

# *The* Pharmacologist

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## Welcoming AI into the *Pharmacology Classroom*



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*On the Cover: Female teacher giving presentation using artificial intelligence.*

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# Message from the President



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Listen to [ASPET](#) President Namandjé N. Bumpus, PhD as she discusses the Cancer Moonshot panel taking place at ASPET 2024, the ADDC/ASPET Colloquium, using AI in pharmacology education and more!

Watch the video



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# A Note from Dave's Desk





# ASPET's Strategic Plan: A Year Later

After one year of the [2023–2027 ASPET Strategic Plan](#) guiding our work, it's reasonable to ask what difference this plan has made for the Society. To start answering that question, I want to focus this month on the progress we've made toward being the "leading voice promoting the field." Overall, ASPET's objective is to be the leading voice for pharmacology, advocating for the essential and unique role the field plays in biomedical research.

From an advocacy perspective, ASPET has launched many new initiatives in the past year as it aspires to be a leading voice for the field with government leaders. These include:

- Launching an [Advocacy Action Center](#), where members can use resources to contact their legislators directly about what's important to them.
- Hosting the first-ever [Capitol Hill Day for the ASPET Council](#), where ASPET leaders advocated for issues of concern to pharmacology on behalf of the Society.
- Holding the first-ever Capitol Hill Day for all ASPET members at ASPET 2024, providing dozens of ASPET members interested in advocating for pharmacology in person the chance to do so in Washington, D.C.
- Creating the *Advocacy Brief*, a member-only newsletter providing the latest updates from Capitol Hill as well as relevant government agencies.

While ASPET strives to be a leading voice with the government guided by its strategic plan, the Society also seeks to serve as a leading voice educating the general public about the importance and impact of pharmacology. To kick off this effort, ASPET launched several initiatives.

- Creating a new [Newsroom](#) site and expanding distribution of press releases to share accomplishments about our members involvement in pharmacology.
- Expanding ASPET's news reach through a relationship with [Newswise](#), a web-based service for science writers to receive releases from organizations and universities on news featuring advances in science, medicine and technology.
- Designating ASPET members who serve as media experts.
- Launching [Pharmaco Corner](#), the official ASPET Blog, where pharmacology experts can discuss issues that affect them professionally and personally. The blog connects science and society through various pharmacology disciplines.
- Initiating [Pharmacology Awareness Week](#) to promote the field of pharmacology.

While much work remains to be done, we believe ASPET is off to a strong start in establishing itself as the leading voice promoting the field.



**Dave Jackson, MBA, CAE**  
Executive Officer, ASPET

[Share this!](#)



Cover Story

Welcoming  
AI into the  
*Pharmacology  
Classroom*





## By Hollie Swanson, PhD

Does your classroom provide a welcoming presence for AI tools or have you strategically barred the doors, battened the hatches and constructed a moat to prevent an AI-based infiltration? While faculty views on this topic vary widely, students are increasingly embracing its use. Given the undoubtable impact that AI will have on scientific professions, it is imperative that both educators and students learn how to use AI and how to use it wisely. Most workforce experts agree that employees who can easily incorporate AI into a wide variety of their professional responsibilities will attain a significant advantage in their career progression.

The educational goals are not only to prepare students for their future careers, but also to ensure that they have attained essential foundational knowledge. Thus, while educational endeavors will continue to emphasize key skills such as critical thinking, the approaches will require modifications to adapt to the ongoing expansion of AI. Despite the absence or presence of AI in the classroom, educators must ensure that students are able to communicate clearly and effectively, can cultivate their own curiosity and build empathy as they progress in their academic careers. Finally, as AI-generated content expands, we must provide leadership by actively engaging in conversations to guide ethical decisions regarding its use.

*Given the undoubtable impact that AI will have on scientific professions, it is imperative that both educators and students learn how to use AI and how to use it wisely.*

Read and share this story online  
[thepharmacologist.org](https://thepharmacologist.org)



*As AI-generated content expands,  
we must provide leadership by actively  
engaging in conversations to guide  
ethical decisions regarding its use.*





## Strategic Options

Many educators are currently considering options to limit classroom use of AI such as reverting to assessments involving either in-class essay questions or oral examinations. These types of approaches can be unnecessarily stressful to students and often fail to promote higher order thinking skills. Educators may also choose to screen written assignments using AI detection software. However, the questionable accuracy of currently available software threatens fairness to the students who may incorrectly be accused of wrongdoing.

Strategies that are designed to encourage students' creativity and scientific curiosity seem to be more effective. In designing assignments and classroom activities, the objective is to foster an appreciation of the learning process while cultivating an engaged learning environment within the classroom. Assignments are often focused on a student's unique experience, which could involve a classroom discussion, a personal experience or a specific observation that is relevant to the class material.

Other approaches that may be considered include assigning students to conduct an interview with a scientist involved in research that is relevant to a topic covered in class. Interview questions could be developed as part of a class activity and the interview could be conducted with students working either alone or in pairs. These interviews would help students understand the different types of pharmacological questions that are currently being addressed by researchers, the approaches being used and the variety of career opportunities available to those with pharmacological training. In addition, students could be asked to identify a current pharmacological issue that is being covered by the news media. Here, they could critique the

accuracy of the science depicted and outline the storytelling attributes of the news story. The assessment portion of these assignments could involve either a written report or an in-class oral report wherein application of both critical thinking and science communication skills would be encouraged. In developing these types of approaches, the classroom will likely not be "AI-proof" but will hopefully minimize the unwelcome appearance of AI-generated content in students' submitted work.

It is best to include a clear policy that is outlined in your course syllabus if AI is included in a course. Students must be aware that claiming AI-generated content as their own work is a form of plagiarism. A number of policies are available ([Syllabi Policies for AI Generative Tools](#)), such as—*“GenAI tools such as ChatGPT may be used in this course for the purposes of pre-submission activities such as brainstorming, testing out ideas, editing text, outlining, or structuring an argument. However, learners are responsible for submitting work that meets the assignment standards for quality and factual accuracy. Before submitting any assignment that was aided in any way by GenAI, students are responsible for fact-checking all statements and ensuring that any content drawn from other sources—including the use of GenAI—is appropriately acknowledged through the citation practices used in this course. By keeping track of your AI use and sharing your experiences, we all gain understanding, identify potential issues in this rapidly changing field, and discover better ways to use the resources for our objectives. If you have any questions or concerns about this policy, contact your instructor before submitting any assignments.”*

Other successful approaches have been used in courses such as “Pharmacology of Treating Human Disease” and “Exploring the Dark Side of Pharmacology” at the University of Kentucky.

*Continued on page 26*

# Fifty Years of *Drug Metabolism and Disposition*

Share this!



By Simone Brixius-Anderko, PhD and Hannah Work

In the [April 2024](#) issue, we highlighted the 50<sup>th</sup> anniversary of the journal *Drug Metabolism and Disposition* with a monthly overview of articles that celebrated the field of drug metabolism. In this second installment of the two-part series, we continue to highlight the work and accomplishments of esteemed researchers and laboratories that were published in the *DMD* journal in late 2023.

## July

### Characterization of Heterobifunctional Protein Degraders

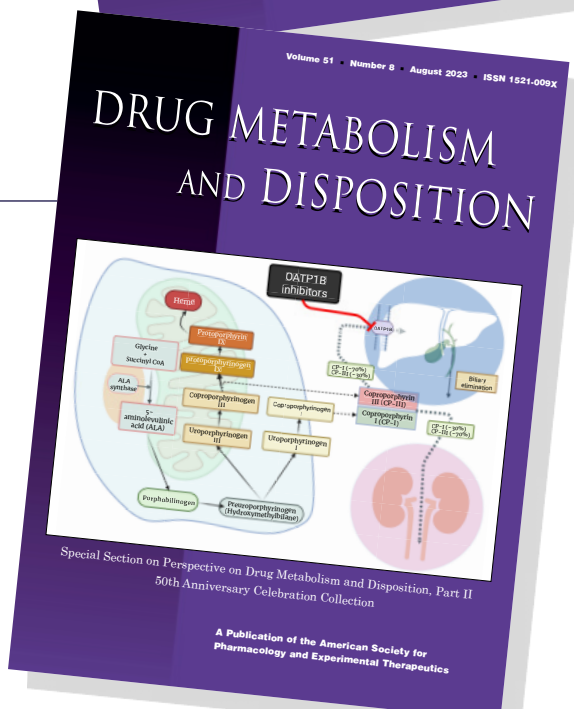
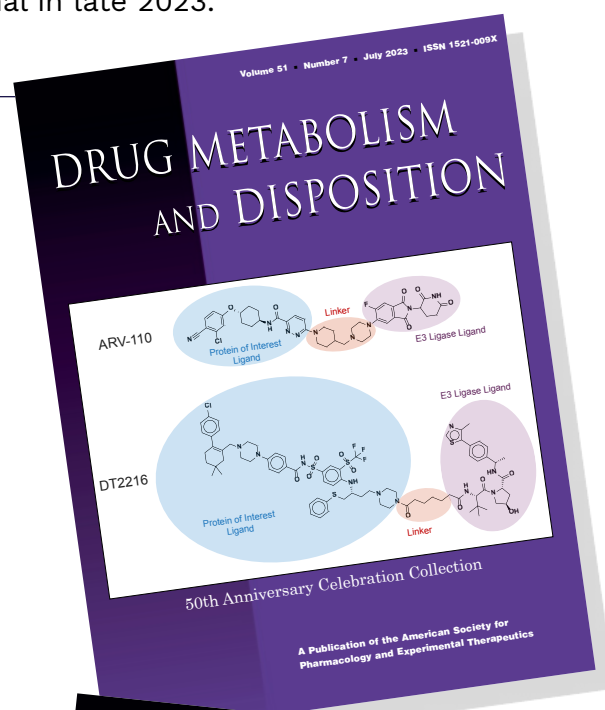
The [July issue](#) included an elaborate survey from industrial companies across the United States and Europe on the techniques and practices used to characterize and optimize targeted protein degrader (TPD) ADME-PK. These companies included Janssen, Merck, Amgen, Novartis, Abbvie, Astrazeneca, Roche, Genentech, Takeda among others.

The article entitled “[Industry Perspective on the Pharmacokinetic and Absorption, Distribution, Metabolism, and Excretion Characterization of Heterobifunctional Protein Degraders](#),” highlights the Degradator DMPK/ADME Working Group, developed to regularly assess the growing field, its needs, and determine what modifications were needed to optimize the general workflow for TPD PK/ADME evaluations.

## August

### Special Section on Perspectives on Drug Metabolism and Disposition, Part II

The [August issue](#) included the second part of the special section on DMD Perspectives by the Associate Editors and an [editorial piece](#) by Drs. Xiaobo Zhong and Xinxin Ding.





The articles highlighted the steadfast progress made in the DMD field.

In a review article "[Cytochrome P450 and Other Drug-Metabolizing Enzymes as Therapeutic Targets](#)," author Dr. Robert S Foti from Merck & Co. examined the recent advancements and beneficial clinical impacts marketed drugs have had that target DMEs.

In "[Translating Kratom-Drug Interactions: From Bedside to Bench and Back](#)," Dr. Mary Paine's team discussed the legal status, chemistry, pharmacology and toxicology of kratom, as well as how kratom and select kratom alkaloids may be modulators of P450 and P-gp activity.

"[How CryoEM Has Expanded Our Understanding of Membrane Transporters](#)," written by Dr. John Schuetz's team, highlighted the structure, function and transport mechanism of ATP-binding cassette and solute carrier transporters related to several diseases and multidrug resistance.

In the minireview "[The Role of Coproporphyrins as Endogenous Biomarkers for Organic Anion Transporting Polypeptide 1B Inhibition—Progress from 2016 to 2023](#)," Dr. Yurong Lai from Gilead Sciences discusses the utility of reported endogenous biomarkers to detect OATP1B inhibition and proposes a decision tree to preclude the need for a dedicated DDI study where a probe substrate drug is administered to human subjects.

## September

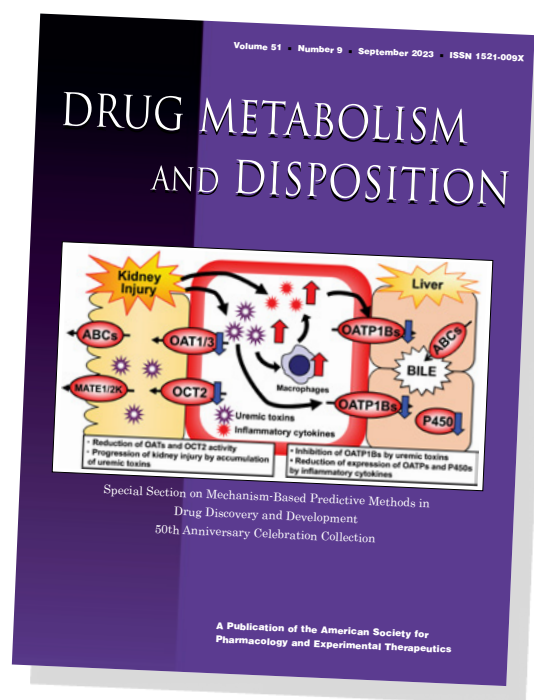
### Special Section on Mechanism-Based Predictive Methods and Drug Discovery and Development

Many of the advancements the community has made in physiologically-based pharmacokinetics and transporter models stem from the seminal work by the highly esteemed scientist Dr. Yuichi Sugiyama. [An editorial](#) in the [September issue](#) by Dr. Yurong Lai and Xiaobo Zhong celebrates Dr. Sugiyama and his contributions to the field of drug metabolism and disposition and other crucial areas of pharmacology.

Included in September is a review by Dr. Sugiyama himself on the extended clearance concept and application of Cluster Gauss-Newton method-based analyses, entitled "[A 20-year Research Overview: Quantitative Prediction of Hepatic Clearance Using the In vitro-In vivo Extrapolation Approach Based on PBPK Modeling and Extended Clearance Concept](#)."

Dr. Sugiyama also provided *DMD* with some of his latest work on PBPK modeling in his and Dr. Woojin Lee's article "[Predicting In vivo Target Occupancy \(TO\) Profiles via PBPK-TO Modeling of Warfarin Pharmacokinetics in Blood: Importance of Low Dose Data and Prediction of Stereoselective Target Interactions](#)."

Other contributions to this month's special celebration collection include six additional articles written by his former students, including Dr. Nozaki, Dr. Kusuhara, Dr. Chu, Dr. Kato, Dr. Maeda, and Dr. Ito.



October

## Special Section on New and Emerging Areas and Technologies in Drug Metabolism and Disposition, Part I

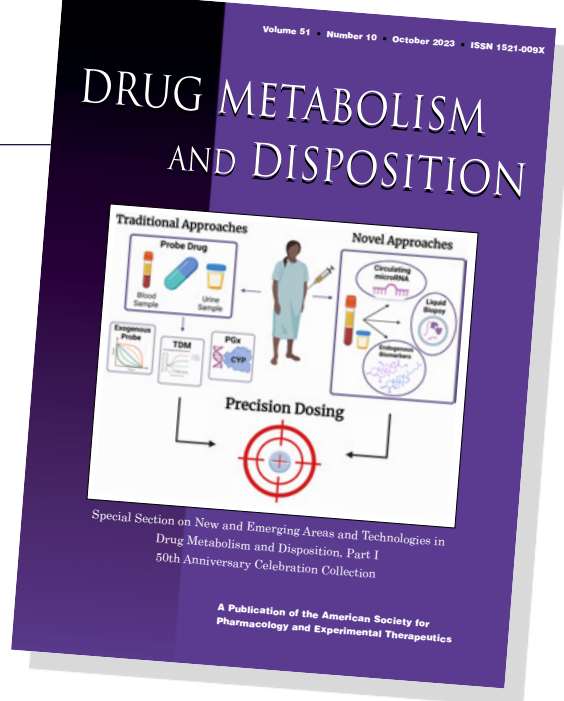
Articles in this [special section](#) were contributed by many members of the *DMD* Editorial Advisory Board along with other notable and important contributors. The authors offer great insight into the new and emerging advancement in the DMD field.

Dr. Donglu Zhang, who has served on the Editorial Advisory Board for almost 15 years, provided a prime example of the different metabolic capacities of humans versus rodents in his research article, "[Identification of a Discrete Diglucuronide of GDC-0810 in Human Plasma after Oral Administration](#)." This human metabolite of GDC-0810 is absent in rats and stems from unique human expression patterns of UDP-glucuronosyltransferase (UGT) isoforms.

In Dr. Micheline Piquette-Miller's research article, "[Use of Traditional and Proteomic Methods in the Assessment of a Preclinical Model of Preeclampsia](#)," she identified similarities between an immunologic rat model and human characteristics of preeclampsia, validating the use of this model to more confidently study ADME properties of drugs under these conditions.

In Dr. Klarissa Jackson's review titled "[Novel Approaches to Characterize Individual Drug Metabolism and Advance Precision Medicine](#)," she discussed recent advancement in methodologies to characterize individual drug metabolism phenotypes in clinical settings. Other exciting preclinical models are being developed to study newer classes of drugs, including antibody-drug conjugates.

Dr. Jingkai Gu's review article "[Bioanalytical Assays for Pharmacokinetic and Biodistribution of Antibody-Drug Conjugates](#)," provided invaluable



information on the advantages, disadvantages, and challenges of the recently developed assays and potential areas of improvement.

In "[Recent Advances in Mass Spectrometry-Based Spatially Resolved Molecular Imaging of Drug Disposition and Metabolomics](#)," Dr. Jiang Zheng overviewed the advantages and disadvantages of MALDI-MS, SI-MS, DESI-MS, LAESI-MS, and LA-ICP-MS for their applications for the drug metabolism and disposition applications, which can help future researchers decide on which instrumentation is best for their proposed studies.

In "[Fluorescence-Based High-Throughput Assays for Investigating Cytochrome P450 Enzyme-Mediated Drug-Drug Interactions](#)," Dr. Guangbo Ge discussed some of the difficulties in developing optical probes to detect individual P450 activity, as well as provides optimization suggestions and future perspectives related to the field.

In Dr. Miki Nakajima's work entitled "[NEATA1\\_2 and DAZAP1, Paraspeckle Components, Interact with PXR to Negatively Regulate CYP3A4 Induction](#)," it is illustrated for the first time that paraspeckles formed by liquid-liquid phase separation affect PXR-mediated induction of CYP3A4 expression.



In her review article, “[Challenges and Opportunities in P450 Research on the Eye](#),” Dr. Irina Pikuleva provided extensive detail on ocular localizations of P450 enzymes and available eye-relevant P450 information and drug delivery challenges. She has done extensive work in the past elucidating the structures of P450 enzymes to better understand their function-activity relationship.

In the review article, “[The Important Role of Transporter Structures in Drug Disposition, Efficacy, and Toxicity](#),” Dr. Su Zeng and his collaborator Dr. Feng Zhu discussed ATP-binding cassette and solute carrier transporters’ structures based on the current number of high-resolution experimental structures and also describe the application of computational methods in transporter structure prediction.

## November

### Metabolism and Excretion of Therapeutic Peptides

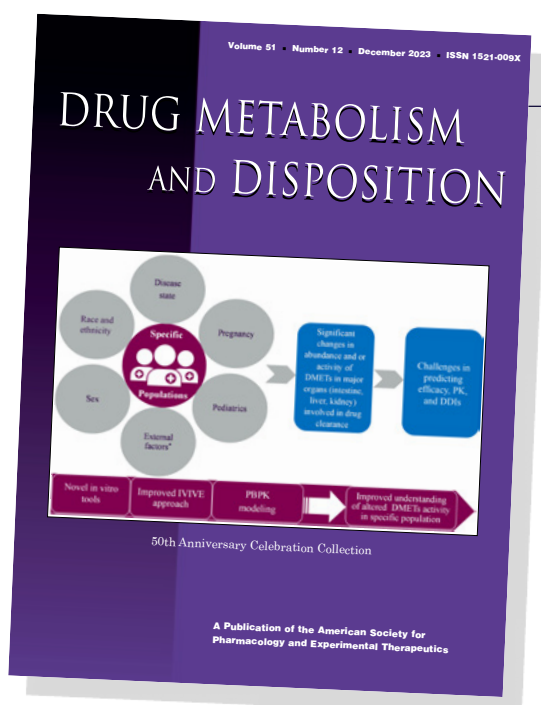
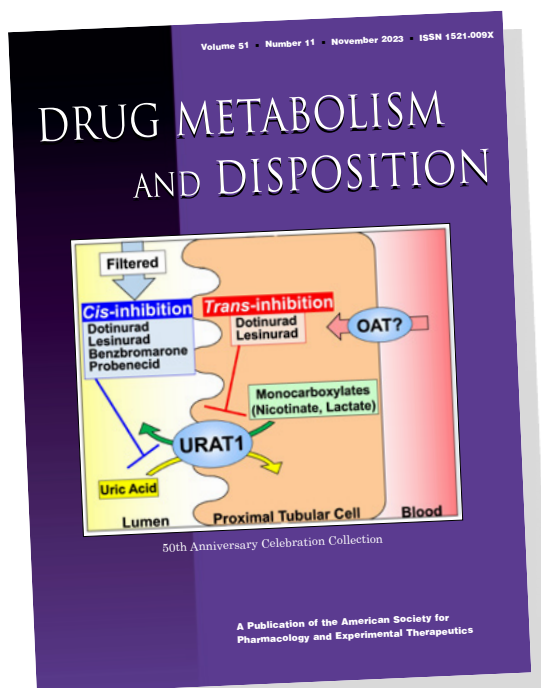
November’s special issue was a stand-alone, comprehensive piece entitled “[Metabolism and Excretion of Therapeutic Peptides: Current Industry Practices, Perspectives, and Recommendations](#).” This effort by the Peptide ADME Working Group, Dr. Minxia Michelle He, the Executive Director at Eli Lilly, and many colleagues across other pharmaceutical companies sought to develop recommendations on conducting metabolism and excretion studies to support discovery and development of therapeutic peptides.

From their Innovation and Quality industry survey, coupled with approved therapeutic peptide submission documents from the U.S. Food and Drug Administration and the European Medicines Agency, the group provided a comprehensive compilation of the differing and varying study practices, exemplifying the lack of distinct regulatory guidelines for the industry on conducting ADME studies for therapeutic peptides.

## December

### Inclusion and Innovations in Characterizing Drug Metabolism and Disposition Activity in Specific Populations

To wrap up [2023’s 50<sup>th</sup> Anniversary Celebration Collection](#), *DMD* highlighted the work of individuals and laboratory groups that enhanced inclusion and diversity in the pharmacology field. In a commentary provided by Drs. Paresh Chothe, Vikram Arya, Bhagwat Prasad, Diane Ramsden, and Kunal Taskar entitled “[Innovations, Opportunities, and Challenges for Predicting Alteration in Drug-Metabolizing Enzyme and Transporter Activity in Specific Populations](#),” the authors discussed the current



knowledge, gaps, and challenges relating to the differences in drug metabolizing enzymes and transporters in specific populations, such as those associated with pregnancy, lactation, pediatrics, geriatrics, organ impairment, and disease states.

In the celebration collection piece entitled [“The African Liver Tissue Biorepository Consortium: Capacitating Population-Appropriate Drug Metabolism, Pharmacokinetics, and Pharmacogenetics Research in Drug Discovery and Development,”](#) Dr. Collen Masimirembwa and collaborators discussed their establishment of the first liver tissue biorepository inclusive of people of African origin. Through this collection, the group discovered gene variants unique to African populations, including CYP2C9\*5 and \*8. The consortium is a significant milestone to improve the DMPK in non-European people and will aid in the drug discovery and development research community by the inclusion and diversity of samples studied.

## The Future of the Drug Metabolism and Disposition Field

As in the past, the drug metabolism and disposition field will face challenges in the future. However, it is always the people who rise to challenges that find solutions. The next generation of researchers stand on the shoulders of past accomplishments and are contributing fresh perspectives and transformative, timely ideas to tackle new scientific questions and challenges.

For future generations, it will be mandatory to expand collaborations and use an interdisciplinary approach to tackle these challenges. Current trainees in the drug metabolism and disposition field agree that there is a need to expand collaborations between academia and industry and to further join forces to emphasize the translational impact of our research.

Over the last 50 years, we have witnessed the successes of the drug metabolism and disposition field, which is closely intertwined with our *DMD* journal. In 100 years, we will celebrate another 50 years of accomplishments that we will witness firsthand by training future scientific leaders, whose accomplishments in turn, we will have another opportunity to celebrate.

*The authors thank Colten Eberhardt and Dr. Dilip Singh for their help with this article.*



### Simone Brixius-Anderko, PhD

Simone Brixius-Anderko, PhD, is an Assistant Professor at the University of Pittsburgh School of Pharmacy. She currently serves as the Communications Officer for the ASPET Division for *Drug Metabolism and Disposition*.



### Hannah Work

Hannah Work is a PhD candidate at the University of Colorado Anschutz Medical Campus, where she is also a graduate student researcher. She currently serves as a Junior Communications Officer for the ASPET Division for *Drug Metabolism and Disposition*.





# Celebrate Pharmacology Awareness Week with ASPET!

May 13–17, 2024

Celebrate pharmacologists!

Promote the field of pharmacology!

Learn how pharmacologists impact lives!

**Learn more about pharmacology at [aspet.org](https://www.aspet.org).**



# Leadership Profile

Share this!

## A Conversation with ASPET's Secretary/Treasurer-Elect Pam Hornby, PhD



Pamela Hornby, PhD, is the Secretary/Treasurer-Elect of the ASPET Council. She holds a doctorate in Physiology from the University of Kentucky. Dr. Hornby applies her knowledge of translational pharmacology to

helping patients and to mentoring the next generation of scientists who also strive to serve them. She is currently Professor (ADJ), Department of Physiology and Pharmacology, College of Medicine, Drexel University, Philadelphia, Pa., and has served as Senior Principle and Fellow (retired), CV & Metabolic (CVM), Janssen R&D, LLC., Spring House, Pa.

Dr. Hornby was a member of ASPET from 1994–2004; and has been a member since 2012. She has served as the Chair of ASPET's Division for Translational and Clinical Pharmacology Division. A Class of 2022 ASPET Fellow, she brings a balanced academic/industry perspective to help drive discussions toward “out-of-box” thinking. Dr. Hornby offers her insight and guidance for young scientists.

### How did you get started in pharmacology?

My research has always involved using tools (chemicals, proteins/peptides, genetic modulators) to understand the physiology of targets (enzymes, receptors and channels) and their potential therapeutic role in preventing

disease progression. A deeper realization of the importance of applying the principles of pharmacology to these tools started when I joined Drug Discovery at Johnson & Johnson and continues to this day.

### How did you first get involved with ASPET?

Initially, I became a member of ASPET as a faculty member in the Dept of Pharmacology and Experimental Therapeutics at LSU Medical School. However, I dropped my ASPET membership when other Societies became more relevant for getting feedback on my specific area of research. My return to ASPET came after I joined Drug Discovery and realized how foundational it is in order to do skillful translational research for therapeutic clinical development. This is how I hope to inspire trainees to realize the value of their skills.

### What do you want the ASPET membership to know about you and your ideas on how to move the organization forward during your term?

I want to make it a Society that recognizes and rewards contributions that impact the field of Pharmacology, irrespective of sector, location and cultural background and knowledge from which it arose. Help realize the value of our membership to diverse careers.

### What has been your proudest accomplishment in your career so far?

It was being privileged to have a brilliant team of chemists and pharmacologists that lead to the discovery and characterization of ‘mudelta,’ as



we informally called what became eluxadoline. Experiencing its progression through clinical trials and regulatory approvals so that it could alleviate the suffering of patients with Irritable Bowel Syndrome was incomparably satisfying as a translational scientist.

**What advice would you give young scientists who are just starting out in their careers?**

Don't be shy about learning a little about what you don't understand by asking someone who does it every day to explain it to you. Scientists are happy to talk about what makes them excited to go to work. Embrace change by stretching yourself by continuous learning but have a deep knowledge of something of core importance to you.

## 2024–25 ASPET Washington Fellows Program

Apply by June 28!



## Upcoming Events

### **ASPET 2024 Annual Meeting**

*May 16–19, 2024 · Arlington, VA*

Join us at the Hyatt Regency Crystal City, just minutes away from Washington, D.C. Register now!

### **ASPET-ADDC: 3<sup>rd</sup> Academic Drug Discovery Colloquium**

*May 19–20, 2024 · Arlington, VA*

Introducing the Next Generation of Drug Hunters

### **European Federation of Pharmacological Societies 2024 Congress**

*June 23–26, 2024 · Athens, Greece*

The Federation of European Pharmacological Societies, 9<sup>th</sup> European Congress of Pharmacology.

### **British Pharmacological Society Pharmacology 2024**

*December 10–12, 2024 · Harrogate, North Yorkshire*

Network and hear the latest developments and research in pharmacology from industry experts and emerging investigators.



# FOCUS ON PHARMACOLOGY

*ASPET Virtual Series*



ASPET is pleased to present Focus on Pharmacology – a virtual series presenting high quality, innovative science in pharmacology and experimental therapeutics. Sessions focus on important and timely areas of pharmacology and feature pre-meeting community discussions on *ASPETConnect*, live and interactive webinars on Zoom, and post-meeting Q&A with the presenters.

New virtual sessions are planned throughout the year.

View the schedule and learn more at [www.aspet.org/focus](http://www.aspet.org/focus).

Check out past recorded sessions on the ASPET Focus on Pharmacology community on *ASPETConnect*.

The Focus on Pharmacology virtual series is free for all ASPET members. Not a member yet? Sign up for membership at [www.aspet.org/membership](http://www.aspet.org/membership).

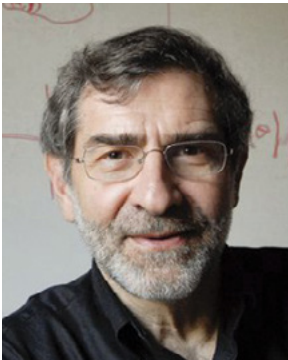




# Member Highlights

Share this!

Credit: Caltech University



## Dr. Henry Lester Receives the Langley Award for Basic Research on Nicotine and Tobacco

Henry Lester, PhD has been awarded the 2024 Langley Award for Basic Research on Nicotine and Tobacco from the Society for Research on Nicotine & Tobacco. This award honors scientists whose work has made groundbreaking advances in pharmacology, neuroscience and/or genetics.

He received this award for the development of a wearable monitor that determines how a person metabolizes nicotine while they smoke or is vaping. [Dr. Lester](#) is a professor of Neuroscience at California Institute of Technology and joined ASPET in 2007. He is a member of the ASPET Division for Neuropharmacology and his research has focused on the molecular and functional aspects of ion channels, receptors, and transporters, as well as mouse genetic models for Neuroscience diseases.

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## Dr. Margarita Dubocovich Recognized for Diversity and Inclusion Contributions

Margarita Dubocovich, PhD, FASPET is the 2024 recipient of the Award for Contributing to the Diversity and Inclusiveness of the Translational Workforce, by the Association for Clinical and Translational Science. This honor recognizes those whose contribution to mentoring, policymaking or team building has advanced diversity and inclusiveness in the workforce.

[Dr. Dubocovich](#) has been an ASPET member since 1983 and was awarded its [FASPET designation](#) in 2020. She is a SUNY Distinguished Professor of pharmacology at the Jacobs School Medicine and Biomedical Sciences at the University of Buffalo. Her research has focused on neuropharmacology and neuroscience focuses on translational research specifically on drug discovery and development of ligands for melatonin receptors as therapeutic target. She is a member of the ASPET Division for Neuropharmacology.





## Dr. Barry I. Gold Acknowledged as a Pinnacle Lifetime Member in The Inner Circle

Barry I. Gold, PhD, has been acknowledged by The Inner Circle as a Pinnacle Lifetime Member for his work as an author and a pharmacologist. Dr. Gold has been an ASPET member since 1984 and has published books focusing on addiction. He earned his PhD in pharmacology from Boston University and was a postdoctoral fellow at Yale University. He is also a member of the ASPET Division for Neuropharmacology.

## Three ASPET Members Elected as 2023 AAAS Fellows

Congratulations to the following ASPET members who were recently elected as 2023 AAAS Fellows:



Credit: Pennsylvania State University

### Richard Mailman, PhD

Pennsylvania State  
College of Medicine



Credit: NIH

### Jürgen Wess, PhD, FASPET

National Institute of Diabetes  
and Digestive and Kidney  
Diseases, NIH



Credit: University of Pittsburgh

### Bennett Van Houten, PhD

University of Pittsburgh

Meet your future collaborators in drug discovery. Be a part of the colloquium that bridges today's research discoveries to tomorrow's therapies. Learn more and [register!](#)



## 3rd ADDC/ASPET Academic Drug Discovery Colloquium *Introducing the Next Generation of Drug Hunters*

May 19-20, 2024  
Arlington, VA



# ASPET Announces the 2024 Scientific Achievement Awards

It is our honor to announce this distinguished group of [2024 Scientific Achievement Award](#) winners who are recognized for their excellence in the pharmacology field. Meet the awardees:

## Scientific Achievement Award Winners

### John Jacob Abel Award in Pharmacology

Andrew C. Kruse, PhD

### Julius Axelrod Award in Pharmacology

John D. Scott, PhD, FASPET

### Pharmacia-ASPET Award for Experimental Therapeutics

Katerina Akassoglou, PhD, FASPET

### Robert R. Ruffolo Career Achievement Award in Pharmacology

Lisa Cassis, PhD

### Louis S. Goodman and Alfred Gilman Award in Receptor Pharmacology

Arthur Christopoulos, BPharm, PhD

### The Otto Kraye Award in Pharmacology

Paul A. Insel, MD, FASPET

## Division-Sponsored Awards

### J.H. Woods Early Career Award in Behavioral Pharmacology

Brian D. Kangas, PhD

### P.B. Dews Lifetime Achievement Award for Research in Behavioral Pharmacology

Michael Nader, PhD, FASPET

### Susan Band Horwitz Award Lecture in Cancer Pharmacology

Sharyn D. Baker, BA, PharmD, PhD

### Division for Cardiovascular Pharmacology Early Career Award

Matthew Brody, PhD

Sarah M. Schumacher, PhD

### Division for Cardiovascular Pharmacology Mid-Career Award

Michael Tranter, PhD

### Scientific Achievement Award in Drug Discovery and Development

Zhiqiang An, PhD

### Bernard B. Brodie Award in Drug Metabolism and Disposition

Edward T. Morgan, PhD, FASPET

### Division for Drug Metabolism and Disposition

#### James R. Gillette Awards

Yueping Zhang, MD

Asami Toshima, PhD

### Division for Molecular Pharmacology Early Career Award

Tao Che, PhD

### Division for Neuropharmacology Early Career Award

Gregory Sartor, PhD

Lauren Slosky, PhD

### Pharmacology Educators Early Career Award

Reem T. Atawia, BPharm, MS, PhD

### Pharmacology Educators Award

Shantanu Rao, PhD

### Division for Toxicology Career Award

Grace L. Guo, MBBS, PhD

### Division for Toxicology Early Career Award

Shuo Xiao, PhD

### Division for Translational and Clinical Pharmacology Early Career Award

Patrick Glassman, PhD

## ASPET Journals Top Reviewer Awards

### *Drug Metabolism and Disposition*

Tom Baillie, PhD

### *Journal of Pharmacology and Experimental Therapeutics*

Greg Collins, PhD

### *Molecular Pharmacology*

Michael Gottesman, MD



This May, ASPET acknowledges **Mental Health Awareness Month** by supporting nurturing relationships and environments that aid strong mental health and help to manage life stressors in healthy ways.

Good mental health increases a person's ability to practice self-care and face challenges with resilience.







# Advocacy Impact

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## Finding Funding for Biomedical Research

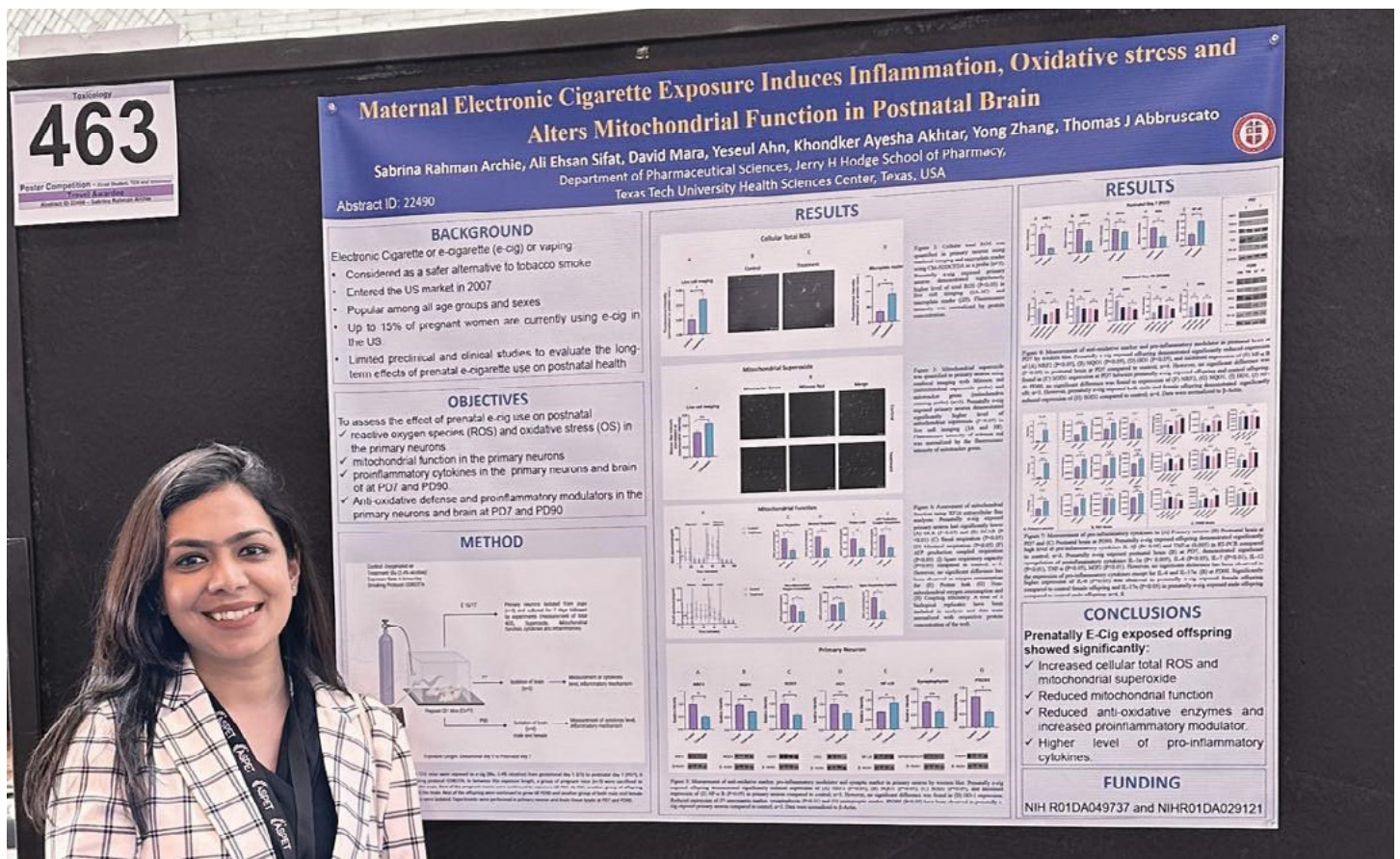
By Lynne Harris, MA, APR

Sabrina Rahman Archie, PhD, focused her doctoral research on maternal and pediatric health. She specifically evaluated the potential harmful impact of [maternal electronic cigarette](#) (e-cig) use, or vaping, on postnatal health using in-vivo models. Dr. Archie's research sparked her interest in public policy and advocacy as she recognized the urgent need for public health policy development.

“This research fueled my passion for understanding the broader implications of

smoking and vaping on public health and inspired me to assess the safety of maternal vaping on neonatal health,” Dr. Archie explained.

After receiving her PhD in Pharmaceutical Sciences from Texas Tech University Health Sciences Center, Dr. Archie began work as a Postdoctoral ORISE Fellow at the U.S. Food and Drug Administration. Her research focuses on ensuring safe and effective drug dosing in the pediatric population and contributing to research associated with policy development.



Sabrina Rahman Archie, PhD, presents her research at the ASPET 2023 Annual Meeting.



*Dr. Archie participated in Hill Day as a 2023 Washington Fellow, where she advocated for science policy on Capitol Hill.*

During her summer ORISE fellowship, she worked on a policy-related project related to the pediatric population. Her policy development work helped address gaps in pharmacokinetic studies and dosing recommendations for pediatric patients. She is committed to driving positive change in public health and pharmaceutical sciences.

“My career path was shaped by my growing awareness of the detrimental impact of tobacco smoking and vaping on the cerebrovascular system. I advocated for increased emphasis on both pre-clinical and clinical research assessing the effect of tobacco and e-cig exposure on pregnant women and pediatric populations,” Dr. Archie said.

Recently, e-cig use has surged in popularity as a perceived safer alternative to tobacco smoke, yet there remains a lack of concrete evidence regarding its safety due to limited preclinical and clinical studies. A significant percentage of pregnant women in the U.S. are e-cig users, posing potential long-term consequences for neonatal health.

“I firmly believe allocating more resources for research is imperative to ensure health safety of individuals exposed to various toxic compounds found in tobacco smoke and electronic cigarette. Pregnant women and

pediatrics are more vulnerable to the adverse effect of these toxic substances. Therefore, I advocate for increased federal funding allocation for biomedical research to uncover and address the threats posed by these substances,” Dr. Archie stressed.

Advocating to address the potential harmful impact of maternal e-cig use on postnatal health, she has presented her research at various scientific meetings, where she has demonstrated the detrimental effects of maternal vaping on postnatal health. In addition, Dr. Archie has expanded her skillset with science policy training.

“My selection as an ASPET 2023 Washington Fellow provided me with the opportunity to deepen my understanding of science policy and advocacy. In Washington D.C., I engaged with congressional staff to advocate for increased federal funding and support for biomedical research, including the importance of animal research. I learned to effectively engage with decision-makers and advocate on Capitol Hill, furthering my commitment to advancing public health and scientific research,” stated Dr. Archie.

Throughout her graduate and post-doctoral studies, Dr. Archie has taken opportunities to fuel her passion for learning and her commitment to becoming more engaged in addressing critical public policy issues.

“Positive change arises from a collaborative effort imbued with positivity, consistency and hard work. My research findings on evaluating the impact of maternal e-cig use on neonatal health were published in peer-reviewed journals. I am hopeful that these findings will serve as a catalyst to assist policy-makers in preparing appropriate guidance on the use of e-cig during pregnancy, thereby safeguarding the next generation from its harmful impact,” Dr. Archie attested.

*Photos provided by Sabrina Rahman Archie, PhD*





ELSEVIER

# ASPET and Elsevier Partner to Publish the Society's Journals

ASPET and Elsevier are partnering to publish the Society's journals beginning in early 2025. This is a positive change for ASPET that will allow long-term growth and security for the Society and its journals. Authors will publish for FREE with no submission fee and no page charges. Open access will continue to be an option.

Our relationship with Elsevier will expand our use of innovative technologies leading to opportunities to increase submissions and the reach of our journals. ASPET evaluated its sustainability under its current self-publishing model and determined the Society should move to a publisher-partnership model to better serve its authors, reviewers, and the Society as a whole.

ASPET is excited about this new endeavor. To learn more about this partnership, [visit the ASPET Newsroom](#).

# On Their Way...

Share this!

Each month, the editors of three of the American Society for Pharmacology and Experimental Therapeutics (ASPET) journals choose who they call their Highlighted Trainee Authors. These early-career scientists are recognized for their innovative research published in *The Journal of Pharmacology and Experimental Therapeutics*, *Drug Metabolism and Disposition*, and *Molecular Pharmacology*. This feature showcases selected young scientists, demonstrates what drives them and reveals why pharmacology is important to them.



## King B. Yabut

King B. Yabut, PhD, is a Drug Metabolism and Pharmacokinetics Scientist at Bristol Myers Squibb, and recently graduated from the University of Washington. Yabut credits his mentors

who encouraged him to pursue his scientific interests and challenged him to do his best. Their immense passion for science and efforts in his career development played a large role in the success he has achieved.

“My mentors are a big reason I am where I am today. As a Filipino immigrant who grew up in a small town in the Pacific Northwest, I never thought that getting my PhD was really ever an option until my later years in college,” Yabut said.

Before graduate school, he worked for several years in a biochemistry lab doing mechanistic studies on yeast centrosome formation which cemented his desire to pursue his PhD. The training he received in drug metabolism and pharmacokinetics provided the opportunity to get his current position at Bristol Myers Squibb. There, he continues to focus on mechanistic research, but is also making an impact on developing drugs that improve the lives of patients.

Yabut’s [research was published](#) in *Molecular Pharmacology* and he remembers that it was at his first scientific conference at ASPET that he got the opportunity to present his work, which led to a co-author publication that help him acquire grants and fellowships.

“Coming full circle, it is a huge honor for me to be able to contribute to ASPET by publishing my thesis work in *Molecular Pharmacology*.”



## Omar Al Yacoub

Omar Al Yacoub, PhD, is currently the University of Minnesota-AbbVie postdoctoral fellow in Clinical Pharmacology and Pharmacometrics. It was during his career as a pharmacist, that he

realized the need for more effective and safe drugs for many conditions.

“I became passionate about conducting research in the field of pharmacology because I believed that it would enable me to directly contribute to developing new therapeutic options for neurological disorders and eventually enhance the quality of life of patients,” Yacoub explained. “I have always been influenced by the need to improve the pharmacological treatment and the quality of life of patients, especially the most vulnerable populations.”



Yacoub is honored that [his research is now published](#) in *The Journal of Pharmacology and Experimental Therapeutics*, which he considers a highly respected and global pharmacology community that advances the science of drugs and therapeutics to improve outcomes and the quality of life of patients.

“Having my work published in an ASPET journal is a significant recognition of the rigor and the importance of our findings,” Yacoub said. “It also provides us with a great opportunity to communicate the significance of our work.”

## Interested in Being a Contributing Writer?

ASPET’s *Pharmaco Corner* blog and award-winning flagship magazine *The Pharmacologist* seek contributing writers on a rolling basis.



*Discussing Science. Discovering Cures.*

[Pharmaco Corner](#) is a dedicated space where pharmacology experts can discuss issues that affect them professionally and personally. The blog connects science and society through various pharmacology disciplines. Send your pitches to [pharmacocorner@aspet.org](mailto:pharmacocorner@aspet.org).



[The Pharmacologist](#) wants writers interested in contributing human interest and science stories focused on pharmacology. Contact us at [thepharmacologist@aspet.org](mailto:thepharmacologist@aspet.org). Please include links to writing samples.



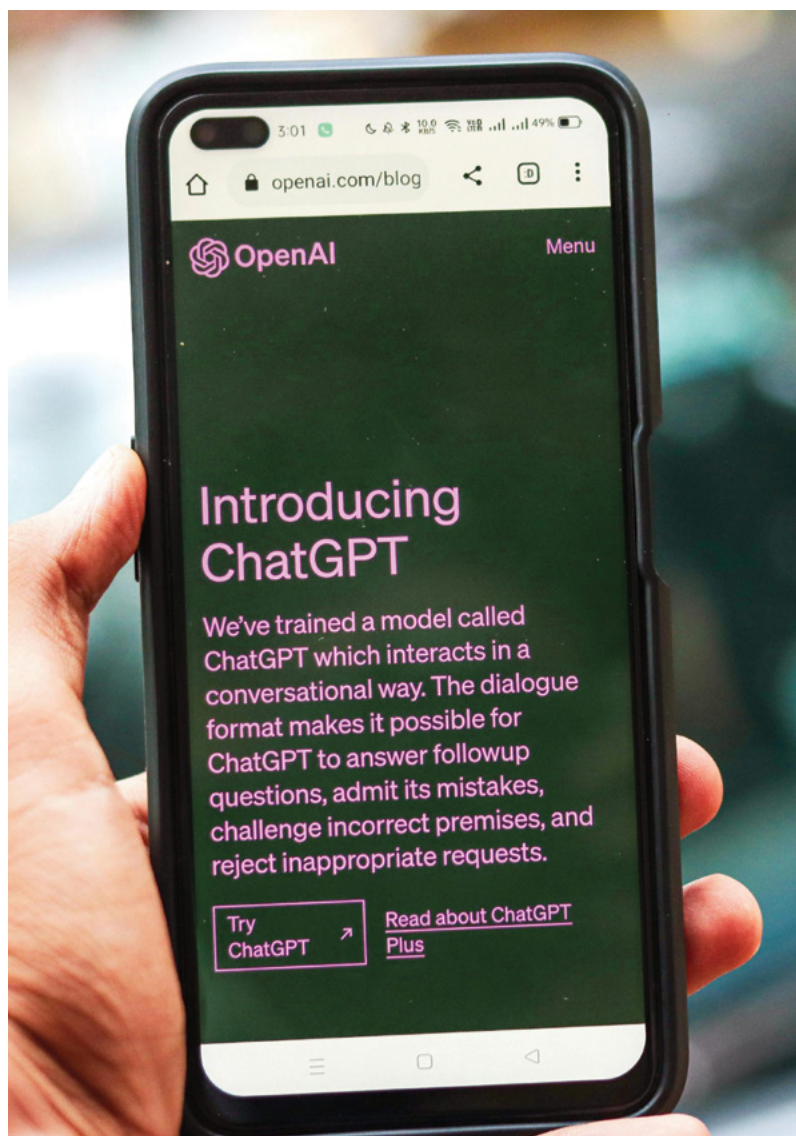
Both of these classes meet twice weekly for a 75-minute period. In the fall class, the lecture is typically approximately 30–40 minutes on topics covering pharmacology principles and specific disease treatments. During the remainder of the class, students work in small groups to engage in activities and discussions. In the spring class, classroom time is primarily spent with students working in small groups to discuss case studies focused on a variety of issues pertaining to drug development and disease treatment.

Many of the students in the fall class are also enrolled in the spring class. The upper-level undergraduate/graduate level pharmacology classes offer ways for students and the instructor to explore AI's potential while also becoming familiar with its shortcomings. In the strategies described below, 1–5 are focused on incorporating AI into the classroom whereas 6–9 are approaches to be used for achieving learning objectives while discouraging students' overt reliance on AI.

## Incorporating AI into the Classroom

### 1. Explore the use of AI as a teaching assistant.

To understand how AI is being used by students (and attempt to outsmart them), educators must become more familiar with how it may be incorporated. Interactions with ChatGPT 3.5 can be used to help organize lectures and to generate quiz questions. For example, this interaction can be used to guide lecture development on drug-drug interactions. The first prompt was “What are the top ten drug interactions?” This was followed by “Put the answers into categories based on mechanisms,” “What are more examples involving enzyme



An OpenAI webpage for ChatGPT, as seen on a smartphone.

inhibitors?” and finally, “What are additional examples involving enzyme induction?” These responses provide a good framework for further developing lecture material.

ChatGPT 3.5 can also be useful for developing quiz questions. It has been especially helpful in developing descriptive stems for questions that can be modified. However, its use for



developing pharmacokinetic questions has been problematic and error prone. As noted by many, “ChatGPT can’t do math.” Below is an example of an interaction used for creating a quiz to query students’ basic understanding of pharmacodynamics.

**(Prompt):** “You are the quiz creator of highly diagnostic quizzes. You will make good, low-stakes tests and diagnostics. You will then ask me two questions: what, specifically the quiz should test, and what audience the quiz is for. Once you have my answers you will construct several multiple-choice questions to quiz the audience on that topic. The questions should be highly relevant and go beyond just facts. Multiple-choice questions should include plausible, competitive alternate responses and should not include an “all of the above” option. At the end of the quiz, you will provide an answer key and explain the right answer.”

**ChatGPT:** “Great! Thank you for the clarification. Please let me know what specific topic you’d like the quiz to test and who the audience is for.”

**(Prompt):** “I am teaching pharmacodynamics to juniors at a university.”

**ChatGPT:** “Excellent! Based on your teaching of pharmacodynamics to university juniors, I’ll create a quiz to test their understanding of the topic. Here is a multiple-choice question: Which of the following best describes pharmacodynamics?”

A) The study of how drugs affect the body;  
B) The study of how the body affects drugs;  
C) The study of drug interactions with other drugs; D) The study of drug metabolism.

**Answer Key:** A) The study of how drugs affect the body. Pharmacodynamics examines how drugs exert their effects on the body and their mechanisms of action.”

## **2. Probe your students’ comfort level with AI.**

On the first day of class in the fall, instructors can conduct an anonymous survey that queried the students’ knowledge and comfort level with AI. Learning whether they would be willing to create individual ChatGPT accounts and use this tool in our class discussions and their assigned work can be helpful. Many students have become more aware of privacy issues and are thus reluctant to engage in these types of activities. To address this issue, some universities have developed closed AI platforms. However, this option is not always available. Some students are not enthused with using ChatGPT. Other approaches can be used to introduce students to the risks and benefits associated with the use of AI while also honing their critical thinking skills as they learned more about pharmacology. These approaches are described in the following strategies.

## **3. Ask students to critique AI-generated responses.**

Using this assignment early in the fall semester helped the students realize how AI could be used, recognize its limitations, and identify the variations in responses from the different AI platforms. For the first two prompts, Bing Chat was used to help describe the estrogen receptor and the mechanisms of Orserdu, a selective estrogen receptor degrader that was approved by the FDA in January 2023. The students were instructed to review the accuracy of the answer, identify any inaccurate statements, and critique the sources. For these prompts, Bing Chat relied primarily on Wikipedia, the package inserts and [drugs.com](https://www.drugs.com). Most students realized that the answers provided by Bing Chat were superficial and lacked the appropriate depth. This led to a good class discussion on what types of references would meet expectations in class assignments and activities.

In a third prompt, Bing and ChatGPT 3.5 were used to “Compare Orserdu to tamoxifen” and “Does Orserdu work better than tamoxifen”? While Bing Chat was able to provide a comparison in the use of these two drugs, ChatGPT 3.5 stated that in its last update in September 2021, there was no drug called Orserdu. Overall, the information provided in these answers was adequate, but poorly organized and lacked appropriate references. Our subsequent class discussion focused on how to write a good paragraph and how information should be organized within a paragraph.

Finally, Google Bard was used for two opposing questions; “Explain for an academic audience why people who eat worms are more likely to have high breast cancer survival rates” and “Explain for an academic audience why people who eat worms are less likely to have high breast cancer survival rates”. Interestingly, Google Bard maintained that in both cases, the underlying mechanism was an enhanced immune system. The students quickly realized that AI was capable of generating quite a bit of confident nonsense that contradicted itself.

#### ***4. Introduce the emerging use of AI in medicine.***

Class discussion can be used to focus on the use of AI in patient care and drug discovery. For example, the objective was to have the students weigh the advantages and disadvantages associated with the use of AI in each application. The class was presented with a brief reading on the selected topic and were then instructed to work in small groups to outline AI’s potential for improving healthcare and any concerns that they may have regarding its use. The readings were selected from either reputable news outlets (i.e., *New York Times* or National Public Radio) or *Nature* or *Psychology Today*. With respect to use of AI in healthcare, the two issues that were

explored were using AI to detect Alzheimer’s disease and to provide advice to patients. Student responses to these issues included their appreciation for the convenience associated with the use of AI in each case, particularly for individuals who may lack access to health care providers. Their concerns included potential loss of privacy, introduction of bias and the lack of human empathy required for communicating emotionally charged medical information.

Students were then introduced to the use of AI in Drug Discovery via this blog—[How artificial intelligence is revolutionizing drug discovery](#). They were instructed to identify and discuss a few areas that they thought were the most exciting. This discussion was lack luster, in part, due to lack of sufficient allotted class time but also because the material presented was too advanced. This topic would be more appropriate for a second-year pharmacology course that would take place after the students were more familiar with advanced biomedical science, scientific research, bioinformatics and the use of AI systems such as AlphaFold.

#### ***5. Introduce the legal and ethical implications of AI use.***

Educational activities that also need attention in the pharmacology classroom are those that address the legal and ethical aspects associated with the use of AI in scientific endeavors. Legal issues include the fair use of data and creative content. In addition, as AI is integrated into the operations of a workplace, potential legal liabilities arise. Ethical implications include the use of AI-generated content in submitted manuscripts and grants as well as the peer review process. A student’s use of AI-generated content in submitted manuscripts or grant applications may lead to cases of research misconduct. While many journals now have statements regarding the use of AI in generating content, some argue that

these policies are insufficient. With respect to peer review, students should be aware that use of AI in this process is considered to be a breach of confidentiality. These topics should be addressed in classroom discussions that are focused on scientific writing and/or scientific ethics.

## Achieving Learning Objectives with AI

### 6. *Emphasize that writing is a process.*

The major written assignment for the Fall 2023 cohort focused on the development of antifungal agents. Students were instructed to assume that they were working as a scientist within a drug company. To aid in their writing process, they were provided with a description of “how to write a paragraph.” They were then asked to address three questions. The first

question pertained to the extent to which host genetics contributed to the lethality of fungal infections. In the second question, they were asked to select the best newly developed antifungal drug from a list of drugs currently being developed (that was provided) and describe why this drug was the best. For these two questions, they were instructed to describe three independent pieces of evidence (i.e., scientific observations or original research) that supported their answers and explain why they chose each reference. In the third question, they were instructed to design three experiments that would test the effectiveness of an agonist or antagonist of Ste2, a fungal G-protein-coupled receptor. In their experimental design, they were prompted to draw their expected results. As they developed their experiments, students were



*Female teacher giving presentation using artificial intelligence.*



expected to review the lecture materials that covered pharmacodynamics and experimental approaches commonly used for demonstrating a drug's mechanism of action.

The emphasis on the writing process rather than the final writing product was facilitated by assigning points for the submission of an initial draft, peer review and the extent to which the final submission had incorporated feedback from me as well as their peers. While none of the students admitted to using AI in this assignment, one submission for the initial draft contained a suspicious inconsistency with previous examples of this student's work and use of highly sophisticated methods that was not accompanied by the required drawing of expected results. Instructor comments on this submission failed to engage the student but did result in the submission of a final draft that more closely aligned with expectations of their own work.

### ***7. Promote engagement, collaboration and oral/written communication.***

To create a unique in-class experience, a debate was designed involving all 20 class participants. This provided the students with an opportunity to learn about a current pharmacological issue being addressed by the FDA, work collaboratively, identify supportive scientific evidence, hone their oral speaking skills and write a critical analysis of their performance and that of their team. The debate focused on the FDA approval of the Alzheimer's drug Donanemab with the class divided into pro and con teams. Each team member had an assigned role (i.e., manufacturer, patient advocate, physician, biomedical scientist, etc.) and a specific time allotted for them to present their prepared statements. Preparation for the debate was conducted during the previous class period. Here, each team elected a leader, signed up for their role and developed their

position statement. To aid in their organization, a matrix of pros and cons for them to complete was used. During the debate, each team presented their argument while following the instructions for debate etiquette that were provided. After the first debate round, each team regrouped to debrief, discuss their strategies and then engaged in the second round of rebuttals. After each team presented their final arguments, a class vote was taken to identify the winning team.

For the written aspect of this activity, the students were instructed to provide their presentation notes, references, a summary of their arguments and their own personal viewpoint on the topic. They were also asked to write a summary of the most important points of each team as well as their strengths and weaknesses. This assignment was very well received with several students providing positive comments in their course evaluations that emphasized how much they had learned and their appreciation for this unique experience.

### ***8. Foster curiosity and the ability to ask good questions.***

For the final assignment in the fall semester, the students were assigned to present a case study. It was expected that the students would be able to incorporate their learning from the course of the semester, research their topic and solicit feedback from the instructor and their classmates. By choosing their topics at mid-semester, overlap between topics was avoided. The objective in this assignment was to emphasize the art of asking good scientific questions. Students were directed to address a gap in knowledge on a topic of their choice. Their presentation included a background section, three research questions that needed to be addressed and well-researched answers to each question. Their presentation could encompass limitations to effective disease

treatment, strategies to be used for disease prevention or improving diagnoses. A brief question-and-answer session allowed for classmates to engage with the speaker. Points were allotted for being able to address questions from classmates or me as well as participating in peer review. In the majority of these presentations, students were highly engaged and posed high-quality questions to each speaker.

### **9. Foster creativity and good science communication.**

In the spring course, the final assignment is a podcast. To prepare for this assignment, a class period was devoted early in the semester to the critique of a relevant podcast. The podcast chosen was “The Dirty Drug and the Ice Cream Tub” produced by Radiolab that focuses on the development of Rapamycin. Using the pair and share approach, the class conducted an expository analysis (addressing questions such as “What are the guiding research questions” and “Who are the sources of this piece”) as well as a rhetorical analysis (addressing questions such as “What is the narrator’s purpose for publishing this piece” and “Who is the audience for this piece”) of the podcast. The class also focused on the podcast’s conclusions and the impact on them. All of the students found the podcast to be inspiring. At mid-semester, the pair and share approach was used again, and each student was asked to describe their plans for their own podcast. This was followed by a written assignment that required them to identify at least two sources for their podcast. The final podcast was submitted during finals week. All of the podcasts were made available for the students after they are graded. The podcasts were very impressive, produced with very high quality, addressed a wide range of topics, and reflected the enthusiasm of the students for their topics.

There are a variety of strategic approaches and options that can be used in the pharmacology classroom to help alleviate anxiety regarding the impact of AI on student learning. While AI is likely to dramatically change instruction in the pharmacology classroom, the key elements associated with scientific discovery and the dissemination of new information are unchanged. It is vital that as we embrace this new technology with students, the foundation of the scientific process remains as well as the pillars that support the scientific community.



#### **Hollie Swanson, PhD**

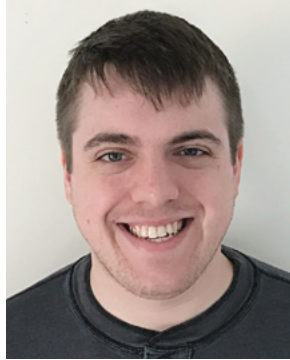
Hollie Swanson, PhD, is a professor in the Department of Pharmacology and Nutritional Sciences at the University of Kentucky College of Medicine. She is also the Director of the Integrated Biomedical Sciences Graduate program and the Summer Training in Environmental Health Sciences program. Her research interests have focused on environmental toxicology, drug metabolism and nuclear receptors.

# Journals Highlights

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## ASPET Names Three New Editorial Advisory Board Members

The ASPET Publications Committee recently approved the following new board members:



**Dr. Patrick Glassman**

Temple University,  
Philadelphia, PA  
*JPET*



**Dr. Josee Guindon**

Texas Tech University  
Health Sciences Center  
*JPET*



**Dr. Lori Isom**

University of Michigan Medical  
School, Ann Arbor, MI  
*Molecular Pharmacology*

## CALL FOR PAPERS

### ***JPET* Invites Early Career Scientists to Submit their Thesis Research Introduction**

*The Journal of Pharmacology and Experimental Therapeutics* is inviting early-career scientists to publish their thesis introduction as a [\*JPET\* minireview article](#). This unique initiative targets senior graduate students and junior postdoctoral fellows to enhance their overall scientific training skills and increase their exposure to the publication system.

- Open to ASPET graduate students and postdocs
- Mentors will serve as corresponding authors
- Mini review articles should be between 4,000–6,000 words
- Unlimited number of references



Authors are encouraged to send a [presubmission inquiry](#) to [Dr. Beverley Greenwood-Van Meerveld](#) and [Dr. Joe Blumer](#). All submissions must refer to *JPET*'s [Instructions to Authors](#).



# ASPET's 2024

## *Member-Get-A-Member* Campaign

Help us recruit new members and contribute to the growth and sustainability of ASPET. As an active member, you understand the valuable benefits that ASPET membership offers. Your firsthand experience makes you an ideal advocate for encouraging others to join. This campaign is the perfect opportunity for you to share your success story and inspire others to become part of our community.

A growing ASPET means greater recognition for the field, more resources and support for our members, and a louder voice with policymakers.

Learn more about how it works [here](#).

**Participate in the Member-Get-A-Member campaign to be entered into a raffle to win a prize. The more members you recruit, the higher the prize!**







# ASPET 2025

Advancing the Science of Drugs & Therapeutics  
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## SAVE THE DATE

