February 2024

The Leading Edge

BCDB Newsletter

Newsletter Highlights

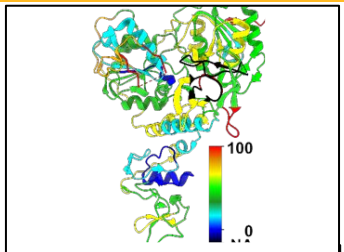
GDBBS Awards Banquet

The annual GDBBS awards banquet at the Druid Hills Golf Club is always a fun time with good food and friends. More on Page 3.

BCDB STUDENT DISCOVERIES

Jose Castro
3rd year

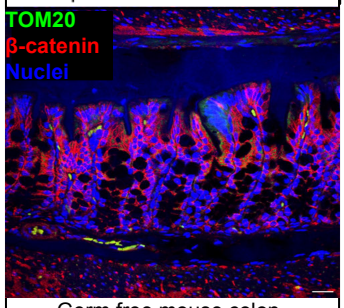
SARS-CoV-2 is an ongoing global pandemic with an urgent need for antiviral agents to prevent and treat infections. Currently, the FDA has only approved two antivirals to treat COVID-19. However, these drugs efficiency has been compromised due to mutations in current variants of concern. During SARS-CoV-2 replication, nsp13 unwinds viral RNA allowing transcription by the replication-transcription complex. This is a crucial step in virus propagation making nsp13 a novel antiviral target. **My research focuses on expanding the repertoire of nsp13 inhibitors by screening compound libraries with diverse conformational space.** These hits will then be validated against fully infectious SARS-CoV-2 virus. Then, I will characterize the type of inhibition, binding kinetics, and the mechanism of action the initial lead compounds exert against nsp13. Outside of the lab, I serve as a member of the BCDB Diversity, Equity, and Inclusion (DEI) committee as part of the policy subcommittee. My responsibilities include promoting DEI by raising awareness at the program level as well as within laboratories.



A) HDX-MS data mapped on nsp13 structure. Different hydrogen deuterium exchange rates (ranged from 0-100) can be seen across the protein demonstrating flexibility and the exposure to solvent.

Lauren Askew
MD/PhD - 4th year

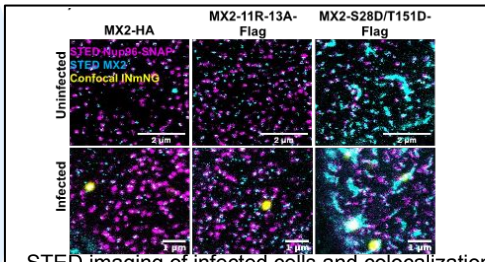
My research focuses on characterizing the effects of a newly discovered gut-derived metabolite, Valerobetaine (VB), in the gut. This project is exploratory in nature because VB has predominantly been investigated in the liver thus far. Specifically, I am interrogating the role of VB in gut cell homeostasis, gut epithelial barrier integrity, and tissue restitution following injury. A better understanding of the roles and mechanisms of microbe-generated metabolites can allow for their utilization as therapeutic options in the treatment of intestinal disorders such as Inflammatory Bowel Disease. What I enjoy most about BCDB is how welcoming everyone is! I've found both the students and the faculty to be approachable, collaborative, and always willing to lend a helping hand.



Germ free mouse colon

Dariana Torres Rivera
5th year

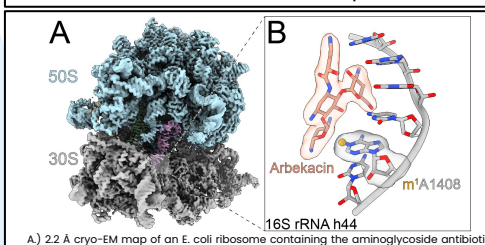
My research focuses on understanding how the restriction factor MX2 inhibits HIV-1 infection. HIV-1 infection involves entry into the nucleus followed by integration of viral genome into the cell genome. MX2 is thought to inhibit HIV-1 entry into the nucleus and this activity can be regulated by MX2 phosphorylation. I use confocal and super resolution (STED) microscopy to examine the mechanism of MX2 mediated HIV-1 restriction. I found that phosphorylation of MX2 at residues S28 and T151 increases MX2 colocalization with the nuclear envelope and with HIV-1 cores in the cytoplasm and at the nuclear pore complex (NPC), suggesting that this mutant has higher affinity to viral capsid than WT MX2. Outside of research, I'm part of the Latinx Graduate Student Association fomenting the interaction of the Latinx community through social activities. In my free time, I enjoy painting, drawing and watching shows with my friends.



STED imaging of infected cells and colocalization of MX2 with NPCs and virus particles.

Jacob Mattingly
6th year

As a member of the Dunham Lab, **I study bacterial translation, with a focus on how the accuracy of protein synthesis is maintained and disrupted.** I use biochemical and structural biology techniques like cryo-EM to study the interactions of the bacterial ribosome with its various ligands (tRNAs, antibiotics, etc.) to better understand messenger RNA reading frame maintenance and the mechanisms by which certain translation-disrupting antibiotics can evade rRNA methylation-mediated antibiotic resistance. During grad school, I've really enjoyed following the breadth of research that falls under the BCDB umbrella – it's always fun to hear about research that's outside of my wheelhouse (and especially fun to hear about others' forays into structural biology).



A.) 2.2 Å cryo-EM map of an E. coli ribosome containing the aminoglycoside antibiotic arbekacin, mRNA, and tRNAs. B.) Structure of arbekacin (orange) bound to 16S rRNA helix 44 in the presence of a resistance-conferring methylation (gold) on 16S nucleotide A1408. Translucent map fragments show cryo-EM density corresponding to arbekacin (orange) and methylated A1408 (gray).

Upcoming events

BCDB Communications Committee meeting:
February 16th 10:15AM
RRC 4052

BCDB recruitment visit:
March 7th–9th

GDBBS Symposium
March 27nd

Grad Formal
March 22nd

LGS Gala
April 6, 2024 at 7PM Zoo Atlanta

FACULTY SPOTLIGHT

Shout out to Dr. Lizzy Draganova for receiving this years NIH New Innovator Award (DP2)!

Anita H. Corbett, Ph.D.

Anita H. Corbett, Ph.D. has been at Emory since 1997 and has been a Professor in the Biology Department since 2016 and Senior Associate Dean of Research at Emory College since 2022. Dr. Corbett's research tends to be highly collaborative, with many students formally co-mentored. Work in her research group focuses on how mutations in genes that are ubiquitously expressed and critical for fundamental cell processes such as gene expression cause distinct clinical symptoms that often impact specific tissues. The work uses a number of different genetic models, including budding yeast and flies, to model human disease mutations and explore the functional consequences of these mutations. Results from these studies can then be translated into human cell models with the ultimate goal of defining pathways or targets for therapeutic intervention.

David (Dave) Gordon, Ph.D. joined the Emory faculty in 2021 as an Assistant Professor in the department of Pathology and Laboratory Medicine and the Pathology Advanced Translational Research Unit (PATRU). Dr. Gordon's laboratory utilizes high-throughput experimental genetics and mass spectrometry to build mechanistic models of biological functions and applies this knowledge to identify therapeutic targets and refine therapeutic treatments. Dr. Gordon is particularly interested in questions relating to immunology and virology, as these offer tractable genetic systems, an ample supply of primary tissues, and opportunities to rapidly test therapeutic interventions. The Gordon Lab also has active collaborations in chemoproteomics, neuroscience, and other areas where they can deploy systems-level analyses. The Gordon Lab is affiliated with the Winship Cancer Center Discovery and Developmental Therapeutics Program, the Wallace H. Coulter Department of Biomedical Engineering, and the Emory Vaccine Center.

David (Dave) Gordon, Ph.D.

Fikri Avci, Ph.D.

Fikri Avci, Ph.D., joined the Emory faculty in 2022. He is an Associate Professor in the Department of Biochemistry and a member of the Emory Vaccine Center, Center for AIDS Research, and Winship Cancer Institute. Prior to his current appointment, he was a faculty member at the Biochemistry and Molecular Biology Department at the University of Georgia (2013-2022). Research in the Avci Lab explores the treatment of and protection from infectious diseases and cancers by understanding and exploiting key molecular and cellular interactions between the immune system and carbohydrate antigens associated with microbes or cancerous cells. The lab also investigates immunoregulatory properties of glycans associated with symbiotic bacteria inhabiting the host gastrointestinal tract to enable the development and healthy functioning of the immune system. Fikri has mentored many predoctoral and postdoctoral trainees in his previous and current institutions and is firmly committed to training and supporting scientists with diverse backgrounds.

STUDENT AWARDS AND ACCOMPLISHMENTS

Good Luck to 2nd years on their Qual II Exams- we are rooting for you!

Publications

Taylor Hailstock (Lerit Lab): 'Colorimetric Synchronization of Drosophila Larvae'

Carly Lancaster (Corbett and Moberg Labs): 'The Drosophila Nab2 RNA binding protein inhibits m6A methylation and male-specific splicing of Sex Lethal transcript in female neuronal tissue'

Sarah Strassler (Conn Lab): 'G9 modification depends on substrate-specific RNA conformational changes induced by the methyltransferase Trm10'

Sarah Webster (Ghalei and Marcus Labs): 'Maturation of small nucleolar RNAs: from production to function'

Levi Gifford (Melikian lab): 'HIV-1 Capsid Uncoating is a Multistep process that proceeds through defect formation followed by disassembly of the capsid lattice.'

GDBBS Awards

The annual GDBBS awards banquet at the Druid Hills Golf Club is always a fun time with good food and friends. The 2023 BCDB award recipients are:

Margaret and Thomas Lew Publication Award in Biomedical Sciences in Biochemistry
– Heidi Ulrichs and Emily Legan

Margaret and Thomas Lew Graduate Career Award in Biomedical Sciences in Biochemistry
– Sarah Strassler

Margaret and Thomas Lew 1st Year Award in Biomedical Sciences in Biochemistry
– Mohamed Barmada, Nasab Ghazal, and Megan Hinrichsen

GDBBS Student Mentor Award
- Colby Schweibenz

BCDB Program Scholar of the Year
- Colby Schweibenz

Alumni Corner

Life as a Scientist I at Sai Life Sciences - an alumni interview with

Tyler Moser-Katz, Ph.D.

Useful skills acquired during your Ph.D.: The wide range of wet lab skills was the first thing that jumped out at recruiters. Additionally, the ability to use analysis applications like Prism, Excel, Powerpoint, Flowjo, etc… was something that was in hot demand. Finally, the rigorous presentation skills that I honed during my time in BCDB (shout-out to Intro and Advanced Seminar), lab meetings and conferences really helped me smoothly discuss science during the interview process.

Interview process: I went through **3 rounds of interviews**

1. An initial screen with the HR rep who asks to just go over your resume and provide any additional skills.
2. Interview with a higher-up who would likely be your boss.
3. 45-60 min scientific presentation to the company/department and several interviews afterward with employees of the company.

← Scan for the full interview with Tyler!

Advice to Ph.D. students interested in a job in life-science consulting: **Stack up the techniques** while in graduate school and try different assays. Also, develop a LinkedIn profile as well as Glassdoor/Indeed. Finally, do not be afraid to shoot your shot and reach out to people that are even remotely in your network for advice or referrals (including me)!

Most exciting aspect of the job: When I first started, it was honestly the ability to take off weekends and holidays which was never forced on me in graduate school but is now explicitly discouraged at my current job. Now, as cheesy as it sounds, it's been the **team environment** and the fact that **projects are shared among groups** working together for a common goal.

Communications Committee is Recruiting!

Come join, we would love to have you! If you are interested in joining please fill out this form: https://forms.gle/8ob9BIpN7yg25Ty88

Acknowledgments

Many thanks to the BCDB community for your help with recruitment. We appreciate you!

This newsletter was written and compiled by Dr. Bo Liang, Heidi Ulrichs, and Hannah Hrncir.