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From Research to Real-World Impact

Meet the innovators bringing game-changing medical treatments and technologies to patients in need

UIC UNIVERSITY OF ILLINOIS COLLEGE OF MEDICINE

dean's message

PHOTO: DIANE M. SMUTNY

ONE OF OUR CORE MISSIONS AT THE UNIVERSITY OF ILLINOIS COLLEGE OF MEDICINE is educating and training the next generation of physicians, scientists, and healthcare leaders. Our faculty not only share and pass along their knowledge to our students as teachers and mentors, but also provide world-class clinical care to our communities through our hospital and clinics. And the College's faculty research portfolio is significant, with $209 million in externally sponsored funding awarded to us in fiscal 2023, representing 41% of UIC's total funding of $509 million for the year.

Through education, we produce physicians and scientists who will impact the world. Through clinical care, we treat and heal the sick in hopes of keeping our communities safe and healthy. We also push to translate research discovery to change the lives of our patients. We explore the process of translating innovations in this edition of *Illinois Medicine*, particularly from the entrepreneurship perspective, where we develop novel diagnostics, therapeutics, and devices. We give you insight into the process of going from idea to marketplace, whether it is a new drug, a new medical device, or new medical software. You'll take a look at our pipeline of medical innovations that are making their way through the development process before—hopefully—hitting the market.

In this edition, we take a deeper dive into several of these discoveries and efforts, including exploring the work of Dr. Bellur Prabhakar supported through a recently launched company, West Loop Innovations, which was formed in partnership with healthcare investment firm Deerfield Management. Dr. Prabhakar's team is developing an innovative therapy that harnesses the body's natural defenses to treat lupus and other autoimmune diseases. We also learn about Dr. Sandeep Jain's groundbreaking dry-eye research that launched a Chicago-based company, Selagine Inc.

Researchers in the laboratory of Dr. Deepak Shukla are developing new ways to fight the herpes virus, while Dr. Bin He and his team are turning a genetically engineered version of the virus into an unlikely ally in the war against cancer. A mental wellness app, developed by Drs. Pauline Maki and Jenna Duffecy, screens pregnant and postpartum women of color from low-income Chicago communities for depression and anxiety while providing them the tools and support they need to thrive. Another app—developed by Drs. Alex Leow, Peter Nelson, and Olusola Ajilore—uses our smartphones to track our mental and cognitive health.

We also teach our students about innovation, which you will read about as we explore our College of Medicine's Innovation Medicine Program. Our students learn to identify a problem, design a product to help solve the problem, and then develop potential commercial solutions.

I hope that you enjoy this edition, and I look forward to your continued engagement with your College of Medicine.

Mark I. Rosenblatt, MD, PhD, MBA, MHA '19
G. Stephen Irwin Executive Dean, College of Medicine
CEO, University of Illinois Hospital and Clinics
Distinguished Professor, Ophthalmology and Visual Sciences

Pipeline

Moving biomedical breakthroughs from the lab to the marketplace

From an islet-cell therapy that prevents dangerous blood sugar drops in people with Type 1 diabetes to a novel treatment for dry eye disease, the College of Medicine's entrepreneurial pipeline is **accelerating the delivery of game-changing medical treatments and technologies** for patients in need.

IMAGINE AN EYE DROP WITH ANTIBODIES GENERATED FROM THE PLASMA OF THOUSANDS OF HEALTHY HUMAN DONORS—antibodies that can zero in on autoimmune inflammation to relieve the burning pain and light sensitivity caused by severe dry eye disease. A life-transforming therapy that replaces malfunctioning pancreatic islet cells with healthy donor cells to prevent severe hypoglycemia in patients with uncontrolled Type 1 diabetes. An innovative treatment that helps the body's immune system heal itself from autoimmune diseases such as rheumatoid arthritis and lupus.

These medical advances—which have immense potential to enhance human health and well-being—all began as innovative concepts or breakthrough discoveries by College of Medicine faculty members and their students. Along with scores of other innovations, these groundbreaking treatments are making their way through the College of Medicine's entrepreneurial pipeline to address humanity's most urgent unmet health needs.

"Our fundamental goal at the College of Medicine is to improve health through outstanding education, research, clinical care, and social responsibility," says Executive Dean Mark I. Rosenblatt, MD, PhD, MBA, MHA '19. "We constantly strive to take advantage of findings made in our laboratories and clinics to improve the lives of patients through new technologies, whether they become cures or more effective diagnostics, therapeutics, devices, or bioinformatics."

The robust innovation environment at the University of Illinois Chicago—and particularly at the College of Medicine—has long yielded game-changing commercial products. Today, UIC has three major drugs on the market: an anti-HIV drug sold by Janssen Therapeutics; Tice BCG, a bladder cancer drug in the Merck portfolio; and an improved shingles vaccine developed by former faculty member Abbas Vafai, PhD, at the College of Medicine's Rockford campus in the late 1980s.

Dr. Vafai's work on the shingles vaccine was further developed by pharmaceutical giant GlaxoSmithKline (GSK) and marketed as Shingrix® through a UIC licensing agreement. Approved by the Food and Drug Administration in 2017, Shingrix has an efficacy rate of over 90% relative to the 51% efficacy rate of its predecessor, Zostavax. Shingrix is now recommended by the Centers for Disease Control and Prevention for adults aged 50 and over and protects millions around the globe from the debilitating pain of shingles and postherpetic neuralgia. In addition to significantly safeguarding public health, Shingrix has become a multimillion-

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Keeping ideas with commercial potential confidential as long as possible helps maximize market exclusivity and the time needed to develop a product, build a business, and get into the marketplace.

Suseelan Pookote, PhD
Senior director,
Office of Technology Management

PHOTO: DIANE M. SMUTNY

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dollar blockbuster therapeutic for GSK—and currently ranks among the top royalty-generating technologies at UIC, providing revenue that helps the university fulfill its academic mission and maintain its stature as a top public research institution.

"For the College of Medicine, commercializing innovation is not about making money but about conducting research that enhances the health and welfare of individuals, communities, and society," says Bellur S. Prabhakar, MSc, PhD, senior associate dean for research and associate dean for technological innovation and training. "Revenue generated through medical entrepreneurship enables us to offer more scholarships for students, provide seed funding for research projects, train the next generation of clinicians and scientists, and continually invest in more innovative ideas."

The College of Medicine's research goals focus, in part, on translating high-impact biomedical and behavioral discoveries into clinical applications. With their strong translational research skills, COM's clinical investigators are well positioned to play a pivotal role in drug

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>
> **Peter Pfanner**
> *Innovation Center executive director, associate vice chancellor for innovation, and COM's medical device development director*

PHOTOS: DIANE M. SMUTNY

and device development as medical entrepreneurs.

While the journey from idea to commercial medical product can be long and filled with challenges, the College has worked to create a strong ecosystem that encourages innovation and provides the framework needed for entrepreneurial ventures to flourish. COM partners with collaborators across UIC, and has an entrepreneur-in-residence program to help faculty members navigate commercialization pathways, from licensing new technologies to launching startups.

Safeguarding Innovations

The first step in the entrepreneurial journey is a critical one: putting safeguards in place to protect all intellectual property (IP) associated with new treatments and technologies. This is where the Office of Technology Management (OTM) comes in. A UIC service, OTM works to commercialize the research and educational activities of faculty members and their students at the university's Chicago, Rockford, and Peoria campuses.

"Keeping ideas with commercial potential confidential as long as possible helps maximize market exclusivity and the time needed to develop a product, build a business, and get into the marketplace," explains OTM Senior Director Suseelan Pookote, PhD. "One of our key functions is to review faculty research results before they are presented, published, or even informally discussed in nonconfidential communications to identify ideas that we should protect."

In the U.S., inventors have up to one year to apply for federal patent protection after the public disclosure of an invention. From Europe to Asia, other countries are not so forgiving and will not entertain IP protection once members of the public learn about the existence of an innovation.

The OTM serves multiple colleges on the Chicago campus—although the College of Medicine is its largest and most productive client. COM provides more than 65% of the products currently in UIC's clinical pipeline of therapeutics, vaccines, and devices. OTM provides a broad array of support services, from conducting marketing analyses and developing scalable business models to wooing potential investors and finding licensees. Generating licensing revenue of more than $20 million annually over the past decade, the OTM is the university's conduit for transferring technology to industry and/or faculty startup enterprises through licensing agreements.

All research universities include the pursuit of scholarship in their missions. Sharing new knowledge for the greater good is imperative, and the focus on faculty scholarly publications within universities remains a strong incentive for career advancement, motivating academic investigators to submit manuscripts to high-impact journals as quickly as possible. But to translate these discoveries requires critically important patent protection that enables commercialization and impact. Dr. Prabhakar—a technological innovator and multiple patent holder—has worked hard to make COM faculty members more knowledgeable about the commercialization and entrepreneurial process.

"Protecting ideas prior to publication allows our clinicians and scientists to extract the full value of their research to make a difference in

improving human health," he says. "To that end, we have created a culture of entrepreneurship that begins with faculty disclosing their inventions to the OTM."

From 2014 to 2023, about 80% of COM invention disclosures resulted in patent application filings with the U.S. Patent and Trademark Office, an agency of the U.S. Department of Commerce. Of those applications, about 25% yielded coveted patents to maintain inventor rights, with 75% of these patented COM medical products leading to licenses that continue to generate revenue for the university as well as the inventors.

While COM possesses a strong life-sciences portfolio of commercial products, there is room for more growth, according to Dr. Pookote. "While quality disclosures from COM have been steady over time, we are always looking for more," he points out. "We are here to help. We encourage faculty to reach out to us early and often."

On average, COM innovations result in 6 to 16 licenses annually, with faculty inventors establishing 1 to 4 startups each year.

The OTM also works with the College of Medicine to cultivate and manage research collaborations with industry to accelerate the development of COM-originated medical products.

In 2023, COM celebrated noteworthy progress toward commercialization due to corporate and faculty startup partnerships. In March of that year, Grifols, a global leader in plasma-derived medicines, announced its collaborative agreement with Selagine, founded by B.A. Field Professor of Ophthalmology Sandeep Jain, MD, for the development and commercialization of immunoglobulin eye drops to treat dry eye disease. In June, the FDA approved CellTrans' Lantidra (donislecel), the first allogeneic (donor) pancreatic islet cellular therapy made from deceased donor pancreatic cells for the treatment of brittle Type 1 diabetes. José Oberholzer, MD, founder and president of CellTrans Inc. and the principal investigator of the islet transplant clinical trials completed at UIC, launched CellTrans out of his scientific research group at UIC. In October, Deerfield Management—a healthcare investment management firm collaborating with UIC through a company called West Loop Innovations—announced its first project to develop an innovative antibody treatment for autoimmune diseases based on research conducted in Dr. Prabhakar's lab.

Bringing Ideas to Life

Home oxygen therapy helps people with respiratory conditions breathe easier. For individuals with chronic obstructive pulmonary disease (COPD) and hypoxemia, supplemental oxygen can improve health outcomes and quality of life. Yet the highly volatile nature of oxygen also poses a fire hazard in the home and in enclosed spaces—especially for patients who smoke. Most people breathe in-home oxygen via a nasal cannula connected to oxygen-generating or oxygen-storage equipment. The nasal cannula, not typically airtight, allows oxygen to leak into the surrounding air—creating an oxygen-rich environment with the potential to ignite at the slightest puff of a cigarette. To make matters worse, patients who smoke often neglect to turn off their oxygen concentrator machines, which pull oxygen out of the air. When they remove their nasal cannulas to smoke, more oxygen escapes, creating a very unstable situation.

Pulmonologists like Professor of Medicine Israel Rubinstein, MD, routinely prescribe home oxygen therapy for COPD patients with lung problems due to a history of lifelong smoking. But many individuals will not or cannot give up the addictive habit while on continuous oxygen therapy—even when warned of the risks. Dr. Rubinstein believed there had to be a better way to protect patients, as well as family members, neighbors, pets, and first responders from serious flash burns, inhalation injuries, and/or death. So he reached out to the UIC Innovation Center to help him create an oxygen therapy safety device.

Located in a former Jewel-Osco grocery store building on the UIC campus, the Innovation Center solves real-world problems by working on real-world projects through corporate-sponsored classes, labs, and programs for students. Operating on the premise that innovation is a teachable, learnable process, the center brings together interdisciplinary teams of students, staff, and faculty members who use their minds and hands to invent, experiment, and innovate.

The practice of innovating involves deep learning, obtaining feedback, prototyping to validate hypotheses, and pitching innovative technology. Not only does the center inspire students to become innovators, but it also helps College of Medicine faculty entrepreneurs like Dr. Rubinstein through the entrepreneurial pipeline—wherever they are in the process.

"What we are seeing now are more clinicians and scientists holding patents and becoming innovators and entrepreneurs. They are taking more control of driving innovation to advance their fields," notes Innovation Center Executive Director Peter Pfanner, associate vice chancellor for innovation and COM's medical device development director. "The Innovation Center has the resources and expertise to help inventors convert promising ideas into actual, tangible 'things.'"

The Innovation Center has four dedicated medical R&D laboratories that focus on products and services: a urology lab; an Ophthalmic Research in Bioengineering, Innovation and Technology lab referred to as the ORBIT lab; a healthcare applications lab dubbed "HAL"; and a medical accelerator devices lab known as "MAD." It was in the MAD lab that Dr. Rubinstein's idea gained traction.

"Dr. Rubinstein came to us with a problem, and we collaborated with him to develop a viable solution," explains Charles Frisbie, MBA, director of the Innovation Center's medical device labs.

Frisbie served as the business and market analysis lead on the project

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Michael T. Flavin, PhD
Research professor in the Colleges of Medicine and Pharmacy and a staff member at the university's Discovery Partners Institute

PHOTO: DIANE M. SMUTNY

and assembled a team that included a bioengineer and an industrial designer. In a year's time, the Innovation Center-based group developed and validated a proof-of-concept prototype for a wearable device they named the "Smart Bolo."

Worn around the neck like a bolo tie, the smart device's flex sensors sit above and around the patient's ears to monitor the correct placement of the nasal cannula. If the user removes the cannula without turning off the flow of oxygen or the cannula comes loose while the patient is sleeping, the Smart Bolo simultaneously triggers an alarm on the oxygen concentrator equipment and shuts down the flow of oxygen.

More than 1.2 million people in the United States receive oxygen therapy. The Smart Bolo has the opportunity to be packaged as a standard safety measure for every home oxygen user. With an estimated market size of $2.5 billion in 2020, the global medical oxygen concentrator market size is expected to reach $5 billion by 2026.

All of this information and more is highlighted in the investor pitch deck developed by Frisbie and the Smart Bolo team.

"Not only did we help Dr. Rubinstein take the project to the next step," says Frisbie, "but we also helped him tell an engaging story about his innovation in understandable lay audience terms to attract the interest of potential investors."

Dr. Rubinstein is now working to procure innovation or small-business funding to support additional translational work to move the entrepreneurial project further along the path toward commercialization.

Faculty Startups

On March 6, 2023, Dr. Jain made a major leap forward in his quest to develop novel therapeutics for patients with debilitating ocular diseases. On this late winter day, his company, Selagine, a UIC spinout company, announced that it had entered into

a global collaboration and licensing agreement with Grifols Inc.—a leading pharmaceutical firm based in Barcelona, Spain—to develop and commercialize a breakthrough therapy for dry eye disease. This strategic alliance has the potential to deliver a more effective and much-needed treatment for a condition that affects more than 100 million people worldwide.

The culmination of more than a decade of cutting-edge research in Dr. Jain's lab, this novel therapeutic targets the inflammatory and immunological factors underlying severe dry eye disease. By securing patent protection for his innovative treatment and demonstrating proof of concept in preclinical studies, Dr. Jain had taken care of two key elements that were critical to moving his idea through the entrepreneurial pipeline to the marketplace to improve eye care.

"These are some of the important clues that tell me that a new technology has good commercial potential," explains Michael T. Flavin, PhD, founder of COMassist, a program designed to help translate the discoveries of COM faculty and their students into first-ever products, services, and technologies. "Dr. Jain had made significant progress, and his technology was ripe for commercialization when I began working with him. Using my experience in creating early-stage ventures, I helped him start up and develop Selagine."

With its corporate headquarters on Taylor Street, Selagine has stayed close to the College of Medicine. The company is currently working to secure R&D laboratory space in the UIC Incubator Laboratory Facility, a startup incubator that supports UIC and local biotech entrepreneurs looking to develop their ideas and technologies into sustainable businesses.

Dr. Flavin relies on his own biotechnology venture experience to advise COM faculty-led teams on how to start, finance, and develop their own startup companies. In 1999, the successful serial entrepreneur founded Advanced Life Sciences, a biopharmaceutical company focusing on new drugs to fight infection, inflammation, and cancer. Six years later, the company completed a $35 million initial public offering (IPO) and several rounds of follow-on funding to advance drugs through clinical trials, including Restanza (cethromycin), a novel once-a-day oral antibiotic in new drug application-stage development for the treatment of respiratory tract infections. In 1987, Dr. Flavin created MediChem Life Sciences, a drug discovery and development company for the pharmaceutical industry. In 2000, the company completed a $54 million IPO. Two years later, it was acquired by deCODE genetics to build a "gene map to drug" business model.

Dean Rosenblatt saw an opportunity to tap into Dr. Flavin's entrepreneurial expertise. So he recruited Dr. Flavin as an entrepreneur-in-residence to help COM's enterprising faculty advance their innovations to the marketplace.

"I see Mike as a catalyst who works with others here at UIC and COM to accelerate progress, especially for mature projects," says Dean Rosenblatt. "He helps make the learning curve less steep, allowing dreams to come true for faculty hoping to make a difference in improving patient care with new technologies."

In 2020, Dr. Flavin joined UIC as a research professor in the Colleges of Medicine and Pharmacy and a staff member at the university's Discovery Partners Institute, which conducts applied research and development and launches new businesses built on university technologies.

In these roles, Dr. Flavin has facilitated the launch of 13 companies. Nine of these startups originated in COM's departments of ophthalmology, neurology, and pediatrics. He also helped four additional firms founded by College of Medicine faculty members secure licensing agreements from the university and pitch their companies to investors.

Often working one-on-one with faculty and their students, Dr. Flavin offers an array of personalized services that address specific aspects of the commercialization process, such as evaluating technologies in development, initiating the incorporation of startup companies, and assisting with proposals for federal technology funding from sources such as the Small Business Innovation Research (SBIR) and the Small Business Technology Transfer (STTR) grant programs—also known as "America's Seed Fund." Dr. Flavin works closely with the UIC Office of Technology Management and the UIC Innovation Center to get faculty-initiated projects off the ground.

"Faculty entrepreneurs yearn to see their research discoveries turned into products that meet unmet medical needs, but they may not have the experience when it comes to commercialization," explains Dr. Flavin. "My goal is to help position them for successful outcomes, whatever form that takes."

Universities and, more specifically, medical schools have a special role to play in commercializing research discoveries to fill gaps in medical care. Every day in academic health centers, clinician-scientists witness the many ways that medical innovations improve patient outcomes and quality of life.

"While industry is certainly thoughtful about health equity, it is one of the College of Medicine's central missions and an orientation that is woven into all we do," remarks Dean Rosenblatt. "We pursue research discoveries and develop new technologies always with the thought of how we can improve care for everyone—regardless of ethnicity, gender, or other socioeconomic factors—to overcome health disparities."

The Innovation Pipeline

Bringing groundbreaking medical treatments and technologies to patients in need

The University of Illinois Chicago is a hub of innovation and cutting-edge research with a commitment to discovery and real-world problem-solving. A leader in translational medicine, the College of Medicine has a proven track record of commercializing therapeutics, with three major drugs on the market today. Clinician-scientists and researchers at the Chicago campus are currently moving 36 medical innovations through the pipeline, with 26 in preclinical development and 10 in clinical trials. Of the 36 inventions in the innovation pipeline, the following 17 are in clinical trails or have been licensed.

INNOVATIONS	INNOVATORS	SPECIALTY	PHASE
Robotic surgical station: Integrated survival unit with robot/operative table/anesthesia machine	Pier Cristoforo Giulianotti, MD, FACS	Surgery	On the market
Shingrix: A safer, more effective vaccine to prevent shingles	Abbas Vafai, PhD	Infectious Diseases	On the market
EnteroTracker: Minimally invasive gastrointestinal sampling	Steven J. Ackerman, PhD	Diagnostics	On the market
Isolating human islets for allogenic transplantation of islets	Jose Oberholzer, MD	Endocrine, Autoimmune, and Metabolic Disorders	FDA approved
OCU300: A treatment for ocular discomfort and redness in patients with ocular graft versus host disease	Sandeep Jain, MD	Ophthalmology	Phase 3
Stem Cell Educator: A one-time, dialysis-like stem cell therapy to treat autoimmune diseases	Yong Zhao, MD, PhD	Endocrine, Autoimmune, and Metabolic Disorders	Phase 2
Ezetimibe: Adjuvant therapy for hepatitis C	Susan L. Uprichard, PhD	Infectious Diseases	Phase 2
DNase eye drops for treating dry eye disease	Sandeep Jain, MD	Ophthalmology	Phase 2
Dronabinol: Cannabinoid treatment for sleep apnea	David W. Carley, PhD	Neurology	Phase 2
TEM8: Prostate cancer vaccine	David J. Peace, MD	Oncology	Phase 2
Oral THU-Decitabine: Formulation to improve oral absorption for treatment of sickle cell disease	Yogen Saunthararajah, MD	Oncology	Phase 2
Pooled human immunoglobulins (OSIG-eye drops): The first biologic for treating dry eye disease arising from inflammatory and immune system disorders	Sandeep Jain, MD	Ophthalmology	Phase 1
P28: Bacterial peptide anticancer agent	Ananda Chakrabarty, PhD	Oncology	Phase 1 clinical trial completed; awaiting funding for Phase 2 clinical trial
dCK inhibitors: Small molecule inhibitors of nucleotide metabolism	Arnon Lavie, PhD	Oncology	Phase 1
DMD cell therapy: Novel allogeneic chimeric cell therapy for Duchenne muscular dystrophy	Maria Siemionow, MD, PhD, Dsc	Rare Diseases	Phase 1
Intuition: AI-driven neurological diseases database for clinical care and research	Jeffrey A. Loeb, MD, PhD, and Biswajit Maharathi, PhD	Neurology Software	Software
Depression diagnostic: Test for therapeutic response to antidepressant therapy	Mark Rasenick, PhD	Diagnostics	Validating clinical samples

PHOTO: DIANE M. SMUTNY

An Entre

Blending his clinical work and research with an enterprising spirit, **Sandeep Jain, MD**, pursues novel treatments for ocular diseases with Selagine Inc.

BY DANIEL P. SMITH

preneurial Eye




BOARD-CERTIFIED OPHTHALMOLOGIST Sandeep Jain, MD, is well aware of the daily discomfort that plagues patients afflicted with dry eye disease. Over many years, Dr. Jain has heard countless patients lament the condition's negative impact on their quality of life, challenging their ability to concentrate on tasks, disrupting sleep, and stirring anxiety.

"It's as if my eyes have been rolled in sand and then dipped in hot sauce," he recalls a patient telling him. This vivid description had a profound impact on Dr. Jain. It continues to motivate him today, fueling his work as an "academic entrepreneur"—his favored term for a clinical scientist who translates real-world clinical data into novel technologies to address unmet medical needs.

"I don't want patients suffering, and when they do, it strikes me as medicine's failure," says Dr. Jain, B.A. Field Professor of Ophthalmology and director of the Dry Eye and Ocular GVHD Clinic at the College of Medicine. "We need to figure out ways that don't exist yet and develop strategies and products to help patients and relieve the misery they're feeling."

In recent years, creating novel solutions for dry eye disease—one of the most common conditions that ophthalmology specialists encounter—has been a personal mission for Jain and one best represented in the launch of Selagine Inc., a business based on Dr. Jain's groundbreaking research. The Chicago-based company is developing two timely, first-in-class eye care products: the first biologic for treating dry eye disease and a next-generation antibiotic for ocular bacterial infections.

Tying the Clinic and Research Together

Dr. Jain moved to UIC from Massachusetts Eye and Ear–Harvard Medical School in 2006, largely to pursue work as an academic entrepreneur, enticed by the ability to devote upwards of 75% of his time to cornea healing and scarring research. Once in Chicago, Dr. Jain immediately began building an active, solutions-oriented lab closely tied to work at the Dry Eye and Ocular GVHD Clinic.

Empowered by support from College of Medicine and Department of Ophthalmology leadership and significant research grants, including a Mentored Clinical Scientist Research Career Development Award from the National Eye Institute/National Institutes of Health, the Jain-led clinic acquired sophisticated technology and examination equipment and began attracting patients from coast to coast. In particular, Dr. Jain focused on patients who had received bone marrow transplants, about half of whom developed severe ocular surface diseases.

Seeing patients four days a week, Dr. Jain gathered clinical data and insights to inform his lab's work. That, in turn, fueled the pursuit of new therapeutic targets, more advanced care, and additional clinical data. The intimate, tightly aligned clinical care-basic research loop proved advantageous for Dr. Jain, as progress in one fostered success in the other—and breakthrough discoveries.

"We run both at full speed, which is the only way it works," Dr. Jain says, crediting a "powerful and unique ecosystem" at the College of Medicine and Department of Ophthalmology for propelling progress. "At our clinic, volume isn't the driver, so we can spend more time with patients investigating their issues in depth. A terrific compounding pharmacy at UIC

> The mission here is to leverage research to improve human health and **help people lead better lives**.

Sandeep Jain, MD
B.A. Field Professor of Ophthalmology and director of the Dry Eye and Ocular GVHD Clinic

turns our ideas into actual off-label treatments that can be dispensed to patients."

While studying patient specimens in the lab, Dr. Jain and his team unearthed key discoveries in dry eye conditions. Notably, they found the presence of neutrophil extracellular traps on the ocular surface of patients with dry eye disease, as well as anti-citrullinated proteins and autoantibodies in the tears.

Dr. Jain, in fact, became the first to describe the use of pooled human immunoglobulin eye drops for treating dry eye patients and earned a five-year, $10.15 million National Eye Institute grant to develop a broad-spectrum eye drop to treat patients with severe dry eye and ocular surface disease due to inflammatory and immune system disorders.

Marching Toward Commercialization

While the lab discoveries invigorated Dr. Jain, he had his eye on a bigger prize: academic entrepreneurship.

With assistance from UIC's Office of Technology Management, Jain incorporated Selagine in 2020. Headquartered in the Illinois Medical District with an R&D lab housed at UIC's Incubator Laboratory Facility, Selagine is marching technologies from Dr. Jain's lab into the marketplace, navigating everything from regulatory steps and preclinical development to clinical trials and marketing.

In 2023, Selagine entered into a research, development, and sublicense agreement with Grifols, a global leader in plasma-derived medicines. Under the agreement, Grifols has made a commitment to fund the estimated $60 million needed for developing immunoglobulin eye drops through U.S. Food and Drug Administration (FDA) approval. The process will be managed collaboratively by Grifols and Selagine, including all clinical, manufacturing, and regulatory activities. Preclinical work with the FDA is complete, and the partners are now preparing for Phase 2B clinical trials.

"The development process is vigorously moving forward," Dr. Jain says.

Simultaneously, Selagine is also developing its antibiotic eye drop for treating bacterial infections, initially focusing on trachoma, a significant public health problem in countries around the globe. The easily transmitted ocular disease is responsible for the blindness or visual impairment of about 1.9 million people, according to the World Health Organization. Here, too, Selagine is readying its promising therapeutic for a Phase 2B clinical study and the Investigational New Drug process.

"The antimicrobial resistance pandemic lurks in the shadows, largely overlooked," Dr. Jain says, noting that the last FDA-approved antibiotic for eye care hit the market some 15 years ago. "This underscores the need to bring new antibiotics to market."

Encouraged by Selagine's potential to deliver life-enhancing treatments, Dr. Jain hopes to build Selagine into a research-based company at the intersection of innovation and philanthropy.

"The mission here is to leverage research to improve human health and help people lead better lives," he says. "That's what energizes me, and I know we can make a difference."

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Artist's rendering of the Robert A. Atkins Memorial Courtyard

Story on page 46.