

**all  
roads**

**lead to**

**UNeMed**





UNeMed improves healthcare by fostering innovation, advancing biomedical research and engaging entrepreneurs and industry to commercialize novel technologies.

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I am pleased to report that FY2015 was another successful year for UNeMed and the University of Nebraska Medical Center (UNMC).

Innovation is a long journey. When we start talking about biotech innovation, it's best to settle in and get comfortable. The road from discovery to products that help people is a long one. It might be years — more than a decade in many cases — before we arrive at our destination.

Much of what UNMC's brilliant researchers, staff and students discover and develop is still early-stage, but there is good news: We're starting to hit some major milestones, and much bigger things are taking shape on the horizon.

We opened a route to the world's second-largest economy in FY2015 when we opened our office in Shanghai, China.

We saw researchers like Tammy Kielian, Ph.D., Howard Gendelman, M.D., and Jonathan Vennerstrom, Ph.D., step closer to bringing new and improved treatments for devastating diseases to people everywhere.

Dr. Kielian is on the brink of a clinical trial that could have a dramatic impact on a rare, children's disease. Dr. Gendelman is also approaching two clinical trials — one for the treatment of Parkinson's Disease and another in the treatment of HIV. And Dr. Vennerstrom's one-dose treatment for malaria that could save millions of lives across the world is doing well in clinical trials.

We have what's sure to be a jewel in the national cancer research apparatus sprouting up right here on campus.

And that's just the beginning.

At UNeMed we're lucky to ride in the front seat on these long journeys, and we're also in a position to help make them as trouble-free as possible—always searching for better tools and new ways to bridge the gap between discovery and commercialization.

We will soon unveil UNeTech, a University of Nebraska institute that will help accelerate promising University biomedical technology by bringing together the disparate resources into one package.

We are planning an incubator program that will help our inventor-founders grow and nurture startups companies that are based on UNMC innovations.

We make the connections with academia and industry, whether it's added research funding or bringing in the right CEO to help grow a UNMC startup

We started a "boot camp" to help young researchers and scientists better understand the process of technology development and commercialization.

It would be easy to point at some of the numbers you will find in this annual report, and claim success: Revenue, sponsored research, and agreements are all near record levels.

But for this long journey, at least today, we can't help but get more excited about where we're all going.

Michael Dixon, Ph.D.  
President and CEO

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## Florescu, MacTaggart honored at Innovation Awards

Marius Florescu, M.D., took home the 2014 “Emerging Inventor” award, while Jason MacTaggart, M.D., received the “Most Promising New Invention” award during UNeMed’s eighth annual Innovation Awards Ceremony and Reception on Oct. 23, 2014, at the University of Nebraska Medical Center.

An estimated 203 attended the Innovation Awards ceremony, the culmination of UNeMed’s Innovation Week, where researchers such

as Drs. Florescu and MacTaggart are honored and celebrated for their inventions and discoveries. UNeMed also honored all the UNMC staff, students, and faculty who received a U.S. patent, licensed an innovation or reported a new invention during the previous fiscal year.

Dr. Florescu, an associate professor in the nephrology division of UNMC’s Department of Internal Medicine, received the “Emerging Inventor” award for two of his recent inventions: A hemodialysis catheter and a device to improve the arteriovenous or AV fistula.

The new hemodialysis catheter is designed with a small balloon that can expand to remove the build-up

that naturally grows into a mass that blocks flow. Florescu’s innovative design would significantly lower the cost of removing the blockage by eliminating the need for additional procedures.

The new design for the AV fistula is the first major improvement in 40 years in the area. AV fistulas are made by surgically creating a portal between a vein and an artery, usually in the wrist, for patients who must undergo regular hemodialysis.

Florescu’s catheter is licensed to Chrysalis Medical, which has already built a working prototype.

Dr. MacTaggart, an assistant professor in the vascular surgery section of UNMC’s Department of Surgery, was awarded the “Most Promising New Invention” for his new surgical tool, the AquaBlade.



Florescu



MacTaggart

### INNOVATION AWARDS

2014	Marius Florescu, M.D.	Emerging Inventor
2013	Howard Gendelman, M.D.	Innovator of the Year
2012	Tammy Kielian, Ph.D.	Emerging Inventor
2011	Jonathan Vennerstrom, Ph.D.	Lifetime Achievement
2010	Amarnath Natarajan, Ph.D.	Emerging Inventor
2009	Rodney Markin, M.D., Ph.D.	Lifetime Achievement
2008	Dong Wang, Ph.D.	Emerging Inventor
2007	Robert LeVeen, M.D.	Lifetime Achievement

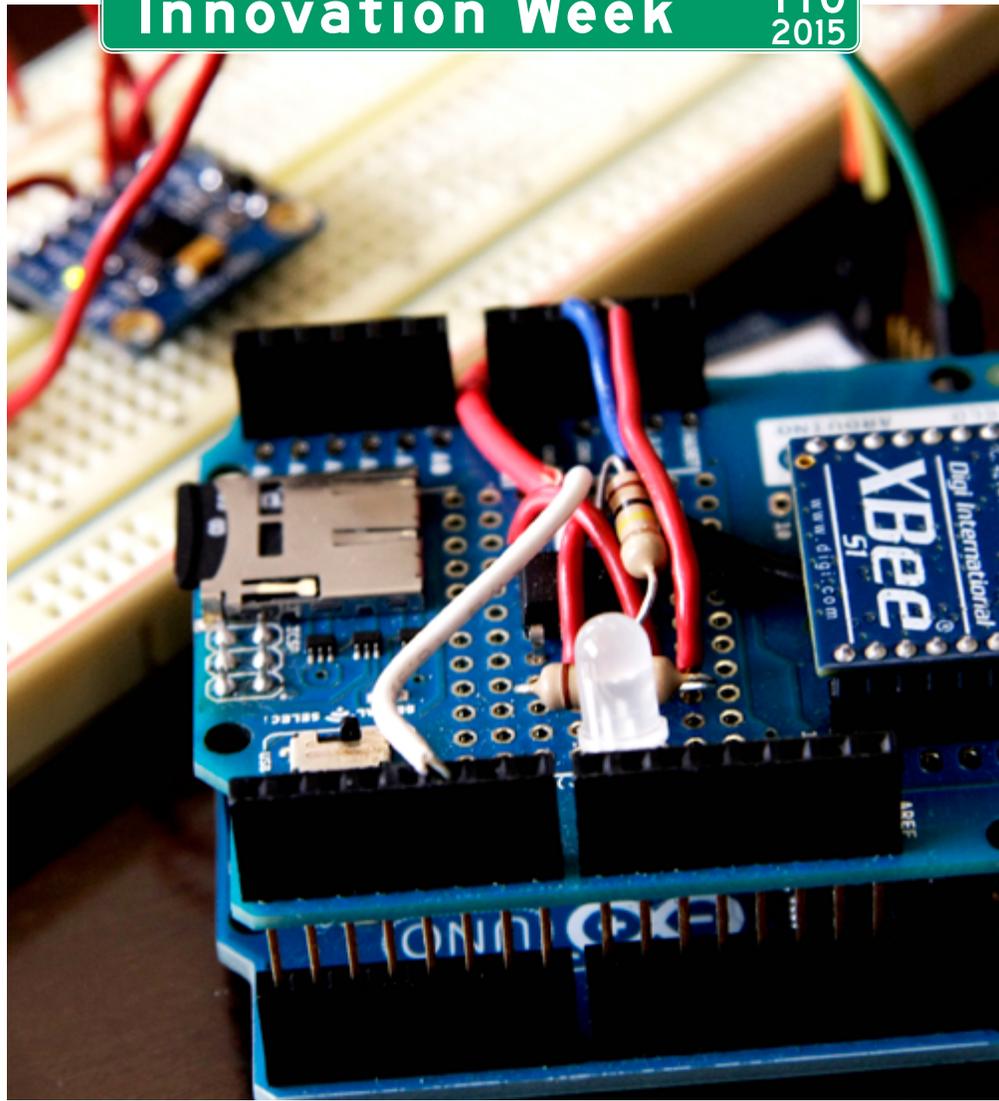
The AquaBlade is designed to cut tissue amid flowing blood using highly-pressurized water. The device can also be used to remove stents in blood vessels. The AquaBlade is less invasive, thereby lowering the risk factor associated with heart surgery and speeding up the recovery process for the patient.

“Considering all of the other outstanding work and creativity demonstrated by many of my colleagues here at UNMC, this award is a great honor for me and my collaborators,” Dr. MacTaggart said via email. “We can’t thank our friends at UNeMed and people like my chairman of surgery, Dr. [David] Mercer, enough for helping facilitate the work that led to this award, as it is their unwavering support of our research that allow us to conceive and refine inventions like the AquaBlade.”

– Tyler Mueller, UNeMed

**MOST PROMISING NEW INVENTIONS**

2014	Jason MacTaggart, M.D.	Orthogonal AquaBlade
2013	Keshore Bidasee, Ph.D.	Targeted Glyoxalase-1 Gene Transfer to Prevent Cardiovascular and End-Organ Complications in Diabetes
2012	Gregory Oakley, Ph.D.	Small Molecule in Vivo Inhibitors of the N-Terminal Protein Interacting Domain of RPA1
2011	Babu Padanilam, Ph.D.	Novel Target for the Treatment of Renal Fibrosis
2010	Stephen Bonasera, M.D., Ph.D.	Noninvasive Monitoring of Functional Behaviors in Ambulatory Human Populations
2009	Paul Dunman, Ph.D.	Novel Antibiotic Compounds
2008	Guangshun (Gus) Wang, Ph.D.	Anti-HIV Peptides and Methods of Use Thereof
2008	Janina Baranowska-Kortylewicz, Ph.D.	Sex Hormone Binding Globulin: New Target for Cancer Therapy



# Six new technologies featured at Demo Day '14

Attendees got a look at some of the innovative technologies developed in the labs at the University of Nebraska Medical Center during UNeMed's Technology Demonstration Day, Oct. 21, 2014.

Part of UNeMed's Innovation Week, Demo Day featured six technologies that are either the foundation of a new startup company, are licensed to an existing company, or are under negotiations for a licensing deal.

Technologies featured were a new blood test for diagnosing heart disease; a new laparoscopic simulator; an improved hemodialysis catheter; data management software; a COPD detection platform; and a next-generation surgical mesh.

Dan Anderson, M.D., Ph.D., kicked-off the event by



PHOTO: Jack Mayfield/UNeMed

Ron Allen, CEO of Chrysalis, during his presentation at UNMC Technology Demonstration Day, an Innovation Week event hosted and sponsored by UNeMed.

presenting a new biomarker that could be used to create a new blood test. Under development at UNMC, the blood test could help flag people who are candidates for serious heart trouble even when other tests

say otherwise.

“It’s a failure of medicine to die from a heart attack at 40,” Dr. Anderson said.

Ron Allen, CEO of Chrysalis, presented a new catheter designed to reduce risk for pa-

tients who undergo the process that filters a patient’s blood, or hemodialysis.

When a catheter needs to be replaced, the entire procedure can cost up to \$18,000. The new catheter, an elegant design by UNMC’s Marius Florescu, M.D., reduces the number of times a catheter needs to be replaced. A small balloon in the tip of the catheter can be inflated to disrupt the blockage and eliminate the need for additional procedures and costs.

Jenna Yentes, Ph.D., presented a new method to better manage the sometimes deadly attacks or exacerbations associated with narrowed or destroyed lung tissue—chronic obstructive pulmonary dis-

**DEMOS** *See page 4*





Chinese and University of Nebraska Medical Center officials cut the ribbon to UNeMed Health Consulting Shanghai on Oct. 29, 2014. Pictured from left are Deloitte's Maria Liang; UNMC's Don Leuenger; UNeMed's D.J. Thayer; and UNMC's Jialin Zheng, Ph.D.

PHOTO: Lisa Spellman, UNMC

## UNeMed opens Shanghai office

The University of Nebraska Medical Center's relationship with China formed a stronger bond with the official opening of a satellite office in the Shanghai Free Trade Zone.

A ribbon-cutting ceremony on Oct. 29, 2014, officially opened the door to deeper biomedical cooperation between UNMC and Chinese sectors in biomedical industry and healthcare education.

"Collaboration with China's biomedical industry and higher education is really the essence of our strategy," said D.J. Thayer, UNeMed's Director of International and Domestic Business Affairs, who oversaw the creation of UNMC-China.

UNeMed Health Consulting Shang-

hai, or UHCS for short, will focus on three core areas: Improve international collaborations, share knowledge, and commercialize UNMC innovations in a vast Chinese marketplace that lives in the world's second largest economy.

"This is taking what we do best, and combining it with what they do best," Thayer said. "We're good at a lot of things, but not everything. Everyone benefits from this. Nebraskans, Americans, the Chinese. Everyone."

UNMC recently celebrated the 10th anniversary of its relationship with China, which has been based largely on educational exchange and research collaborations.

Opening a fully-staffed operation

in Shanghai expands that relationship for greater collaborations with Chinese medical schools and hospitals.

UNMC already has a long track record of successful student and faculty exchanges, as well as several UNMC inventions licensed to Chinese companies.

But UNMC will also expand its focus abroad to consulting with Chinese officials and developers who are increasingly trying to provide more Western-styled healthcare options. Already, UHCS is meeting with Chinese architectural and engineering firms on a \$3 billion project that would create a massive healthcare facility for a piece of the growing medical tourism market.

### Demos *From page 3*

ease, commonly known as COPD. The technology is a result of a collaboration between UNO's Biomechanics Laboratory and UNMC's division of Pulmonology.

Using a device attached to the chest and feet, the platform measures walking and breathing and calculates how the two bio-rhythms interact. The result is an unprecedented early warning for an COPD exacerbation.

John Glock, president and founder of Labpoint, shared his solution for sharing information between medical institutions. Labpoint improves the communication between labs, clinics and hospitals sharing critical information despite using different hardware and software.

Joe Runge, UNeMed's Business Development Manager, introduced a new laparoscopic simulator developed at UNMC, which cuts down costs and space requirements.

The new portable system renders usable nearly any open space for the simulator at a fraction of the cost, enabling surgeons or students to practice more often.

Matthew MacEwan, president of Acera Surgical, ended Demo Day with a presentation on CeraFix™ Dural Substitute, a new design for surgical meshes for use in brain surgery.

The surgical mesh, CeraFix™ Dural Substitute, is the flagship product of Acera Surgical, and is paving the way for next generation surgical materials.

— Tyler Mueller, UNeMed



Don Leuenberger, Chair of UNeMed's Board of Directors, holds up the special award he was presented for 25 years of service as the "Godfather" of UNeMed.

PHOTOS: Charlie Litton/UNeMed

## Annual gathering highlights UNeMed success

During its annual Shareholder Meeting, UNeMed Corporation announced four new strategic initiatives that officials expect will help expand the scope and productivity of research commercialization across the University of Nebraska Medical Center campus.

Highlighted by a keynote address from UNMC Chancellor Jeffrey Gold, M.D.—and a special award presented to UNeMed Board Chair Don Leuenberger for 25 years of service—the meeting was an invitation-only event at TD Ameritrade Park in downtown Omaha.

Chancellor Gold told the gathering of select University leaders, researchers and UNeMed staff that UNMC's innovative researchers all share the same goal of improving lives. But that research can't get there by itself.

"UNeMed is an incredible organization that provides the infrastruc-



Chancellor Jeffrey P. Gold, M.D.

ture, provides the glide path...and turns it into intellectual property that changes people's lives," Gold said.

UNeMed president and CEO Michael Dixon told the crowd that UNMC's invention pipeline continues to thrive with 63 new invention disclo-

tures filed in fiscal 2015. In the last five years, UNMC researchers developed 412 inventions—compared to the 291 filed during the previous five years.

Dixon also announced a 40 percent increase in total revenue, the fourth-highest in UNeMed's 24-year history. The \$1.11 million UNeMed secured in sponsored research funding was a 69 percent improvement over the previous year, nearly eclipsing the combined total of the previous five years. UNeMed also signed 20 licensing agreements for UNMC inventions, a 43 percent improvement.

Dixon also discussed four initiatives for fiscal 2016, beginning with the continued operation and expansion of UNeMed Health Consulting Shanghai. Doing business as UNMC-China, UHCS is now fully operational and has

MEETING See page 6





Grad students Richard Nelson (left) and Simarjeet Negi look on during a session of UNeMed's first Technology Transfer Boot Camp, a week of immersive training sessions that dove into the commercialization of biomedical science.

PHOTO: Charlie Litton/UNeMed

## UNMC students complete first tech transfer boot camp

UNeMed's first-ever tech transfer Boot Camp churned out seven University Nebraska Medical Center students and postdocs that are now better armed to help commercialize the science and discoveries that emanate from university research.

Created and designed by UNeMed's Agnes Lenagh, Ph.D., the Boot Camp was a rigorous, hands-on course about the commercialization process. It gave participants a chance to experience the day-to-day operations of a technology transfer office like UNeMed. Students participated in mock contract negotiations, evaluated technology disclosures, and simulated marketing campaigns to commercialize hypothetical technologies.

"This will definitely impact me positively, and lead to more career choices," said Simarjeet Negi, a Ph.D. candidate at UNMC.

Dr. Lenagh, a licensing specialist at UNeMed, created the week-long Boot Camp after UNeMed recently received almost two dozen applications for one internship position at UNeMed. With so much interest in the industry, she wanted to help others boost their experience, and perhaps give them a chance to land a similar opportunity at another institution.

"We wanted to give students a chance to experience what it's like at UNeMed and expose them to tech transfer," Dr. Lenagh said.

The course featured a wide range of UNeMed staffers as guest speakers who instructed topics that covered the entire range of day-to-day technology transfer activities.

"I found the talks not only informative, but engaging as all the speakers welcomed interruption and indulged even tangentially related questions from the participants," said another participant, Tyler Scherr, also a Ph.D. candidate.

Dr. Lenagh hopes the students will walk away with more than just a certificate of completion.

"Hopefully, they'll think differently about their research in the lab," she said. "Hopefully, they'll think about how their research can become a product and help people."

As the technology transfer arm of UNMC, a part of UNeMed's mission is education, offering special services including the Boot Camp, various free seminars, and an educational course. The course, "Bioscience Entrepreneurship," was first offered in the 2013 fall semester, and is expected to return to the curriculum in the 2016-17 school year.

## Meeting From page 5

already licensed one UNMC invention to be developed in China, Dixon said.

UNeMed will also work with the University of Nebraska-Lincoln to develop a certified biomedical entrepreneurship course that aims to help UNMC students gain more business savvy.

UNeMed will collaborate with the University of Nebraska at Omaha on a third initiative: UNeTechH. It will be a support structure for biomedical and high-tech inventions that will bring together expertise and resources to build and develop innovative technologies.

"We're going to break down barriers," Dixon said.

The final planned initiative is a next-generation approach to education with highly sophisticated simulation and training facilities. Called iEXCEL, Dixon said the program "is going to fundamentally change the way medical education occurs."

Dixon also recognized board chairman Don Leuenberger and his 25 years of service—a fixture at UNeMed since its founding in 1991, even playing a role in its creation. When UNeMed was created there weren't many universities with their own technology transfer offices, but Leuenberger immediately saw the value in protecting and developing UNMC's research innovations, Dixon said.

"Don had the foresight to say we need a structure for this," Dixon told the gathering.



UNeMed's Agnes Lenagh, Ph.D.



Greg Gordon, M.D., aligns a prototype of his patented Lock-Block radiation shield during a round of early tests. Dr. Gordon built his own startup company—Radux Devices—around inventions designed to better protect physicians from radiation.

PHOTO: Charlie Litton/UNeMed

## Radux opens round of prototype testing

A successful interventional radiology procedure can improve a patient's life, but the people performing them, physicians like Greg Gordon, M.D., limp away feeling worse.

"I get home, and I can't walk," Dr. Gordon said. "I can't move."

Dr. Gordon invented two devices and built around them a new startup company, Radux Devices, which he hopes will make some of the pain and risk of IR a distant memory for him and other physicians. A proof-of-concept grant from the University's Nebraska Research Initiative will give him the chance to prove his ideas can work.

Interventional radiologists like Dr. Gordon—who practices at Omaha's Veteran Administration Hospital while holding a faculty appointment at the University of Nebraska Medical Center—use continuous X-ray scans to do things like

inject dyes and clear arterial blockages through an access sheath, usually in a patient's neck, arm or thigh.

In any IR procedure, Dr. Gordon must wear a lead-heavy protective apron that shields him from X-ray radiation. With multiple

patients in a day, it's not uncommon for physicians to wear the vest for up to 10 hours. Even with the 30-pound protective vest, X-ray radiation exposure is still a legitimate risk. And the extra weight adds bodily stress and strain that, like

radiation exposure, accumulates and gets worse over time.

Bodily stress, strain, and other similar injuries are common issues, and anywhere from 60 percent to 70 percent of interventional radiologists complain about spinal problems according to a 2009 study conducted by the Society of Interventional Radiology. These injuries are caused by the leaded protection IR physicians wear while standing in awkward positions and angles. Dr. Gordon said he's had five knee surgeries and two hip procedures to fix the damage caused—all the while suffering from an unrelated arthritic condition, ankylosing spondylitis, an inflammation of the spine where joints can fuse together.

"I think my skillsets go down because I get pain and



PHOTO: Charlie Litton/UNeMed

Lock-Block is a radiation shield that protects physicians from radiation during procedures that require continuous X-ray imaging, such as inserting a stent.

**RADUX** See page 8



UNeMed's Qian Zhang, Ph.D., M.B.A.

## Radux *From page 7*

so stressed that I can't maintain the steady hand that I need," Dr. Gordon said.

Besides bodily stress, cancers and tumors are another risk from IR procedures. Working closely with X-ray radiation for extended periods cumulatively increases the chances of developing health problems such as cataracts, breast cancer and central nervous system tumors, even when wearing protective garments. According to the same 2009 study, radiologists are three times more likely to die from brain cancer than physicians who do not use radiation.

Dr. Gordon's solutions to the problems were a flexible sheath and a radiation shield. The sheath reduces radiation exposure by pushing physicians' hands further away from the radiation field and allowing them to operate in more comfortable positions. The portable radiation shield, about the size of a steno notebook, blocks X-ray radiation from the physician's hands and body.

But in order for the devices to be saleable in the medical market, they need FDA approval and studies proving their effectiveness. The University of Nebraska awarded Dr. Gordon a \$250,000 Nebraska Research Initiative proof of concept grant to develop and test working prototypes.

— Tyler Mueller, UNeMed

## Kielian, UNeMed ink deal with pharma company

Tammy Kielian, Ph.D., professor of pathology and microbiology, took on the search for a treatment for Juvenile Batten disease (JBD) when her niece was diagnosed with the rare, fatal disorder. In June 2015, UNeMed, the technology transfer and commercialization office for UNMC, entered into a licensing agreement with PlasmaTech Biopharmaceuticals to further develop a gene therapy approach discovered in her laboratory that holds promise as a potential therapeutic.

It's a potential breakthrough development in the fight against a devastating childhood disease that as yet has no treatment or cure.

Dr. Kielian said a final product might still be years away, but her lab is working on a solution that does more than just slow disease progression. "Ours is a demonstration of a treatment that would correct the genetic defect," she said.

Also known as juvenile neuronal ceroid lipofuscinosis, JBD is an inherited, autosomal recessive, neurodegenerative disorder that results in lysosomal storage problems -- basically, due to a gene mutation, protein and lipids build up inside brain cells, resulting in neuron death in the central nervous system. Other cells outside the brain also accumulate this material, leading to other complications typical of the



Tammy Kielian, Ph.D.

disorder, including heart disease.

The first symptom is vision loss, followed by seizures, cognitive loss and motor decline. Finally, premature death.

Dr. Kielian has seen first-hand how Juvenile Batten disease can affect a family.

"It changes everything," she said.

But PlasmaTech, a biopharmaceutical company focused on gene therapy

and cell therapy products for severe and life-threatening rare diseases, is optimistic the therapy developed in Dr. Kielian's laboratory has the potential to change that. The goal is to work with Dr. Kielian to advance her research into clinical trials, PlasmaTech officials said.

Steven Hinrichs, M.D., chair of pathology and microbiology, said the research turned on a key finding: "Her laboratory demonstrated that expression of the therapeutic gene in only a few cells was able to benefit neighboring cells. That discovery completely changes the outlook for gene therapy in Juvenile Batten disease and makes a true therapy possible for this terrible disorder."

The therapy has demonstrated significant and promising results in animal models of the disease.

Dr. Kielian is optimistic that with continued funding and development, the potential therapy could be fast-tracked.

UNMC's Munroe-Meyer Institute, which treats children with rare genetic diseases, will be involved in the planned future clinical trials, said MMI pediatric geneticist William Rizzo, M.D.

Dr. Kielian credits her laboratory staff as essential to recent success.

— Kalani Simpson, UNMC



Protransit Nanotherapy's Steve Curran demonstrates part of the process for building the nanoparticles that could make skin care products more effective at preventing skin cancer, wrinkles and blemishes. ProTransit is an Omaha startup based on technology invented at the University of Nebraska Medical Center.

PHOTO: Charlie Litton/UNeMed

## Nebraska invests \$100k in UNMC nanotech startup

A UNeMed startup in Omaha reached a major milestone, completing its first round of fundraising and inched a step closer to providing skincare products that prevent skin cancer, wrinkles and other blemishes. The investment also keeps hope alive the company will be able to expand as intended to create applications that can treat brain damage caused by stroke and even heal spinal cord damage.

ProTransit Nanotherapy, a company based on a technology invented at the University of Nebraska Medical Center, announced on Nov. 17, 2014, a \$100,000 investment from Invest Nebraska, a program administered by the state's Department of Economic Development that focuses on fostering high-growth, high-paying industry startups and small businesses in Nebraska.

Gary Madsen—the former entrepreneur in residence at UNeMed—said Invest Nebraska gave his fledgling company the final push it needed.

“That’s going to allow us to really get up and running here in this laboratory, buying equipment, and buying supplies,” Madsen said.

ProTransit Nanotherapy will begin developing bench-scale products, and move nanoparticle production to Omaha from the Cleveland Clinic in Ohio, where co-founder and inventor Vinod Labhasetwar, Ph.D., now works.

Already, ProTransit employs 2.5 full-time positions, including skilled and highly-specialized scientists, Steve

Curran, M.S., and Bala Vamsi Karuturi, Ph.D.

“The really good thing is both of these guys have worked on exactly these type of nanoparticles before,” Madsen said. “I never thought I would find anyone like that, and here’s two of them right on campus.”

Before joining ProTransit, Curran and Karuturi worked in the laboratories of Dr. Joseph Vetro in the College of Pharmacy. They specialize in building the type of nanoparticles that Madsen expects will deliver powerful antioxidants to the deepest layers of skin.

Dangerous UV light from the sun, chemicals, smoke, smog and even the natural aging process create free radicals within the skin. If unchecked, free radicals bang around inside the tissue, damaging cells, which leads to things like wrinkles, blemishes and even cancer. Antioxidant enzymes are known to be an effective treatment against free radicals, but stabilizing and getting the enzymes to where they’re needed has been the tricky part.

Developed by a former UNMC researcher, Dr. Labhasetwar, ProTransit’s nanoparticles essentially serve as a delivery vehicle that can reach places within the human system that others can’t. That means antioxidant enzymes can finally penetrate to the deepest layers of skin where they can do the most good, Madsen said.

“Up till now,” Madsen said, “the problem with the enzymes is they don’t

penetrate the skin, and they’re really unstable. They last for just a few minutes.”

By enclosing the enzymes in a harmless, biodegradable nanoparticle, Dr. Labhasetwar not only stabilized the enzymes, but also created a slower, more gradual release.

Applying a skin product with ProTransit’s technology could have a lasting effect that battles free radicals for weeks after just one application. Finding out just how long and how effective will be part of the early round of testing. Testing for the skin care products will be done on artificial skin and tissue cultures grown in a lab.

Madsen was also involved in securing a recent \$1.2 million grant from the Nebraska Research Initiative at the University of Nebraska to upgrade and purchase new equipment in the biology production facility. That money is being used to equip the nanoparticle pilot plant that Madsen—along with UNMC researchers on other projects—is using for early-stage production.

Madsen said he expects to move into a phase-two round of fundraising where he will need an estimated \$1.2 million to scale-up the process, and fully develop the skincare product. Although one of the world’s largest cosmetic manufacturers is already expressing interest in ProTransit’s first product line, it will likely be several years before it will be available on store shelves, Madsen said.

—Charlie Litton/UNeMed



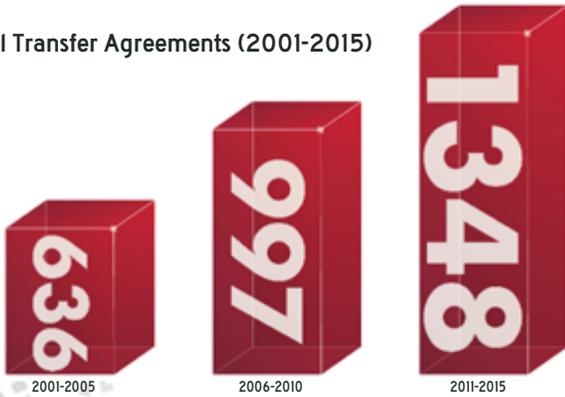


# Metrics

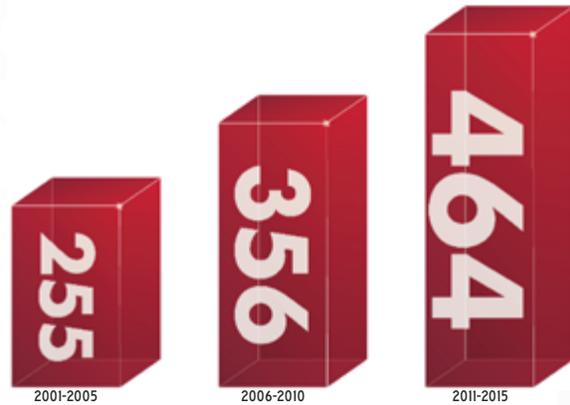
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2015

New Inventors	38
Active Licenses	78
Opportunities	96

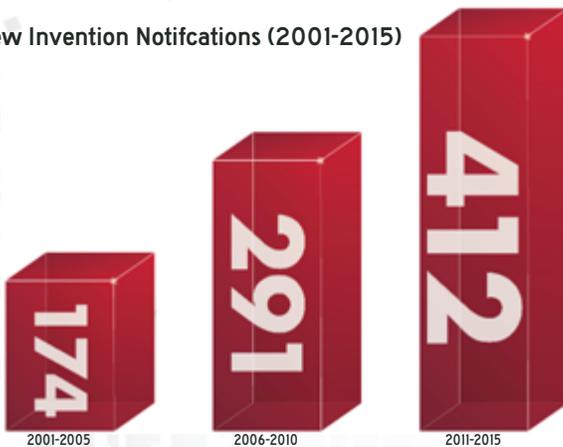
Material Transfer Agreements (2001-2015)



Confidential Disclosure Agreements (2001-2015)



New Invention Notifications (2001-2015)



Patent Applications (2001-2015)



2001-2005



2006-2010

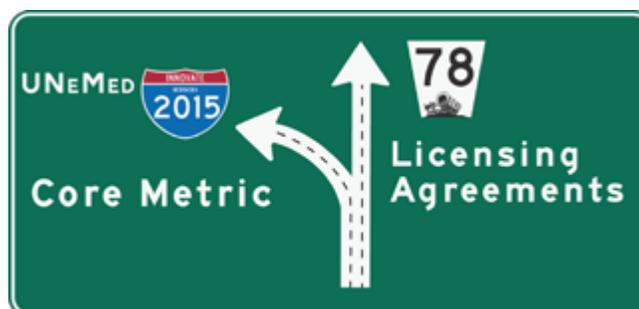
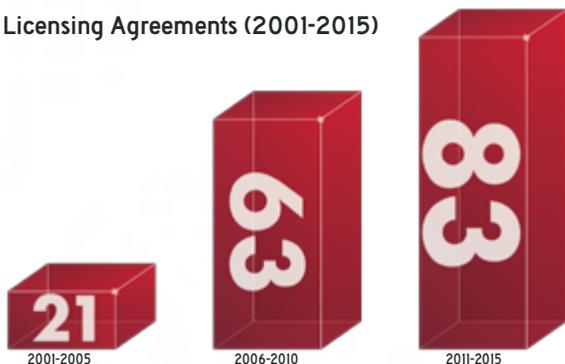


2011-2015

## » U.S. patents issued to UNMC inventors in fiscal 2015

PATENT NO.	PATENT TITLE	ISSUED	INVENTOR(S)
9,060,781	Methods, Systems, and Devices Relating to Surgical End Effectors	Jun 23, 2015	Shane Farritor, Tom Frederick, Joe Bartels
9,044,381	Method for Delivering Drugs to the Brain	Jun 2, 2015	Howard Gendelman, Barrett Rabinow
9,010,214	Local Control Robotic Surgical Devices and Related Methods	Apr 21, 2015	Shane Farritor, Eric Markvicka, Tom Frederick, Joe Bartels, Jack Mondry
8,998,804	Suction Catheter Assembly for a Laryngoscope	Apr 7, 2015	Ben Boedeker
8,993,758	Quinoxaline Compounds and Uses Thereof	Mar 31, 2015	Amarnath Natarajan, Vashti Bryant, Wian Yi Chen, Rajkumar Rajule
8,986,736	Method for Delivering Particulate Drugs to Tissues	Mar 24, 2015	Howard Gendelman, Barrett Rabinow
8,974,440	Modular and Cooperative Medical Devices and Related Systems and Methods	Mar 10, 2015	Shane Farritor, Mark Rentschler, Amy Lehman
8,968,267	Methods and Systems for Handling or Delivering Materials for Natural Orifice Surgery	Mar 3, 2015	Dmitry Oleynikov, Carl Nelson, Alan Goyzueta
8,968,332	Magnetically Coupleable Robotic Devices and Related Methods	Mar 3, 2015	Shane Farritor, Dmitry Oleynikov, Mark Rentschler, Jason Dumpert, Amy Lehman, Nathan Wood
8,962,685	Creatine Oral Supplementation Using Creatine Hydrochloride Salt	Feb 24, 2015	Jonathan Vennerstrom, Donald Miller
8,911,396	Sheath	Dec 16, 2014	Gregory Gordon
8,894,633	Modular and Cooperative Medical Devices and Related Systems and Methods	Nov 25, 2014	Shane Farritor, Mark Rentschler, Amy Lehman
8,877,766	Neuroprotective Multifunctional Antioxidants and Their Monofunctional Analogs	Nov 4, 2014	Peter Kador
8,871,497	Device and Method for Automating Microbiology Processes	Oct 28, 2014	Rodney Markin
8,865,216	Surface-modified Nanoparticles for Intracellular Delivery of Therapeutic Agents and Composition for Making Same	Oct 21, 2014	Vinod Labhasetwar, Jaspreet Vasir
8,834,488	Magnetically Coupleable Robotic Surgical Devices and Related Methods	Sep 16, 2014	Shane Farritor, Dmitry Oleynikov, Stephen Platt, Mark Rentschler, Jason Dumpert
8,828,024	Methods, Systems and Devices for Surgical Access and Procedures	Sep 9, 2014	Shane Farritor, Stephen Platt, Mark Rentschler, Amy Lehman, Jeff Hawks
8,821,943	Methods and Compositions for Targeted Delivery of Therapeutic Agents	Sep 2, 2014	Uday Kompella, Sneha Sundaram, Swita Singh

Licensing Agreements (2001-2015)

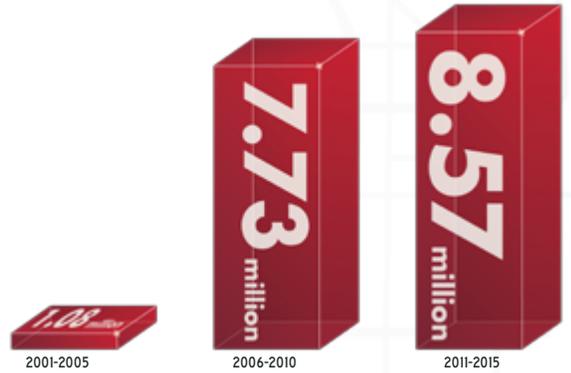


CORE METRIC  
**Total Revenue**  
\$1,949,649

INCREASE OF 40  
PERCENT OVER PREVIOUS YEAR

HIGHEST AMOUNT  
SINCE 2012 & FOURTH-BEST  
IN UNEMED'S 24-YEAR HISTORY

Total Revenue (2001-2015)



Distributions (2001-2015)



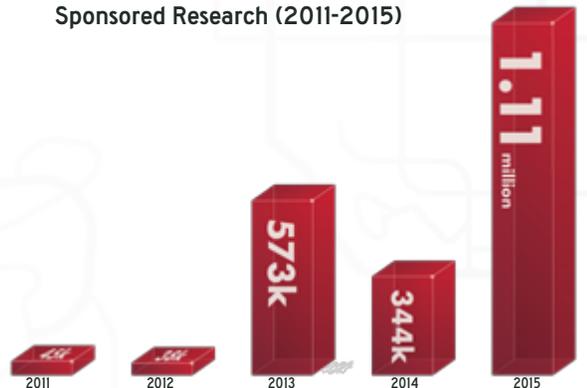
CORE METRIC  
**Distributions**  
\$242,513

Sponsored Research (2011-2015)

CORE METRIC  
**Sponsored Research**  
\$1,106,241

INCREASE OF 221 PERCENT  
OVER PREVIOUS YEAR

BETTER THAN PREVIOUS  
FOUR YEARS COMBINED





Researcher Dong Wang, Ph.D., is a pharmaceutical chemist at UNMC.

PHOTO: UNMC

## Novel fluoride formulations protect teeth

The major challenge in effectively treating oral diseases is sustaining medications in the proper dosage for the right amount of time. Water fluoridation has improved dental health worldwide; however, it is also difficult to bring fluoride into direct contact with dental surface and facilitate remineralization, as fluoride ions do not have strong binding force to the surface of the teeth.

Researchers at UNMC, led by Dong Wang, Ph.D., have developed a new formulation platform technology that can load and deliver fluoride to the tooth

surface for protection against cavities or tooth decay. Therapeutic agents can be packaged in this delivery vehicle and efficiently delivered to bones and teeth.

The most significant advantage of this platform technology is that it can be used both locally and systemically, and can carry both soluble and insoluble compounds. In addition, the chemistry that Dr. Wang used to introduce targeting parts is extremely versatile, and a large number of different targeting agents can be easily incorporated.

### INVENTOR

» Dong Wang, Ph.D.

### THE RUNDOWN

- » Novel dentotropic formulation
- » Specifically targets hard tissues
- » Sustained release in oral cavity
- » Bio-degradable and non-toxic

## Novel formulations for dental plaque prevention and treatment

A new mouthwash or toothpaste more effective at eliminating dental plaque could lead to a more profound impact than just brighter smiles and less cavities.

Dental plaque not only leads to cavi-

ties and gum disease, but studies indicate it also contributes to cardiovascular disease, diabetes, rheumatoid arthritis and respiratory diseases.

Researchers at the University of Nebraska Medical Center have developed a new material that could be used in preventing dental plaque, and to reduce tooth decay, cavities, and discoloration. The new formulation is such a giant leap forward in oral hygiene it might even provide a positive impact to overall health.

The formulation was tested with an antimicrobial agent, Tricolsan, which has demonstrated the enhanced power to reduce the coating of bacteria or biofilm that promotes plaque buildup. Even in the presence of human saliva, the new formulation is strong enough to break

through existing biofilms, and could be used to improve current oral hygiene products.

Currently, antimicrobial therapy is one of the most effective management strategies against diseases related to dental plaque. But because of the constant flow of saliva in the mouth, successful antimicrobial treatment is incredibly difficult.

To solve the problem, researchers at UNMC have developed a new, non-toxic, biodegradable formulation for better, more effective and safer antimicrobial therapy. The formulation can be loaded with therapeutic agents that swiftly bind to the tooth surface, and gradually release the therapy that all but stop the buildup of plaque, and even whiten teeth.

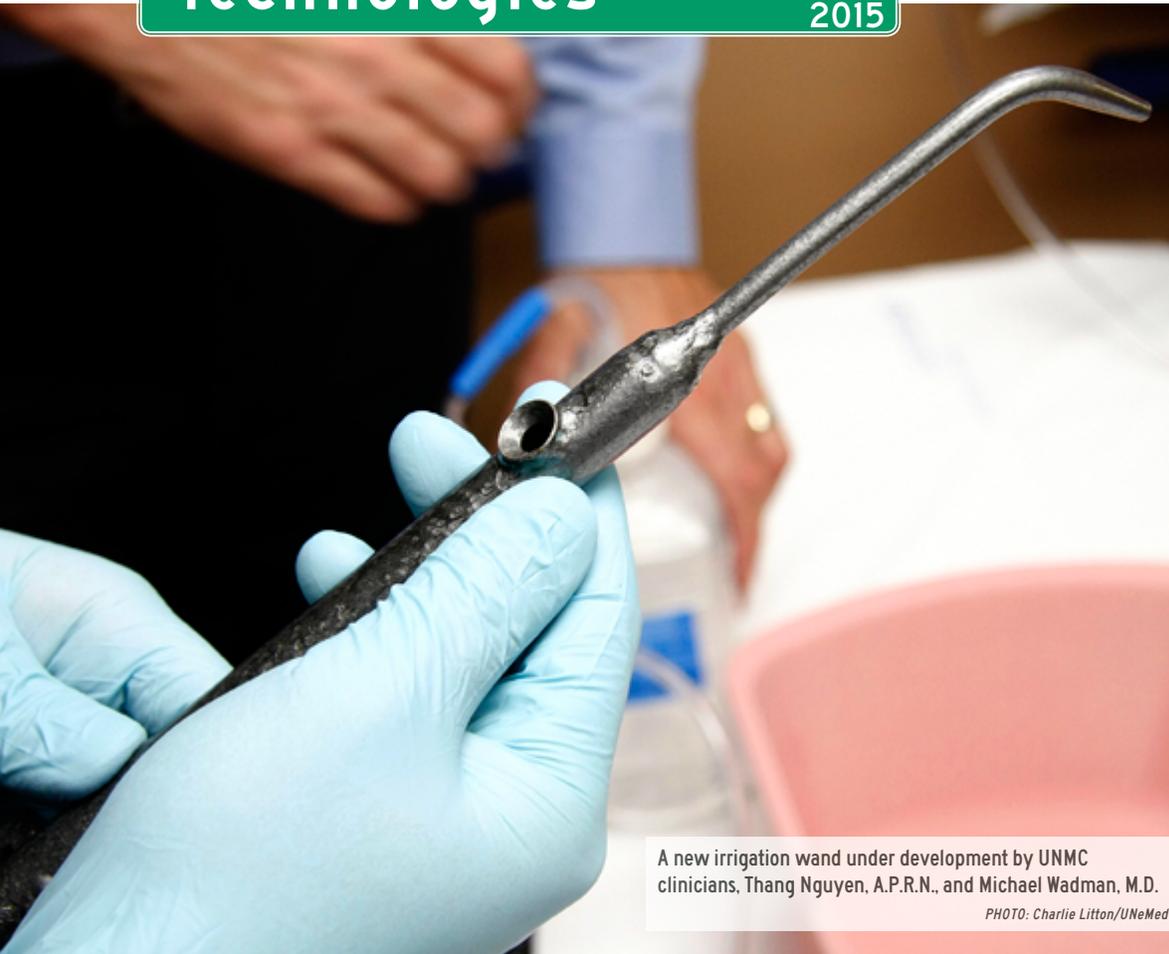
### INVENTORS

- » Dong Wang, Ph.D.
- » Xinming Liu, Ph.D.

### THE RUNDOWN

- » Targets hard tissue and medical implants
- » Can be used both locally and systemically
- » Can carry large spectrum of compounds and macromolecules
- » Easy formulation process





A new irrigation wand under development by UNMC clinicians, Thang Nguyen, A.P.R.N., and Michael Wadman, M.D.

PHOTO: Charlie Litton/UNeMed

## EFFICIENT IRRIGATION Faster, easier wound-cleaning with continuous spray control

Inspired by their frustrations of repeatedly plunging a syringe into a sterile solution to spray a wound, emergency room personnel at UNMC found a way to save time and energy with a new irrigation system called “Wadwand.”

Wound cleaning is an art where the doctor or nurse must pour the sterile saline solution into a basin, load the solution into a syringe, and spray the liquid from the syringe with the same force and consistency each time.

This method produces inconsistent amounts of pressure, particularly for deep wounds, which require much greater amounts of saline pressure.

The Wadwand uses a standard sterile solution bottle fitted with a specialized cap that hooks up to a uniquely designed irrigation wand. Providers are then able to initiate the flow of the saline solution and adjust the fluid pressure with the press of a finger.

The inventors have also developed a portable version that allows the user to clean wounds outside a healthcare facility.

UNeMed is seeking a partner to complete preclinical testing and help place a Wadwand irrigation system in ERs across the nation.

## Clear airway obstruction with improved suction tips

Whether secretions, vomit, blood, food, clots, or tissue are blocking the airway, healthcare providers rush to clear the blockage. When the equipment being used is clogged, the patient’s safety is at risk.

A team of nurses and doctors at the University of

Nebraska Medical Center found a creative solution in the form of a revolutionary design for suction tips that promote optimal air flow and prevent foreign bodies from sticking to the tip.

Fluid buildup and obstructions can hinder the providers’ ability to see ana-

tomical landmarks, and put the patient’s comfort and safety at risk due to choking.

Existing suction tips share a common flaw as they are not designed to rapidly remove large foreign bodies. The user has to frequently stop suctioning and manually clear the blocked tip, further delaying endotracheal intubation or oral surgery.

UNMC’s innovative suction tips are specifically designed for successful removal of fluids and foreign bodies while improving grip during procedures. The ergonomic tips also have a flexible neck that let the user actively mold the shape of the suction tip during use and reach around obstructions or anatomical landmarks.

### INVENTORS

- » Thang Nguyen, A.P.R.N., M.S.L., H.S.L.
- » Michael Wadman, M.D.
- » Vincent Morris, N.P.
- » Richard Morris
- » Albert R. Dunn, M.D.
- » Richard Walker, M.D.
- » Peter Anaradian, M.D.

### THE RUNDOWN

- » Successfully remove obstructing fluids and foreign bodies
- » Designed for optimal air flow
- » Avoid foreign bodies from adhering to the tip
- » Angled to reach around obstructions
- » Better reach anatomical landmarks
- » Improved grip
- » Comparable to Yankauer suction tip

### INVENTORS

- » Thang Nguyen, A.P.R.N., M.S.L., H.S.L.
- » Michael Wadman, M.D.
- » Vincent Morris, N.P.
- » Richard Morris

### THE RUNDOWN

- » Fitted to a sterile solution
- » Ergonomic design
- » Cost-efficient
- » Adjustable fluid pressure
- » Continuous wound irrigation
- » Improve wound cleansing
- » Faster irrigation process

## TREATMENT RESISTANCE

## Improve fight against cancer of the pancreas

There may finally be an answer to pancreatic cancer.

Every year, roughly 45,000 people are diagnosed with pancreatic cancer, one of the most lethal forms of cancer. With current treatment options, almost 43,000 of them will die within five years of diagnosis.

The few treatments that exist are too soon rendered impotent as patients quickly develop resistance to the drugs.

But researchers at the University of Nebraska Medical Center may be able to increase the odds for those who receive the grim news: A novel drug called "13-197" that has shown promise in mouse models.

"13-197" is still in preclinical development for pancreatic cancer, and may be useful in the treatment of other forms of cancer and other diseases such as diabetes.

UNMC is interested in partnering with a pharmaceutical company to further develop "13-197" and future analogs for clinical use.

## INVENTORS

- » Amarnath Natarajan, Ph.D.
- » Qian Chen, Ph.D.
- » Vashti Bryant, Ph.D.
- » Rajkumar Rajule

## THE RUNDOWN

- » Novel drug
- » Orally Available
- » Potent inhibitor of cancer cell proliferation
- » Effective in pancreatic cancer animal model
- » Treat other forms of cancer
- » Treat diabetes, other diseases

## Improved approach to classifying and predicting recurrence of prostate cancer

Improving patient survival and predicting prostate cancer reoccurrence are now possibilities with a recently discovered biomarker at the University of Nebraska Medical Center.

Vimla Band and her colleagues have identified a protein in prostate tissue that could aid in diagnosing prostate cancer and more accurately determine a patient's prognosis.

According to Dr. Band's research, increased levels of a specific biomarker could be related to the severity or aggressiveness of the cancer.

As an additional prognostic biomarker, the identified protein could accurately classify cancer severity, aid in determining appropriate treatment options, and serve as the most significant marker for predicting cancer recurrence in patients.

## INVENTORS

- » Vimla Band, Ph.D.
- » Hamid Band, M.D., Ph.D.
- » Sameer Mirza, Ph.D.

## THE RUNDOWN

- » Predictive biomarker of Prostate Cancer
- » Monitor recurrence of disease
- » Better classification of disease severity
- » Avoid unnecessary treatments or procedures
- » Improve therapeutic strategies



UNMC researcher Amarnath Natarajan, Ph.D.,

PHOTO: UNMC

## Diagnose, treat tumors with one compound

Two of the most prevalent forms of cancer are prostate cancer and breast cancer, accounting for more than 60,000 U.S. deaths each year. As a result they have become a major focus of both diagnostic and therapeutic development.

As with all diseases, the main

goal is to develop more accurate forms of diagnosis and disease tracking along with safer and more effective therapies.

Researchers at UNMC have developed a way to accomplish both goals with one compound. The compound can be used to image a patient's cancer and treat it at the same time.

Compounds are tagged with a radioactive isotope that can be used to kill, see, or track a tumor.

The compounds specifically target a cellular protein called the androgen receptor, which is commonly found in a variety of cancers, including breast and prostate cancers.

These compounds have undergone extensive cellular and animal studies and an Investigation New Drug application has been filed with the FDA. UNMC plans to start a clinical trial in prostate cancer patients in the near future.

## INVENTORS

- » Janina Baranowska-Kortylewicz, Ph.D.
- » Zbigniew P. Kortylewicz, Ph.D.

## THE RUNDOWN

- » Novel compound
- » Accurate diagnostic
- » Track cancer growth
- » Image and kill cancer cells
- » Effective against prostate cancer
- » Comprehensive, successful cellular and animal studies



Jason MacTaggart, M.D.

## AQUABLADE Eliminate risks associated with open-heart surgeries

AquaBlade, a new medical device invented at the University of Nebraska Medical Center and UNeMed's Most Promising New Invention of 2014, could provide a less invasive treatment for cardiovascular disease and eliminate a significant amount of the inherent risks associated with open-heart surgeries.

AquaBlade is an innovative surgical instrument that uses a catheter to deliver a specialized cutting tool through a patient's artery where it uses a high-pressure water jet to repair life-threatening tears in artery walls. The device could also be used to help remove previously deployed stents.

Arterial tears in the inner lining of an artery can lead to the formation of blood clots that obstruct blood flow and eventually lead to a heart attack or stroke. If left untreated, an arterial tear is fatal for 80 percent of patients.

Current treatments for arterial tears often require open-heart surgery, which carries a 25 percent risk of death and an

### INVENTORS

- » Jason MacTaggart, M.D.
- » Nicholas Phillips
- » Alexey Kamenskiy, Ph.D.
- » Amy Mantz

### RUNDOWN

- » Treats aortic dissection
- » Removes stents
- » Less invasive
- » Faster patient recovery

extended recovery period.

AquaBlade eliminates most of those risks while also minimizing the time of recovery. It is currently at the conceptual stage, preparing a functional prototype for preclinical testing.

## SURE SNARE *Remove obstructions from within blood vessels swiftly, safely*

A new endovascular medical device created at the University of Nebraska Medical Center, Sure Snare, could efficiently remove obstructions within blood vessels and result in less time in the operating room.

Existing snares are often difficult to navigate, manipulate or retrieve objects in a timely manner. They must also be deployed under X-ray guidance, which increases the radiation exposure of both the patient and physician.

Sure Snare is an innovative grappling tool with multiple snaring loops that capture objects within blood vessels or ducts of a patient. Once captured, the tangled object is encapsulated by a membrane cap to prevent damaging the vessel walls as the object is removed. A catheter-based system allows for easy manipulation of the device. Together, these novel features will significantly reduce the time spent under X-ray guidance.

The Sure Snare is early-stage with a working prototype in development.

### INVENTORS

- » Jason MacTaggart, M.D.
- » Alexey Kamenskiy, Ph.D.

### RUNDOWN

- » Novel vascular medical device
- » Removes objects from blood vessels
- » Safer and better capture of objects
- » Faster procedure
- » Reduced risk of injury to patient

## PARKINSON'S DISEASE

## New vaccine strategy may signal beginning of end

A novel combination developed by researchers at the University of Nebraska Medical Center may be the final solution that could deliver a knockout blow to Parkinson's disease.

UNeMed's 2013 Innovator of the Year, Howard Gendelman, M.D., and his team believe they are on the verge of producing an effective vaccine to battle the debilitating disorder that affects more than 1 million Americans. Right now, the only treatment options for Parkinson's—the world's second-leading neurodegenerative disorder behind Alzheimer's—are methods for reducing symptoms.

But if Dr. Gendelman's approach succeeds, the immune systems of vaccinated patients will be armed to fend off the disease and prevent its disastrous effects.

The vaccine turns an old foe into a potential ally.

Vaccination with a protein alone, alpha-synuclein, actually has the ability to make Parkinson's even worse. But when the protein is paired with an immune modulator, it

## INVENTORS

- » Howard Gendelman, M.D.
- » R. Lee Mosley, Ph.D.
- » Ashley Reynolds, M.D., Ph.D.

## THE RUNDOWN

- » Novel therapeutic combination
- » Treats underlying factors, not just symptoms
- » Treats existing disease
- » Prevents future disease
- » Potentially useful for other neurodegenerative disorders

promotes an immune response that protects brain cells from further damage.

Preclinical studies show a remarkable 91 percent survival rate of neurons in treated laboratory mice. In 2014, early stage clinical trial testing began on one of the vaccine's critical components. The early test will help determine if the immune system of a Parkinson's patient can be successfully modulated.



UNMC researcher Howard Gendelman, Ph.D.

PHOTO: UNMC

## Perform affordable laparoscopic surgery for all

One of the greatest advances in surgery is the advent of laparoscopic surgery, now a standard of care in most countries.

Looking to extend the use of laparoscopic surgery into developing economies, Chandra Are, M.D., a surgical oncologist at the University of Nebraska Medical Center invented a portable system that takes laparoscopic surgery beyond the dedicated operating room and into the hands of surgeons in a non-traditional environment with minimal support.

Laparoscopic surgery owes its success to the minimally invasive strategy. Laparoscopic surgery occurs with no open incisions as the surgeon makes

small holes to insert cameras and other surgical tools. As a result, laparoscopy is a dedicated specialty that involves expensive laparoscopic suites, with state-of-the-art equipment. It's a kind of surgery performed in one kind of place.

Dr. Are's portable laparoscope technology allows emerging economies to keep up with the standard of care and practice laparoscopic surgery. This groundbreaking system takes the function of a laparoscopic suite and reproduces it in a portable system enabling laparoscopic investigation outside of the minimally invasive suite.

## INVENTORS

- » Chandrakanth Are, M.D.
- » Madhuri Are, M.D.
- » Dennis Alexander, Ph.D.

## THE RUNDOWN

- » Inexpensive to manufacture and employ
- » Requires only minimal clinical support
- » Improves access to laparoscopy in emerging economies
- » Expands the clinical usefulness of the laparoscope beyond the operating room





**Jeff Andersen**  
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» J.D., Creighton University School of Law  
» Joined UNeMed: 2015



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» Joined UNeMed: 2009



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» J.D., Creighton University School of Law  
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» Joined UNeMed: 2009



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» Joined UNeMed: 2013



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» M.S., Molecular Biology, University of Iowa  
» J.D., University of Iowa  
» Joined UNeMed: 2005



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» Ph.D., Pathology and Microbiology, University of Nebraska Medical Center  
» M.A., Microbiology, University of Nebraska at Omaha  
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» M.B.A., University of Nebraska at Omaha  
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## Board of Directors



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*President & CEO*  
» Ph.D., Pathology and Microbiology, University of Nebraska Medical Center  
» Joined UNeMed: 2003



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*Associate General Counsel for Health Sciences*  
» University of Nebraska Medical Center



From his small office at UNeMed, Jack Mayfield churned out agreements, licensing contracts, wit and wisdom at prolific rates.

Then Jack fell from an apparent heart attack on a Tuesday. By Friday, Oct. 31, 2014, the 63-year-old was gone.

Jack joined UNMC in 2012, working as a contracts specialist in the technology transfer office, UNeMed. Any researcher, student, staff or faculty who ever needed a quick contract drawn up to share materials or protect confidentiality, probably worked with Jack.

But to ask anyone who worked with him, few mention his chops as a lawyer. In fact his unequalled production rarely even rates a mention. More often we use words like “mentor” and “teacher” and “friend.” And of course we talk about his passions: Photography and cycling, pursuits he chased with vigor and vitality.

Jack was perhaps most visible as a regular fixture during UNeMed’s Innovation Week, relentlessly snapping photos of anyone and everyone who stood still long enough. Long before joining UNeMed, Jack ran a successful photography business in Tennessee, and he was always willing to lend his skills whenever asked.

But no part of Jack was larger than his enthusiasm for cycling. A member of an Omaha bike club, the Dundee Chain Gang, Jack logged somewhere on the order of 9,000 miles in 2013. For the record, if you wanted to drive from New York to L.A., you’d log about 2,700 miles. From Omaha, that 9,000 miles would get you to somewhere between India and Inner Mongolia.

After every long weekend of even longer rides—marathons, really—Jack would recount the exhausting trips with glee. And he had photos too. The new pictures of Jack and his rider-buddies—beaming under their bike helmets in all their spandex glory—would find a special place on his bulletin board.

We’ll always remember Jack for his good work, and better humor. But more than that, we’ll remember the man in those happy pictures—taken in some far off place where the hills were steep climbs, but the glide down to the finish worth every exhausting pump and kick.



**Jack Louis Mayfield**  
September 16, 1951 – October 31, 2014



*the science of innovation*

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