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INSIDE

ASPET
Transforming Discoveries into Therapies

Naloxone to the Rescue

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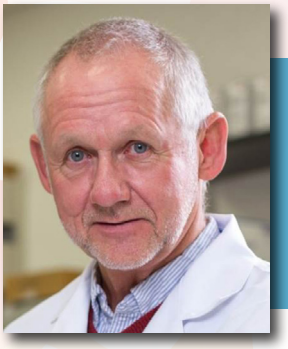


Message from The President

Dear Friends, Colleagues, and Members of ASPET,

I am honored to be writing to you as the 89th president of ASPET, and as my first official communication, I want to begin by thanking ASPET members in laboratories, clinics, and elsewhere who are working to find a cure for the pandemic that is gripping our nation and the world—on behalf of everyone in ASPET, thank you and be safe! These are incredibly challenging times for everyone, personally and professionally. Many families are facing financial hardships, and some are doing their best to educate their children at home, while others have lost their jobs, lost their health insurance, and might not be able to be with loved ones, including those in medical crisis who most need companionship and compassion. My deepest sympathy and condolences go out to ASPET members who have lost a family member, friend, or colleague to COVID-19.

Professionally, the pandemic has forced many of us to abandon our research programs and laboratories temporarily, and our academic institutions are bracing for what is sure to be a period of financial insecurity. Navigating this difficult situation can be exhausting, largely because of what we don't know. How can we publish if we are not generating data as we did before the pandemic, and how will grants be renewed? Will students be able to attend classes or work in laboratories? Graduate students and postdocs learn pharmacological research from doing, and that typically requires personal contact in laboratories. Will students and other trainees find postdoctoral positions or jobs? Will we attend scientific meetings to present our data and interact with our colleagues?

Scientific societies like ASPET are facing many challenges as well, including unprecedented financial pressures with cancellations of meetings due to COVID-19 and changes in the publication landscape that are on the near horizon. On the one hand, ASPET is fortunate to have its journals that provide much needed revenue to support various Society activities, especially during a pandemic. On the other hand, Plan S and other open-access publishing initiatives are emerging as a serious challenge to many scientific societies and will need to be navigated very carefully so the journals continue to be an asset for ASPET, not only during these unprecedented times but also for the long-term health and financial stability of the Society. This pandemic is impacting all of us in one way or another, but together our Society will persevere and emerge from this crisis stronger and more resilient than ever. We also need each other more now than ever before, and ASPET is fully committed to serving the pharmacology community as a resource for learning, engagement, and support. One outcome of the pandemic is the greater visibility of science and the increasing appreciation of the critical role scientists play in our lives, especially in matters of public health. Thanks to all of you for the incredible work that you do!

Thinking beyond the pandemic, I want to thank Eddie Morgan (outgoing past president) and Wayne Backes (past president) for their tireless work on behalf of the Society and for their insight, patience, and integrity while leading ASPET Council. Thanks to their leadership, the Society is very healthy and well-positioned to weather the pandemic storm. I also want to thank outgoing councilor Alan Smrcka for his many contributions to the Society, most recently as a member of Council.

Despite the current challenges, there is good news to share. First, the Global Partnerships Committee under the leadership of Eddie Morgan is reaching out to pharmacologists around the world to support the discipline of pharmacology and expand the scope and impact of ASPET. The Society is striving to be more diverse and inclusive; although much has been accomplished, there is still much more to do. Please reach out to individuals who are underrepresented in science—ask them to join our ASPET family or nominate them for an ASPET

award or for a leadership position in a division or in the Society overall. Second, a long overdue review of ASPET governance is ongoing and having a very positive impact in reshaping management and oversight of the Society. Third, in its second year, the ASPET Fellows Program acknowledges outstanding contributors to pharmacology and to ASPET by recognizing Fellows on the ASPET website, in *The Pharmacologist*, on various social media, and at the Annual Business Meeting. Fourth, the ASPET strategic plan continues to shape the policies and procedures of the Society in many positive ways, enhancing the value of ASPET to its members and strengthening the impact of ASPET and the discipline of pharmacology in the larger scientific community. Finally, I hope that you are using and enjoying ASPET*Connect*, the private online community that is integrated into the ASPET website. This is a convenient platform for learning about ASPET and communicating with members, leadership, and staff. ASPET*Connect* provides pre- and post-meeting community discussions for Focus on Pharmacology, a new virtual series presenting high quality, innovative science in pharmacology and therapeutics. The first Focus on Pharmacology presentation was a timely and extremely informative lecture by Thomas Gallagher (Loyola University Chicago) on *Antiviral Measures Targeting Coronavirus Entry*. I encourage you to "attend" upcoming Focus on Pharmacology lectures.

ASPET will weather this pandemic storm in large part because of the talented, dedicated staff in the ASPET office. From the cancellation of EB 2020 in San Diego to contingency planning for EB 2021, and all of the challenges in between, Judy Siuciak and her team are doing a remarkable job keeping the Society healthy, vibrant, and a valued resource for its members and the discipline of pharmacology. Thank you ASPET staff!

Respectfully,

Charles P. France, PhD
ASPET President

2020 ASPET Fellows

The ASPET Fellows Program was initiated in 2019 to honor our most distinguished members. Selection as a fellow of the American Society for Pharmacology and Experimental Therapeutics (FASPET) is an honor bestowed on ASPET members recognized for their meritorious efforts to advance pharmacology through their scientific achievements, mentorship, and service to the Society. Learn more about the FASPET program at www.aspet.org/faspet.

The ASPET Council is pleased to announce the 2020 class of fellows:


Joseph A. Beavo Jr., PhD


Joan Heller Brown, PhD


Marc G. Caron, PhD


Brian Cox, PhD


William L. Dewey, PhD


Raymond J. Dingledine, PhD


Margarita L. Dubocovich, PhD


Lorraine J. Gudas, PhD


Susan Band Horwitz, PhD


Lori L. Isom, PhD


Eric F. Johnson, PhD


Curtis D. Klaassen, PhD


John D. Scott, PhD


David R. Sibley, PhD


Paula H. Stern, PhD


Stephen F. Traynelis, PhD


Mary Vore, PhD


Scott A. Waldman, MD, PhD


Pancras C. Wong, PhD

To read more about the ASPET fellows and their accomplishments, please visit: www.aspet.org/faspet-2020

We would like to thank the Fellows Review Committee for their hard work.

John Lazo, Chair
Susan Amara
James Barrett
William Catterall
James Halpert
Paul Hollenberg
Charles Rutledge
Lynn Wecker

ASPET CONNECT
Your Member Community

Have you checked out ASPET*Connect* yet? As ASPET's newest member benefit, ASPET*Connect* gives members the ability to network, communicate, and collaborate with fellow ASPET colleagues from anywhere, at any time. As a member, you get exclusive access to discussion forums within your division community that enable you to connect with members, get or give advice, and discuss topics that are important to you.

Log in to ASPET*Connect* today and begin connecting: https://connect.aspet.org.

What's Happening on ASPET*Connect* Right Now?

Division Communities

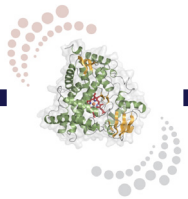
ASPET's 10 divisions are actively discussing topics ranging from COVID-19 to advice on publishing an article. Introduce yourself to fellow division members, participate in a current discussion, or start a discussion of your own. The opportunities to get involved and expand your connections are endless!

Staying Connected

"Nothing gets the blood of a behavioral pharmacologist boiling more than an exciting piece of data. And, nothing leads to new collaborations more than an exciting piece of data. Therefore, I would like to know if there is interest in having a once-a-month post of data over which everyone could interact. In all likelihood, the more interesting the data, the more our members will tune in and comment. We could also have different categories of data (e.g., data of the month from established investigators, postdoctoral fellows or graduate students). What do you think? Should we try it?"

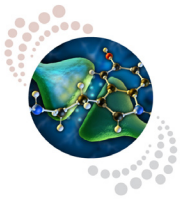
Advice at the Beginning of Your Career

First, some practical suggestions: I recommend getting some experience using animal models. Too many of graduates are seduced into highly reductionist, albeit powerful, studies. They never touch an animal, whether that be a worm, fly, mouse, rat or primate (including humans), and, consequently, miss seeing the big picture...



Tips for Getting Published

Here is something to consider—with our new online manuscript system [*Drug Metabolism and Disposition*], we now can give feedback on papers via a "Presubmission Inquiry". The authors just need to provide an abstract and significance statement for the paper and they will receive an opinion as to whether the paper is 'in scope' or not...



How Do You Think Research on COVID-19 Will Change the Way Neuroscience Is Funded?

"As new funding opportunities to join the fight against COVID-19 continue to be announced, I think the fields of neuropharmacology and neuroscience are integral in understanding the long-term effects of what SARS-CoV-2 is doing in the brain..."

Submitting Symposium Proposals for EB Meeting

If I were to offer advice to anyone submitting a new proposal, it would be to gather as much information from your prospective speakers/panelists as possible. While a title or abstract may change slightly during the course of the review process, this information is valuable to reviewers who will be determining the symposium's broad interest to the society...

Visit your division community and add your voice to these important conversations!

ASPET Focus on Pharmacology Series Community

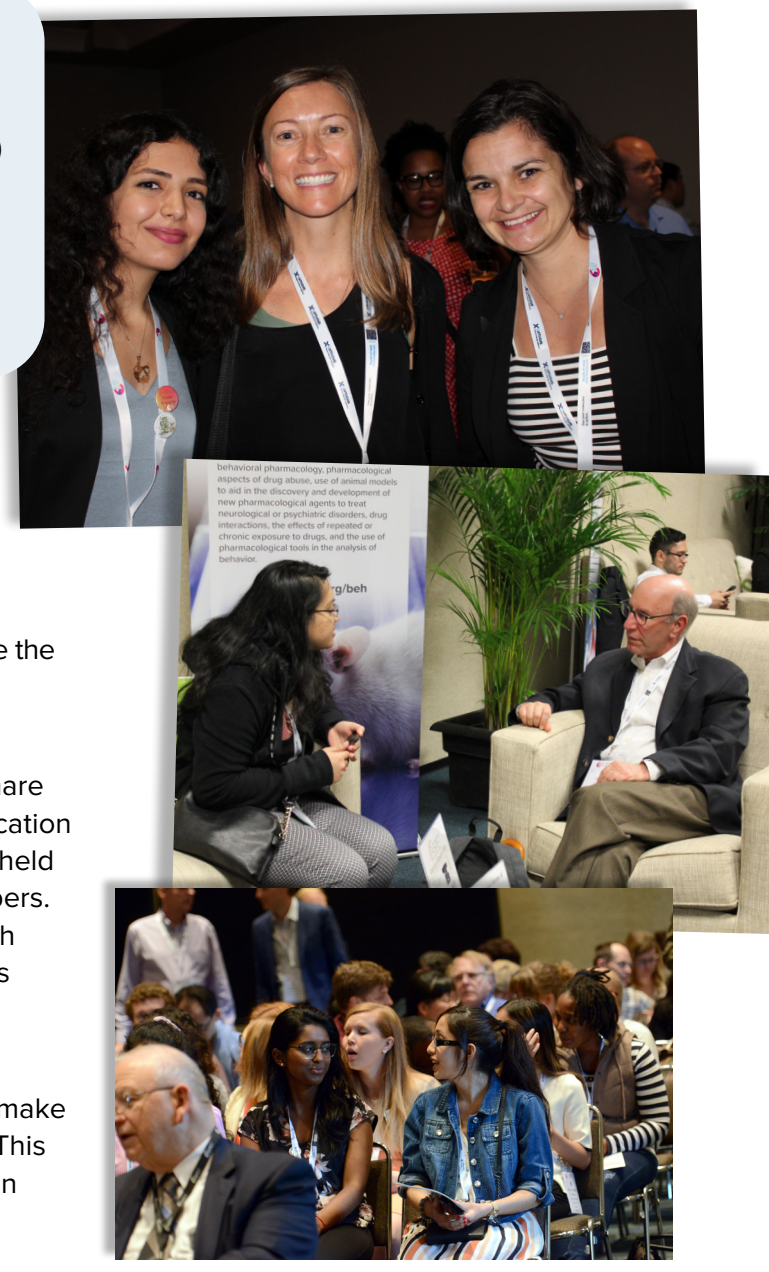
FOCUS ON PHARMACOLOGY
ASPET Virtual Series

Focus on Pharmacology is a new virtual series presenting high quality, innovative science in pharmacology and experimental therapeutics. Sessions focus on important and timely areas of pharmacology. Members are invited to join the ASPET Focus on Pharmacology Series community to gain free access to session registration, past session recordings, and discussions about each session. Check it out at: www.aspet.org/focus-on-pharmacology

Get Started Now!

https://connect.aspet.org

1. Sign in using the same username (your email address) and password that you use to log in to www.aspet.org.
2. Accept the terms and conditions
3. Click on Communities/My Communities
4. Click on your primary division community
5. Start exploring



Making Connections on ASPET*Connect*

ASPET*Connect* is a community for networking and making connections with fellow ASPET members. So how do you make the most of this important member benefit?

Update Your Profile

Your individual profile on ASPET*Connect* allows you to share information about yourself. Adding a personal bio, your education history, job history, focus areas, and any positions you have held in ASPET is a great way to introduce yourself to other members. You can control who sees different pieces of your profile with your privacy settings. Updating your profile also helps others search and find you through our robust search options.

Connect with Members

Find your friends and colleagues on ASPET*Connect* and make sure you click on the Add as Contact button in their profile. This sends them a contact request (similar to a “friend request” on

other social media platforms). Once you are connected with someone, you are able to send private messages. You are also encouraged to use the membership directory to find others you would like to collaborate with or get advice from. Check out member profiles and expand your network with people doing similar work.

Participate in Discussions

A great way to get to know other members is to participate in discussions. Ask a question to start a conversation in your division community or provide your input in a discussion that is already taking place. Ask for advice or offer your own expertise. The more you participate, the more people will recognize your contributions.

Besides participating in discussions, if you have other ideas to stimulate conversations and collaborations, we want to hear from you! Email membership@aspet.org with any ideas or comments about ASPET*Connect*.

Get More Involved with Your Division Community

If you are interested in becoming more involved with your division community, please contact your division communications officer on ASPET*Connect*. Volunteers are needed to help lead discussions, start conversations, and advocate for your division.

Division Communications Officers

Behavioral Pharmacology – Vanessa Minervini / Alison G. Wakeford
Cancer Pharmacology – Markos Leggas / Megan Zavorka Thomas
Cardiovascular Pharmacology – Rayna J. Gonzales
Drug Discovery and Development – Alicja J. Urbaniak
Drug Metabolism and Disposition – D. Fernando Estrada / Lindsay Czuba
Molecular Pharmacology – Jennifer Cash
Neuropharmacology – Luisa Torres
Pharmacology Education – Helmut Gottlieb
Toxicology – Cheryl Rockwell
Translational and Clinical Pharmacology – Brandi M. Wynne

Need Help Getting Started?

Check out the Getting Started Guide, FAQs, and some video tutorials online at https://connect.aspet.org/help/getting-started

A Virtual Meeting Experience

ASPET 2021 Annual Meeting at Experimental Biology

ASPET Annual Meeting at EB 2021 Moves to a Virtual Venue

ASPET is committed to providing our members an excellent platform to discover and present the highest quality, innovative science in pharmacology and experimental therapeutics. Holding the 2021 annual meeting in an online format gives us the opportunity for many new and exciting ways to network, collaborate, share research, and hear the latest scientific advances in diverse areas. We look forward to delivering an outstanding experience to all our members.

We are committed to continuing to deliver an experience that our members will find valuable in achieving their professional objectives and pursuing their scientific passion, while we wait for a time we can safely be reunited in person.

In our virtual venue you can expect:

- **Recognition for top research** through high-scoring abstract submissions and poster presentations
- **Relevant and timely symposia and lectures** in pharmacology as well as in physiology, biochemistry, molecular biology, investigative pathology, and anatomy.
- **Q&A with speakers and award winners**
- **Exclusive look at the latest research** as presented in posters
- **Awards** exclusively for ASPET undergraduate, post-baccalaureate, graduate student and postdoc members to subsidize registration fees and publicly recognize your outstanding work
- **Robust ability to meet and make connections** with other scientists

Plus a few surprises....

Stay tuned for updates throughout the Fall as we build our new venue. Visit www.aspet.org.

VISIT THE **ASPET CAREER CENTER** *TODAY!*

WWW.ASPET.ORG/CAREERCENTER/

WHAT YOU NEED: ASPET'S CAREER CENTER HAS IT

Jobseekers:

- No registration fee
- Advanced search options
- Sign up for automatic email notifications of new jobs that match your criteria
- Free & confidential résumé posting
- Access to jobs posted on the National Healthcare Career Network (NHCN)
- Career management resources including career tips, coaching, résumé writing, online profile development, and much more

Employers:

- Searchable résumé database
- Hassle-free posting; online account management tools
- Reach ASPET's Twitter followers (almost 2,000), LinkedIn Members (over 2,000), and email subscribers (over 4,000)
- Post to just ASPET or to the entire NHCN network
- Sign up for automatic email notifications of new résumés that match your criteria
- Job activity tracking

ASPET is committed to your success:

The ASPET Career Center is the best resource for matching job seekers and employers in pharmacology and related health science fields. Our vast range of resources and tools will help you look for jobs, find great employees, and proactively manage your career goals.

ASPET
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1801 Rockville Pike, Suite 210, Rockville, MD 20852-1633
Main Office: 301.634.7060
www.aspet.org

Naloxone to the Rescue

Rebecca J. Anderson, PhD

When Julie Stampler's phone rang at 10:30 pm, the doctor said her brother was in the emergency room and "if you want to see him, you should hurry" *(1)*. Hialeah Hospital was near her home in Miami, but when she arrived, Jonathan was already in a coma.

Jonathan Stampler had been in and out of rehab since he was 17 years old *(1)*. In the 1990s, he was arrested for stealing needles and contracted hepatitis C. But by 1998, he had improved significantly. For the next five years, he remained drug-free and even worked as a drug counselor *(1, 2)*.

Then, in October 2003, he told his girlfriend he was going to get high one last time. Inside his dealer's house, he injected a combination of drugs, probably heroin, cocaine, and fentanyl, along with baby formula *(1)*. He stopped breathing, and someone dumped him outside the hospital emergency room.

A week later, Jonathan's mother, Joy Fishman, authorized the medical team to remove Jonathan from life support and he died *(1)*. At that time, laypeople in Florida, like Jonathan's friends and family, could not legally purchase or administer naloxone—the drug that Jonathan's stepfather had created *(2)*.

Leake's Students

In the 1930s, scientists, including Chauncey Leake, were searching for strong analgesics that lacked the addiction, respiratory depression, and overdose lethality of opiates *(3)*. Leake, who established the Pharmacology Department at the University of California, San Francisco, assigned several graduate students to the problem. Elton McCawley looked for potent analgesics. Another of Leake's students, E. Ross Hart, found that allyl-substituted opiates seemed to stimulate respiration *(3)*.

Chauncey Leake

The American Society for Pharmacology and Experimental Therapeutics

Leake fostered a congenial atmosphere among his graduate students, and in one of those brainstorming sessions, Hart wondered whether an allyl-substituted analog of morphine might be analgesic and cause less respiratory depression *(3, 4)*.

Hart and McCawley found some encouragement while reviewing the literature. In 1915, German scientists had synthesized an allyl-substituted analog of codeine. This compound, N-allylnorcodeine, antagonized the respiratory depressant effects of morphine in rats and dogs *(3)*. Unfortunately (perhaps because of World War I), they never followed up on their initial observation.

In 1939, Hart and McCawley joined forces. McCawley would synthesize the N-allyl-substituted analog of morphine, which they called nalorphine: N-allyl-morphine. Hart agreed to evaluate the compound pharmacologically.

Over the next year, McCawley chipped away at the nalorphine synthesis, interspersed with other commitments. The compound he produced was of poor quality and insufficient for pharmacologic evaluation. Another graduate student, David Marsh, suggested a modified procedure, which yielded a compound that appeared to be nalorphine. The three students published their synthetic method in 1941 *(5)*.

Hart found that, like the Germans' codeine analog, nalorphine reversed the respiratory depressant effects of morphine. He presented his preliminary findings at the April 1941 annual meeting of ASPET in Chicago *(4)*. However, this substance, which was made by Marsh's method, was probably actually a mixture of nalorphine and another derivative *(3)*.

To speed up their research efforts, Leake contacted Randolph Major, director of research at Merck & Co. Leake and Major had been Princeton classmates, and in 1930, they had collaborated on the development of divinyl ether as an anesthetic. Leake sent the students' preliminary data to Major and asked if the Merck scientists would prepare enough nalorphine for further pharmacology studies *(3)*.

Major assigned the problem to John Weijlard and E. A. Erickson. Initially, they followed McCawley and Marsh's procedure, but their "many efforts... have failed" *(6)*. They then turned to the method that the German chemists had used to prepare N-allylnorcodeine in 1915. Chemical analysis verified that this compound had the "correct" chemical structure of nalorphine *(6)*.

In parallel, McCawley independently revised his synthetic methods and prepared a new batch of nalorphine. And, this time (like the Merck chemists), he confirmed through chemical analysis that the compound really was nalorphine. His new method and results were included in his 1942 doctoral dissertation *(3)*.

Also in 1942, Weijlard and Erickson published their synthetic method, much to the consternation of Leake and his students. The California group felt that the Merck scientists should have at least consulted them and allowed them to work on nalorphine together *(3)*.

He reported that nalorphine was more potent than N-allylnorcodeine in antagonizing morphine-induced respiratory depression *(3)*.

That same year, Klaus Unna, a pharmacologist at Merck, published detailed nalorphine results in the *Journal of Pharmacology and Experimental Therapeutics (JPET)* and acknowledged that his work had been suggested by Leake *(7)*. In addition to reversing morphine-induced respiratory depression, Unna reported that nalorphine retained analgesic and some other morphine-like properties *(7)*.

Merck did send Leake's lab 5 grams of nalorphine, which was sufficient for their own pharmacologic evaluation *(8)*. McCawley and Hart's results, which were published in *JPET* in November 1944, were viewed by many readers as merely confirming Unna's *JPET* report from a year earlier. Often overlooked were the California team's 1941, 1942, and 1943 abstracts.

Nalorphine No-Show

Following this burst of activity, interest in nalorphine lapsed. Leake moved to Galveston to direct the medical program at the University of Texas. His students completed their doctoral work and also moved on. Unna took an academic position in Illinois and pursued basic research. And Merck's management saw limited clinical uses for nalorphine and did not pursue development *(3)*.

A few abstracts appeared in 1950-1951, confirming the original results by Leake's students and Merck. Another abstract in 1951 reported that nalorphine was an antidote for acute morphine overdose *(3, 9)*. But James Eckenhoff, an anesthesiologist in Philadelphia, deserves the most credit for reviving interest in nalorphine.

In 1951, Eckenhoff began administering nalorphine to a series of 400 patients at the University of Pennsylvania School of Medicine. He reported that nalorphine reversed the effects of narcosis induced by morphine or meperidine and improved respiration in surgical patients *(10)*. Nalorphine also counteracted neonatal depression produced by sedative and analgesic drugs given to mothers during the final stages of labor. Eckenhoff also used nalorphine to successfully treat four cases of opiate overdosing *(9)*.

These clinical results confirmed that nalorphine achieved Leake's objectives. It was an analgesic without respiratory depressant properties, and it also reversed the respiratory depression of other opiates. This combination of effects made it a partial agonist *(3, 11)*. Unfortunately, nalorphine could not be used for pain relief because it also caused hallucinations, nightmares, and other dysphoric effects. It also had poor oral efficacy and was short-acting *(3)*.

They Called It Naloxone

Throughout the 1950s, researchers continued their search for a potent analgesic with none of morphine's drawbacks *(3)*. Among them was Harold Blumberg, who had joined Endo Laboratories in 1947. As associate director of research in 1956, Blumberg began urging Endo chemists to synthesize a nalorphine-like compound using oxymorphone *(1, 12)*.

Oxymorphone is three times more potent than morphine, and Blumberg speculated that the N-allyl analog of oxymorphone would, likewise, be a more potent analgesic, while—hopefully—possessing the nonaddiction property of an antagonist *(12, 13)*. Unfortunately, no one at Endo pursued the idea *(12)*.

Among Blumberg's subordinates at Endo was Mozes Lewenstein. Lewenstein led Endo's narcotics division on Long Island, but he also maintained a small private lab in the New York borough of Queens. That private storefront lab lacked hot water, but it was licensed to conduct narcotics research *(1, 3, 12, 13)*. On Sundays, Jack Fishman moonlighted in the Queens lab *(3)*.

Jacob Fiszman was born in Krakow, Poland, in 1930 *(13)*. He spent much of his youth in Shanghai and immigrated with his family to the US when he was 18 *(2, 13)*. The Americanized "Jack Fishman" earned bachelor's, master's, and PhD degrees in chemistry from Yeshiva University, Columbia, and Wayne State University, respectively *(12, 13)*. His doctoral thesis involved both steroid and alkaloid research *(12)*.

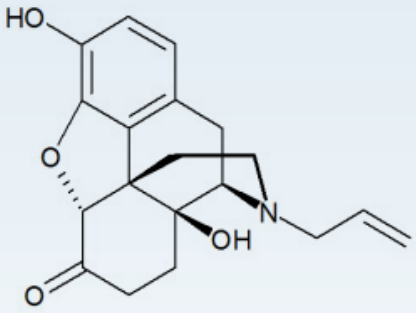
In 1960, Fishman was an assistant in chemistry and biochemistry at Sloan Kettering Institute for Cancer Research, primarily working on steroid compounds *(1, 3, 13)*. To avoid conflict with that job, Fishman confined his work in Lewenstein's lab to narcotic alkaloid chemistry. There, he synthesized about 15 opiate

Rockefeller University Archive Center

Jack Fishman

agonists and antagonists, one of which was the N-allyl analog of oxymorphone *(12)*. They called it naloxone: N-allyl oxymorphone *(1, 3)*.

Lewenstein brought naloxone to Endo for pharmacology evaluation. Blumberg immediately recognized it as the drug he had proposed earlier, and he was keenly interested in studying its properties *(12)*. The Endo researchers found that naloxone was 10-fold more potent than nalorphine as an opiate antagonist *(3, 12)*.



Naloxone

In parallel, Lewenstein and Fishman submitted a patent application on naloxone *(14)*. Lewenstein assigned the patent rights to Endo Laboratories *(3, 14)*.

Blumberg and the Endo group continued to characterize the compound. In 1966, they reported that naloxone, interestingly, had no analgesic activity of its own *(12)*. This result set naloxone apart from all other known narcotic antagonists: it was the first "pure" opiate antagonist *(3, 11)*. In addition, along with its potency as an antagonist, naloxone produced few side effects—and only at very high doses *(12)*.

Blumberg was disappointed. Researchers were seeking better analgesics, and no one, including Blumberg, saw commercial value in a pure antagonist. Fishman had little interest in pursuing naloxone, either. His primary interest was steroid chemistry, not alkaloids *(12)*.

Handy, But Just a Tool

Through the 1960s, researchers (mostly anesthesiologists) investigated clinical applications of naloxone *(12)*. It reversed deep narcotic analgesia/anesthesia *(1)*. In addition, emergency departments used intravenous naloxone to reverse the respiratory depression caused by overdoses of opiates *(1, 15)*.

Because of its extremely low toxicity, naloxone could also be used as a diagnostic tool for comas of unknown origin. If the coma was caused by narcotics, naloxone would reverse it within minutes. On the other hand, if the coma persisted after naloxone, narcotics were ruled out as the cause—without causing additional harm to the patient *(12)*.

On April 13, 1971, the U.S. Food and Drug Administration (FDA) approved naloxone (Narcan®) as an injectable solution for reversing opioid overdoses *(1, 11, 13)*. Hospital operating rooms, emergency departments, and even some ambulance teams routinely stocked it.

In 1983, WHO placed naloxone on its list of essential medicines, to treat acute respiratory failure from toxic opioid overdose *(1)*.

Researchers explored naloxone as a cure for narcotic addiction. It counteracted the euphoric effect of narcotics and induced immediate withdrawal. But it was an impractical treatment because of its short duration of action (a few hours) and its poor oral efficacy *(12)*.

On the other hand, naloxone became a valuable research tool *(12)*. In the early 1970s, researchers used its selective binding to demonstrate the existence of opiate receptors in the brain. In 1975, John Hughes and others discovered endogenous opioid peptides that bind to these receptors: the enkephalins and endorphins.

Just Junkies

For generations, doctors had respected opium for both its benefits and hazards. Morphine, which was first extracted from the opium poppy in the early 1800s, was even more effective for severe pain, but it also had greater addiction liability. Those properties were further amplified by introduction of the hypodermic needle and the discovery of heroin, which is about three times more potent than morphine *(16)*.

Congress took action to protect the public by passing the Harrison Narcotics Tax Act in 1914. Heroin and several other drugs were heavily taxed and strictly regulated. In 1924, the Heroin Act specifically outlawed the importation, possession, or manufacture of heroin *(16)*.

Making heroin illegal turned narcotic addicts into criminals. They resorted to opium dens and other underground sources. The epithet "junkie" originated from desperate heroin users, who gathered and sold scrap metal (i.e., junk) to support their habit *(16)*. Addiction was viewed as a moral failing, and addicts received scorn rather than sympathy. That attitude greatly hampered efforts to assist those who had overdosed, as well as those seeking treatment for their dependence *(16)*.

For the next 50 years, scientists continued the search for a potent, nonaddicting opioid painkiller. Unfortunately, each of those new analogs carried the same risks as heroin (i.e., addiction, respiratory depression, and overdose death) *(16)*. Doctors were taught to prescribe opioids sparingly and only for the severe pain of cancer patients and the terminally ill *(17, 18)*.

In 1996, all of that began to change.

Purdue Pursues Prescriptions

Purdue Pharma, a privately owned company founded in 1892, was purchased by three Sackler brothers in 1952. They transformed the company, which sold consumer products like earwax remover and laxatives, into a pain management powerhouse. Their leading product was MS Contin, an extended-release form of morphine sulfate for cancer patients *(18)*. ("Contin" was short for "continuous" release) *(16)*.

As the patent expiration on MS Contin approached in the late 1980s, the Sacklers faced a massive loss of revenue. Robert F. Kaiko, Purdue's vice president of clinical research, decided to apply the company's extended-release technology to oxycodone *(18)*. Oxycodone was already available as a generic product, and like generic morphine, it controlled pain for up to 6 hours. But it is 50% more potent.

Purdue invested $40 million over 10 years to develop the new extended-release product, OxyContin®. They aimed to relieve pain for 12 hours *(18)*.

The first clinical trial began in 1989 in Puerto Rico and enrolled women recuperating from abdominal and gynecological surgery. The women were given OxyContin, short-acting painkillers, or placebo. More than a third of the OxyContin-treated women complained of pain after 8 hours, and about half required more medication before the 12-hour mark *(18)*.

Purdue Pharma conducted a half-dozen more clinical trials, and in every study, many of the OxyContin-treated patients would ask for more medication before 12 hours. In one study, the investigator moved half of his patients to 8-hour dosing. In another study, up to a third of patients dropped out because they said OxyContin was ineffective *(18)*.

Despite these results, Purdue continued to focus on the claim that OxyContin was a 12-hour drug. This claim gave OxyContin two advantages over generic oxycodone: convenience and "smooth and sustained pain control" *(17, 18)*. In its 1992 patent application, Purdue called OxyContin a medical breakthrough that controlled pain for 12 hours "in approximately 90% of patients" *(19)*. But this claim was based on the formulation's pharmacokinetic profile, not on an assessment of pain relief.

The longer half-life of the OxyContin formulation flattened the blood levels of oxycodone, rather than the large swings in blood levels seen with a short-acting opioid. Fewer peaks, fewer valleys, and, presumably, a long, slow, steady relief of pain. Purdue said the steady-state blood levels also meant less addictive potential, but the company offered no proof of this, either *(16)*.

Scientists continued the search for a potent, nonaddicting opioid painkiller. Unfortunately, each of those new analogs carried the same risks as heroin.

Purdue Pharma successfully negotiated with the FDA to claim on the label: "Delayed absorption as provided by OxyContin tablets, is believed to reduce the abuse liability of a drug" *(16, 20)*. Despite a lack of data, FDA's Advisory Committees and other experts agreed, and the FDA approved OxyContin in December 1995 *(16, 18, 20)*.

Purdue argued that OxyContin prescriptions should not be restricted to cancer patients. Because it was "less addictive," OxyContin was promoted for all kinds of pain, from toothaches to chronic back and knee pain. The sales force pitched it to family physicians, general practitioners, and dentists—not just to oncologists *(16-18)*.

To back up their claim, the sales force cited a letter that had been published in the *New England Journal of Medicine* in 1980 *(21)*. Hershel Jick, a physician at Boston University School of Medicine, summarized the outcomes of hospital patients who had been treated sparingly for acute pain. In this highly controlled setting at one hospital, Jick found that opioid addiction was rare *(21)*.

Jick would later say that the data were published in a letter, rather than a full article, because the evidence was not strong, and Purdue never consulted him regarding his findings *(17)*. The National Institute on Drug Abuse has found that at least 8-12% of patients experience problems with addiction from prescribed opioids.

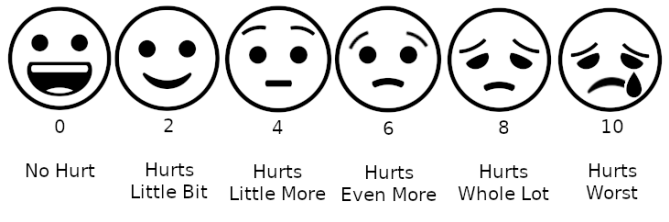
Nevertheless, Purdue's executives and sales force generalized Jick's conclusions and claimed in their marketing materials that "the rate of addiction amongst pain patients who are treated by doctors is much less than one percent" *(17)*. This "less than one percent" phrase became a cornerstone of Purdue's marketing initiatives *(16)*.

The Fifth Sign

Around the time of OxyContin's market launch, James Campbell, president of the American Pain Society, coined the phrase "pain as the fifth vital sign" and argued that pain should be routinely assessed like the other vital signs *(16)*. Although temperature, blood pressure, heart rate, and respiratory rate are measured objectively, pain is subjective

(16, 17). Doctors must ask their patients to describe the severity of their pain. This is usually done by marking a numbered scale from 0 to 10 or a smiley face chart *(16)*.

In 2001, the Joint Commission on Accreditation of Healthcare Organizations, a nonprofit organization that accredits hospitals, urged the medical community to consider (but did not mandate) pain as the "Fifth Vital Sign" *(16, 17)*.



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Smiley face chart

Defining pain as a vital sign, combined with the OxyContin marketing strategy, caused a major shift in opiate prescribing in the late 1990s *(16, 17)*. The medical community was persuaded that patients were suffering needless pain and that opiate addiction was rare. Routine assessment of pain using the smiley face pain scale became standard practice across the US. And, OxyContin prescriptions for noncancer-related pain soared 10-fold in 5 years *(17, 18)*.

Other companies—some, even more aggressive and ruthless—followed Purdue's lead. They introduced their own extended-release oxycodone products. And, they mimicked Purdue's marketing strategy, repeatedly referring to a single literature source—Jick's letter—as the basis for their claim that opioid addiction was rare *(17)*. By 2010, one out of five doctor's visits for pain resulted in a prescription for narcotic painkillers, and OxyContin accounted for a third of that revenue *(18, 22)*.

Making an Epidemic

The shift in opioid prescribing practices led to an epidemic of addiction, overdosing, and deaths *(16, 20)*. At the peak of opioid prescribing, Americans (who represent less than 5% of the global population) were consuming 80% of the total global opioid supply *(16)*.

Unappreciated at the time is the fact that opioids don't work very well for chronic pain *(16)*. Their efficacy diminishes within weeks *(23)*. Purdue's sales representatives soon began hearing from doctors that OxyContin did not last, and many physicians were directing patients to take it three to four times a day *(18)*.

By 2005, some doctors and public health clinics stopped dispensing OxyContin altogether. They switched to generic morphine, which worked as well and cost much less *(18)*.

OxyContin's only marketing advantage over less expensive painkillers was its long duration, and Purdue steadfastly perpetuated the 12-hour relief claim. If doctors complained that OxyContin didn't last, they were told to increase the strength of the dose, rather than the frequency *(18)*. OxyContin tablets contained strengths of oxycodone up to a massive 80 mg. And, the highest-strength tablets contained an unprecedented 160 mg *(16)*. That is 800% higher than the therapeutic dose of morphine.

Boosting the dose strength could extend OxyContin's duration somewhat, but it did not guarantee 12 hours of relief. And, it was dangerous. More than half of the patients taking OxyContin longer than 3 months were prescribed doses greater than 60 mg/day—a dose that the Centers for Disease Control and Prevention urged physicians to avoid or carefully justify *(18)*.

In parallel with opioid prescriptions, overdosing also soared *(18, 24)*. From 1999 to 2010, overdose deaths from prescription opioids quadrupled and surpassed car accidents as a cause of death *(16, 25)*.

A New Kind of Overdose Victim

Because OxyContin was expensive, addicted patients were incentivized to switch to heroin, a much cheaper alternative *(16, 22, 23, 25)*. In the 2000s, three-fourths of heroin users said their addiction had started with prescription opioids *(16)*. More recently, they have turned to illicitly manufactured fentanyl, which is 50-100 times more potent than morphine *(22, 23, 26)*.

This progression, from prescription opioids, to heroin, to illicit fentanyl, is now called the "triple wave" *(26-28)*. The result was that more than 20 million Americans were suffering from substance abuse disorders, far more than cancer diagnoses *(25)*. And, hundreds of thousands of them died from opioid overdose *(20)*.

A Life-Saving Tool

In 2003, Jack Fishman was president of IVAX Corporation, a pharmaceutical company in Miami. Like many others, he did not foresee a use for naloxone outside of hospital emergency rooms and surgical suites—until his stepson, Jonathan Stampler, died. Julie Stampler said, "One of Jack's greatest sadnesses was that he couldn't save my brother" *(2)*.

The path that put naloxone in the hands of opioid users and their loved ones had many twists and turns.

Even before the introduction of OxyContin, John Strang at the National Addiction Centre in London had taken constructive steps to address narcotic overdoses. He was prompted by the rising death toll among heroin

users *(11, 15)*. Because respiratory depression caused death in minutes, immediate intervention was essential.

Heroin users rarely overdosed alone. But the bystanders were usually other heroin users, and their resuscitation attempts often failed *(28)*. They were reluctant to call an ambulance, for fear of police involvement, and they usually abandoned the dead victim, who was often found alone *(1, 11, 28, 29)*.

Strang advocated issuing naloxone to heroin users and their peers or loved ones because they were at the scene and could act immediately *(30)*. He launched his "take-home naloxone" program in 1992, and the results were impressive. Naloxone worked, and serious side effects were rare *(15, 29)*.

In the fall of 1996, Dan Bigg and colleagues started a naloxone training and distribution program at the Chicago Recovery Alliance *(31)*. Bigg trained heroin users and their peers on resuscitation techniques and how to administer naloxone. Naloxone (1-2 mg) was injected intramuscularly and worked within minutes.

Although naloxone was effective, neither the victim nor the person giving the injection was anxious to use it again because "naloxone use is inherently unpleasant for all" *(32)*. The high naloxone dose precipitated a full-blown withdrawal syndrome. Lowering the dose greatly reduced that reaction, and the Chicago program became a template for other take-home naloxone programs around the country *(11, 32)*.

These early programs required the rescuer to open an ampoule of the commercially available solution, draw up the contents into a syringe, and inject the drug *(15)*. A more convenient option was needed for use by the lay public.

In 2001, drug addiction programs in San Francisco and New Mexico began distributing an easier-to-use naloxone kit to heroin users. The makeshift kit included two prefilled injection cartridges of naloxone (0.4 mg), two injection devices, and gloves in a plastic case, along with a compartment for used needles *(29, 33)*. Participants were also given a written prescription for naloxone, in case they needed evidence that they were legally carrying a prescription drug. Interestingly, most of the overdose victims receiving naloxone were not in the take-home program. This demonstrated that heroin users were willing and able to intervene and resuscitate a peer *(29)*.

Saved by a Nose

In 2006, a drug addiction program in Boston assembled jury-rigged kits that contained pre-filled syringes of naloxone solution (2 mg/2 ml) and a nasal atomization device *(33, 34)*. Intranasal administration eliminated the risks of needle stick injuries and needle disposal, and it was also faster and easier for nonmedical bystanders to use *(34)*.

Many funding organizations thought that drug users would view naloxone as a safety net, which would encourage more drug use, and that would simply cause more overdosing

By 2010, at least 188 local opioid overdose prevention programs were distributing naloxone *(33)*. The Harm Reduction Coalition surveyed 50 of those programs, which had distributed naloxone (intramuscular or intranasal) to 53,032 individuals and received reports of 10,171 overdose reversals *(33)*.

In 2012, the UN Office on Drugs and Crime stated that opioid overdose treatment, "including issuing opioid receptor antagonists such as naloxone, is part of a comprehensive approach to services for drug users and can reverse the effects of opioids and prevent mortality" *(35)*.

Zero Tolerance

The early naloxone distribution programs were sponsored by organizations whose mission was to assist narcotic addicts—primarily heroin users. And they faced significant resistance *(32)*.

The prevailing political climate in the US was "zero tolerance" for drug abuse *(29)*. Many funding organizations and researchers were hesitant to support and study treatment options *(32)*. They thought that drug users would view naloxone as a safety net, which would encourage more drug use, and that would simply cause more overdosing *(29)*.

In fact, the track record of the naloxone distribution programs was impressive. Injection drug abusers took action without hesitation when they witnessed a heroin overdose. And, most overdose victims were still alive one year later *(30, 36, 37)*. Simply put, naloxone saved lives and, if anything, encouraged heroin users to seek treatment to reduce their dependence *(29)*.

But, then, politicians and physicians questioned the legality of prescribing naloxone to laypersons for use in others who overdose *(29)*. Nonmedical personnel were not authorized to distribute or administer a prescription drug to a person who had not been prescribed the medication *(34)*. Doctors feared malpractice suits, and laypeople feared prosecution *(11)*. But drug treatment programs reported that no arrests occurred, and no bystanders were prosecuted for administering naloxone to an overdose victim *(29)*.

The Turning Point

Attitudes changed dramatically in the mid-2000s. Surgeon General Vivek Murthy saw "a cultural shift in how we think about addiction" *(25)*. Physicians and the public realized that opioid addiction was not a moral failing but rather the result of misguided and excessive opioid prescribing.

Instead of blaming addicts, the public viewed opioid-dependent people as innocent victims of drug companies that marketed opioids too aggressively and doctors who prescribed potent opioids too freely. Thousands of cities, counties, and state attorneys general filed law suits against them *(17, 20)*.

States passed laws indemnifying clinicians from malpractice for prescribing naloxone to laypersons and those in treatment programs *(11, 13, 33, 38)*. Take-home naloxone was compared to epinephrine injectors issued to parents for treating their child's anaphylactic shock and automated external defibrillators used by nonmedical bystanders *(34)*. Some states passed Good Samaritan laws, which further shielded bystanders and those experiencing overdose from legal charges for using naloxone and calling 911 *(33, 38, 39)*.

All 50 states and the District of Columbia now have laws designed to improve layperson access to naloxone *(30, 40)*. And, under "standing orders" legislation, retail pharmacists can dispense naloxone to their customers without a physician's prescription *(39-42)*.

In 2012, the American Medical Association officially endorsed take-home naloxone, saying, "Educating both physicians and patients about the availability of naloxone and supporting the accessibility of this lifesaving drug will help to prevent unnecessary deaths" *(11)*.

James Heilman, MD – own work. Licensed under CC BY-SA 4.0

Naloxone kit

New Barriers

Naloxone actually became a victim of its own success. The increased demand led to shortages of naloxone, and with limited competition, drug makers increased the price of naloxone 244 to 3,797% *(38, 42)*. Also, the only FDA-approved formulation of naloxone (injectable for clinical use) was not optimal for take-home use *(38)*.

In 2014, the FDA approved Evzio®, a portable kit specifically designed for laypeople *(1)*. The kit contained a prefilled autoinjector for intramuscular injection of naloxone, similar to the EpiPen for anaphylaxis *(1, 41)*. In 2015, the FDA approved the first nasal spray device, Narcan®. The FDA also now has procedures for rapidly reviewing naloxone applications from generic manufacturers *(41)*.

In 2018, Surgeon General Jerome Adams urged the wide distribution of naloxone to those dependent on opioids, their family, and friends, and the community organizations that assist them *(39)*. Police officers in many jurisdictions are now equipped with naloxone *(41, 42)*. And, it is routinely stocked in the medical kits at American Red Cross shelters.

The changes in attitude and legislation have led to notable improvements in prescribing practices. Since 2010, overall opioid prescribing has decreased *(22, 24)*. Physicians are now prescribing weaker opioids for headache, migraine, and back pain *(43)*. From 2017 to 2018, the number of high-dose opioid prescriptions decreased 21%, and the number of naloxone prescriptions doubled *(40)*.

Recent data show that for the first time since 2007, the number of overdose deaths from prescription opioids and heroin has declined *(40, 44)*. Although deaths from illicit fentanyl and its analogs continue to rise, the rate of rise has slowed *(44)*.

"A Tremendous Legacy"

Harold Blumberg and Jack Fishman both had long and distinguished careers in science. Blumberg continued to

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An ad in the New York City subway with a testimonial from a layperson who used naloxone to save a loved one.

focus on opioid research, but Fishman concentrated on cancer and steroids, especially estrogen *(12, 13)*.

After Sloan Kettering, Fishman taught at Albert Einstein Medical College and served as director of the Institute for Steroid Research at Montefiore Hospital. In 1980, he became director of biochemical endocrinology research at the Strang-Cornell Institute for Cancer Research at Rockefeller University. In 1988, he moved to Miami as president of IVAX Corporation *(12, 13)*.

After Fishman's death in 2013, his wife launched a foundation in his name and worked to make naloxone more available to mothers of people, like her son, who struggle with addiction *(2)*. Other members of Jack Fishman's family have also become involved in promoting naloxone. Neil Fishman said, "It's a tremendous legacy that my father left this world. Naloxone is a miracle drug and I don't use that word lightly. Ask virtually any health care worker" *(2)*.

Chauncey Leake was the president of ASPET in 1958. He is credited with founding *The Pharmacologist*.

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Biosketch:

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In the next issue of *The Pharmacologist*...

Dr. Anderson will highlight longtime ASPET member Dr. Dolores Shockley and her contributions to pharmacology.

Don't miss the December 2020 issue.

Science Policy News

Washington Fellows Op-Eds

In early March, just before Capitol Hill shut down, the 2020 class of Washington Fellows traveled to Washington, D.C. to advocate for increases to funding for biomedical research and to educate lawmakers and staff on the necessity of animal research. Following their return home, fellows were asked to write an op-ed that drew on their experiences in D.C. The op-ed could be on a topic they learned about during their fellowship, on a topic related to science that is in the news, or on a science policy topic to which they felt a personal connection. Several fellows were able to place their op-eds in local newspapers: Bayli DiVita-Dean in the Gainesville Sun (Gainesville, FL), Christopher Szlenk in the Spokesman-Review (Spokane, WA), Jerry Madukwe in the Washington Examiner (Washington, D.C.), and Melissa Wilkson in the Highland Park Planet (Highland Park, NJ). The three op-eds published here are examples of work by fellows that we also felt was of exceptional quality and wanted to highlight for our members.

For more information on the Washington Fellows program, please visit the Advocacy section of ASPET's website: www.aspet.org/advocacy

Angela Dorigatti

University of Texas Health Science Center at San Antonio

Monkeys in Research: A Better Model for a Rapid Response to COVID-19

The entire planet is in a desperate race to create a vaccine or treatment that will put a stop to the deadly novel coronavirus pandemic. Even as states begin to loosen restrictions and open up businesses, the threat of hospitals reaching capacity and the subsequent rise in the death toll looms heavily on researcher's minds. But, before these potentially life-saving vaccines and drugs can be administered in humans, researchers must prove the safety and efficacy of these treatments first in animal models.

While mice have been the traditional go-to model for animal research, their biology is not as similar to humans. As it relates to COVID-19, mice do not display any of the same symptoms as humans. Thus, using mice for drug discovery and development may not translate well into humans. There could be false positives (drugs that worked in mice but do not work in humans) and false negatives (a treatment that could work in humans but was disregarded because it failed in mice). This disparity could result in thousands of hours of wasted time and effort; meanwhile, the virus continues to spread. Therefore, different animal models are being explored as possible vectors for the virus.

In the case of COVID-19, non-human primates such as marmosets, baboons, and rhesus monkeys may hold the key to a speedy and accurate treatment. Non-human primates are more biologically similar to humans than mice and rats. This means the virus is more likely to attack non-human primates in a similar manner to humans than compared to mice and rats, making it an ideal model to study the effects of the virus and to screen potential drug candidates. More importantly, non-human primates have immune systems which are more similar to humans as well.

The vaccines which are being developed to combat COVID-19 rely on the host's own immune system to detect and eliminate the virus. Non-human primates infected with the novel coronavirus exhibit many of the mild symptoms that are seen in humans, including signs of pneumonia in the lungs and weight loss. At the Texas Biomedical Research Institute in San Antonio, Texas, researchers are working diligently to identify which non-human primate would be the best candidate to test coronavirus vaccines and therapeutics which can easily translate to human testing. Testing potential vaccinations and treatments on non-human primates allows researchers to develop these drugs at a faster pace and with better precision to effectively treat human disease.

In order to mitigate the risks associated with introducing a new vaccine into the human population, non-human primates can bridge the gap between the development of the vaccine and the administration in human testing. While there are ethical concerns involved with infecting a healthy animal with a virus, all research conducted using animals is tightly controlled by the instructional animal care and use committee (IACUC) which directly approves and oversees all aspects of animal research to ensure the highest quality of care and humane treatment of subjects.

Unfortunately, biomedical researchers have had pushback on the use of non-human primate models, even in light of the COVID-19 outbreak. There have been several 2020 appropriations bills and reports which undermine the current progress being made in animal research. The language presented in these bills seeks to disrupt and restrict research which is fundamentally crucial in fast-tracking coronavirus treatments to the market. The American Society for Pharmacology and Experimental Therapeutics (ASPET) advocates for the support of using critical animal models (such as non-human primates, canines, and felines), stating that, "(a)t a time when emerging threats like coronavirus are a worldwide concern, we urge Congress to ensure that U.S. researchers are free from arbitrary and unscientific restrictions so we can maintain our global preeminence in biomedical research."

Now, more than ever, we need to support American biomedical research. There is a critical need to use non-human primates in biomedical research to better understand the basic biology underpinning the coronavirus infection and to quickly and efficiently develop vaccines and treatments to save human lives. Last years' appropriations bill added restrictions to the usage of non-human primates in biomedical research, limiting the access of animals being transported to laboratories, and impeding the progress of research. While non-human primates represent only a tiny fraction of all animal models used in biomedical research, it is critical that research is not restricted so that congressionallymandated research objectives can be met. Non-human primates are crucial in identifying and testing novel treatments with the primary goal of saving human lives. The race for the cure of COVID-19 has just begun, and it will take collaborations amongst laboratories across the globe to solve this crisis. Biomedical researchers in the United States should be able to study all aspects of the novel coronavirus in multiple models without unscientific constraints in order to identify novel treatments. With the support of Congress in these efforts, we will be one step closer to beating this pandemic.

Aratrika Saha

Louisiana State University Health Sciences Center, New Orleans

Role of Scientists in Policy Making: To Be or Not To Be

Research is crucial for the advancement of medical sciences and as a result is fundamental to the well-being and advancement of our society. However, it is currently under threat. Several recent legislations that have been signed into law have the potential to be detrimental for research.

The PUPPERS Act amends title 38 of the United States Code to prohibit the Secretary of Veterans Affairs from conducting medical research causing significant pain or distress to dogs. Bills like the PUPPERS Act are the result of the concerted efforts by animal rights groups that seek to end all canine research at the Veterans Affairs despite its importance and necessity. Canine research remains vital to areas of cardiovascular research and spinal cord research pertaining to veteran's health. The VA recently released a statement that emphasizes the importance of canine research for the health of

seriously ill and disabled veterans. The statement contained information about a recent canine study that led to the development of a device that improved the quality of life of paralyzed patients. It helped them cough independently, breathe without a ventilator and communicate better with the device.

In addition to the PUPPERS Act, the S.3201 Temporary Reauthorization and Study of the Emergency Scheduling of Fentanyl Analogues Act seeks to extend the Drug Enforcement Administration's (DEA) Temporary Emergency Scheduling Order of fentanyl-related substances until May 2021. A class 1 scheduling of fentanyl analogues would increase regulatory burdens on the researchers and result in increased licensing costs, longer approval times, supply limitations, and increased inspections, thereby impeding research on these analogs. Hindering fentanyl research would obstruct our ability to identify new treatments for pain and potential therapies related to the opioid epidemic, which impacts millions of lives.

While it is yet unknown just how restrictive these bills will be on research, what is known is how to curb these restrictions from occurring in the future – advocacy. There is a great need for scientists to play a more active role in advocacy and public policy making.

However, what does advocacy entail? Advocacy is a primary mechanism that the scientific community utilizes to guide policymaking. Organizations like ASPET show their support for or against a particular bill by writing letters to the various members of the Senate, House, and/or the President. Scientists often visit the offices of the Senators, House representatives and their advisors in person to discuss the implications of concerned bills and provide their input and advice. Often, students from STEM pursue various fellowships that train them in advocacy and science policy-making (for example, ASPET's Washington Fellowship and the AAAS Science and Technology Policy Fellowship). Organizations like the National Association for Biomedical Research (NABR) exist solely to advocate sound policy that recognizes the vital role that animals play in biomedical research. NABR provides the unified voice of the scientific community on legislative and regulatory matters in support of animal research.

There are several organizations that provide formal policy advice to Congress or the federal government like the federal advisory committees, congressionally chartered honorific organizations and federally funded research and development corporations. Scientists are appointed to these committees and organizations by either one or all of the following: Congress, the President, a cabinet member, or an independent agency member. Some examples of the above-mentioned committees and organizations are the National Science Board (NSB), the National Academies (including but not limited to the National Academy of Sciences-NAS), National Science Foundation (NSF) and National Aeronautics and Space Administration (NASA).

These organizations provide an overview of the scientific and technological data and provide the consensus view of the scientific and technological community. Unfortunately, if the scientific and technological communities are unable to reach a consensus, the policymakers are left to face uncertainties, and this could lead to an uninformed decision. This is why it is vital that the scientific and technological community be informed about the current issues and bills under advisement, participate in discussions and come to a consensus. Unless we take an active part in this process, bills like the PUPPERS Act and S.3201 will continue to sneak their way into the law.

Therefore, today I hope you will answer the call and take on a more active role in policy-making and advocacy.

Sean Collins

University of Cincinnati

Preventing a Pandemic: What COVID-19 has Taught us About the Critical Role of Federal Funding to Basic Science Research

As a scientist, a large part of my job is spent collecting and interpreting data. Over the past several months, I have spent much of my free time mulling over numbers of new COVID-19 cases, deaths, and testing rates. With each day's new data, it is increasingly clear to me that we were not prepared for this virus. The ability for an effective national response to COVID-19 was bottlenecked by a lack of basic scientific

understanding of infectious disease. It is certain that more disease outbreaks will occur, but our response to them does not have to remain subpar. Preparation for future pandemics will require significant, sustained increases in U.S. federal funding to basic scientific research.

In the United States, the only federally funded entity exclusively devoted to basic science research is the National Science Foundation (NSF). The role of the NSF is to fund research laboratories across the U.S. These tax dollars fund research that push the boundaries of scientific innovation. Currently, the NSF is actively funding hundreds of research projects focused on characterizing the fundamental mechanisms by which SARS-CoV-2 (the virus that causes COVID-19) infects the body, causes the symptoms of COVID-19, and spreads from human to human. These federally funded studies aim to provide us with information to minimize the worldwide loss of life and economic devastation caused by COVID-19. However, this will come as little comfort to those suffering from the loss of loved ones or the millions of Americans struggling to support their families through this pandemic.

Mitigation of damage following widespread infection of the U.S. populace during a global pandemic is simply not good enough. We must orchestrate a united effort to establish the scientific infrastructure required to swiftly react to outbreaks the moment they threaten to reach our shores. This requires a better biological understanding of infectious agents such as viruses at the fundamental level, which will be driven by basic research. Basic research aims to discover new insights about how biological agents work, and in turn, develop versatile methods on how to stop them in their tracks. For example, advancements in nanoparticle technology have begun to improve the stability, delivery, and efficacy of vaccines, overcoming many limitations of prior vaccination methods. In the technology sector, advancements in computer science and artificial intelligence can improve surveillance and detection of viral outbreaks, providing the crucial time needed to mitigate spread. Investing federal tax dollars into basic research programs like NSF can lead to development of broadly applicable vaccines before outbreaks occur, or methods that allow us to track disease spread far more effectively. These tools will undoubtedly save lives from future outbreaks as well as avoid economic shutdowns.

There are some that believe taxpayer funding of basic science is 'frivolous' and that scientific discovery should fall upon entities within the private sector such as pharmaceutical companies. However, technological and scientific discoveries by these corporations are proprietary and are not typically shared. While this is an important strategy to avoid others from profiting on a company's intellectual property, it can come at the cost of important technological discoveries being inaccessible to scientists for use in other applications. This makes federal funding for basic science critical, since all research funded by the NSF requires findings that are openly shared with the public. This allows scientists to apply new technologies to a variety of applications, bolstering advancements in a myriad of disciplines.

Fortunately, in response to the COVID-19 pandemic, a bipartisan initiative called the 'Endless Frontiers Act' has recently been introduced. This bill proposes a $100 billion expansion of the NSF, with aims to spark scientific progress and technological innovation within the U.S. by investing in computing, artificial intelligence and biomedical technology. Additionally, the bill proposes to open research centers across the U.S. which will not only be hubs for scientific innovation, but also stimulate job growth and manufacturing. This will ultimately accelerate economic recovery following the financial crisis caused by the COVID-19 pandemic.

The power to influence important policy decisions lies with the people. We can help decide whether this bill becomes law or dies on the floor of Congress. If you are in support of improving the ability of the United States to respond to the next looming pandemic, call or email your local representatives and tell them you support the Endless Frontiers Act because you feel strongly about funding basic science to protect our people. The contact information for your representatives and senators can be found at house.gov and senate.gov, respectively. Urge your policy makers to support this bill and create the infrastructure so desperately needed to prevent the next pandemic.

Education News

Science from Home: Adapting Summer Research Experiences for Undergraduates During a Pandemic

Submitted by Lauren Aleksunes, PharmD, PhD

Rutgers University closed its doors to undergraduate education in March 2020 as SARS-CoV-2 infections began to spread quickly across New Jersey. Courses moved online for the second half of the semester similar to many colleges across the country. In short time, it became increasingly evident that experiential programs would need to adapt to a virtual format. We have hosted the Summer Undergraduate Research Fellowship (SURF) program, sponsored in part by an institutional ASPET award, for over 10 years. But in 2020, this would be the first summer with no undergraduate students permitted on campus. Confronting this new normal required SURF leadership to re-think the methods traditionally employed for the summer program. With 20 SURF students spread across the United States and 6 weeks to run our program, we had many questions that needed to be considered. These are just a few that we tackled in launching a virtual summer research program:

How does a program focused largely on wet lab research develop virtual projects?

Faculty mentors developed a number of research projects that could be completed by undergraduate interns at home. These included computational toxicology projects using existing big data, secondary analysis of RNA-Sequencing datasets, as well as quantification of histochemical and immunohistochemical stains using online software. Other students involved in yearlong research at Rutgers pursued literature-based projects to design future experiments. Keys to successful research projects were well-defined milestones, weekly one-on-one meetings with near peer and faculty mentors, and access to university VPNs and file sharing services.

Intern Tanvi Banota displays the welcome package sent to her home containing materials for the virtual SURF program.

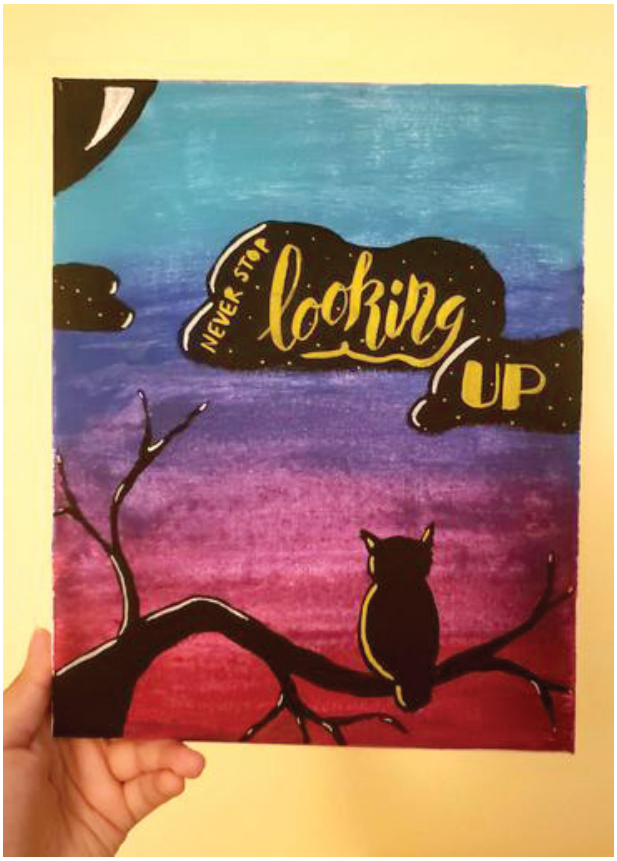
Intern Andrés Rivera Ruiz displays the lab coat that he tie-dyed as part of the virtual SURF program.

What approaches can be used to provide a community experience among the interns?

We expanded the number of graduate student and postdoctoral fellow instructors from two to six for the summer of 2020 to improve instructor-to-intern ratios. The community experience was developed by placing students in small teams with one or two instructors. Teams were used for group projects and discussions in Zoom breakout rooms. A sense of community was also accomplished upfront with welcome packages sent to the students' homes. Boxes included program swag (t-shirt, lab coat, water bottle, pen), kits to simulate experiments at home, and welcome materials (instructor photos and fun facts, BINGO cards, painting canvas and paint, and a tie-dye kit). During the first few days, students were required to tie-dye their lab coats, submit their goals for SURF to a video compilation website, and participate in a BINGO-based networking game on Zoom—all key steps to get interns engaged upfront.

How do we recapitulate the experience of experimentation from home?

Rutgers SURF took two approaches to tackle this question. First, we adapted three kits from Science Takeout© on lead-induced neurotoxicity, infectious epidemiology, and clinical toxicology to an undergraduate level. Using these kits, students pipetted simulated materials to answer scientific research questions from their homes. Instructors guided students with cases and questions as they advanced through the exercises over Zoom. Second, interns were also provided tubes for testing drinking water in their homes for heavy metals such as lead. Following instruction on proper sampling, students returned samples by week 3 of the program using prepaid postage envelopes. By week 6, Rutgers scientists had their data ready to review over Zoom with the interns. Thankfully, the homes of our interns all had low levels of lead in their drinking water.



Artwork from the virtual painting night with interns, graduate students, and postdoctoral fellows.

SURF interns were asked to describe SURF using 5 words. The assembled word cloud reflects the collective descriptions of all 20 interns.

What opportunities are there for informal networking among interns and with graduate students when running a virtual program?

The formal structure of the SURF program included twice weekly career development and research meetings with instructors and program directors. In addition, we hosted three optional events during the 6-week program. These included two evenings playing Jackbox games in small groups as well as a painting night with graduate students and postdocs. For the painting night, students received a canvas, brushes, and a small paint set in their welcome packages. They logged into Zoom and every 20 minutes students ”moved” across breakout rooms where they discussed their summers as well as post-graduate career options such as graduate education. Instructors also held weekly online open meetings where interns selected topics for discussion—ranging from the preparation of competitive applications for graduate school to instruction on how to effectively use reference and graphical software. The open nature of these unstructured meetings spurred informal networking and deeper connections between interns.

What new opportunities could an all-virtual program provide?

Moving to an online format opened new avenues for engagement that were previously unconsidered. We were able to collaborate more effectively with other Rutgers summer programs on responsible conduct of research and science communication training. The breadth of speakers and career panelists was wider than past years as we hosted scientists from NIH, US Coast Guard, US FDA, and numerous pharmaceutical, environmental, chemical, and consumer product companies. We were also able to invite numerous scientists to share their latest research findings. In collaboration with the Protein Databank, we hosted scientists and clinicians who shared their latest experiences with testing and managing patients with COVID-19 including the first saliva test for SARS-CoV-2 developed at Rutgers.

Going forward, we certainly prefer an in-person research internship program for Summer 2021. However, the limitations of the current summer challenged us to develop innovative approaches to student engagement. Many of these new activities will continue beyond COVID-19. When asked to describe their experiences during the virtual SURF 2020 program, students generated a collective word cloud centered on ”informative,” ”educational.” and ”engaging”—affirming that a number of our goals were achieved. While all 20 students would have preferred a summer in Rutgers laboratories, their gratitude for an adapted online program and their virtual mentors was evident. Over the upcoming years, we will continue to learn from these unprecedented times to educate and train the next generation of biomedical scientists in new and creative ways.

Our SURF program is supported by funding from the NIH (Grants R25ES020721, U54AR055073, and P30ES005022), the American Society for Pharmacology and Experimental Therapeutics, the Society of Toxicology, and multiple units and partners at Rutgers University.

Journals News

Xinxin Ding Selected as Next Editor of *DMD*

Xinxin Ding

The Board of Publications Trustees (BPT) has selected Xinxin Ding to serve as the next editor of *Drug Metabolism and Disposition*. Dr. Ding succeeds Dr. Jeff Stevens. His term begins on January 1, 2021 and runs for an initial three-year period to December 31, 2023. Dr. Ding will then be eligible for a second three-year term.

Dr. Ding is a professor and head of the Department of Pharmacology and Toxicology, College of Pharmacy, University of Arizona. He is also a member of the Bio5 Institute, the University of Arizona (UA) Cancer Center, and UA Southwest Environmental Health Sciences Center. Prior to joining UA, he held various positions at the University of Michigan, the New York State Department of Health, the State University of New York at Albany, and SUNY Polytechnic Institute.

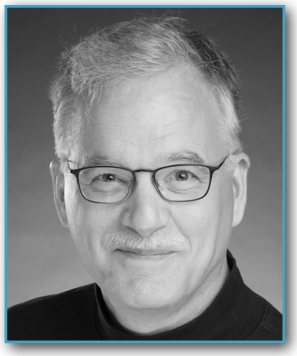
Dr. Ding has been an associate editor for *DMD* since 2010. He has served as an editorial board member for *Toxicology and Applied Pharmacology*, *Journal of Biochemical and Molecular Toxicology*, *Journal of Biological Chemistry*, *International Journal of Biochemistry and Molecular Biology*, *Cell Biology and Toxicology*, and *Current Pharmacology Reports*. Dr. Ding has been an associate editor of *Acta Pharmaceutica Sinica B* and *Tobacco Regulatory Science*. He has been a member of ASPET since 1997.

As of this writing, he has published nearly 170 articles and 27 book chapters, review articles, and other publications.

New Associate Editors for *Pharmacological Reviews*

Dr. Susan L. Mooberry is a professor in the Department of Pharmacology at the University of Texas Health Science Center at San Antonio. She is also an affiliate member of the Institute for Natural Products Applications and Research Technologies at the University of Oklahoma and a member of the Cancer Therapy and Research Center at UTHSCSA. Dr. Mooberry has served on the editorial boards of *Journal of Natural Products* and *Journal of Medicinal Chemistry* and has been a reviewer for 14 journals within the last 4 years.

Susan L. Mooberry



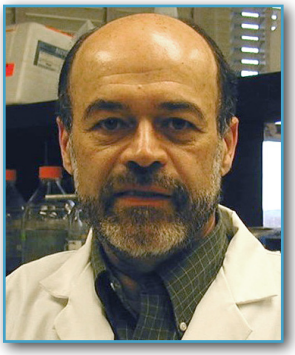
John D. Schuetz

Dr. John D. Schuetz is the vice-chair of the Pharmaceutical Sciences Department at St. Jude Children's Research Hospital. He has served as a special section/special volume guest co-editor for two journals, is a member of several editorial boards, and is an associate editor for *Drug Metabolism and Disposition*. In addition, Dr. Schuetz has served as president of ASPET.

New *Molecular Pharmacology* Associate Editors

Dr. David A. Gewirtz is professor of pharmacology and medicine at Virginia Commonwealth University, Medical College of Virginia. He has been an editorial board member for five journals and served as an associate editor for six. Dr. Gewirtz was also an associate editor for *JPET* and has been a member of the *Molecular Pharmacology* Editorial and Advisory Board since 2012. Dr. Gewirtz has been an ASPET member since 1986.

Dr. Manojkumar Puthenveedu is associate professor and chair for postdoctoral development in the University of Michigan (UM) Medical School Department of Pharmacology and associate director of the UM Cellular and Molecular Biology Program. He has been a reviewer for numerous journals and is the guest editor for a special section on opioid receptor signaling in the October issue of *Molecular Pharmacology*. Dr. Puthenveedu has been a member of ASPET since 2018 and serves on the Mentoring and Career Development Committee. He is a member of the Division for Molecular Pharmacology Executive Committee.



David A. Gewirtz

Manojkumar Puthenveedu

JPET Adds a New Editorial Advisory Board Member

D. Samba Reddy

Dr. D. Samba Reddy is a professor of neuroscience and experimental therapeutics and an NIH CounterACT investigator at Texas A&M University Health Science Center College of Medicine. He is also a faculty member at the Texas Brain & Spine Institute and the Texas A&M Institute of Neuroscience. Dr. Reddy currently serves in various roles on the editorial boards of nine journals.

The Board of Publications Trustees thanks the new editorial appointments for their commitment and service to the journals and to ASPET.

Update on Plan S and ASPET's Journals

Beginning in January 2021, research based on funding from organizations and agencies that support Plan S must be published in gold open access journals (where an article processing charge or APC is levied) or in journals that allow green open access. Green open access allows authors to place accepted manuscripts in a publicly accessible, open access repository under a CC BY license.

ASPET has made the manuscripts for its three primary research journals freely accessible to all since 2005. Unfortunately, they do not meet the Plan S repository and CC BY requirements. The Board of Publications Trustees has decided to allow green OA for papers that cite funding from members of the Plan S coalition. Because all content in the primary research journals has been made free in manuscript form since 2005 without a concurrent elimination of subscription sales, it is unlikely that green OA for Plan S papers will have much of a financial impact on the Society. The ability to publish without having to pay an APC could result in increased manuscript submissions and benefit the journals.

The BPT welcomes authors funded by Plan S to continue publishing in ASPET's journals. Those authors may deposit their accepted manuscripts in Europe PubMed Central to meet their funder's compliance requirements. Europe PubMed Central will accept only manuscripts that cite funding from cOAlition S funders. The impact of the new green OA policy will be monitored by staff.

Highlighted Trainee Authors

Congratulations to the latest Highlighted Trainee Authors selected for *Drug Metabolism and Disposition*, *The Journal of Pharmacology and Experimental Therapeutics*, and *Molecular Pharmacology*:

Drug Metabolism and Disposition

- Dahea You (Rutgers Univ./NIH)
- Lara Rosenberger (Merck KGaA)
- Lyrialle Han (Univ. of Washington/Genentech)

Dahea You

Lara Rosenberger

Lyrialle Han

JPET

- Stevie C. Britch (Washington State Univ./Univ. of Kentucky)
- Alexa Torrens (Univ. of California, Irvine)
- Matthew Strauss (Univ. of South Carolina)

Stevie C. Britch

Alexa Torrens

Matthew Strauss

Molecular Pharmacology

- Antonio J. López Quiñones (Univ. of Washington)

Antonio J. López Quiñones

A brief description of their areas of research, current projects, the anticipated impact of their work, and what they enjoy when not in the lab is online at https://bit.ly/2yX1YeH. We congratulate all of them for being selected.

Transition to eJP Complete

On March 11, 2020, ASPET's journals began processing manuscript submissions using eJournal Press (eJP). Since that time, much effort has been put into completing the peer review process for any papers in the old BenchPress system. At the end of July, the BenchPress sites were shut down and the handful of papers still going through peer review in that system were transferred to eJP. We thank the editors, associate editors, editorial board members, reviewers, and authors for their work to move papers to a final decision as quickly as possible.

Staff continues to work with eJP to improve the new sites to provide the best experience for all who use them. Many positive comments have been received about eJP's capabilities and ease of use. We welcome feedback, good and bad, about the system at journals@aspet.org.

Membership News

The Value of ASPET Membership

Everyone at ASPET works to fulfill the Society's mission of promoting pharmacology and to provide our members with the necessary tools to enhance their careers, expand their networks, and share their important research to transform discoveries into therapies. We asked some ASPET members to talk a bit about what their membership means to them.

D. Fernando Estrada is an ASPET member with the University of Buffalo. He joined ASPET in 2016.

Why did you join ASPET?

Prior to joining ASPET as a trainee, I came to know various Society members through my mentor's network. At that point I knew that joining and becoming active in ASPET would be a great way to stay connected with scientists who had similar interests.

How has membership in ASPET benefitted your career?

I'm a structural biologist with an overlapping interest in the structures of drug metabolizing enzymes. Because of my research field, it's been very important for me to climb outside my bubble and exchange ideas with scientists who think about research in a different way than I do. To that end, my membership in ASPET has definitely paid off. I've met researchers who have become friends as well as collaborators.

Why do you think it is important to attend the ASPET Annual Meeting at EB?

There's just no substitute for engaging with other ASPET members in person, or for the time being, virtually. Introducing yourself and getting to know other ASPET scientists lowers barriers to collaborative science in the future. It also makes it easier to ask for help from Society members.

What advice would you give members who want to get more involved in ASPET?

Consistent attendance at the annual meeting is very important. If you're interested in being active in your Society, make sure that it's well known that you're willing to help organize symposia or serve on executive committees. Sometimes starting with a small role early in your membership leads to larger roles as your career progresses.

What advice would you give to someone who is interested in a career in pharmacology?

Keep an open mind regarding career alternatives. There is a need for pharmacologists at all levels: in private and public industries, and in government, as well. A career as an academic pharmacologist is just one way to make an impact. Consider all of your options.

Ana Vergara is an ASPET member from Washington State University. She joined ASPET in 2016.

Why did you join ASPET?

I joined ASPET to be able to present my research at the Experimental Biology conference not knowing what other additional benefits were available. As part of my registration to the conference, I learned that ASPET provided travel scholarships to the conference and also offered a Mentoring Network Program among other things.

How has membership in ASPET benefitted your career?

Membership in ASPET has benefited my career in many ways! I received a travel scholarship to attend

the Experimental Biology conference, which gave me the opportunity to present my research as a poster and as an oral presentation in my division as well as compete in the Poster Competition. In addition, I was selected to join the 2017-2018 cohort for the ASPET Mentoring Network Program where I joined a mentoring circle that had an industry mentor. The biggest impact was working on my resume to be ready to apply for a position in industry. In 2019, a Merck employee went to my poster presentation, and I gave him my business card and told him I was interested in working in industry. He reached out to me in the fall and asked me if I was interested in an open position at Merck. I applied for the position and interviewed in late January of 2020, right before the pandemic started. I got the position and started my position at Merck in July as a senior scientist in the Transporters and In Vitro Technologies Group in the Pharmacokinetics, Pharmacokinetics, and Drug Metabolism Department.

Why do you attend the ASPET Annual Meeting at EB?

I attend to present my research, for professional development opportunities, to learn about my field, and to network with other scientists. It is a fun conference that provides different ways of engagement. I have attended three conferences and would like to continue to attend in the future.

What do you think is the best way to get involved in ASPET?

Take advantage of the different opportunities whether it is presenting your research, joining programs such as the ASPET Mentoring Network Program, or joining committees. I am currently part of the Young Scientists Committee, which provides programming for early career scientists and has given me additional opportunities to get to know other early career scientists from different fields.

What advice would you give to students who are interested in pursuing pharmacology?

Get to know other scientists who are working in pharmacology and how it spans many research areas. Apply for internships or summer fellowships that give you an opportunity to learn more to see if you like it and want to pursue it as a career. At Washington State University where I received my PhD in pharmaceutical sciences, the College of Pharmacy and Pharmaceutical Sciences offers a Summer Undergraduate Research Fellowship sponsored by ASPET that provides hands-on experience to undergraduates. Those programs are across the US and in many institutions, so it is a great opportunity for students who are curious and want to learn more about pharmacology.

How to Renew

Be sure to watch your email for your 2021 dues renewal notice later this month. Don't want to wait for the email? You may complete your renewal online by visiting http://www.aspet.org/renew or by contacting Member Services at 301-634-7060. Thank you for your valued support of ASPET. We look forward to another amazing year!

New Members

Regular Members

Howard Ball, Ball Pharma Consulting, LLC, WI
Evgeniya Beskhmelnitsyna, Belgorod National Res Univ, Russian Federation
Oliver Burk, Dr. Margarete Fischer-Bosch-Inst of Clinical Pharmacology, Germany
Matthew E. Butchbach, Alfred I duPont Hospital for Children, DE
Eugene Douglass, Columbia Univ, NY
S. Saif Hasan, Univ of Maryland Sch of Med
Corey R. Hopkins, Univ of Nebraska Med Center
Basil P. Hubbard, Univ of Alberta, Canada
David P. Jacobus, Jacobus Pharmaceutical Co Inc, NJ
Beata Jastrzebska, Case Western Reserve Univ, OH
Launa Lynch, Idaho Coll of Osteopathic Med
Edward U. Maduh, US Department of Veterans Affairs, MD
Mark S. Moehle, Vanderbilt Univ, TN
Augusto Montezano, Univ of Glasgow, UK
Terri L. Morton, Tolmar Inc., CO
Andrea Orellana Manzano, Escuela Superior Politecnica del Litoral, Ecuador
Sergej Pirkmajer, Univ of Ljubljana, Fac of Med, Slovenia
Ulrike M. Steckelings, Univ of Southern Denmark
Katharine B. Williams, Merck & Co Inc., CA
Fumiyoshi Yamashita, Kyoto Univ, Japan

Postdoctoral Members

Robert S. Jones, Genentech Inc., CA
Zaikuan J. Yu, Johns Hopkins Univ, MD

Affiliate Members

Dorothea H. Shamilimo, Univ of Namibia
Haiyang Wang, Georgetown Univ, DC

Graduate Student Members

Bandar D. Alrehaili, Kent State Univ & NEOMED, OH
Keti Bardhi, Washington State Univ
Julien C. Dodu, Virginia Commonwealth Univ
Ubong S. Ekperikpe, Univ of Mississippi Med Center
Kennedy N. Goldsborough, Virginia Commonwealth Univ
Victoria O. Oyanna, Washington State Univ
Farheen Sultan Shaikh, Washington State Univ

Post-Baccalaureate Student Members

Alexa Torrens, Univ of California, Irvine

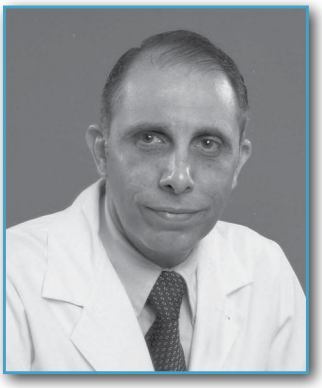
Undergraduate Student Members

Brianna Ames, Univ of Delaware
Vijay Anand, Rutgers Univ, NJ
Taylor P. Andrews, Rutgers Univ, NJ
Tanvi Banota, Rutgers Univ, NJ
Brittney Bobowski, Monmouth Univ, NJ
Kevin Chen, Rutgers Univ, NJ
Kerry Chou, Univ of Arizona
Savannah Corradi, Bemidji State Univ, MN
Filip Hanak, Univ of Arizona
Chenghui Jiang, Rutgers Univ, NJ
Joanna Kopko, Stevens Inst of Technology, NJ
Jack Lyman, Rutgers Univ, NJ
Alexander Major, Wake Forest Univ, OH
Syeda Maliha, Rutgers Univ, NJ
Kevin Ozkuyumcu, Rutgers Univ, NJ

Erin N. Peck, Montana State Univ
Grace C. Rerick, Univ of North Dakota
Andrés D. Rivera, Univ Ana G. Méndez, Gurabo Campus, PR
John Sauer, Rutgers Univ, NJ
Matthew M. Siegel, Univ of Arizona
Kristina P. Sin, Univ of Arizona College of Med- Phoenix
Nina O. Suss, Cornell Univ, NY
Samuel A. Tombokan, Rutgers Univ, NJ
William P. Wisen, Tulane Univ, LA
Victoria H. Woo, Rutgers Univ, NJ
Joyce Xu, Rutgers Univ, NJ

Remembering Dr. Benedict Robert Lucchesi (1933-2020)

Submitted by D. Adam Lauver, PhD



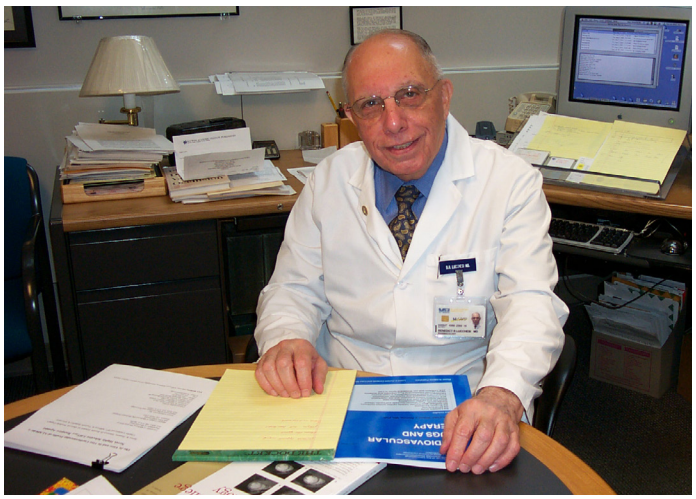
We mourn the loss of our dear friend and colleague, Benedict R. Lucchesi, MD, PhD, who passed away at his home in Ann Arbor, MI on May 12, 2020. As his final doctoral student, I would like to reflect on Ben's life and career in which he contributed so much to pharmacology research, medical education, and the lives of the students he mentored.

Dr. Lucchesi was born June 9, 1933 in New York City, NY. He graduated from Newtown High School in the Elmhurst neighborhood of Queens before attending St. John's University where he earned both his bachelor's degree in pharmacy (1955) and master's degree in physiology (1957). It was during this time that he was first exposed to pharmacology and laboratory research by Dr. Alfred Livingston who encouraged him to seek a graduate degree in pharmacology, but only after he earned a graduate degree in physiology. This idea—a physiological basis for understanding pharmacology—would serve as a theme throughout his career. Later in his life, he would often speak fondly of these formative years in New York and regale his students with stories of how he met his wife (as a self-appointed substitute lecturer in pharmacy school) and how he read his copy of Goodman & Gilman's *The Pharmacological Basis of Therapeutics* in its entirety (three times!) during his daily subway commutes from his home in Queens to St. John's in Brooklyn.

In 1957, Ben accepted an opportunity to enroll at the University of Michigan in the Department of Pharmacology, a decision that would shape the remainder of his life and career. There he was assigned to work under the supervision of Dr. Harold F. Hardman. In Dr. Hardman's laboratory, he worked on a secret government-sponsored project which involved the investigation of compounds that could induce catatonia and were potentially useful to astronauts travelling long distances to Mars and beyond. The classified project was conducted under high levels of secrecy due to Cold War security concerns, and many of the students were unaware of the true nature of their experiments until years later. The undertaking seemed straight out of a science fiction novel. Nevertheless, the project left a lasting impression on Dr. Lucchesi and reinforced his fascination with pharmacology and experimental research.

It was also during this time that Ben first interacted with one of the most influential mentors in

1965 University of Michigan Department of Pharmacology Faculty. Dr. Lucchesi (back row left) pictured with chairman Dr. Maurice Seevers (front row middle) and longtime friend and colleague Dr. Edward Domino (front row, second from right).



his life, Department Chairman Dr. Maurice Seevers. Under the guidance of Drs. Hardman and Seevers, Ben was afforded the freedom to explore his intellectual curiosities. He focused his early efforts on investigating the antiarrhythmic effects of a new class of compounds, the β-adrenergic receptor blockers. Despite a general lack of awareness and enthusiasm for the antiarrhythmic potential of these agents, he persevered. A fortuitous meeting with Sir James Black (who generously provided a new reagent, propranolol) solidified his resolve. Eventually his efforts were rewarded in the publication of his first manuscript in the *Journal of Pharmacology and Experimental Therapeutics* and completion of his doctoral dissertation in 1961. Following Dr. Hardman's departure from the University, Dr. Lucchesi was offered a part-time instructor position by Dr. Seevers. The appointment, however, would be conditional upon his enrollment in medical school. This was an unanticipated change of events, but Ben agreed and went on to earn a medical degree in 1964. From there, Dr. Lucchesi rose through the academic ranks being promoted to full professor in 1973.

Dr. Lucchesi's research achievements are numerous. His laboratory focused on the investigation of cardiac arrhythmia, coronary thrombosis, and myocardial reperfusion injury. He was one of the first investigators to describe the "stone heart" phenomenon, later referred to as reperfusion injury, which occurs when blood flow is restored to the heart following revascularization

procedures. Dr. Lucchesi also jointly developed the first nitroglycerin patch to be approved by the FDA. He had a notable history of sustained research funding from the National Institutes of Health and the American Heart Association, as well as research contracts with the pharmaceutical industry where he helped bring several therapies to market. Given his prominence in the field, Dr. Lucchesi was asked to serve as director of the Upjohn Center for Clinical Pharmacology (1978-1981) and as director of research for the Michigan Diabetes Research and Training Center (1981-1986). He was active in numerous professional societies including more than 50 years as an ASPET member. Dr. Lucchesi's extensive accolades include the ASPET Torald Sollmann Award (2001), the University of Michigan Medical School Lifetime Achievement Award (2004), and the American Heart Association Esprit de Coeur Award for Distinguished Achievement (2006). He was also inducted into the University of Michigan Medical School League of Research Excellence (2014). The Department of Pharmacology honored the Lucchesi family with the creation of the Dr. Benedict and Diana Lucchesi Graduate Education Fellowship (2016) and endowment of the Benedict R. Lucchesi Collegiate Professorship in Cardiovascular Pharmacology (2019). Altogether, he published over 600 peer-reviewed manuscripts, 50 book chapters, and five books during his 50+ year career.

An outstanding teacher in both the classroom and the laboratory, Ben mentored 20 PhD students, 8 MS students, 36 postdoctoral research fellows, 14 clinical fellows, and countless undergraduate and medical students. Each of his trainees likely remember their first encounter with his diminutive stature, yet larger-than-life personality. I first met Ben during my graduate school interviews at the University of Michigan. We met in his dimly lit basement office while he typed away on his outdated Apple computer throughout my interview. While I don't remember the exact topic of our discussion, I remember leaving the meeting thinking I had ruined whatever slim chance I had to receive an offer to attend. However, to my amazement, two days later I received a personal phone call from Dr. Lucchesi where he not only formally offered me a position in the graduate program, but also invited me to join his laboratory. His signature mischievous grin was apparent even if I could only hear his voice.

In remembering Ben's life, we also remember his family which he loved and brought him joy. He is survived by his wife of 63 years, Diana; four sons, Thomas (Mary), Richard (Lisa), Steven, and John (Debra); one daughter, Mary; and nine grandchildren.

In addition to his many accomplishments in cardiovascular pharmacology, Ben leaves a rich legacy of students, postdocs, physicians, and faculty whom he generously mentored throughout his career. He was truly one of a kind and our lives have been enriched for having known him.

IN SYMPATHY

ASPET notes with sympathy the passing of the following members.

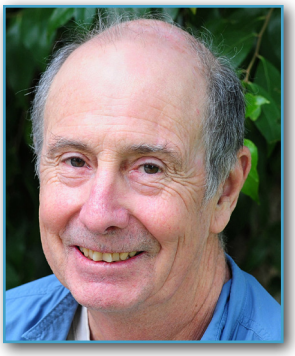
Alan Cowan Terriann Crisp J.R. Crout Nicholas P. Plotnikoff Herbert Tabor

Members in the News

Achievements, Awards, Promotions, and Scientific Breakthroughs

Bruce Hammock

University of California, Davis



Bruce Hammock, distinguished professor in the Department of Entomology at UC Davis, will receive The Lifetime Achievement in Innovation award, part of the 2020 Chancellor's Innovation Awards at UC Davis. This award recognizes innovations that have led to a long-term positive impact on the lives of others. Due to the pandemic, the award presentation date is still undecided.

Dr. Hammock holds more than 95 patents in agriculture, environmental science, and medicinal chemistry. He founded the field of environmental immunoassay using antibodies and biosensors to monitor food and environmental safety, and human exposure to pesticides. His laboratory developed the first recombinant virus for insect control, and extending from his insect research, he discovered a human enzyme termed soluble epoxide hydrolase that regulates a new class of natural chemical mediators, which in turn regulate inflammation, blood pressure and pain. This discovery led to a new drug now in human trials for neuropathic pain as well as a version in development for treating painful conditions in companion animals.

Dr. Hammock has been a member of ASPET since 2003 and is a member of the **Divisions for Toxicology, Cardiovascular Pharmacology, Drug Metabolism and Disposition, Molecular Pharmacology, and Neuropharmacology.**

Alison Wakeford

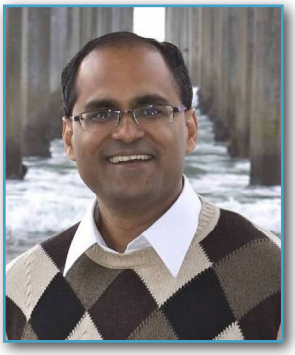
McLean Hospital, Harvard Medical School

Alison Wakeford is the recipient of the 2020 Joseph and Susan Gatto Award for excellence in imaging and drug abuse research from the McLean Imaging Center at McLean Hospital, Harvard Medical School. This one-year award will allow for Dr. Wakeford to conduct novel and high-impact research investigating the role of serotonin and social-cue processing and reactivity in awake, non-human primates. Because deficits in social behavior are included in diagnostic criteria for substance use disorders, understanding the neurobiological mechanisms contributing to social cue-processing and reactivity could lead to targeted and effective pharmacotherapies aimed at rescuing these deficits. These studies will take place in the Behavioral Neuroimaging Center directed by Dr. Steve Kohut.

Dr. Wakeford has been a member of ASPET since 2012 and is a member of the **Divisions for Behavioral Pharmacology and Neuropharmacology.**

Manoranjan D'souza

Ohio Northern University



Manoranjan D'souza, associate professor at Raabe College of Pharmacy, Ohio Northern University (ONU) received an outstanding teacher award from the Pharmaceutical and Biomedical Sciences department in May 2020. This is a teaching award that is determined by polling the senior pharmacy students prior to starting their clinical rotations. At ONU, he teaches the pharmacology of drugs used to treat mental disorders. His research focuses on identifying neural mechanisms underlying drug addiction.

Dr. D'souza has been a member of ASPET since 2008 and is a member of the **Divisions for Behavioral Pharmacology, Drug Discovery and Development, Neuropharmacology, Pharmacology Education, and Translational and Clinical Pharmacology.**

Markos Leggas

University of Kentucky College of Pharmacy

Markos Leggas, PhD, was promoted to Professor of Pharmaceutical Sciences in the College of Pharmacy at the University of Kentucky. Dr. Leggas serves as the leader of the Translational Studies core in the Center for Pharmaceutical Research and Innovation (CPRI) which facilitates drug development across campus. The CPRI was awarded a Center of Biomedical Research Excellence (COBRE) grant in February 2020 to support the development and training of young investigators who are conducting pharmaceutical research and Dr. Leggas is the PI of the Translational core and a research mentor. Dr. Leggas' research program is focused in experimental and clinical therapeutics with funding from the DoD, the state of Kentucky, NIDA and the NCI. In June 2020, he was awarded an R01 grant to conduct mechanistic and pharmacologic studies of selective mithramycin analogues targeting EWS-FLI1 in Ewing sarcoma. This program is using natural product analogues to target oncogenic transcription factors associated with tumor malignancy and is expected to develop novel treatments for Ewing sarcoma, leukemias, and prostate cancer.

Dr. Leggas has been a member of ASPET since 2013 and is a member of the **Divisions for Cancer Pharmacology, Drug Discovery and Development, Drug Metabolism and Disposition, Molecular Pharmacology, Neuropharmacology, Toxicology, and Translational and Clinical Pharmacology.**

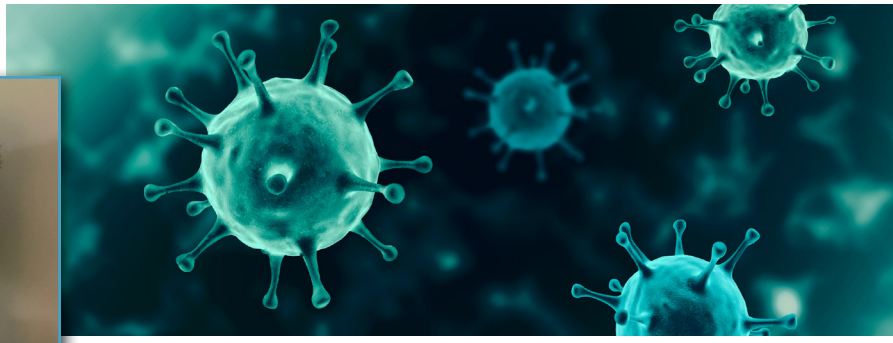
Meeting News

ASPET Focus on Pharmacology Virtual Series

Submitted by Michael F. Jarvis, PhD, FBPhS

ASPET's Focus on Pharmacology Virtual Series was launched in July as a new venue for communicating cutting-edge science in pharmacology and experimental therapeutics. These webinars are broadcast live and have interactive components before, during, and after each session. The Focus on Pharmacology Virtual Series is sponsored by the Burroughs Wellcome Fund and is free for ASPET members. Dr. Charles France, ASPET president, launched the series by noting that these webinars provide important connections and knowledge sharing for the Society's membership. A useful feature of this virtual series is that each of the webinar presentations is available on ASPET*Connect* in the Focus on Pharmacology Series section.

Coronavirus Series



Given the ongoing societal and economic impact of the COVID-19 pandemic worldwide, the ASPET Program Committee organized two webinars on coronavirus. The first of these presentations was given on July 30, 2020 by **Dr. Thomas Gallagher**, Department of Microbiology and Immunology, Loyola University Chicago. His talk entitled **"Antiviral Measures Targeting Coronavirus Entry"** provided a primer on the virology of coronaviruses. Coronaviruses comprise a family of enveloped virions characterized by 80-100 extracellular spike proteins per virus. These viruses are very common and can be pneumotropic, entrotropic, or neurotropic. Several strains (NL63, 229E, OC43, HKU1) are endemic, accounting for approximately 30% of common colds. The outbreak strains (SARS-CoV, MERS-CoV, and SARS-CoV-2) are closely related to bat viruses and are primarily pneumotropic.

Dr. Gallagher reviewed the CoV replication cycle and potential antiviral targets including viral receptor (ACE2) binding and entry, proteolysis of translation products, and RNA synthesis. The investigational antiviral agent remdesivir effectively inhibits CoV RNA synthesis in many mutant CoV strains. Additionally, Dr. Gallagher reviewed the strengths and limitations of

various SARS-CoV-2 cell entry assay systems noting key issues in the interpretation of the resulting data. For example, chloroquine and hydroxychloroquine can inhibit CoV endocytic trafficking in kidney epithelial cells (Vero) but not in lung epithelial cells (Calu-3), thus providing key insights regarding end-organ/cell type specificity of potential therapeutic interventions. View the recorded session here: https://www.aspet.org/coronavirus1

"Great science, clear presentation, highly topical."

"Excellent speaker, covered virology at an appropriate level for pharmacologists not well versed in virology."

Dr. Clifford Lane, Deputy Director for Clinical Research and Special Projects, National Institute of Allergy and Infectious Diseases, NIH gave the second talk in the Coronavirus Series entitled **"Therapeutic Research for COVID-19: Challenges and Accomplishments"** on August 19, 2020. Dr. Lane provided an overview of the clinical progression of COVID-19 that includes viral infection and host response phases. COVID-19 has a wide range of clinical signs ranging from asymptomatic to mild-moderate symptoms to severe disease requiring intensive care. Early clinical evaluation of potential therapeutic options against COVID-19 was conducted with limited resources in the context of an escalating worldwide health-care crisis. These studies generated anecdotal reports of effects in small numbers of patients or larger observational cohort findings that also contain uncontrolled confounders.

During his talk, Dr. Lane described recently completed rigorous large-scale randomized clinical trials (RCTs) for two antiviral agents, hydroxychloroquine and the investigational drug remdesivir, and one immunomodulator, dexamethasone, using 28-day mortality and clinically validated ordinal disease progression scales. Despite early reports of clinical benefit, six well controlled RCTs including the RECOVERY and WHO-SOLIDARITY studies have consistently demonstrated no clinical benefit for hydroxychloroquine treatment in hospitalized or non-hospitalized COVID-19 patients. In the ACTT-1 trial, a large multi-country trial of hospitalized COVID-19 patients, remdesivir treatment significantly reduced time to recovery and showed a trend for decreased mortality. Finally, the RECOVERY investigators recently reported that dexamethasone treatment significantly reduced 28-day mortality in severe COVID-19 patients who were ventilated or receiving supplemental oxygen. However, there was no detectable benefit for COVID-19 patients not receiving respiratory support. Taken together, the available data from rigorous RCTs indicate that remdesivir therapy may be more effective in early COVID-19 disease progression while dexamethasone may have the most benefit in late-stage disease. View the recorded session here: https://www.aspet.org/coronavirus2

"Very clear explanation of the relevance of the clinical studies."

"What I liked best was 'seeing the data that the news media don't show.'"

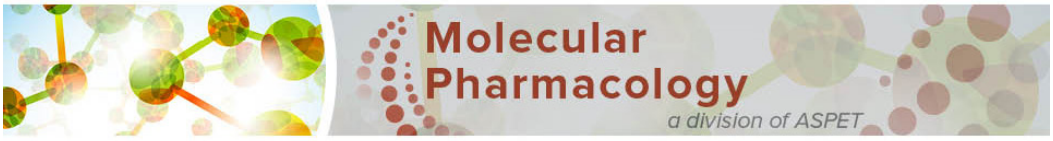
Both Coronavirus Series webinars have been very well attended and provided the audience with important pharmacologic and clinical insights regarding potential therapeutic treatments for COVID-19.

The next coronavirus session is currently being planned – please check www.aspet.org/focus for the full schedule of virtual sessions this fall.

Young Scientist Research Series

In addition to the coronavirus series, several ASPET divisions have been using the ASPET*Connect* platform to feature their young scientists in a scientific oral competition.

Molecular Pharmacology Postdoctoral Award Competition



This session featured presentations that reported new insights into the regulation of 7-transmembrane receptor cellular signaling that regulate novel pathways in health and disease. Three postdoctoral members were chosen to compete for a spot on the Division for Molecular Pharmacology's executive committee. Presentations were given by:

- **Wen-An Pan, PhD**
  University of California, San Diego
  "a-arrestin ARRDC3 is a Multifunctional Adaptor That Regulates G Protein-Coupled Receptor Signaling and Breast Cancer Invasion"
- **Hannah M. Stoveken, PhD**
  Scripps Research Institute
  "GPR139 Signals Through Gq/11 to Oppose Mu Opioid Receptor Signaling"
- **Ya Zhuo, PhD**
  Medical College of Wisconsin
  "Identifying β-arrestin1 Conformational States by a Non-GPCR Binding Partner"

Congratuations to winner Hannah Stoveken. View Dr. Stoveken's presentation and the full session recording: https://www.aspet.org/young-scientist-mp

Behavioral Pharmacology Postdoctoral Award Competition

This session showcased the work of four postdoctoral fellows who are engaged in innovative research in behavioral pharmacology. The presenters were selected based on abstracts submitted for the ASPET Annual Meeting at EB 2020 and they competed for a spot on the Division for Behavioral Pharmacology's executive committee. Presentations were given by:

- **Ewa Galaj, PhD**
  National Institute on Drug Abuse
  "Beta-caryophyllene, a Volatile Phytocannabinoid, Attenuates Cocaine Self-administration and Relapse in Rats"
- **Fernando de Moura, PhD**
  Harvard Medical School/McLean Hospital
  "Receptor Mechanisms in Nicotinic Enhancement of Opioid Antinociception"
- **Meghan Hibicke, PhD**
  LSU Health Sciences Center
  "One Dose of Psilocybin in Late Adolescence Mitigates Deleterious Effects of Developmental Stress on Cognition and Behavioral Despair in Adult Female Rats"
- **Laura Erwin, PhD**
  McLean Hospital / Harvard Medical School
  "Discriminative Stimulus Effects of (R)(-)-DOI and AM8936, a Synthetic Cannabinoid"

Congratulations to winner Ewa Galaj. View Dr. Galaj's presentation and the full session recording: https://www.aspet.org/young-scientist-beh

The next session in the Young Scientist Series is being organized by the Division for Cardiovascular Pharmacology and will take place in late September. Stay tuned for more information and view the full Focus on Pharmacology schedule online at www.aspet.org/focus.

Next Virtual Session

Professional Development Series – Part 1: *Zooming with Possibilities*
Tuesday, September 15, 2020, 12:30 pm – 1:45 pm ET

This interactive session brought to us by the ASPET Division for Pharmacology Education will provide attendees with easy-to-learn strategies and applications to engage students in remote/virtual learning environments. In addition to short presentations on collaboration platforms, engagement tools, and asynchronous learning, participants will be able to share their own challenges they have experienced in the transition to online teaching and get solutions from experienced educators and online instructors in small group settings.

Register for this session on ASPET*Connect*: www.aspet.org/prof-development-dpe

Discover our next sessions at http://www.aspet.org/focus and register on ASPET*Connect*. New sessions are regularly added to the schedule, so keep checking back!

Know any non-members who would be interested in the series?

Encourage them to sign up now for a trial membership using appeal code **FOCUS20** to get the reduced trial membership rate. The trial membership will run through December 31, 2020.

Thank you to our Focus on Pharmacology Virtual Sessions Sponsor

BURROUGHS WELLCOME FUND

The ASPET 2020 Focus on Pharmacology Series is brought to you with the generous support of Burroughs Wellcome Fund. Learn more about their Innovation in Regulatory Science Awards and learn more about the Fund itself here: www.aspet.org/BWF

Talk of the Town (Hall): The Young Scientists Committee (YSC) Holds their First-Ever Virtual Town Hall Sessions

Submitted by Stephanie M. Davis, PhD

YSC members at the EB 2019 meeting.

On the afternoon of March 5, 2020, members of ASPET received an email containing a disappointing announcement—after careful deliberation, the organizers of the 2020 Experimental Biology meeting in San Diego decided that the growing COVID-19 pandemic was too great of a risk to allow the meeting to happen. While this path was the most responsible decision, it also left early-career ASPET members crestfallen. The ASPET Annual Meeting, which normally provided opportunities for engaging scientific discussions, professional development, networking, and the chance to connect with long-distance friends and colleagues, was no more. For members of the ASPET Young Scientists Committee, the meeting cancellation meant losing opportunities to engage with the early-career members and share opportunities to get involved.

However, one silver lining to socially distancing is that every video call novice is now a certified Zoom expert, and video chatting has replaced in-person interactions from lab meetings to happy hours. Therefore, the YSC decided to adapt their in-person Town Hall session, which was originally scheduled for April 5, to Virtual Town Hall sessions on June 3

and June 17, 2020. Nearly 70 early career members of ASPET registered for at least one of the Town Hall sessions, and they entered the Zoom call with a desire to know more about subjects ranging from networking opportunities for grad students/postdocs to caring for one's mental health during a global pandemic.

Each session began with the members of the YSC sharing their name, current position, and primary ASPET division. After the introductions, I gave a short presentation on the purpose of the committee, the roles that YSC members serve within the society at large, and some of our recent accomplishments. For instance, Dr. Joe Jilek, who currently serves as the Board of Publication Trustees liaison, explained how issues such as open access publishing and ghostwriting in peer review affect graduate students and postdocs. Other members, including Dr. Ana Vergara and Yadira Perez Paramo, described their roles on the Science Policy Committee and the new Partnerships Committee, respectively.

The remainder of the Town Hall sessions were dedicated to allowing attendees to ask questions of current members of the YSC. According to Jason Albert, who is a new member of the YSC and the freshly-elected science policy liaison, the Q&A sessions were "a great way for prospective members to learn more about the committee in a casual environment." He also mentioned that "having so many different voices able to answer questions was really helpful." Dr. Khalid Garman, who stepped up as committee chair on July 1, agreed that these sessions were a great opportunity for students and postdocs who did not have a close colleague on the YSC to learn more about the committee and voice their concerns.

Although an unfortunate situation led to the creation of the Virtual Town Hall sessions, they allowed graduate, postdoc, and early-career members to learn more about their representation within the ASPET leadership structure and to feel more connected to their peers during a very isolating time.

Division News

2020 Annual Membership Survey: Divisions

Thank you to everyone who participated in the 2020 ASPET Annual Membership Survey. Each year, we reach out to members to get feedback on the Society's many benefits, programs, and services. Member feedback helps us better understand your needs and make improvements to the Society. This year's membership survey focused on divisions.

ASPET divisions are an important part of the Society and provide a great opportunity for our members to network with other scientists, share research at the annual meeting, and explore leadership opportunities within ASPET. The last time we conducted a focused survey on division efforts was in 2014. Over the last six years, the division webpages have been revitalized, the divisions have created more programs and awards, changed processes, been more active on social media, and provided new opportunities for members. Additionally, based on prior member survey feedback, ASPET introduced a new division focused on cancer pharmacology.

ASPET now has 10 divisions to facilitate interaction among members with similar research interests. Members are asked to affiliate with one primary division but may also choose any number of secondary divisions. ASPET divisions help drive our annual meeting programming, provide networking opportunities, recognize science, and conduct many other activities that are meant to enhance your membership in the Society.

The survey was designed to better understand how our divisions are serving members' needs and expectations, while aligning with ASPET's mission to be your professional home.

Two-hundred and seventy-two members participated in the survey, with representation from all 10 divisions. The percentage of respondents by member type, location, and work/study environment closely reflect ASPET membership.

Division Value

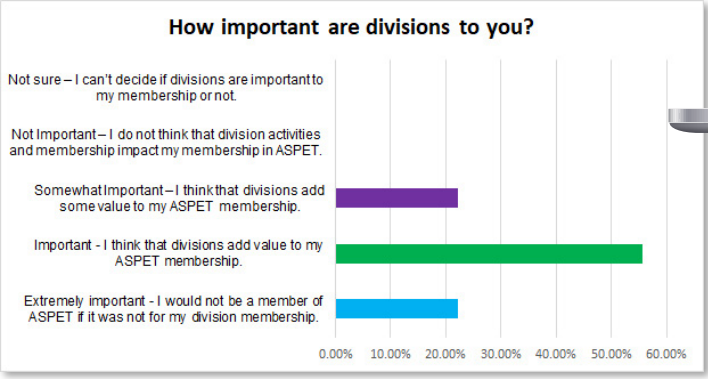
We asked a series of questions focused on determining how well divisions are serving member needs and expectations. A large majority of survey respondents felt either their primary division or two or more divisions combined closely represented their professional interests. In order to help divisions align their efforts with member interests, we asked survey respondents to prioritize several items. Survey respondents identified the following actions/outcomes from the highest to lowest priority:

1. Exchanging research knowledge
2. Facilitating networking AND providing mentoring opportunities for trainees (tied for 2nd place)
3. Recognizing, supporting, and awarding research in divisional topic area
4. Advocating for relevant science policies
5. Other priorities
6. Developing leadership skills
7. Sharing member accomplishments

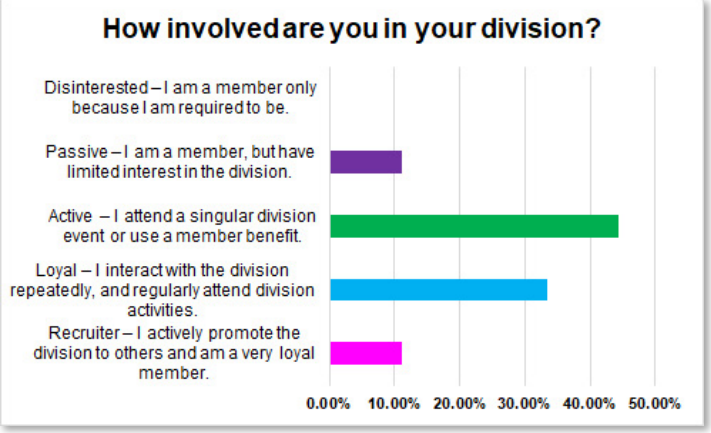
We then asked survey respondents to tell us to what extent they felt their primary division was providing these actions and outcomes. According to the respondents, exchanging research knowledge and recognizing, supporting, and awarding research in the division topic area are being provided to a very

great or great extent. Facilitating networking, sharing member accomplishments, and providing mentoring opportunities for trainees are being provided to a moderate extent. Developing leadership, advocating for relevant science policies, and other priorities are being provided to a small extent or not at all.

We are happy to report that the majority of survey respondents feel that divisions are an important component of their membership.



Survey respondents value their division membership. Their level of involvement in the division varied a bit; however, it was still very positive.



Within the ASPET website, divisions have individual webpages that provide information on the division's goals, news, activities, and programs. Division web pages were redesigned in 2017. According to survey

respondents, the most useful webpages are news and announcements about division activities and programs, the membership directory, division awards information, news and announcements about division members, and executive committee information.

When asked about specific types of communications, the highest ranking items were articles and news about division interest/research areas, followed closely by requests for symposia submissions, awards opportunities, volunteer opportunities, and division business and updates about division activities. Member news, promotions, achievements, and member spotlights/interviews also ranked moderately high.

ASPET has been using social media for many years to promote ASPET programs, members, and scientific news and articles. Over the last several years, some division leaders have wanted greater use of social media, and ASPET has encouraged divisions to make use of hashtags (see sidebar) by tagging ASPET and contributing to division social media takeovers. To better understand our members' interest in social media, we asked how often survey respondents follow and use social media platforms to stay informed about scientific and professional activities. About 61% of survey respondents utilize LinkedIn on some level for scientific or professional activities. Most survey respondents stated

Are you active on social media?
Be sure to use your division hashtag and tag @ASPET!

#ASPETBEH #ASPETDCP	#ASPETCVP #ASPETDDD	#ASPETDMDD #ASPETMP	#ASPETNEU #ASPETDPE	#ASPETTCP #ASPETTOX

they do not use Facebook, Twitter, Instagram, or YouTube for scientific or professional activities.

Divisions offer many opportunities for members to volunteer; participate in leadership, awards, and programming; nominate or apply for awards; and receive information from divisions at annual division business meetings. We were pleased to see that most survey respondents understand how to get involved with their division's executive committee, the path to division leadership, and also feel that division opportunities and awards are clearly communicated. Most respondents also found value in the division annual business meeting at Experimental Biology, allowing them to hear about division activities and provide input.

We are always open to suggestions for improvement. If you have any additional comments, suggestions, or ideas, please contact us at membership@aspet.org.

A Lineage of Leadership: An interview with Dr. Namandjé Bumpus and Dr. Paul Hollenberg

Submitted by D. Fernando Estrada, PhD

Dr. Namandjé Bumpus

Dr. Paul Hollenberg

A long-time member of the ASPET community and the Division for Drug Metabolism and Disposition, Dr. Paul Hollenberg served as a department chair of pharmacology twice: once at Wayne State University School of Medicine from 1987-1994 and again at the University of Michigan Medical School from 1994-2014. While at Michigan, one of Paul's trainees was a promising graduate student named Namandjé Bumpus. Upon graduating, Dr. Bumpus continued her training at the Scripps Research Institute in La Jolla, California before beginning an independent research program at Johns Hopkins. Recently, Namandjé was promoted to full professor and selected as the new chair of the Department of Pharmacology and Molecular Sciences at the Johns Hopkins School of Medicine. With the addition of Paul's graduate advisor, Dr. "Jud" Coon, who had also been a department chair, the lineage now extends to three department chairs from the same academic tree. In this interview with a mentor-mentee pair, Paul and Namandjé discuss leadership, mentorship, and thriving professionally in a post COVID-19 world.

You've both had the opportunity to either lead departments in the past or have recently embarked as a department chairperson. What challenges did you experience and what challenges are you most looking forward to in this leadership role?

NB: I began my role as department chair in May and right away dove into navigating the impacts of COVID-19. The first challenge was to work through the reopening of laboratories and to develop a departmental reopening plan. It was a major and unexpected task to take on during my first couple of months as a department chair, but it gave me something to focus on right away that could have a positive effect on the department. It also enabled me to immediately begin working as a team with the faculty, staff, students,

and postdocs in the department on the common goal of reopening our labs and department safely.

As far as the future in this role, I am looking forward to hiring new faculty and helping them to develop their research programs. I am also excited to play a broader role in the career development of our students, postdocs, staff, and faculty in the department.

PH: I have been fortunate to serve as chair of pharmacology at two different universities. When I arrived at both places, there were opportunities to improve a number of situations and more importantly members of the departments were eager to make improvements. A rule that I learned early in my career was that you should not make any significant changes in a lab, program, department, etc., until you have an understanding as to how it works and who the key leaders and doers are. Thus, the most important challenges that I faced early on had to do with learning the cultures of the departments and schools, while getting to know the department members and how comfortable they were with change. At Wayne State we addressed opportunities to restructure the graduate program, implement curriculum changes, and improve faculty recruitment, retention, and development. At the University of Michigan, we also worked to develop an umbrella graduate program, institute a postdoctoral recruitment and support plan, and formed a working group of the basic science chairs to harmonize and support the activities within the departments. The members of both pharmacology departments put a lot of thought, time, and effort into these changes and did an excellent job of implementing them.

What advice do you have for young scientists (students or postdoctoral fellows) who are just starting their career during the era of COVID-19?

NB: Even with the uncertainty that we face in this unprecedented time, it is as clear as ever that the world needs pharmacologists. This is a great time to really hone your craft, and to deepen your commitment to your science and scholarship. In thinking about the future, there will continue to be meaningful career opportunities for emerging scientists. Many of the areas in which pharmacologists uniquely contribute, including drug discovery/development, clinical trials, sustainability, science/health communication, and policy, have an amplified need for scientists in the era of COVID-19. Importantly, as we continue to operate virtually there is the chance to increase relationship building efforts and cultivate new mentoring relationships. I, too, am working on this. Having a range of mentors is important as these relationships provide room for you to explore your interests, self-reflect, identify growth opportunities, and develop a vision for what you want your professional life to be. Augmenting professional connections is critical in this moment. One way to go about this is to ask your current mentors to e-introduce you to people that you might benefit from talking with. An additional approach is to reach out to people that you previously interacted with, including at scientific conferences and/or through ASPET, and ask to chat with them.

PH: My suggestions are relatively straightforward and involve growth as a scientist. Read the literature broadly—look at the tables of contents for a wide-range of journals and read articles outside of your comfort zone. You never know when something will stimulate your imagination and innovate how you approach research projects. Volunteer to do preliminary journal article reviews for your PI, write first drafts of your own articles, submit proposals for your own funding, help with first drafts of your PI's grant proposals. When it becomes possible, you should volunteer to mentor, be as active in departmental activities as possible, and look for leadership opportunities. When Namandjé was a student, she was active in the department as well as in the Association of Multicultural Students (AMS) which provided tutoring, mentoring, and career advising opportunities for students from historically underrepresented groups. She served as the vice-president and then president of the AMS, providing her with important leadership experience and skills. While at the Scripps Institute as a postdoctoral fellow, she was on the Executive Board of the Network for Women in Science and she was the Career Development Chair for the Society of Fellows. Whether you end up in academia, industry, or some other career, you will be teaching, mentoring, and leading people the rest of your life so practice doing it as much as possible. It is also important that you become proficient in networking with potential colleagues and employers. This may prove to be more difficult to do than as in previous years, but do not be shy and build that network, and then use it to help your research and enhance your career. It is important to remember that the COVID-19 pandemic has negatively impacted everyone's career,

not just yours. You just need to do the best to be ready for when the right opportunity comes along, because it will if you are prepared.

You have each been highly involved with ASPET/DMD. How do you feel the society has helped you become a better mentor?

NB: ASPET helped me to develop as a mentor in many ways. At the early stages of my involvement I was a student and several established scientists within ASPET served as mentors to me and helped me to grow. They would meet one-on-one with me during the annual meeting to talk about my science and my career. This continued through the course of my training and my time as a junior faculty member. From them, I learned first-hand the power of mentoring and the contributions that a mentor can make to the development of a mentee. These positive experiences in ASPET really made me think about ways that I too could mentor others. Being active in ASPET has been valuable for this since I get many opportunities to meet emerging scientists that I can get to know and share my knowledge and experiences with. In addition, ASPET provided me with some of my earliest leadership opportunities as a scientist. In this way, my leadership skills have been cultivated within the society. I think that the personal mentorship I have received through ASPET, the range of mentees that I have gained through ASPET, as well as the leadership development I have received through participating in ASPET have all shaped me as a mentor.

PH: I was very fortunate to become active in ASPET/DMD early in my career. At the time, it just seemed like a natural thing to do. It was a good way to get to meet and interact with the people who were doing the types of things and using the techniques of interest to me and that I could learn from. As I became more active in ASPET/DMD and attended ASPET meetings, I learned that there are many ways to do research, to mentor, to teach pharmacology, and to participate in departmental activities. That broadening of my background led me to realize that one size does not fit all and that you really need to understand both the individual and the situation before you can initiate a plan of action to effectively mentor someone. The lessons I learned through my participation in ASPET/DMD regarding the differences in individuals and how to lead group activities have been invaluable in developing my mentoring skills.

What advice can you share for young scientists looking to expand their involvement in their communities and promote inclusion in science while also balancing primary work responsibilities?

NB: Improving inclusivity in science is key to strengthening the scientific enterprise. I think this is a worthy and important cause. I have always had an interest in inclusion, equity, and social justice, and I consider my scholarly pursuits as a scientist to be one aspect of my activism. I also find that my involvement and activism in these causes fuels my science since they bring me joy and help to reinforce my sense of purpose as a scientist. In addition, having an active research lab not only gives me a platform to speak from but also gives me the chance to directly provide opportunities in science for others. I have been able to work in my local community as well, including as a science commissioner within the city I live in. My advice would be that it is valuable to identify causes that resonate with you, and then support those causes. If you lead with your science, you will find unique and meaningful ways to contribute to your local community and to the promotion of inclusion in science. Being dedicated to science as your craft creates opportunities for service and the sharing of your experiences with others.

PH: I think there are many things that young scientists can do to expand their involvement in their communities and promote inclusion in science that will not only balance their primary work responsibilities, but also enhance them. The first would be to offer to teach about pharmacology to elementary, middle, high school students, or their parents in the community. Everybody wants, and needs, to know about drugs, especially now. It would be particularly valuable to do this at schools where a significant number of the students are underrepresented minorities. Namandjé volunteered at a school with primarily underrepresented minority students while she was a student at Michigan. If your school, institute, etc. has an organization like the AMS, you can become active in that. If there is not one in existence, you can start one. Another possibility is volunteering to serve as a science advisor for local governments. You can also expand your involvement by becoming active in ASPET. There are opportunities for students and postdoctoral fellows in the various divisions as well as in ASPET itself. The knowledge that you gain, the leadership skills that you develop, and the contacts that you make from these types of activities will be very helpful to you as you develop your career.

Chapter News

Canadian Society of Pharmacology and Therapeutics

CSPT 2020 Virtual Conference A Major Success

Submitted by Kerry Goralski, PhD

We've heard it time and time again in almost every context: "These are unprecedented times." It is without question that the COVID-19 pandemic has impacted, and will continue to impact, our lives in all respects for the foreseeable future. For the Canadian Society of Pharmacology and Therapeutics (CSPT), COVID-19 dashed our plans for our annual conference in Ottawa, which was to be our primary scientific programming event for the year. With creativity and focused effort, however, and appreciating the efforts so many had put into the abstract submissions outlining their research, the CSPT Scientific Programming Committee and Board of Directors decided to pivot and set their sights on offering a free virtual conference in its place.

Following several weeks of preparation, the virtual conference took place June 10 to 12, 2020 — the same days our in-person event would have happened — using a now well-known virtual meeting platform called Zoom. As this was our first-ever virtual conference, it felt like a bit of an experiment. Although we had spent ample time preparing and practicing, offering each presenter a chance to try things out in the days leading up to the event, we were still somewhat nervous about how it would all work out. We had close to 18 presentations to move through over 2.5 hours in each of three days and more than 130 registrants globally. We were anxious for it to be successful or, at the very least, problem-free.

Aside from a few very minor technical/connectivity issues with our international speakers, everything went smoothly. We are pleased to say that, based on our own experience and the feedback received from presenters and attendees, the event was a definite success.

The conference included 50 research presentations (three-minute thesis style and ten-minute oral platform style) by trainees, as well as 15-minute talks by our 2019/20 Senior Scientist, Junior Scientist and Postdoctoral Research Award Recipients and our annual general meeting. The conference was attended by approximately 90 people per day. While the majority of our presenters and attendees were from within Canada, the virtual conference made it feasible for a large number of international participants to easily join, including those from the United States, the Netherlands, Pakistan, India, Namibia and the United Kingdom.

We awarded six awards for the best trainee presentations. For the first time, we were able to bestow our new CSPT-ASPET travel awards, which were developed to recognize outstanding research by CSPT trainees by providing financial support to attend and present their research at the next ASPET Annual Meeting at Experimental Biology.

We would like to acknowledge the following award recipients:

CSPT-ASPET Travel Awards

Pierre Thibeault, *Western University*

Functional role of C-terminal tail and helix-8 residues in the thrombin- activated GPCR, Proteinase Activated Receptor 4 (PAR4)

Thomas Velenosi
National Cancer Institute

Urinary diacetylspermine as a metabolic biomarker of doxorubicin effectiveness in triple negative breast cancer

Trainee Awards

Rhoderic Reiffenstein Award (3-minute oral):

Joanna Cunanan
McMaster University

Quercetin as a novel treatment for abnormal nephron formation in renal dysplasia

Peter Dresel Award (3-minute oral):

Catrina Loucks
University of British Columbia

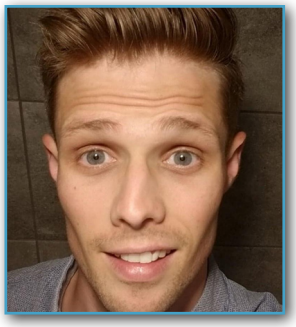
Host genetic variation is linked to treatment failure in sofosbuvir-treated hepatitis C patients

Ken Piafsky Award (8-minute oral):

Annemarie Dedek
Carleton University

The T-type calcium channel inhibitor, Z944, reduces excitability of lamina I spinal neurons and attenuates pain hypersensitivity

William Mahon Award (8-minute oral):

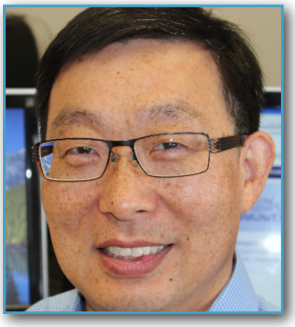


Brandon Baer
Western University

Exogenous surfactant as a pulmonary drug delivery vehicle for budesonide in the treatment of ARDS

CSPT Research Awards

Senior Investigator Award



Qingping Feng
Western University

Junior Investigator Award

Basil Hubbard
University of Alberta

Postdoctoral Award

Khaled Abdelrahman
University of Ottawa

Canadian Publication Award

Anna Taddio
University of Toronto

CSPT Publication Award

Niina Kleiber
Université de Montréal

CSPT Members' Choice Presentation Award

Xin Tong Ma
Western University

The Role of Regulator of G-Protein Signaling 2 in Inflammatory Cytokine Release in Endotoxemia in Mice

Victoria Gudzak
University of Toronto

Perspectives of CARDTM implementation in Wellington-Dufferin-Guelph (WDG) Public Health staff

We would like to thank our Scientific Program Committee, and especially the committee chair, Dr. Donald Miller, the Board of Directors and our Executive Director for their hard work in organizing the virtual conference. It would not have been possible without your efforts. We would also like to thank our presenters who shared their latest research, the session moderators and judges, and CSPT members and society guests who were in attendance. Special appreciation goes to Dr. Eddie Morgan, ASPET Past President, for attending and judging trainee presentations. Finally, we would like to acknowledge the generous support of our trainee awards sponsor, *The Canadian Journal of Physiology and Pharmacology.*

We look forward to seeing you all again in person at CSPT 2021 in Ottawa!

Quarantine BINGO

Virtual meetings are the new normal now - so here's a fun bingo card to keep handy for the next meeting you attend. How many times can you win?

B	I	N	G	O
"You're on mute"	Connection Dropped	"Can you email that to everyone?"	"There's another meeting after this, so we have a hard stop at..."	"Can everyone hear me?"
Seeing something you weren't supposed to on screen share	Coughing or sneezing	Audio cutting out mid-sentence	"Next slide."	Muted while talking
Echo	Child noises in the background	FREE SPACE	Pet noises in the background	Lag
"Is (insert name) on?"	Dinging noise from late arrivals	"Could you repeat that please?"	Someone eating and talking	Only one person with webcam on
Awkward silence	"Can everyone see my screen?"	Multiple people trying to talk at once	Random background noises from someone who didn't mute	"Who just joined the call?"

ASPET CONNECT

Your Member Community

Network, communicate, and collaborate with your fellow ASPET colleagues through ASPET's online community.

ASPET*Connect*'s online communities allow you to network, communicate, and collaborate with your fellow ASPET colleagues anytime from anywhere. As a member, you get access to discussion forums where you can connect with subject matter experts, get or give advice on career matters, or work with your committee or division members. Have a question or discussion topic? Post it on the community and allow members to provide their input. Want to see what other members are discussing? Visit your division community and scroll through the discussions.

- Online Communities
- Discussions
- Membership Directory
- Unique Profile Pages
- Customizable Notifications
- Online Library
- Communicate with Leaders

connect.aspet.org