

MMI NEWS



FALL 2024



DEPARTMENT OF MEDICAL MICROBIOLOGY & IMMUNOLOGY RELAUNCHES NEWSLETTER!

As we embark on the 2024–25 academic year, we are filled with anticipation and excitement for the remarkable journey ahead. Our department continues to thrive, achieving new milestones and setting the stage for innovative research and groundbreaking discoveries in medical microbiology and immunology. This issue of our newsletter reflects our collective dedication and the many accomplishments that mark the beginning of what promises to be an extraordinary year.

We invite you to explore these stories and more as we celebrate the achievements of the past year and look forward to the exciting opportunities that await. Thank you for being an integral part of our community, and we are eager to share another year of success and discovery with you!

Vanessa Sperandio, Department Chair

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Department of Medical
Microbiology and Immunology
UNIVERSITY OF WISCONSIN
SCHOOL OF MEDICINE AND PUBLIC HEALTH

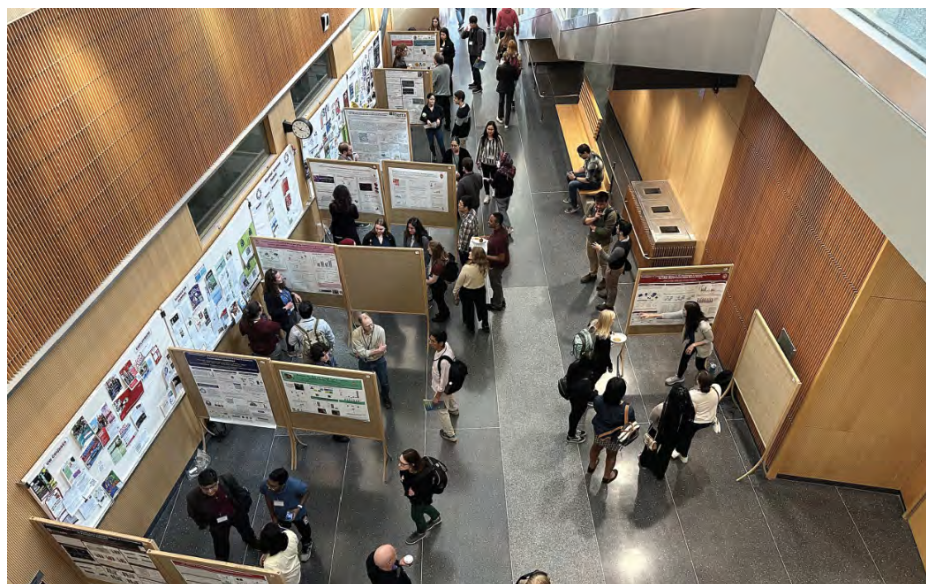
ANNUAL PERLMAN SYMPOSIUM SEES RECORD NUMBER OF ATTENDEES

On April 26, 2024, the Department of Medical Microbiology (MMI) at the University of Wisconsin-Madison welcomed a diverse array of students, trainees, and scientists from 21 esteemed institutions to the 14th annual Perlman Symposium on Antibiotic Discovery and Development. This year's event, held in honor of the late David Perlman, a revered figure in microbial biochemistry, and generously supported by his wife Kate Perlman, saw a record-breaking turnout of attendees and poster presenters.

The event is made possible by a generous gift by Kate Perlman to honor her husband's legacy. David Perlman, a Madison native, earned his bachelor's, master's and doctoral degrees from the UW-Madison, the latter in biochemistry. A microbial biochemist, he made several discoveries linked to antibiotics and vitamin B-12 while working at the Squibb Institute for Medical Research in New Jersey. He returned to the UW-Madison in 1967, where he served as dean of the School of Pharmacy from 1968 to 1975.

Kate Perlman's career began in her native Budapest, Hungary, where she earned her PhD in organic chemistry and worked for a pharmaceutical company and the Research Institute for Pharmaceutical Industry. When she emigrated, she joined her brother in the United States. Kate found a perfect career fit in the Princeton University Department of Chemistry. She met David Perlman a week after arriving in Princeton, married him in 1968 and followed him to Madison.

The symposium showcased the latest advancements and breakthroughs in the field of antibiotic research, featuring four distin-



guished speakers who captivated audiences with their expertise and insights: Dr. Helen Blackwell from UW-Madison, Dr. Jason Crawford from Yale University, Dr. Kimberly Kline from University of Geneva, and Dr. David Weiss from Emory University.

Every year, the symposium features a poster session where dozens of scientists submit their research and compete for awards. This year, we saw a record 46 posters! The quality and diversity of the research presented were truly exceptional, reflecting the vibrant and dynamic nature of the scientific community.

We are delighted to announce this year's award winners:

First Place:

You-Xing Chen

Second Place:

Nayanna Mercado-Soto

Third Place (tie):

Thibaut Rosay & Madhusudan Day

Best Lightning Talk:

Anna Dickfoss

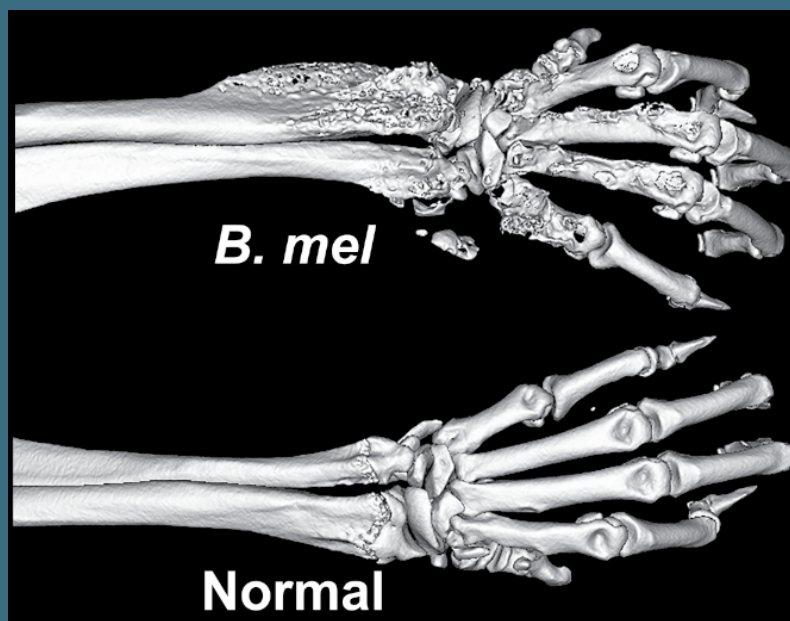
The symposium gives a special thank you to a few key individuals, to whom we extend our heartfelt

gratitude. Vanessa Sperandio, MMI Department Chair, Allison Bauer, MMI Communications Manager, and John Lawler, MMI Department Administrator, worked tirelessly to organize and plan this event, ensuring its success and impact.

As we reflect on the resounding success of the 14th annual Perlman Symposium, we are reminded of the power of scientific community and collaboration in tackling one of the most pressing global challenges of our time: antibiotic resistance. Through continued dedication and innovation, we honor the legacies of visionaries like David Perlman and propel the field of antibiotic discovery and development toward a brighter future.

COOL SCIENCE IMAGE!

This image is brought to us by the Judith Smith lab. It is an image of a micro-CT showing bony erosion, and new bone formation in a mouse model of chronic brucellosis. These were SKG mice infected for 12 weeks with *Brucella melitensis* or uninfected (normal).



DR. VANESSA SPERANDIO SELECTED AS ASM DISTINGUISHED LECTURER



Congratulations to Dr. Vanessa Sperandio on being selected as an American Society for Microbiology Distinguished Lecturer. Lecturers serve 2-year terms, and she will serve as a Lecturer for the 2024-2026 Program.

The ASM Distinguished Lecturer Program annually selects a scientifically diverse group of lecturers to deliver lectures at ASM Branch meetings throughout the country. Lecturers are screened through a competitive nomination process, and only the most distinguished lecturers and researchers are selected to participate in the Program. The ASMDL Program has a tradition of scientific excellence that has made it a mainstay of Branch programming for over 60 years.



FACULTY AWARDS & ACKNOWLEDGEMENTS

Dr. Joseph Dillard Received the 2023 Jack Kenney Award for Outstanding Service

Dr. Laura Knoll Received the 2024 Kellett Mid-Career Award

Dr. Mark Mandel and Dr. Caitlin Pepperell were promoted to full Professor.

Dr. Marta Gaglia was featured in the Journal of Virology on the origins of Covid.

Dr. Andrew Hryckowian was selected for the Infections and Immunity 2024 New Voices in Microbiology collection.

Dr. Andrew Hryckowian is now the Judy L. and Sal A. Troia Professor in Gastrointestinal Disease Research.

Dr. Mark Mandel is now serving as Vice Chair. Thank you to Dr. Joe Dillard who was serving in the role previously.



DEPARTMENT HOSTS 2ND ANNUAL RETREAT

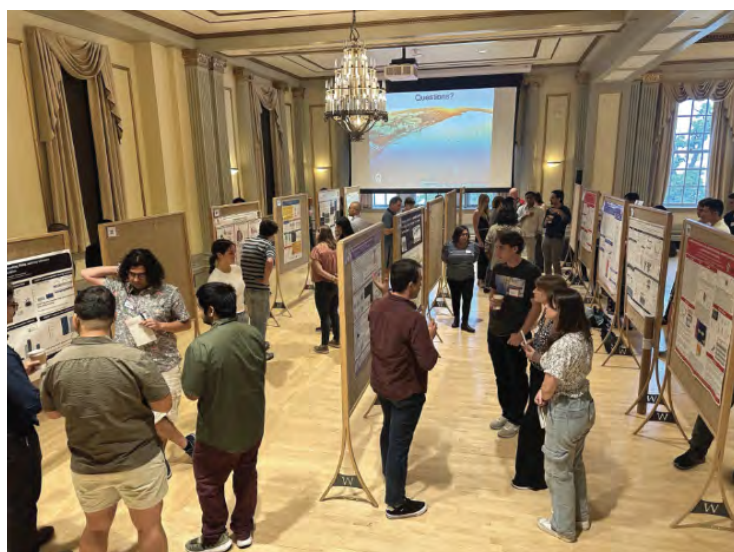
The Department of Medical Microbiology & Immunology at the University of Wisconsin-Madison successfully hosted its second annual retreat on Thursday, August 15, 2024. Building on the momentum from last year's inaugural event, the retreat saw enthusiastic participation from department members, reinforcing its role as a cornerstone for collaboration and academic exchange.

Held at the picturesque Memorial Union on the UW campus, the retreat provided an ideal setting for a day dedicated to fostering connections and sharing knowledge. The schedule was thoughtfully designed to engage attendees, with a series of 20-minute presentations by faculty, research staff, and trainees. These talks offered a comprehensive overview of the department's ongoing research, covering a broad spectrum of topics in medical microbiology and immunology. The presentations sparked lively discussions and provided valuable insights into the innovative work being conducted across various labs.

A key highlight of the retreat was the poster session, which featured the work of trainees. These sessions allowed young researchers to present their findings, discuss their methodologies, and receive feedback from more experienced colleagues. The session underscored the

department's commitment to supporting the next generation of scientists and encouraging a culture of mentorship and peer learning.

As the day drew to a close, it was clear that the retreat had once again succeeded in bringing the department together in a meaningful way. The event not only celebrated the achievements of its members but also strengthened the collaborative spirit that is essential to advancing the department's research goals. Attendees left with new ideas, strengthened connections, and a shared sense of purpose as they continue



The retreat featured 30 posters from trainees and researchers.

CELEBRATING EXCELLENCE: ROD WELCH DISTINGUISHED LECTURESHIP FUND WELCOMED DR. JAMES KAPER AND DR. HARRY MOBLEY

The Department of Medical Microbiology & Immunology at the University of Wisconsin-Madison proudly welcomed the inaugural speakers sponsored by the Rod Welch Distinguished Lectureship Fund. On Friday, September 6, esteemed university professors Dr. James Kaper and Dr. Harry Mobley shared their research titled, "Molecular Pathogenesis Studies with My Colleague Rod Welch, Ph.D."

Established in honor of the distinguished scientist, administrator, and educator, Dr. Rod Welch, the lectureship fund stands as a testament to his extraordinary legacy. Dr. Welch's illustrious career at UW-Madison began in 1982, culminating in his tenure as Chair of the Department of Medical Microbiology & Immunology—a role he held with distinction for 21 years until his retirement, earning the title of Professor Emeritus.

Under Dr. Welch's visionary leadership, the Department flourished, evolving into one of the nation's premier hubs for microbiology and immunology research. His unwavering dedication to excellence and tireless efforts to nurture talent have left an indelible mark on our institution and the global scientific community.

The establishment of the Rod Welch Distinguished Lectureship Fund symbolizes our heartfelt gratitude and profound respect for Dr. Welch's unparalleled contributions. By endowing this lectureship in his name, we ensure his legacy endures, empowering us to invite trailblazing individuals who are shaping the future of science.

The Rod Welch Distinguished Lectureship Fund embodies a commitment to excellence, innovation, and the relentless pursuit of knowledge—a legacy that Dr. Welch has embodied throughout his remarkable career. As we celebrate this momentous occasion, we pay tribute to Dr. Welch's enduring legacy and reaffirm our dedication to fostering intellectual curiosity and academic excellence in the field of medical microbiology and immunology.

On September 6, we embarked on a journey of discovery with Dr. James Dapper and Dr. Harry Mobley, honoring the legacy of Dr. Rod Welch and celebrating the spirit of scientific inquiry that defines our department.



Dr. James Kaper



Dr. Harry Mobley



Dr. Rod Welch

DR. BRUCE KLEIN AND MARCOS ISIDORO-AYZA UNLOCK THE SECRETS OF WHITE-NOSE SYNDROME

July 11, 2024 By Will Cushman | Inside UW

An invasive fungus that colonizes the skin of hibernating bats with deadly consequences is a stealthy invader that uses multiple strategies to slip into the small mammals' skin cells and quietly manipulate them to aid its own survival. The fungus, which causes the disease white-nose syndrome, has devastated several North American species over the last 18 years.

Scientists have learned much about the fungus, *Pseudogymnoascus destructans*, since it was first documented in a New York cave in 2006, including where it thrives, its distribution, and clinical features. But exactly how the fungus initiates its infection has remained a "black box – a big mystery," says Bruce Klein, a professor of pediatrics, medicine and medical microbiology and immunology at the University of Wisconsin–Madison.

That dearth of understanding has made it challenging to develop countermeasures to treat or prevent infections.

Now, Klein and Marcos Isidoro-Ayza, a PhD candidate at Klein's lab, have for the first time been able to study in detail how the fungus gains entry and covertly hijacks cells called keratinocytes at the surface of bats' skin.

The feat is detailed in the July 12, 2024, issue of Science.



Dr. Bruce Klein

The researchers found that *P. destructans* uses infected cells as a refuge and prevents the cells from dying, which in turn thwarts the bats' immune system and allows the microbial invader to continue growing and slip into more cells.

To do so, Klein and Isidoro-Ayza created the first-ever keratinocyte cell line from the skin of a little brown bat. Further, they successfully mimicked the conditions of hibernation, which are marked by wide body temperature fluctuations that accompany periods of torpor – when the animals' metabolism slows and body temperature drops – and arousal.

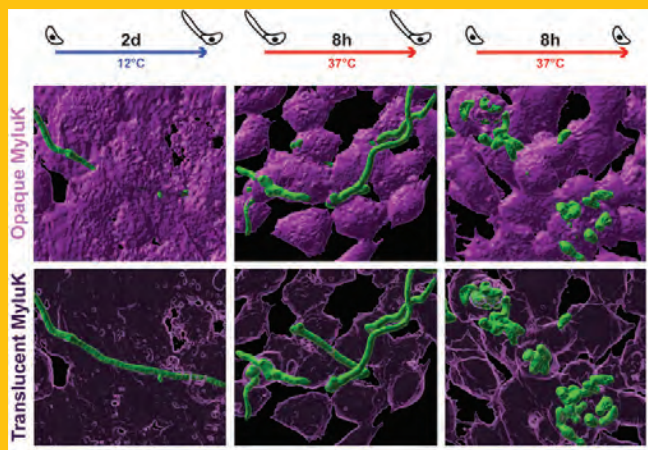
This is crucial to understanding *P. destructans* infections because the cold-loving fungus gains its foothold during the chilly conditions of torpor and is able to persist during arousal, when the bats' body temperature increases.

Klein and Isidoro-Ayza have already identified how the fungus gains its stealth entry into cells: by co-opting a protein on their surface called epidermal growth factor receptor, or EGFR. Mutations in the same receptor in human cells drive certain lung cancers and these cancers are treated with an existing drug called gefitinib, opening the possibility it could be used to treat or prevent white-nose syndrome.

"Remarkably, when we inhibited the receptor with this drug, we stopped the infection," says Isidoro-Ayza. "This is an FDA-approved drug that could potentially be used in the future for the treatment of susceptible bat species."

While EGFR's precise role in infection is not yet completely clear, Klein and Isidoro-Ayza have learned much about how the fungus works.

Its initial entry occurs during torpor, when bats' immune systems are dormant and their body temperature is in an ideal range for *P. destructans* to germinate and grow. During torpor, the fungus penetrates bats' skin cells with its hyphae – slender filaments through which it grows and



These images show the hyphae and spores of the fungus that causes white-nose syndrome (in green) invading the lab grown skin cells of little brown bats.

gathers nutrients – without breaking the cells' membranes. Doing so would trigger the cells' death and expose the fungus to the bats' immune system.

Klein and Isidoro-Ayza also found that the fungus employs multiple strategies that allow it to continue its invasion during periods of arousal, despite the bats' higher body temperatures and reactivated immune system.

First, during arousal periods, the fungus manipulates the cells so they engulf the fungus in a process known as endocytosis, rather than the fungus using its hyphae to penetrate the cell.

Second, they found that the fungus spores – microscopic particles by which it reproduces – are coated in a layer of melanin that protects them from the cells' strategies for killing invading microbes.

"That allows the spore to survive that period of arousal, and when the bat goes back into torpor, the spores inside of its cells start germinating again and keep colonizing the skin," explains Isidoro-Ayza, who is a student in the UW-Madison School of Veterinary Medicine's comparative biomedical sciences graduate program.

P. destructans' final infection strategy is to block apoptosis, also known as programmed cell death, which is a defense mechanism cells use to expose pathogens so immune cells can root them out and destroy them.

"By not killing the cells, the fungus can linger in the tissue and go into deeper layers of the skin," says Isidoro-Ayza.

With this new knowledge in hand, the researchers are hopeful that treatments and a potential vaccine are closer to becoming reality.

These findings are just one product of a collaboration between Klein and Isidoro-Ayza and scientists at the U.S. Fish and Wildlife Service and U.S. Geological Survey's National Wildlife Health Center in Madison. The effort received \$2 million in funding from the National Science Foundation and Paul G. Allen Family Foundation in 2023 to search for better insight into how *P. destructans* causes infection and develop treatment and prevention strategies against white-nose syndrome.

The research is valuable not only for the conservation of bats, which provide a number of benefits including as pollinators and insect predators, but because fungal pathogens are a growing problem for many species.



Marcos Isidoro-Ayza, a PhD candidate at Klein's lab.

"There are fungal diseases causing epidemics and pandemics in different types of organisms, including plants, invertebrate animals, amphibians, reptiles and bats," says Isidoro-Ayza. So, any mechanism that we discover or better understand in this disease could have implications for the conservation of other species too."

This research was supported by funding from The U.S. Geological Survey (G20AC00050), the U.S. Fish & Wildlife Service (13190304), the Canadian Institute for Advanced Research (MSN247980), the National Science Foundation (2301729), La Caixa Foundation fellowship (ID 100010434) under agreement LCF/BQ/AA17/11610020, National Institutes of Health (T32OD010423) and the Morris Animal Foundation (D23ZO-461).

MEET OUR RESEARCHERS: MINJU KIM, PHD

Hometown: Gyeongju, South Korea

Zodiac Sign: Taurus

Minju is a postdoc in the David Andes lab. The overriding themes of their research programs are [1] to advance our understanding of antibacterial and antifungal activity and drug resistance, and [2] to identify new antimicrobial drug treatment strategies and drug targets.

What inspired you to select your field of study?

I always liked science, especially biology. Having lab experiences in college led me to the fungal world and to go to grad school.

What is one piece of advice you would give to students?

Try to ask questions as much as you can. And ask for help when you're in trouble.

When you're not in the lab, how do you spend your time?

Run/walk somewhere in Madison. Or eating ice cream somewhere.

If you didn't become a scientist, what career would you have pursued?

I would be a teacher.

What is the best meal you've ever had?

Dishes from a Michelin restaurant when I attended a wedding in New York.

You have to sing karaoke, what song do you pick?

Definitely Taylor Swift's songs.

Have you ever completed anything on your "bucket list"? If so, what was it?

Studying abroad and I got my PhD in the US.

What is the last TV show that you binge-watched?

Grey's Anatomy. I am still on season 10.



MEET OUR RESEARCHERS: DREW HRYCKOWIAN, PHD

Hometown: Latrobe, Pennsylvania

Zodiac Sign: Libra

The goal of the Hryckowian Lab is to understand the molecular and genetic underpinnings of gut microbiome community dynamics. This work is necessary in order to build the concepts and approaches needed to cope with “problematic” microbial communities, such as those that predispose and perpetuate gastrointestinal infectious diseases. They employ in vitro and in vivo approaches (including gnotobiotic and conventional mouse models of human disease) and a variety of molecular and genetic techniques. They also work with collaborators at UW Hospitals and Clinics to reciprocally inform our work and to translate our findings into clinical practice.

What inspired you to select your field of study?

A research opportunity I had in high school which involved bacteriophage research in Graham Hatfull’s lab at the University of Pittsburgh. This was enabled by my 9th grade biology teacher (Debbie Jacobs-Sera) who invited me to participate. This opened countless doors for me and helped lead me to my current interests in bacterial pathogens and microbial communities.

What is one piece of advice you would give to students?

In the timeless words of Stanley Falkow, “DTFE.”

When you’re not in the lab, how do you spend your time?

Staying physically active – running, biking, climbing, kayaking, etc.

What is the best meal you’ve ever had?

A birthday dinner at Chez Panisse in Berkeley.

You have to sing karaoke, what song do you pick?

Wild Wild Life by the Talking Heads.



Have you ever completed anything on your “bucket list”? If so, what was it?

I visited Japan. In addition to speaking at the Japanese Society for Bacteriologists meeting, my partner and I got lost in Shinjuku, immersed ourselves in Hanami, stayed in a hotel with a view of Mt. Fuji, and ate tonkotsu ramen in Fukuoka until we thought we’d explode. I added “Japan” to my bucket list again shortly after returning from this trip.

What is the last TV show that you binge-watched?

The 4400

If you could have any superpower, what would it be?

Photosynthesis

ABOUT US

Since its founding in 1935, the Department of Medical Microbiology & Immunology has significantly advanced the study of infectious diseases and immunity. Our renowned faculty lead research on bacterial, fungal, protozoan, and viral pathogens such as *Toxoplasma gondii*, *Neisseria gonorrhoeae*, *Mycobacterium* sp., *Brucella* sp., *Listeria*, *Blastomyces*, *Aspergillus*, *Cryptococcus neoformans*, *Candida*, influenza virus, Herpes simplex, enterohemorrhagic *E. coli*, and uropathogenic *Escherichia coli*. They also explore immunological topics including regulatory T cell biology, leukocyte migration and vaccine development. Additionally, the department study the roles of diet, the immune system and the gut-brain-axis in the intestinal microbiome.

We offer undergraduates rigorous coursework and research opportunities, and our nationally acclaimed Microbiology Doctoral Training Program allows graduate students to earn a Ph.D.

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