publications featured in the Publication Highlights? Please complete this ***REDCap survey*** *to share the information with us!*

From the group of Dr. Zhenbang Chen:

KDM5B is essential for the hyperactivation of PI3K/AKT signaling in prostate tumorigenesis. Guoliang Li, Thanigaivelan Kanagasabai, Wenfu Lu, Mike R Zou, Shang-Min Zhang, Sherly I Celada, Michael G Izban, Qi Liu, Tao Lu, Billy R Ballard, Xinchun Zhou, Samuel E Adunyah, Robert J Matusik, Qin Yan, Zhenbang Chen. *Cancer Research*. 2020 Nov 1. DOI: 10.1158/0008-5472.CAN-20-0505

Lysine-specific demethylase 5B (KDM5B) is a histone modification enzyme that removes methyl groups from histones. Histones are proteins that bind to and organize DNA into chromatin. Histone modification influences heritable epigenetic changes that do not involve any alteration of DNA sequence. In this study, the authors showed that KDM5B promoted prostate cancer progression by facilitating PI3K/AKT signaling, particularly when tumor suppressor PTEN was deactivated. Using cultured cell lines and mouse models, they showed that KDM5B deletion significantly attenuated prostate cancer progression. Conversely, KDM5B overexpression enhanced AKT signaling, subsequently promoting prostate cancer progression. Their findings uncover KDM5B as a potential therapeutic target in prostate cancer.

From the group of Dr. Minu Chaudhuri:

Tim17 updates: A comprehensive review of an ancient mitochondrial protein translocator. Minu Chaudhuri, Chauncey Darden, Fidel Soto Gonzalez, Ujjal K Singha, Linda Quinones, Anuj Tripathi. *Biomolecules*. 2020 Dec 7. DOI: 10.3390/biom10121643

Translocase of the mitochondrial inner membrane 17 (Tim17) is a mitochondrial import protein. Its homologs exist in all eukaryotes. This review examines the structure and function of Tim17 homologs and their associated complexes. It also compares Tim17 complexes in other species to those in *Trypanosoma brucei*, a parasite that causes sleeping sickness in humans. To conclude, the review highlights the function of Tim17 in mitochondrial stress response and cancer, further emphasizing the need to study its mechanism of action.

From the group of Dr. Pius N. Nde:

***Trypanosoma cruzi* modulates PIWI-interacting RNA expression in primary human cardiac myocytes during the early phase of infection.** Kayla J Rayford, Ayorinde Colley, Ashutosh Arun, Girish Rachakonda, Yulia Kleschenko, Fernando Villalta, Siddharth Pratap, Maria F Lima, Pius N Nde. *International Journal of Molecular Sciences*. 2020 Dec 11. DOI: 10.3390/ijms21249439

Trypanosoma cruzi is a parasite that causes Chagas disease in humans. People with Chagas disease may experience cardiac complications. This study examines the expression profile of small non-coding RNAs (sncRNAs), particularly PIWI-interacting RNAs (piRNAs), in human primary heart muscle cells upon infection by *T. cruzi*. piRNAs guide PIWI proteins to their target destinations where they can cleave specific RNAs, promote heterochromatin formation, and methylate target DNA sequences. Consequently, piRNAs play a role in epigenetic regulation. The authors observed marked changes in the levels of several piRNAs in heart muscle cells infected by *T. cruzi*. These piRNAs can affect the expression of specific genes that play a role in the early stages of *T. cruzi* infection. This study is the first to report a role for piRNAs in an infectious disease, and to propose piRNAs as potential biomarkers and therapeutic targets.

From the group of Dr. Pandu R. Gangula:

SARS-CoV-2 Infection and Oral Health: Therapeutic Opportunities and Challenges. Christopher J Coke, Brandon Davison, Niariah Fields, Jared Fletcher, Joseph Rollings, Leilani Roberson, Kishore B Challagundla, Chethan Sampath, James Cade, Cherae Farmer-Dixon, Pandu R. Gangula. *Journal of Clinical Medicine*. 2021 Jan 5. DOI: 10.3390/jcm10010156

This review details the infection mechanism of SARS-CoV-2, the novel coronavirus that causes COVID-19, with a specific focus on oral and dental health. It highlights periodontal disease (PD) as a potential pre-existing condition that may exacerbate COVID-19 symptoms. Many patients with PD also suffer from metabolic ailments such as obesity, diabetes mellitus, and cardiovascular diseases. Such ailments are also risk factors for COVID-19. Next, the review describes the plight of dental

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healthcare professionals who face increased risk of COVID-19 infection and transmission due to their exposure to oral cavities and use of aerosol-generating devices. Finally, the review covers potential treatments and vaccines for COVID-19, and how these treatments may interact with oral health medications. The authors concluded the review with information regarding new and ongoing research on COVID-19 diagnostics and treatment.

From the group of Dr. Regina S. Offodile:

Enhancement of medical student perception of surgical specialization with peer-assisted laparoscopic simulation: a pilot study. Jordan J Baechle, Alexander M Lopez, Jyotsna Thota, Mitchell F Bowers, Paula Marincola Smith, Regina S Offodile. *Journal of Surgical Simulation*. 2020 Nov 24. DOI: 10.1102/2051-7726.2020.0008

Under the mentorship of Dr. Regina S. Offodile from the Department of Clinical Skills and Competencies, Meharry medical students conducted a study to determine whether attendance of peer-led laparoscopic simulation workshops can help medical students improve self-confidence and preparedness in the pursuit of surgical residency. The authors conducted the study using the SurgeonBox^{TM}, a laparoscopic simulator box designed at Meharry that is currently patent pending. This study shows that simulation learning may enhance the students' perceptions of surgical fields.

From the group of Dr. Christine M. Lovly:

A Call to Action: Dismantling Racial Injustices in Preclinical Research and Clinical Care of Black Patients Living with Small Cell Lung Cancer. Portia L Thomas, Chioma J Madubata, Melinda C Aldrich, Montessa M Lee, Taofeek K Owonikoko, John D Minna, Charles M Rudin, Julien Sage, Christine M Lovly. *Cancer Discovery*. 2020 Dec 14. DOI: 10.1158/2159-8290.CD-20-1592

This commentary discusses the incidence of small cell lung cancer (SCLC) among Black individuals. Particularly, it highlights the lack of genetic and genomic analyses of SCLC among Black individuals, the lack of cell lines and tumor samples derived from Black patients, low participation from Black individuals in clinical trials, and the lack of cultural competency among healthcare providers. These factors contribute to the racial disparities Black patients encounter when seeking consultation and treatment.

GRANT HIGHLIGHTS

In November 2020, **Dr. Stephania Miller-Hughes** received the following award from the Patient Centered Outcomes Research Institute (PCORI):

Diabetes medical nutrition therapy in southeastern African American women

Congratulations!

Photo by Sang Huynh on Unsplash

*Want to share your research news, highlights, and announcements with us? Want your stories featured in the Research Digest? Please submit this **REDCap survey** to share your updates with us. We look forward to celebrating your achievements!*

Happy 2021!

The Office for Research and Innovation wishes all Meharrians and their families a safe and fulfilling year ahead.