

## MESSAGE FROM DEAN LISA DOLOVICH



### I am so proud of all the Leslie Dan Faculty of Pharmacy has achieved over the past year.

Tackling the COVID-19 pandemic has shown us just how much the world needs pharmacists and pharmaceutical scientists. While we have not yet exited the pandemic, we are at a point where we can reflect on our contributions and draw lessons from the issues and tensions in our societies that the pandemic has laid bare.

These far reaching contributions, and many more are Through an incredible feat of scientific effort and highlighted in the report, are outstanding. And while ingenuity, vaccines against COVID-19 have given us the our sights and ambitions continue to be set on making power to fight back against the virus, to reclaim some impact in the world around us, we have also turned our elements of our pre-pandemic lives, to draw hope and attention inward, to reflect on how we create healthy renewed resilience despite the continued uncertainty and inclusive places of work and study. Building on that lies ahead. momentum from 2019, we have established a Working Group focused on equity, diversity and inclusion. I have tasked the Working Group with developing evidencebased recommendations on how to support a healthy and inclusive learning and work environment for everyone at our Faculty.

As places where scientific knowledge is created, where health care providers are trained, where fundamental ethical issues around truth and equity are voiced and debated, what do lessons of the pandemic mean for the role and place of universities? As we continued much of our work over the past year in an almost exclusively I encourage you to join with me in celebrating the virtual world, what are the lessons learned about our efforts and contributions made over the past year Faculty as a physical place and the importance of place by everyone who is part of the Leslie Dan Faculty of in fostering community and innovation? These are Pharmacy. It has been a truly remarkable time for questions many people across higher education and the profession of pharmacy and the pharmaceutical beyond are asking. sciences as we continue to move science forward and contribute to a healthier society.

As I reflect on the many remarkable stories and achievements captured in this year's Dean's Report I have kept these questions in my mind and I invite you to do the same.

In just over six months, educators in our Doctor of Pharmacy (PharmD) program trained more than 600 PharmD students to deliver injections and join the frontlines of the provincial vaccination campaign. Several of these students share their reflections on how the vaccine clinics where they worked were transformed to be inclusive and culturally appropriate spaces. "Through the success of these inclusive clinics," they write, "we came to appreciate that responding to people's diverse needs is instrumental to facilitate trust in seeking health care."

To support our colleagues in pharmacy worldwide, we developed a virtual demonstration of how to prepare the Pfizer-BioNTech vaccine. This video has been viewed more than 50,000 times and has bolstered the pandemic response in countries like Australia where it is being used as part of a training package for Queensland Health's surge workforce.

This last year we celebrated 100 years since the discovery of insulin at the University of Toronto – the one place that fostered the historic discovery by Frederick Banting and Charles Best. It's a phenomenal example of how important drug discoveries can change the lives of people all over the world. And our researchers, whether focused on diabetes or other conditions, are part of a culture of innovation and discovery inspired by Banting and Best.

Sincerely,

Loader

Lisa Dolovich Professor and Dean Leslie Dan Faculty of Pharmacy University of Toronto

## RESEARCH IMPACT



Despite this past year's disruptions, it has been inspiring to see the resilience of our research community and our ability to adapt and contribute to the global pandemic response. While some of our researchers have pivoted their work to address the virus, others continued with ongoing research and some have engaged with news media for non-canonical contributions. All these examples continue to heighten the impact and visibility of our Faculty and our research enterprise.

This year's Dean's Report highlights our research accomplishments over the past year and the way we continue to advance pharmaceutical sciences. In our pursuit to advance science and health through our five research areas, our scientists have attracted over \$13 million in new funding. Collectively we have published more than 300 peer-reviewed articles, advanced commercialization activities including two new startup companies, and engaged with media to deliver over 1,300 interviews published by top Canadian and international news outlets. In November 2020, we celebrated the 100-year anniversary of the discovery of insulin at the University of Toronto. A number of our researchers continue to advance our understanding of diabetes and have contributed to the development of new therapies and technologies.

## MESSAGE **FROM THE ASSOCIATE DEAN OF** RESEARCH

As we build on our 2020 successes and continue to foster our research enterprise, it is bittersweet for me. As I take on a new role as the Director of the Donnelly Centre for Cellular and Biomolecular Research, I reflect on my last 15 years at the Leslie Dan Faculty of Pharmacy. In this time, I have seen the Faculty grow and expand the breadth and impact of its research activities. We have created a number of research centres and initiatives, internal funding programs, and expanded the Research Office to help elevate our capacity and impact. In this next chapter, I look forward to continued opportunities as we keep advancing pharmaceutical sciences.

### Stéphane Angers

Director of the Donnelly Centre for Cellular and Biomolecular Research Professor, Leslie Dan Faculty of Pharmacy University of Toronto

## **INSULIN 100: U OF T RESEARCHERS** WORK ON NOVEL DRUG THERAPIES FOR **DIABETES, OTHER ILLNESSES**

Leslie Dan Faculty of Pharmacy researchers Stéphane Angers, Shana Kelley, Shirley Wu, **Carolyn Cummins and Marisa Battistella** 

### In the 100 years since Frederick Banting and Charles Best discovered insulin as a treatment for diabetes, the process of drug discovery has changed radically – from lab equipment to techniques and technology.

But pharmaceutical scientists' drive to develop lifesaving drugs remains as strong as ever.

"Insulin is a phenomenal example of how important drug discoveries can change the lives of people all over the world," says Lisa Dolovich, dean of the University of Toronto's Leslie Dan Faculty of Pharmacy.

"We're really proud to be working on therapeutic discovery and new diagnostics that we hope will also have significant impacts on people's health and quality of life."

Written by Eileen Hoftyzer Photos by Steve Southon

Whether focused on diabetes or other conditions. researchers at Leslie Dan are part of a culture of innovation and discovery inspired by Banting and Best that benefits from the faculty's breadth of expertise and research approaches.

"It provides new opportunities and new ways of thinking to infuse our different labs because people can learn from one another," says Dolovich. "And, of course, we benefit from having students who have been educated in different areas, all coming together in pharmaceutical sciences."

Here are five researchers at the Leslie Dan Faculty of Pharmacy who are pushing the boundaries when it comes to drug treatments for diabetes and other diseases.



Carolyn Cummins, Associate Professor and Director of the Pharmaceutical Sciences Program

### Understanding mechanism of drug-induced diabetes may lead to new treatments

One of the first stages of drug discovery is understanding cellular pathways and what goes wrong in different conditions in order to find ways to counteract these effects.

"Part of my research is trying to discover new drug targets and then collaborating with chemists to make small molecules that we hope might eventually be turned into therapeutics," says Carolyn Cummins, an associate professor at the Leslie Dan Faculty of Pharmacy.

### "This drug discovery research is central to the pharmaceutical sciences."

Cummins studies how glucocorticoids – stress hormones that are often prescribed as anti-inflammatory drugs – cause drug-induced diabetes. These drugs activate a receptor in the liver that stimulates the body to produce glucose, and, if they are taken chronically, predispose patients to conditions such as obesity and diabetes.

Her work focuses on the nuclear receptors involved in the glucocorticoid signalling pathways. A better understanding of how these signalling pathways work and what happens when they are overstimulated may suggest new drug targets and a way to dose the antiinflammatories to avoid this side effect.

Although her work is at the early stages of drug discovery, she says her research is still informed and broadened by considering the patient perspective.

"As pharmaceutical scientists, we have the capacity to learn about the patient perspective because we have access to front-line clinicians and pharmacists," she says.



**University Professor Shana Kelley** 

### Clinical collaborations key to moving research forward

Interacting and collaborating with clinicians is a key element of Shana Kellev's research, enhancing her ability to make new breakthroughs and allowing her to see first-hand the challenges related to curing disease.

"If you go to see a collaborator at a hospital, you cannot miss seeing the people who are there to receive care," says Kelley, a University Professor. "We have a very collaborative clinical community in Toronto, and it is such a huge resource for people like me, but it also keeps the patients top of mind."

Kelley and her team develop technologies that use molecular biology and nanotechnology to detect and diagnose disease - and look for drug targets in large volumes of sample – and they frequently collaborate with clinicians to access patient samples. Much of their work has focused on systems that scan large populations of cells to look for specific genetic sequences or mutations, which can be used for early detection of diseases such as cancer.

Kelley's team isn't focused on a single disease. They apply their expertise to solve problems that apply to different types of conditions.

"Pharmaceutical science is a broad field, and it's very inclusive," says Kelley.

"In our faculty, we feel really strongly about solving critically important problems, and so it has a culture that lends itself to discovering new things and developing new technologies."

The focus on applying discoveries to solve problems is a particular strength of the Leslie Dan Faculty of Pharmacy, according to Dolovich.

"We see beyond the boundaries of one medical area or one condition and look at these problems from the drug perspective or from the device perspective," she says. "We can build on discoveries that have happened within the context of one medical condition [so it can be] considered for others."



Professor Shirley Wu

### Drug delivery technologies for improving patient health

Professor Shirley Wu and her team develop new drug delivery technologies to ensure drugs reach their intended targets in the body.

The research is multidisciplinary and can be applied to many different diseases, so collaborations with experts in these diseases is essential.

"A lot of work can't be done with just one lab," says Wu. "We have the technology to improve drug delivery, but we need other people's expertise to understand the biology and assess what we develop."

Wu's team has led work relating to a number of conditions, including cancer, diabetes and Alzheimer's disease.

To improve insulin therapy in diabetes, her team has studied intelligent insulin delivery over the last two decades. Recently, they developed a "smart" microneedle patch to help people with diabetes manage hypoglycemia, a potentially dangerous complication of insulin therapy. The patch senses low blood sugar levels and, in response, automatically releases the hormone glucagon, which raises blood sugar levels. The noninvasive and painless device is currently in preclinical development.

Wu says that her team approaches research with the intent to make a difference for patients. "We want to improve patient care, their health and their lives," says Wu.

"After we published the first paper on the microneedle patch, we received multiple emails from patients and relatives asking when and where we were going to run clinical trials. This is an in-demand treatment, which motivates us to work harder and faster toward clinical use."





**Professor Stéphane Angers** 

### Advanced biologics may help treat complications of diabetes

When insulin was discovered 100 years ago, it was the world's first biologic treatment that used a protein to treat disease. A century later, researchers at U of T are also developing advanced biologics to help treat conditions such as diabetic retinopathy, an eye condition that can cause vision loss and blindness that affects about a third of people with diabetes.

An impermeable physiological barrier in blood vessels around the eye – the blood-retina barrier – protects the eve from molecules circulating the body through the blood. But in diabetes, high blood sugar levels cause the barrier to "leak," damaging the retina and causing blindness.

"Right now, there are limited drugs to treat diabetic retinopathy and they don't work for everyone, so there's an urgent need to develop other medications that could benefit patients," says Stéphane Angers, professor and associate dean of research. "We're developing a biologic that uses a completely different mechanism than the existing treatment, and our preclinical research shows that this biologic is very powerful for promoting barrier function."

Angers and his team developed an antibody that regulates a signalling pathway involved in blood-retina barrier function in order to strengthen the barrier. To help bring this biologic treatment to the clinic, he has launched a start-up company to complete the preclinical work, and he hopes that the drug will be ready to start clinical trials within a couple of years.

"Our Toronto-led effort to develop a biologic for people with diabetic retinopathy follows the legacy of Banting and Best," says Angers.

"Being in a drug discovery ecosystem, we're ideally positioned at the faculty to develop new drugs and translate our research into drug therapies."



Associate Professor, Status and Clinician Scientist Marisa Battistella Clinical experience informs drug discovery process

Just as researchers aim to move discoveries into the clinic, clinician-scientists also bring their front-line perspectives back to drug discovery.

"Because we have health professionals and students learning and working alongside those who are focused on scientific discovery, we can cross the bridge from drug discovery to health care," says Dolovich. "It allows us to think about how new drug discoveries are going to impact patients and their care and the professionals who deliver that care. All that information feeds back into the drug discovery process."



Marisa Battistella is a pharmacist and clinician-scientist specializing in chronic kidney disease (CKD). "People with diabetes are at higher risk for other conditions, including CKD, and often take many different types of medication, which may result in drug interactions," she says. Battistella's research focuses on pharmacy practice, including using genomics to guide drug selection and optimizing patient medications, which may also include de-prescribing.

She says having clinical and basic scientists working together helps to spur innovation in drug discovery.

"Clinician-scientists and basic scientists are all trying to improve patient care – that's our ultimate goal. Having these collaborations is really important and they can inform each other in ways to improve research and patient care," she says. "I have the relationships at the hospital to roll out discoveries made in the lab, but we can also explain to researchers at the faculty how we translate research or clinical studies into practice."

Battistella is also active in education, not only as a course instructor and co-ordinator, but also serving as a preceptor and mentor. "Students often ask really good questions or they dig deeper into a particular disease or medication," she says. "Their questioning minds help inform my thinking and help me to think deeply and consider ideas or research questions we could pursue."

With nearly four million Canadians living with diabetes and this number projected to grow over the coming years, U of T students studying both pharmacy and pharmaceutical sciences will play active roles in improving diabetes care in the future, says Dolovich.

"We're proud that we graduate pharmaceutical scientists and pharmacists who will be in a position to help people with diabetes, whether it's in community pharmacy, in hospital, or research settings," she says. "We do our best to prepare our students to take up the challenge and contribute as integral members of the health-care team."

## RESEARCH **FEATURE AWARD**

Professor **Shana Kelley** is among nine professors from across the University of Toronto appointed as Fellows to the Royal Society of Canada – a recognition awarded to the country's most distinguished scholars, artists and scientists.

As University Professor at the Leslie Dan Faculty of Pharmacy, Professor Kelley united materials chemistry, analytical chemistry, and chemical biology to detect biological and cellular analytes with unprecedented sensitivity. Her research spans the basic to applied and has yielded new nanomaterials and biomimetic molecules with advanced properties: it has also produced new medical diagnostic technologies for the diagnosis of infectious disease and cancer.

"I am incredibly honored to join this elite community of scientists and scholars in Canada and greatly appreciate the recognition of my group's work. In particular, this honor highlights the many spectacular contributions of the trainees and scientists I have worked with at the University of Toronto," said Kelley who recently joined the Department of Chemistry at Northwestern University but remains connected to the Leslie Dan Faculty of Pharmacy through a Status-Only

Widely recognized for her ability to build multidisciplinary research teams focused on tackling real-life clinical challenges, Professor Kelley developed a new "liquid biopsy" technology to improve treatment of prostate cancer, the second most common cancer in men.

"We are very excited about our new technologies that essentially allow us to find a needle in a haystack," said Kelley when the Nature Chemistry study was published in 2018. "It paves the way for a straightforward and personalized screening tool that allows clinicians to see if a patient will respond to therapy or not. Our method is also rapid, accurate and inexpensive, which gives it real potential for clinical uptake," she said.



Researchers at the Leslie Dan Faculty of Pharmacy adapted an off-the-shelf glucose meter to potentially detect a range of diseases, but there's still much work to be done before the technology is ready for use outside the lab

## RESEARCHERS ADAPT GLUCOSE METER TO HELP DETECT DISEASES, INCLUDING COVID-19

Written by Eileen Hoftyzer Photos by Steve Southon

Researchers at the University of Toronto, led by Assistant Professor **Keith Pardee** of the Leslie Dan Faculty of Pharmacy, have developed a point-of-care diagnostic test using a widely available glucose meter that can be adapted to diagnose a number of diseases, including COVID-19.

The new gene circuit–based system is described in a new paper published in Nature Communications.

"Advanced diagnostic tests, including COVID-19 diagnostic tests, require some specialized equipment that you really only find in a lab," says **Evan Amalfitano**, a PhD candidate in Pardee's lab and lead author of the study. "A commercial, off-the-shelf glucose meter is a lot cheaper and already widely distributed."

Glucose meters are used to monitor the blood sugar levels of people with diabetes. The system relies on an enzyme, which interacts with an electrode to produce an electrochemical signal. The stronger the electrochemical signal, the higher the blood glucose level.

Yet, while the approach shows considerable promise, there is a significant amount of product development work needed before the technology could be moved from the lab and into the field. That could ultimately make the research of limited utility when it comes to battling the current pandemic, depending on how long it takes to get COVID-19 under control globally. Pardee, an expert in synthetic biology, has developed several cell-free systems that can detect the genetic material of different pathogens, including Zika virus.

"We're interested in extending access to health-care tools geographically to rural or northern communities, as well as globally," says Pardee. "There's also emergency health-care applications, including public health emergencies like what is happening now."

Pardee's lab has focused on developing systems that use optical signals, such as fluorescence or colour change, to indicate when the pathogen is present, but they recently began examining electrochemical signals to expand the applications of these systems.

Amalfitano began studying how to generate electrochemical signals in cell-free systems early in his PhD program, with Pardee calling Amalfitano's idea to take advantage of the existing technology of the glucose meter a "home run."

Because glucose meters are relatively inexpensive and accessible, they are an ideal platform to adapt for different purposes, especially tests that need to be done in remote or low-resource communities. Though it was a simple idea in theory, Amalfitano says it was challenging to get it working in practice – and that he was close to giving up on the idea when his perseverance finally paid off.

To use the system, patient samples are processed to extract and amplify the genetic material present. The sample is then tested for the pathogen's genetic material. A type of genetic switch called a "toehold switch" is activated when it detects the target's genetic material, producing an enzyme that generates glucose. The glucose meter measures the glucose level, which indicates whether the toehold switch was activated and the pathogen's genetic material is present.

The team first demonstrated the system with artificial sequences of RNA. It then successfully developed a panel of tests for the bacterium that causes typhoid fever. Just as they were preparing to publish these results early in 2020, the COVID-19 pandemic started. So, the team considered applying their new technology to the emerging public health emergency.





Evan Amalfitano, a PhD candidate in Assistant Professor Keith Pardee's lab, led a study that described a point-of-care diagnostic test using a widely available glucose meter

- Alex Green, a collaborator from Boston University, designed a toehold switch to target regions of the SARS-CoV-2 virus. The team was able to use the glucose meter to detect the virus in clinical samples – all within the space of just a few weeks. They are now working on streamlining the sample-preparation stage of the system to make it easier to extract the genetic material outside of laboratory settings.
- "Because it is reasonably quick to adapt and the commercial inputs to adapt it are relatively inexpensive, the system reduces the technical burden for diagnostics development," says Pardee. "We're hoping to increase the range of diagnostics that could be built for neglected diseases in low-resource regions of the world and for agricultural diseases."
- The research was supported by the Canadian Institutes of Health Research and the Natural Sciences and Engineering Council of Canada, among others.

## NEW DIGITAL 'ATLAS' TO SUUPORT EFFECTIVE PLANNING OF PHARMACY SERVICES

Written by Nicole Bodnar Photo by Steve Southon

Researchers at the University of Toronto's Leslie Dan Faculty of Pharmacy have launched an interactive atlas that provides a snapshot of pharmacist services across Ontario.

Among the first of its kind in Canada, the **Ontario Pharmacy Evidence Network (OPEN) Interactive Atlas Tool** enables regional comparisons, helping policymakers plan pharmacist services more effectively.

"This tool is arriving at a critical time for decisionmakers," said **Suzanne Cadarette**, an associate professor at the Leslie Dan Faculty of Pharmacy who is the lead scientist and author of the atlas tool.

"It describes the evolution of community pharmacy practice in Ontario, can be used as a guide for the expansion of pharmacist service delivery across Canada, and may help health services delivery pivot in the face of external factors, including the COVID-19 pandemic."

The province began funding several professional pharmacist services in 2007, starting with MedsCheck, a program that remunerates pharmacies for completing medication reviews among patients with diabetes or taking three or more medications for chronic diseases. Ontario now also funds programs in which pharmacists communicate with prescribers regarding drug therapy-related problems, provide smoking cessation counselling services, administer influenza immunizations and provide COVID-19 testing.

In the initial research brief – published recently in the Canadian Pharmacists Journal – the authors describe how the OPEN Interactive Atlas Tool enables a comprehensive analysis of trends and regional differences in professional pharmacist health services delivery.

Using interactive data visualization software, the researchers display large-scale health care administrative data from 2007 to the most recently available date, then manipulate it based on region, calendar year, sex and age. For example, users can click forward or backward by influenza season to compare influenza immunization delivery over time, or play a video loop of the change in flu vaccine delivery by region.



With these features, the researchers found that more women than men aged 65 or older receive influenza immunizations, yet immunization rates are higher among older men.

Future research briefs for each service are in development that will provide broader context across Canada. Cadarette's research team urges other provinces and territories to consider creating similar descriptive atlases of pharmacy services as a starting point for discussion, collaboration and education.

"Community pharmacists are one of the most accessible primary health-care professionals, providing a wide variety of evidence-based care. As such, the utility of a pan-Canadian tool would be tremendous," said **Ross Tsuyuki**, professor and chair of the department of pharmacology in the Faculty of Medicine and Dentistry at the University of Alberta. He is also editor-in-chief of the Canadian Pharmacists Journal.



Suzanne Cadarette, associate professor at U of T's Leslie Dan Faculty of Pharmacy, is the lead scientist behind the Ontario Pharmacy Evidence Network (OPEN) Interactive Atlas Tool

With additional funding, Cadarette hopes to update the atlas annually. Her team is also working on an initial descriptive analysis of the impact of COVID-19 on the delivery of professional pharmacist services.

The OPEN Interactive Atlas Tool was funded by the Ontario Pharmacy Evidence Network (OPEN) program's peer-reviewed Health Service Research Fund, the Government of Ontario and the Leslie Dan Faculty of Pharmacy.



Alison Thompson's media expert and provincial advisory roles contribute to public discussions about challenging topics during COVID-19 pandemic

## EXPERT IN PANDEMIC ETHICS HELPS SHAPE PUBLIC CONVERSATIONS

#### Written by Eileen Hoftyzer Photos by Steve Southon

Science advisory tables and public health experts have been crucial in providing evidence to the government and public to help guide the COVID-19 pandemic response. At the same time, experts in bioethics have also been important voices, engaging the public and decision-makers in challenging conversations about the ethical aspects of these policy decisions. Their expertise has been particularly important in an ever-changing situation in which the science has not always provided clear answers about the best course of action.

"We tend to think of science and ethics as separate

issues, but values can't really be separated in this kind of situation," says **Alison Thompson**, associate professor at the Leslie Dan Faculty of Pharmacy.

### "When there is a lot of uncertainty about the science, ethics becomes really important."

Throughout the pandemic, Thompson has been a frequent expert voice in the media and has participated in a provincial bioethics advisory group. With a research program focused on ethics related to public health, pandemic planning and public engagement in health policy, she has a unique set of expertise for the moment.

These additional roles were time-consuming and often challenging, but Thompson also found them to be valuable learning opportunities and a way to contribute to the pandemic response at a time when it was easy to feel helpless.

"It was rewarding to feel like I was actually doing something, especially during those times when we were in lockdown and felt frustrated about not being able to help," she says. "It was one way to feel like I was contributing to the response."

## Media interviews are important way to shape public conversation

Thompson is an internationally recognized expert in pandemic ethics, and over her career she has worked with the World Health Organization on guidance for communication during outbreaks and with various levels of government to develop pandemic plans and address the ethical issues that may arise.

As COVID-19 dominated the headlines for most of the last 18 months, Thompson was often called on by journalists to comment on the ethical aspects of a wide range of issues, including patient care, vaccine distribution in Canada and globally, vaccine passports and many others.

She wrote op-eds for national outlets and did more than 150 interviews for both print and broadcast media. She also had long background conversations with journalists to help them think through the complex topics they were covering. Thompson says that she was averaging several hours every week on this voluntary media work, but that it was well worth the time commitment.

"When you have a lot of voices weighing in, it's really important for the people who have some expertise in thinking through the complex issues that a pandemic raises to shape some of the public conversation," she says. "It's really about making sure that those ethical conversations are happening in the public space and actually engaging people."

For example, in recent months as governments across the country have deliberated if and how to implement a vaccine passport, Thompson has been interviewed a number of times about the ethical issues that should be considered in such a decision, when clear scientific evidence is not yet available, including ensuring equitable vaccine access in marginalized communities and the right to privacy.

Thompson says that it is challenging to be seen as a trustworthy policymaker during a pandemic when the science is always changing, but being transparent about the scientific and ethical considerations behind decisions can help to build trust and engage the public.

"Public engagement and conversation around health

issues are really important in a democracy," she says. "Ultimately, ethics is about trying to come to a consensus about the right thing to do, and when the science is uncertain, a lot of policy decisions will be made based on values. Talking about these issues has helped people become more aware of this and start to have these important conversations."

## Advisory table provided ethical guidance to government

Thompson also volunteered as a member of the Ontario COVID-19 Bioethics Table, an advisory group established by the Ministry of Health and Ontario Health. The table included experts from institutions across the province to provide government officials with advice and guidance on ethical issues to help with decision-making.

The table drafted briefs that provided ethical frameworks for making policy decisions on topics ranging from drug shortages to vaccine distribution to paid sick days. Thompson and the other members of the table relied on research on pandemic preparedness, social determinants of health, and previous outbreaks, such as the SARS and H1N1 flu outbreaks, to help inform their recommendations.

While the table's recommendations weren't always incorporated into government policy, and there were many lessons to be learned about how to run such a table and conduct research in real time, having an advisory group focused solely on ethics helped increase the field's visibility among decision-makers.

"It really was a really remarkable opportunity to provide advice like that," says Thompson. "It's rare to have a formal bioethics table advise a provincial response, so that was a significant milestone for the bioethics community."

## EDUCATION



The 2020-21 academic year was a time marked by significant shifts in how we teach and learn at the Leslie Dan Faculty of Pharmacy.

I was honored to accept the role of Associate Dean Academic and to assist our planning as we pivoted to a predominantly virtual learning environment. Our faculty and staff collaborated to ensure students and learners received the best possible experience. Through the many challenges we faced, we found opportunities for innovation and growth, ones we will continue to leverage in the years to come.

We also found new depths of resilience and inspiration whether as essential frontline workers, educators, researchers and trainees, or the administrative staff that support our programs and education delivery. We welcomed Assistant Professor Natalie Crown as our new Director of the Doctor of Pharmacy program and announced Associate Professor Carolyn Cummins as the new Director of the Pharmaceutical Sciences graduate program.

## MESSAGE FROM THE ASSOCIATE DEAN ACADEMIC

Although the pandemic disrupted our usual educational delivery, our community rose to the challenges and supported each other in the provision of high quality learning experiences.

It was truly a collective effort that I am grateful to have been a part of.

### Jamie Kellar,

Associate Dean Academic Leslie Dan Faculty of Pharmacy University of Toronto

## FACULTY MEMBERS RECOGNIZED UNIVERSITY-WIDE FOR OUTSTANDING TEACHING AND MENTORSHIP

Professor **Keith Pardee** of the Leslie Dan Faculty of Pharmacy is one of two faculty members honoured with a 2021 Early Career Supervision Award from the University of Toronto.

The award recognizes pre-tenure faculty who over a period of up to six years have demonstrated excellence in graduate supervision.

"It's important to me to do everything I can to support my students' chosen career paths," says Pardee, an assistant professor who holds a recently renewed Canada Research Chair in Synthetic Biology and Human Health.

Pardee joined the Leslie Dan Faculty of Pharmacy in 2016 after completing a postdoctoral fellowship at Harvard University. Since then, the U of T alumnus (he earned his PhD in Molecular Genetics in 2010) has been hard at work in his lab, where he and his trainees create low-cost, molecular diagnostic tools for the health care sector.

Pardee says that part of his lab's mission is to make sure that he prepares students not just for careers in academia, but also for careers in industry or in entrepreneurial ventures.



"I want to see my students thriving in the lab and after they graduate, in whatever path they are choosing," says Pardee, who spends a few days every week meeting with students to work through challenges.

"It's very one-on-one approach," says Pardee. "Everyone needs a slightly different kind of mentorship."

Assistant Professor **Jamie Kellar** of the Leslie Dan Faculty of Pharmacy has been recognized with a President's Teaching Award from the University of Toronto, the highest honour for teaching that the University bestows.

"I was surprised by this award, and I'm delighted to join the teaching academy," said Kellar, who is the associate dean, academic, and an associate professor (teaching stream) at the Leslie Dan Faculty of Pharmacy. "Funding support for teaching stream faculty can be challenging to secure, especially for qualitative health professions research, so I'm also grateful for this opportunity to build out my research program."

The University calls on teaching academy members to discuss teaching issues as they arise, and to advise the vice-president & provost and the director of the Centre for Teaching Support & Innovation. Members also help with the University's assessment of teaching and advocate for teaching excellence.

Kellar said the teaching academy offers an opportunity to learn how other faculties at U of T approach education. "The health professions can be a bit insular. We talk to medicine and nursing, but don't get out of our lane too often," she said. "The academy will provide exposure to world-class faculty with fresh ideas, and some of what we're doing in Pharmacy is broadly applicable, so I hope to share those efforts as well."



Primary care pharmacist and preceptor Heather Hadden works with 2T2 PharmD student Sonia Gupta and registered practical nurse Tatyana Arleta

Pharmacy students interested in direct patient care might typically consider career paths in community or hospital pharmacy. But another route – primary care pharmacy – is a different way to care for patients, working within a health care setting such as a family health team or community access centre.

A rotation in primary care caught **Maeryl Sumagang**'s attention when she was looking at her options for her advanced pharmacy practice experience (APPE) in her final year of the PharmD degree.

"I'm really interested in direct patient care. I think that's where I really excel and what I find most meaningful," she says. "I was very interested in getting experience in primary care because it's a different type of environment to practice in that allows us to utilize our scope of practice in a unique way, and I knew I wanted to have this experience before leaving school."

In May 2021, she started her first APPE rotation at CarePoint Health, an interprofessional health team in

Mississauga, under the supervision of her preceptor, **Heather Hadden**. CarePoint Health includes three full time pharmacists, as well as dieticians, social workers, nurse practitioners, psychologists and other health care professionals, all of which work together to support approximately 70 physicians in Peel Region.

"The culture in primary care is one of teamwork and collaboration, and I really enjoyed that," says Sumagang. "This practice site, and primary care in general, includes a lot of collaboration with other members of the patient's circle of care —not only their family doctor or nurse practitioner but any specialists, community pharmacist and any other health care provider."

### Primary care pharmacists often "jack of all trades"

Pharmacists were first integrated into family health teams in Ontario in 2006, with approximately 200 pharmacists now working in a primary care setting in the province. These pharmacists are embedded within interdisciplinary health care teams to provide comprehensive pharmacy services to physicians and patients.

Different from a community pharmacist, primary care pharmacists provide services to patients and physicians through the health team or centre (rather than a pharmacy). These services include comprehensive medication reviews for patients on multiple medications, providing drug information and education to the other health care professionals on the team and patients, and working with the patient's community pharmacist on their prescriptions.

The number of pharmacists working in primary care has grown in recent years, but rotations in these settings are not yet as common as other direct patient care settings. These in-demand rotations allow students to see a different scope of pharmacy practice from both community and hospital settings.

Heather Hadden (8T4) has been working as a primary care pharmacist for more than 13 years and has supervised a number of learners during that time.

"You have to be a jack of all trades," says Hadden. "Students who really excel have a huge knowledge base and are very good communicators, and they have the confidence to speak with physicians and know that their knowledge is valid."

### Primary care rotation provides learnings that can apply in any setting

Sumagang says that, throughout her ten-week rotation, she was able to gain valuable experience in caring directly for patients and in providing the different pharmacy services offered at the practice site. Much of the day-to-day work with Hadden was helping patients



2T2 PharmD student Maeryl Sumagang

- manage medications, including identifying drug therapy problems and making medication recommendations to prescribers. But she was also involved in taking medication histories, educating patients on how to use properly use their medications, and conducting literature searches to answer drug-related questions from health professionals and patients.
- Being part of an interprofessional health care team that all work together to provide comprehensive patient care also allowed Sumagang to learn about other health care disciplines and community services that she could refer patients to in any pharmacy practice setting.

After the primary care rotation finished in August, Sumagang completed a clinical rotation at Headwaters Health Care Centre in Orangeville, Ontario, and recently started her next one at the Hospital for Sick Children. She says that her experience in primary care will be helpful in any setting.

 "We saw a number of complex patients with a lot of drug therapy problems, and I learned a lot of ways that we can help them. As a pharmacist, you're well suited to provide a wide range of patient care services in a primary care setting," she says.

> "I gained a lot of knowledge and skills in working with complex patients that will be helpful, not just in my rotations but also in my future practice."

> > Leslie Dan Faculty of Pharmacy | 19





Newfoundland pharmacist and PharmD for Pharmacists (PFP) alumni Stephanie Burden made it her mission to offer expanded services to patients in her rural comunity.

## PFP STUDENT NAMED PHARMACIST OF THE YEAR BY CPHA

By: Eileen Hoftyzer

## Stephanie Burden recognized by the Canadian Pharmacist Association.

**Stephanie Burden** had been working as a community pharmacist in rural Newfoundland for several years when she began feeling uninspired with her career. She had earned a Bachelor of Science in Pharmacy from Memorial University, but she was looking for new challenges and wanted to increase her clinical skills. She enrolled in the Leslie Dan Faculty of Pharmacy's PharmD for Pharmacists Program, and almost immediately the program opened her eyes to the varied career paths that pharmacists can have.

"When I met the other students in my cohort, I was astounded that there were so many specialties and different types of pharmacists," she says. "All of a sudden, it was like a light bulb moment for me."

After that light bulb moment, while still studying at the Leslie Dan Faculty of Pharmacy, she opened her own pharmacy that would allow her to expand her practice while staying in rural Newfoundland. She began offering services that were uncommon in her community, such as compliance packaging and medication reviews, and focused on preventive health care, including blood pressure and blood glucose monitoring and immunizations. "These services are new to my area, but they aren't new in community pharmacy," says Burden. "I want to make sure that my rural patients are not underserviced and that they receive the same level of care as anyone else in any other part of the country."

These services, and her commitment to providing her patients with high quality care and advice before and throughout the COVID-19 pandemic are some of the reasons the Canadian Pharmacists Association selected her as the 2021 Pharmacist of the Year. The award is given to a pharmacist who demonstrates leadership and exemplifies the expansion of the pharmacist role in health care.

"For me, this award means that the small things done day-in and day-out really add up to the big things," says Burden. "I'm doing what lots of pharmacists are doing, taking care of our patients every day, and that adds up over your career."

Kathy Vu, director of the PharmD for Pharmacists profession. program, says Burden epitomizes the vision of the program to train leaders in pharmaceutical care. "It "In pharmacy right now, we have incredible is absolutely wonderful to see one of our students opportunities out there once you start looking for them," achieve personal success with this prestigious award she says."And sometimes programs like these can be while helping to advance health care in her community, the eye opener that you need to see what you can do." especially through the COVID-19 pandemic," Vu adds. "She has effectively combined clinical knowledge and skills with entrepreneurial skills, passion and social media experience to advance pharmacy practice for her patients." Burden's clinical and social media knowledge have been particularly important because of her rural practice, even more so during the pandemic. Some of her patients live far from the pharmacy and don't come in person regularly; even before the pandemic, she would connect with these patients virtually and provide advice and education through video.

But her comfort with social media and in front of a camera became even more important when her

contact with all patients was limited because of the pandemic. She used her knowledge and experience to create videos to explain public health guidelines to her patients, how to properly wear a mask, and how to stay safe and calm.

"I'm a problem-solver, and my patients like to come to me with questions. I was able to help them understand what to do for COVID, and it resonated with them because they trusted what I was saying," says Burden. "When they were being bombarded with information, they could rely on me to help them understand what was most relevant to them."

# Burden credits the PharmD for Pharmacists program for exposing her to wide possibilities for her practice and reinvigorating her passion for the profession.



## COMMUNITY



In June 2021 the Leslie Dan Faculty of Pharmacy established an EDI Working Group to develop a strategy and draft terms of reference for a standing committee that will be integrated into our governing Faculty Council.

Co-lead by Professor Jillian Kohler and Lachmi Singh, Director, Education Programs and Administrative Services, the EDI Working Group will make recommendations on how to support a healthy and inclusive learning and work environment for everyone at the Faculty.

### The recommendations will provide evidence-based guidance on how we can:

- Develop more EDI training opportunities for all members of our community to address issues of unconscious bias, mistreatment and implementation of EDI into practice.
- Further incorporate principles of EDI in our recruitment, retention, and career advancement practices with regards to faculty, staff and students.
- Ensure the makeup of our committees and decision-making bodies is inclusive and works to reflect the diversity of our department.

### MESSAGE **FROM THE** EQUITY, DIVERSITY, **AND INCLUSION WORKING GROUP**

- Assure that our programs and curricula prepare our graduates to meet the needs of the diverse communities they will serve in their careers in Canada and around the world.
- Create a data strategy to collect, maintain and interpret data on EDI.
- Develop a mechanism/framework for feedback and • complaints processes within the Faculty.

"The strategy will provide Dean Dolovich with recommendations on how to support EDI in key areas such as training and education, recruitment and career advancement, and governance," said Jillian Kohler who is also Director of the WHO Collaborating Centre for Governance, Transparency and Accountability in the Pharmaceutical Sector.

The EDI Working Group will finalize its recommendations by January 2022.

## **OUR DONORS**

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## **STUDENT VOICE:** REFLECTION **ON JOINING THE COVID 19 VACCINE CAMPAIGN**

Pharmacy students at the Leslie Dan Faculty of Pharmacy have played a key role in supporting the provincial vaccination campaign. Working with the University Health Network (UHN)/ U of T St George Campus Clinic pharmacy students helped host COVID-19 vaccination clinics throughout the Greater Toronto Area. The students share their remarkable experiences and reflections:

Our pharmacy team had the important role of ensuring the safe handling and preparation of vaccines for clinics, which requires careful precision and technique. As we worked with other health care professionals to deliver vaccines into the arms of Canadians, we observed the many fascinating shapes and forms that a clinic can take.

By: Abbas Al-Jabri (2T3), Zena Al-Janaby (2T3), Paulina Kmiec (2T3), Anna Kukovska (2T4), Caitlin Lam (2T3), Vivian Le (2T3), Annie Li (2T3), Pooja Patel (2T4), Jenna Rizzo (2T3), Veronica See (2T3)

Photos provided by: Linda Dresser

### Accessible and culturally appropriate vaccine deliverv

In March 2021, the U of T exam centre on McCaul Street was transformed into a UHN vaccination site. In addition to local vaccination efforts, this site hosted clinics aimed to improve access to special populations including migrant workers, Indigenous peoples and clients of the Hospital for Sick Children. To ensure these clinics were safe and low-barrier spaces, multilingual translators, sensitivity training, modesty rooms, cultural rituals (i.e., smudging) and fun activities (ice cream trolleys and photo booths) were incorporated. Implementing these small adjustments to the clinic demonstrated our respect for the community and their traditions, allowing members to feel safe and equitably acknowledged. Through the success of these inclusive clinics, we came to appreciate that responding to people's diverse needs is instrumental to facilitate trust in seeking healthcare.

As vaccination rates climbed across Ontario, there were notable differences in vaccine uptake within marginalized communities. In April 2021, 22 per cent of residents in Toronto's more affluent St. Clair and Rosedale neighbourhoods received at least one dose, in contrast to 5.5 percent in the Black Creek area. This may owe to demographics, as neighbourhoods with higher percentages of South Asian, Black, and Latin American groups were associated with lower rates of vaccination. Given this disparity, a variety of pop-up clinics designed to provide appropriate cultural and religious care were held in racialized areas. For example, we supported the Jamaican Canadian Association and Black Physicians' Association of Ontario to host clinics with an authentic Afro-Caribbean atmosphere in the Black Creek community and offered wrap-around care such as blood glucose testing and blood pressure monitoring. The first Canadian Emancipation Day celebrations happened around us, which included live music, steel pan drumming and inspirational speeches. All the pop-up clinics had staff unlikely to get the vaccine, and an additional 9.4 per cent of Canadians were unsure.. Reaching this group is and volunteers from local community organizations and essential to achieving herd immunity and protecting the welcomed patients with a familiar and safe atmosphere to help alleviate the stress associated with vaccinations. most vulnerable. Clinics such as these demonstrated the importance of collaboration and community engagement.

### More than 26,000 vaccines delivered in one day at Toronto mass vaccination clinic

The vaccination efforts have shed light on the accessibility and cultural barriers in the healthcare Mass vaccination clinics at Nathan Phillips Square and system. While it is far from equitable, the variety of Scotiabank Arena allowed us to be part of something clinics hosted in this unprecedented time of need for that brought all of Toronto together. While we were access has opened our eyes to the expansive potential expecting these large-scale events to be chaotic of the healthcare system to become a safe space for and stressful, they were exceptionally organized and all. From preparing vaccines in the backrooms of uplifting. These clinics offered live music, free ice churches to seeing doses administered in a candle lit cream, raffle tickets and free transportation which basement - these experiences have taught us resilience created a joyful environment and made vaccines more in adapting to changing environments, and commitment accessible. At Scotiabank Arena, an impressive world to a high standard of care. Pharmacists at the forefront record of 26,771 doses were administered in one day. of vaccination efforts are in a uniquely accessible position to correct misinformation. We have observed Nearing the end of the summer, traffic to pop-up clinics the importance of starting from a place of empathy declined despite known communities with belowlistening to patients and supporting cultural needs to average levels of vaccination. A clinic hosted in early earn the trust of hesitant groups.

August for youth sports clubs yielded low turn-out even with incentives such as free haircuts and food. This may As mass vaccination clinics wind down, it is our be a symptom of the vaccine hesitancy that still lingers responsibility to continue reaching out to communities despite Toronto's impressive vaccination rates. A survey and providing solutions that address the inequities and from June indicated that 14 per cent of Canadians were challenges in our healthcare system.



### Shedding light on health care barriers amidst a pandemic



Max Yaghchi (left) and Narthaanan Srimurugathasan, both PharmD graduates in 2020, co-founded Pharmacy Awareness of Indigenous Health in 2018

## **STUDENT GROUP HELPS IMPROVE CARE FOR INDIGENOUS PATIENTS**

### Pharmacy Awareness of Indigenous Health centres on health care barriers and cultural competency

A student-led organization at the Leslie Dan Faculty of Pharmacy is increasing awareness of Indigenous health and cultural competence among student pharmacists.

#### Pharmacy Awareness of Indigenous Health (PAIH)

shares resources to educate students about barriers that Indigenous people often face in health care and has partnered with Indigenous organizations to deliver education on health care topics.

"As pharmacy students we want to do good, but we need to be mindful that working in a health care setting is not the same as doing good for a community," said Max Yaghchi, co-founder and former executive member of PAIH. "Simply providing a service might not be enough for our patients, especially those facing health care barriers, and we need to be more patient-centred."

Yaghchi and Narthaanan Srimurugathasan, both PharmD graduates in 2020, co-founded PAIH in 2018. As non-Indigenous students, they wanted to complement the topics explored in the third-year elective focused on Aboriginal health and healing, and offer opportunities for students who didn't take the elective to learn about Indigenous health and increase their cultural competency.

PAIH's executive members, who have all been non-Indigenous, share resources and articles focused on Indigenous health care — particularly as they relate to barriers to access such as prejudice, racism and lack of cultural understanding.

They also connect pharmacy students with cultural events led by Indigenous student groups at U of T and other organizations.

"We wanted to go further than just health care and to have more of a human connection and an opportunity for pharmacy students to grow in different areas, like cultural competency," said Yaghchi. "A lot of the resources we share are from Indigenous people and organizations so students have access to their expertise."

The group has also undertaken larger initiatives to a better understanding of Canada's history with bridge the gap between pharmacy services and Indigenous people and how non-Indigenous people Indigenous people. They have presented to staff at the Native Canadian Centre of Toronto about opioid use give back." and naloxone kits, as well as to Native Child and Family Services of Toronto about sexual health. In both cases. "Ideally, more Indigenous people are represented in staff from the organizations reviewed the presentation in pharmacy so that they can share their culture, what advance to ensure it was culturally appropriate. they want and what they think is the best course of action for Indigenous patients."

One of the group's biggest initiatives has been creating infographics to increase awareness of the Non-Insured Health Benefits (NIHB) program for First Nations and Inuit people. This federally funded program covers the costs of prescription medications, medical supplies, devices and equipment, as well as eligible over-thecounter products recommended by a pharmacist.

As a student, Yaghchi worked with Kenny Tan, assistant professor at the Leslie Dan Faculty of Pharmacy and faculty liaison of the PAIH, in a community pharmacy near the Native Canadian Centre of Toronto. They served a significant Indigenous population and were familiar with the NIHB program, but many pharmacists are not.

To raise awareness. PAIH partnered with Whole Health Pharmacy Partners to develop infographics for both pharmacists and Indigenous patients that easily and visually explain the program and what is covered.

The infographics have been translated into French and shared nationally, and have been included in various courses at the Leslie Dan Faculty of Pharmacy and University of Waterloo pharmacy school. The PAIH recently ran a fundraiser to translate the patient-facing infographics into Cree and Ojibway.

While PAIH aims to improve understanding among non-Indigenous pharmacists, Yaghchi says that the group's long-term vision is that more Indigenous students will pursue careers in pharmacy — both of which will improve patient care.

"As non-Indigenous people, we need to do our part to build a relationship between pharmacy and the Indigenous community," said Yaghchi. "Maybe through have benefited, we can think about what we can do to



"Considerable finesse and technique" are required to draw doses from each vial of vaccine, says Linda Dresser, pharmacy director of a vaccine clinic hosted by U of T on the St. George campus

## **'SUPERSTAR' PHARMACISTS PLAY CRITICAL ROLE AT VACCINE CLINIC HOSTED** ON U OF T'S ST. **GEORGE CAMPUS**

Written by Eileen Hoftyzer Photos by David Dubins

Two hours before the COVID-19 vaccine clinic hosted on the University of Toronto's St. George campus opens, pharmacists show up to receive the vaccines from the university's hospital partners.

**Linda Dresser**, the pharmacy director of the clinic and an assistant professor at the Leslie Dan Faculty of Pharmacy, leads the 20-person team whose responsibilities include ensuring the cold chain is maintained throughout the vaccine's transport.

The team stores and monitors the vaccine vials inside the clinic's fridges, then prepares the supply using a careful aseptic technique. Each vial must be handled cautiously - no shaking, swirling or dropping.

"Considerable finesse and technique are required to reliably draw multiple doses out of each vial, so we trained a group of pharmacists to repeat these steps multiple times," said Dresser, who is also on staff at University Health Network (UHN).

Pharmacists at the Toronto Public Health-approved clinic - a satellite site of UHN's network of vaccination centres that's managed and operated in collaboration with U of T and Sinai Health – are also responsible for managing the process to ensure empty vials are recorded as empty, and then safely destroyed.

The steps form part of the careful and critical process led by pharmacists to prepare and manage doses at the vaccination clinic near McCaul and College Streets, one of three planned vaccine sites across U of T's three campuses.

The St. George clinic welcomed its first patients earlier this month. By the end of March, it is expected to deliver more than 1,000 doses per day. "We've essentially opened a pop-up pharmacy in a short period of time," Dresser said.

"If these behind-the-scenes processes to prepare the vaccine don't work really well, it could lead to downstream issues such as long waits or delays in vaccine administration."

Dresser and her colleagues issued a call to pharmacists **Lynn Wilson**, professor and vice-dean of clinical and across the Toronto Academic Health Sciences Network faculty affairs at the Temerty Faculty of Medicine, (TAHSN) to work at the new clinic. The network added: "The U of T health sciences community is includes a large number of pharmacy faculty, alumni committed to helping with the vaccine effort – one of the most important public health initiatives of this and preceptors. century – and pharmacy is essential to our collective success."



Natalie Crown and Linda Dresser, both assistant professors in the Leslie Dan Faculty of Pharmacy, prepare for a training session at the U of T St. George vaccine clinic

Dresser worked with a large group of pharmacy faculty, staff and students to train clinic staff, develop training materials and work on operations and logistics. The team included: Associate Professor David Dubins. Assistant Professor Natalie Crown, Assistant Professor Sandra Bjelajac Mejia, Assistant Professor Marcia McLean and Peter Zhang, a combined PharmD/MBA student.

During each in-person session, a pharmacy technician provided a refresher on aseptic technique. demonstrated the vaccine preparation steps, coached the pharmacists as they practised doing these steps themselves and built confidence in handling the delicate vials.

While using aseptic technique is part of every pharmacists' scope of practice, for many it is not a routine part of their practice.

"You can imagine the pressure to meet the demand while working with a temperamental product," Dresser said.

Lisa Dolovich, dean of the Leslie Dan Faculty of Pharmacy, praised the collaboration between the faculty and pharmacists across the university and TAHSN. "The speed with which we have come together to effectively open the clinic has been truly impressive." she said.

As the vaccine clinic scales up its operations, Dresser anticipates opportunities for pharmacy technicians, pharmacy students and other health-profession learners to help.

Pharmacists may also participate in injections and follow up with vaccine recipients.

"We know there are many students waiting to lend their support," said Jamie Kellar, an associate professor and associate dean, academic at the pharmacy faculty. "We aim to bring students from across the health disciplines into the space, both to contribute to their learning as well as to build capacity to support the province-wide vaccine rollout."

Erin Bearss, the medical director of the St. George COVID-19 vaccine clinic and assistant professor in the Faculty of Medicine's department of family and community medicine, also saluted the pharmacists working on site.

"The role of pharmacy as part of the interdisciplinary team is absolutely critical," she said. "Our pharmacists are superstars."

## **BY THE NUMBERS**

Тор

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The Leslie Dan Faculty of Pharmacy is recognized as one of the top faculties of pharmacy in the world

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57 Staff

**38** Continuing Faculty

**18** Part-time Faculty

85 **Community-based** and Affiliated Faculty

### **OUR PROGRAMS**

Enrolled: 957 Graduated: 234

**PharmD** 

Graduated: 1

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**Enrolled:** 160 Graduated: 35 **PharmD** for **Pharmacists** 

MSc • PhD

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Enrolled: 98 Graduated: 89

Enrolled: 142 50 MSc, 92 PhD Graduated: 23

Enrolled: 59 Graduated: 18

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- 5 Other

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