

T. A. EDISON. Electric-Lamp.

No. 223,898.

Patented Jan. 27, 1880.



technology transfer for unmc



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UNEMED IMPROVES HEALTHCARE BY FOSTERING INNOVATION, ADVANCING BIOMEDICAL RESEARCH AND ENGAGING ENTREPRENEURS AND INDUSTRY TO

COMMERCIALIZE NOVEL TECHNOLOGIES.



Dec. 30, 19

2017 ANNUAL REPORT

EVOLUTION OF INNOVATION The big idea is only the beginning

Darkness often represents uncertainty. The unanswered question. The unsolved problem.

['] Illumination, then, reveals the unknown. Lights the path to answers. Unveils potential solutions.

It should be obvious why the light bulb has become one of the more persistent clichés on the planet. The symbolic meaning of a light bulb has entrenched itself in the public psyche as the ultimate brand for inventive creativity. It's true that the light bulb is a cornerstone achievement for modern civilization, but that doesn't fully explain its symbolic ubiquity.

It's really about the light itself: the antidote for darkness.

Before Thomas Edison, the

BIG IDEA

Continues on next page





COPD

A team of researchers at the University of Nebraska at Omaha's world-leading biomechanics facility are working on a device that might finally predict what was once considered unpredictable: an exacerbation of chronic obstructive pulmonary disease or COPD. An exacerbation is the sudden onset of life-threatening symptoms that make breathing increasingly difficult sometimes impossible—for COPD patients. How quickly a patient gets to the hospital in this condition is often the difference between life and death. The ongoing development of UNO's technology—the earliest prototype is above, and a later model as at left could provide COPD sufferers the time they need for a life-saving medical intervention.

2

2017 ANNUAL REPORT

EVOLUTION OF INNOVATION 1, 1937

2,131,321

Big Idea

Continued from previous page

symbol was a simple flame, such as you might see flickering from a candle or oil lamp.

But look closer at Edison's light bulb. He tried hundreds, if not thousands, of different concepts in his quest for electric light—Different filaments, in different shapes, in different sizes and different metals, encased in different gases... The original idea turned out to be something different than what ultimately succeeded. And this was long, long after people devised flaming sticks, candles, oil lamps, gas lanterns and whatever else they used in times past to light the way.

And the journey continues today: That first light bulb looks considerably different than today's modern LED light. What new forms—presently inconceivable—will light the darkness for us in another 100 years?

That mystery of an invention's maturation is the very core of innovation. It's the incremental change from the first grand idea to the thing that emerges from the development process...and then continues to evolve.

As a commercialization and technology transfer office for a major university medical school, UNeMed sees first-hand how innovations can play out like this.

Sometimes the idea is too advanced to work in the here and now.

We saw that about 10 years ago when an inventor proposed to solve the third-world's lack of surgical access. His idea was essentially a laparoscopic tool with a





One of the early versions of Virtual Incision's surgical robots (above) bears little resemblance to a later iteration that was eventually used in a human patient in August 2016. The later model (right) turned an open surgery procedure—a bowel resection—into a minimally invasive procedure, which reduces recovery time from months to a matter of days.

EVOLUTION OF INNOVATION

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camcorder stuck to the top. (Think of the ill-fated Flip Camera, which was THE go-go gadget for about 20 minutes in 2009.) The laparoscopic invention

was probably unworkable and impractical only because the idea was too advanced for the time.

Then smartphones and the

iPad happened. Now the portable laparoscope is not only entirely possible and actually feasible, it is also, dare we say, likely.

It might actually bring minimally invasive surgery to places where such lavish, first-world luxuries were but a

dream only five years ago. Even as the portable laparoscope relied on external technologies, most of the

BIG IDEA

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TRAK SURGICAL

Joint replacement in orthopedic surgery, it has been said, closely resembles carpentry. Tools of the trade include hammers, screws, chisels, saws and jigs that are functionally similar to miter boxes. On top of those tools, the hallmarks of a master surgeon include talent and a long record of experience. Trak Surgical's hand-held surgical saw removes the need for most of those hardware pieces, and allows more precision in a novice surgeon's hands. (Depicted at left is an early prototype during a demonstration. Above is the same tool after a few years of refinement.)

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PIPETTE

Filed July 21, 1

EVOLUTION OF INNOVATION

Big Idea

1,547,562

Continued from previous page

innovations UNeMed sees will need to run grueling marathons.

One marathon began as an unnamed discovery back in 1993. (Founded in 1991, UNeMed still had that new tech transfer office smell.)

Years later, we came to know the discovery as a synthetic peptide called EP67, and marveled at its ability to stimulate the human immune response to any number of things. Primarily, it showed promise as a way to produce vaccines for everything from the common flu to even chemical dependency.

Later, it proved to be a potent immune stimulant all by itself. The technology continued to grow and evolve as the inventor, Sam Sanderson, Ph.D., continued tinkering with different formulations.

Different approaches. Different applications.

Sound familiar?

A startup company, Prommune was born from the work in the early 2000s. A nanoformulation of the technology

followed.

Then a handful of analog formulations. And most recently, a little more than a year ago, Sanderson and Prommune were awarded about \$4 million in federal grants to examine EP67's use against dangerous infections, including methicillin resistant Staphylococcus aureus, or MRSA.

What bega'n in 1993 was little more than an intriguing discovery with a lot of promise and hope. Just as Edison's light bulb bears little resemblance to modern light fixtures, so too does Dr. Sanderson's EP67 from his first discovery 25 years ago.

A lot of blood, sweat, and too many tears have passed under the bridge since then. The inventor, Dr. Sanderson, unexpectedly passed away in August.

unexpectedly passed away in August. But Prommune and EP67—and the portable laparoscope and heaps of others—live on.

And so continues the hard work of lighting the way to better health.

PROMMUNE

Marathon man Sam Sanderson, Ph.D., (above) made his initial discovery more than two decades ago. He continued developing and tweaking his discovery right up until his final days. His important work survives, however, in the company he founded—Prommune.

2016 INNIATION AWARDS Zucker named & Innovator of the Year

(Oct. 6, 2016)—Irving Zucker, Ph.D., landed top honors at UNeMed's annual Research Innovation Awards Ceremony and Reception last week, taking home the 2016 "Innovator of the Year" award.

Collaborators Joyce Solheim, Ph.D., and Tatiana Bronich, Ph.D., also earned special recognition as the inventors of the "Most Promising New Invention" of 2016. Together, Drs. Solheim and Bronich developed a nanoparticle formulation of a protein called CCL21. The nanoformulated CCL21 has shown great potential for the treatment of cancer.

Hosted by the University of Nebraska Medical Center's technology transfer and commercialization office, the Innovation Awards recognized more than 150 UNMC innovators. Each year, UNEMed sponsors Innovation Week as a way to celebrate and honor all UNMC faculty, students and staff who reported a new invention, secured a U.S. patent or licensed a technology. UNMC Chancellor Jeffrey Gold,

UNMC Chancellor Jeffrey Gold, M.D., and UNeMed President and CEO Michael Dixon, Ph.D., presented the awards.

Dr. Zucker, UNMC's 2007 Scientist Laureate, won the Innovator of the Year Award on the back of a new treatment strategy he and his team developed for cardiovascular disease.

"This was really an unexpected honor," Dr. Zucker said during his brief acceptance speech. "Really, the credit goes not to me—I provided the laboratory and maybe some of the funding to get it started—but I've been very fortunate to have some really talented people who work in our laboratory."

His laboratory is focused on reducing the excessive sympathetic nerve activity found in chronic heart failure and in patients with high blood pressure. A biopharmaceutical company recently licensed one of Dr. Zucker's innovations in a collaborative agreement that could lead to an FDA-approved treatment for chronic

INNOVATION AWARDS

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UNeMed Corporation, the technology transfer and commercialization office for the University of Nebraska Medical Center, hosted the Innovation Awards Ceremony and Reception on Thursday, Oct. 6, 2016. The awards recognize all faculty, students and staff who disclosed a new invention, secured a U.S. patent or licensed a technology during the 2016 fiscal year. Irving Zucker, Ph.D., (above) was named the 2016 Innovator of the Year.

Patented Ded. 1, 1863

Awards

Continued from previous page

heart failure and high blood pressure. The nanoparticle developed by Drs. Solheim and Bronich is based on a protein messenger, or chemokine, that has the ability to attract immune cells to a tumor. But the chemokine, CCL21, degrades too quickly inside the body to do much good. By encapsulating the chemokine in a nanoparticle, Drs. Solheim and Bronich found a way to prolong the effects of CCL21.

Previously, Dr. Solheim was named a 2006 Distinguished Scientist. Dr. Bronich was a 2007 New Investigator Award winner, then a 2011 Distinguished Scientist. In 2014 Dr. Bronich was named Scientist Laureate, UNMC's highest honor bestowed on researchers.

UNeMed, which celebrated its 25th anniversary during Innovation Week, raffled away a free 3D printer to Erik Rask, a graduate student in UNMC's cardiovascular and biomechanics laboratory.

Innovation Week began Monday, Oct. 4, with a Kick-off event that featured UNeMed staffers handing out free T-shirts and other items. Innovation Week continued Tuesday with a panel discussion about the biomedical applications of 3D printing.

On Wednesday, Oct. 5, ŬNeMed hosted its fourth UNMC Technology Demonstration Day, which featured six startups and technologies. Learn more about all Innovation

Week events at http://www. unemed.com/innovation-week or view pictures from all events on UNeMed's Flickr page at http://bit.ly/ InnovationWeeki6pics.

A.A.Marki





U.S. PATENTS ISSUED TO UNMC INVENTORS

Here is the list of all U.S. patents issued to UNMC personnel during the 2017 fiscal year. Patent numbers are followed by the patent titles, the date the patent was issued and the names of all co-inventors listed on the patent.

ND.	TITLE	ISSUED	INVENTOR(S)
9,585,691	Sheath	Mar 7, 2017	Gregory Gordon
9,579,088	Methods, Systems, and Devices for Surgical Visualization and Device Manipulation	Feb 28, 2017	Shane M. Farritor Mark Rentschler Amy Lehman Nathan A. Wood Adam Bock Reed Prior
9,580,472	Anti-Microbial Peptides and Methods of Use Thereof	Feb 28, 2017	Guangshun Wang
9,545,452	Biomineral and Metal Binding Liposomes, Their Synthesis, and Methods of Use Thereof	Jan 17, 2017	Dong Wang Xin-Ming Liu
9,525,698	Risk Prioritization and Management	Dec 20, 2016	Robin A. Gandhi Harvey Siy Keesha M. Crosby
9,517,230	Small Molecule Rnase Inhibitors and Methods of Use	Dec 13, 2016	Paul M. Dunman Patrick D. Olson Wayne Childers
9,498,231	On-Board Tool Tracking System and Methods of Computer Assisted Surgery	Nov 22, 2016	Hani Haider Ibrahim Al-Shawi Osvaldo Andres Barrera
9,498,292	Single Site Robotic Device and Related Systems and Methods	Nov 22, 2016	Shane Farritor Eric Markvicka Thomas Frederick Joseph Bartels Jack Mondry
9,498,533	Drug Delivery Compositions and Methods	Nov 22, 2016	Tatiana K. Bronich Alexander V. Kabanov Johg Dh Kim
9,486,424	Creatine Oral Supplementation Using Creatine Hydrochloride Salt	Nov 8, 2016	Jonathan L. Vennerstrom Donald W. Miller Mark C. Faulkner
9,457,030	Compositions and Methods for the Treatment of Juvenile Neuronal Ceroid Lipofuscinosis and Related Disorders	Oct 4, 2016	Tammy Kielian
9,433,492	Method and Device for Facilitating Surgical Access to a Body Area	Sep 6, 2016	Jeffrey W. Delaney
9,421,341	Laryngeal Tube	Aug 23, 2016	Ben Boedeker, David Miller, Tom McGrail, Volker Bertram
9,403,911	Compositions and Methods for Detection and Treatment of Cancer	Aug 2, 2016	Surinder Batra, Maneesh Jain, Moorthy Ponnusamy
9,403,281	Robotic Devices With Arms and Related Methods	Aug 2, 2016	Dmitry Dleynikov, Mark Rentschler, Shane Farritor, Jason Dumpert, Adnan Hadzialic, Stephen Platt, Nathan Wood
9,402,90 <u>8</u>	Polymeric Delivery Systems for Active	Aug 2, 2016	Alexander Kabanov, Robert Luxenhofer,







2008-2012

2013-2017

2003-2007

PATENTS

UNeMed more than doubled last year's total patents issued with s2. That's a 108 percent increase over the 25 patrents secured in 2016.

2003—2007

2008-2012

million



reements



\$2.1 million

2013-2017



Sponsored Research

In fiscal 2017,

\$910,917 that

sponsored research at UNMC. That's a

40 percent improvement over the previous year, and the thirdhighest amount since 2007, when UNeMed started

tracking the

UNeMed Secured



Total Revenue





2017 ANNUAL REPORT



LICENSES

The 23 licensing deals signed in 2017 was an all-time high. The previous record, 22, was set in 2013.

Core Metrics

2,270,973 Revenue \$910,917 Sp. Researc \$237,621 Distribution

Revenue

UNeMed brought in \$2.27 million in fiscal year 2017, a 31 percent increase over the previous year. It was the highest tally in the last five years, and the third-highest in UNeMed's 26-year history.



FEATURED TECHNOLOGIES

MedLens Upgrade any smartphone into a diagnostic tool



MedLens is a versatile attachment that fits any smartphone, upgrading it into a diagnostic tool, such as a fundoscope or otoscope. MedLens can be quickly and easily attached to a smartphone and positioned over the camera lens using a simple rail-andclamp system.

Once in place, the modular lens package design allows for multiple anatomical imaging applications. Users can even control the level of illumination for perfect contrast no matter the application.

matter the application. This new device saves clinicians time and money, particularly in outreach or out-of-clinic settings. It also provides clinicians with a convenient way to record images and share them for further diagnostic examination and second opinions.

RUNDOWN

- Flexible fit for several smartphone models
- Modular lens packages for multiple anatomical imaging applications
- Illumination control for perfect contrast no matter the application

Use the immune system to infiltrate and destroy tumors

University of Nebraska Medical Center researchers have found a way to harness the power of the immune system to recruit immune cells to help treat cancer.

Tatiana Bronich, Ph.D., and Joyce Solheim, Ph.D., have shown that a protein messenger, or chemokine, called CCL21, can be used to treat tumors. CCL21 is capable of attracting immune cells to the area where it's administered.

However, one problem with this approach is that CCL21 doesn't last long inside the body, providing a relatively short-lived therapeutic benefit.

To get over this hurdle, Drs. Bronich and Solheim created a new way to deliver CCL21 directly to the tumor site while protecting it from degradation. The nanoformulation allows for extended release of CCL21 within the tumor site, prolonging its effect and increasing its overall therapeutic impact.

The CCL21 nanoparticle formulations have been developed, and their release kinetics have been

RUNDOWN

- Personalized immunotherapy
- Extended release formulation
- Enhance existing immunotherapies

optimized. Researchers have also performed small-scale animal studies using subcutaneous PancO2 tumors where the nanoformulated CCL21 showed significant inhibition of tumor growth over nine days.

In addition to use as a standalone immunotherapy, the CCL21 nanoparticles can also enhance other immunotherapies.

By enhancing immune infiltration into tumors, the CCL21 nanoparticles can greatly enhance the efficacy of tumor vaccines, cell therapies, oncolytic viruses, and antibody therapies. Future studies will look at the benefits of co-administering CCL21 nanoparticles with existing cancer immunotherapies.

New technology quickly stops serious bleeding

A new technology to stop severe bleeding injuries has been developed by researchers at the University of Nebraska Medical Center. The technology is a nanofiberbased sponge capable of rapidly absorbing blood and other fluids while still retaining its overall shape and size.

The nanofiber sponge absorbs more fluid, more quickly than traditional gauze products and gelatin sponges currently on the market.

The nanofiber sponges were tested in a large animal liver injury model. In the tests, the nanofiber sponges effectively stopped the catastrophic bleeding, and greatly reduced overall blood loss.

The new nanofiber sponge will be a useful addition to surgical suites, emergency rooms and the battlefield.

- Rapidly absorb blood and other fluids
- Retain shape when wet
- Capable of retaining more fluid than gelatin sponges and other products
- Effective in large animal study



FEATURED TECHNOLOGIES

Suh precision injection syringe New syringe allows precise, one-handed injections



RUNDOWN

- Can be securely operated with one hand
- Allows use of a precise, pencil-grip
- Designed with feedback from several clinical specialties
- Potential applications in ophthalmology, ear-nose-throat, plastic surgery, pediatric surgery, rheumatology and self-injections
- Also allows traditional syringe use

A novel syringe developed at the University of Nebraska Medical Center enables users to safely perform onehanded injections with improved control. The new syringe is particularly useful in several delicate medical procedures, like correcting crossed or lazy eyes in children. The syringe frees up the other hand to safely secure the injection site, allowing doctors even more precision.

Led by pediatric ophthalmologist Donny Suh, M.D., the inventors gathered hands-on feedback from a wide range of clinical specialists to create an elegant working prototype. While the design facilitates the comfortable operation of the syringe with one hand, it can still be used as a traditional syringe.

This technology has potential applications in ophthalmology, earnose-throat, rheumatology, plastic surgery, and self-injections, among others. Currently, there is strong clinical interest in using this syringe for the delicate delivery of therapeutics for the treatment of acute macular degeneration. We are in discussions with a large pharmaceutical company in Europe and are looking for a partner to manufacture prototypes for further evaluation.

Parkinson's vaccine clears hrst clinical trial

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.

Howard Gendleman, 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 secondleading neurodegenerative disorder behind Alzheimer's—are methods for reducing symptoms. But if Gendleman's approach

But if Gendleman'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, alphasynuclein, alone actually has the ability to make Parkinson's even worse. But when the protein is paired with an immune modulator, it promotes an immune response that protects brain cells from further damage. Preclinical studies show a remarkable

Preclinical studies show a remarkable 91 percent survival rate of neurons in treated laboratory mice. Dr. Gendelman's team recently

Dr. Gendelman's team recently completed a small clinical trial in Parkinson's patients testing one of the vaccine's potential components an immune modulating drug. Treatment with the drug transformed the immune response to a more neuroprotective immune response and also showed clinical signs of improvement in the patients.

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



CRISPR/Cas9 editing tool Get more out of CRISPR with new insertion protocol

The discovery of the new gene editing technology, CRISPR, was a dream come true for scientists everywhere. Never before could DNA be cut so cleanly and precisely. But CRISPR only solves half the problem.

While CRISPR can delete a specific segment of mutated or faulty DNA, the process for replacing that piece has been unwieldly, imprecise and very inefficient. In short, CRISPR is the precision of a laser, while current DNA insertion methods are closer to bludgeons.

An international collaboration invented a better method to capitalize on CRISPR's strengths, while dramatically improving efficiency of inserting new material by as much as 400 percent. The University of Nebraska Medical Center's Dr. Channabasavaiah Gurumurthy and Drs. Masato Ohtsuka and Hiromi Miura at the Tokai University School of Medicine in Japan invented the protocol, which has a remarkable high rate of efficiency (up to 100 percent in some genetic loci).

Ás a research tool, the new protocol could have a profound impact in developing new genetically engineered model organisms, including animals, cells and plants, and other testing media that could lead to future cures of genetic conditions.

RUNDOWN

- Insert larger DNA fragments
- Improve efficiency to 83 percent
- No special equipment needed

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 help 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

Arterial tears in the inner lining of an artery can lead to the formation

RUNDOWN

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



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 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.

RUNDOWN

Surgically implanted

organ of interest

Can be mounted to a

Highly customizable

for different

microscopes

longitudinal studies

animals, organs, and

above the tissue or

Provides drug delivery and real-time imaging

microscope for precise,

Abdominal access viewport Custom viewport reveals organs, delivers medication

A novel abdominal window enables researchers to view functioning tissue and organs of living animals. The surgically implanted device is made from multiple biocompatible materials and highly customizable.

The Abdominal Access Viewport offers a new, affordable and customizable method of performing accurate observations during long-term animal studies. With applications in numerous animal models including surgical intervention, infection, tumor placement, and drug screening, among others, this versatile research tool upgrades a standard microscope into a real-time imaging system.

real-time imaging system. A rigid window frame containing a glass coverslip is surgically implanted onto the surface of the animal above the tissue or organ of interest, and can be tailored to allow microscopic imaging and drug delivery.

This new device provides researchers with two major benefits. First, the window allows real-time imaging of live-animal tissues with nearly any laser microscope, which eliminates the need for an inverted microscope. Second, access portals allow the delivery of a range of substances, including macromolecules, pharmaceuticals and cellular populations for real-time monitoring of tissue response.

FEATURED TECHNOLOGIES

REBOA: Automated hemorrhage control system New device to save patients from catastrophic bleeding

A new automated bleeding-control system that can reduce deaths related to catastrophic internal bleeding has been developed at the University of Nebraska Medical Center.

Internal bleeding is a common result of injuries from car crashes, falls, and gunshot wounds, accounting for more than half of all American deaths between 1and 44-years-old. Depending on the severity of the injury, the risk of death increases if the internal bleeding is not controlled in the first hour after the incident.

In the hospital, surgeons can stop severe bleeding by inserting a small balloon into a blood vessel near the injury site. The balloon—called a REBOA or Resuscitative Endovascular Balloon Occlusion of the Aorta—is then inflated, blocking flow and preventing further blood loss.

The problem with this approach is that traditional REBOA devices block all blood flow, which can lead to permanent damage if organs and tissue downstream of the device are starved from their blood supply for too long. UNMC's novel device does more than just block flow: The innovative design has the ability

RUNDOWN

- Rapid occlusion and cessation of hemorrhaging vessels
- Shunts blood flow to downstream organs and tissue
- Reduced mortality from traumatic bleeding injuries
- Easy retrieval of a temporary endovascular medical device
- Better and safer alternative for REBOA
- Automated system for reduced operator error

to bypass the damaged area and maintain blood supply to vital organs and tissues downstream of the injury.

The automated REBOA device precisely controls inflation and regulates the amount of blood flow to downstream tissue. The device is fully automated to decrease user error. It can be easily deployed within the injured vessel to prevent blood loss at the site of the injury while preserving blood flow to downstream organs and tissue.

Endovascular snare Eliminate risks associated with open-heart surgeries

Remove obstructions from 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

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 reduce the time spent under X-ray guidance.

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

RUNDOWN

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

Alexey Kamenskiy, Ph.D., presents the automated REBDA device during UNeMed's 2017 Industry Partnering Summit.



2,131,321

Faster, easier wound-cleaning

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

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.

RUNDOWN

- Connects easily to sterile solution source
- Ergonomic design
- Cost-efficient
- Adjustable fluid pressure
- Continuous wound irrigation
- Improve wound cleansing
- Faster irrigation process

UNeMed | Tech Transfer for UNMC

Improve AV fistula maturation Device makes fistulas mature faster, better, safer



Inventor Marius Florescu, M.D., describes his fistula maturation device to UNeMed staffers in November 2014.

Healthcare providers now have a better, more reliable way to improve dialysis in patients with kidney failure.

Hemodialysis simulates kidneys function by filtering a patient's blood outside the body to cleanse it from toxins. For dialysis to work properly, dialysis machines must filter as much blood as possible during each treatment.

An arteriovenous or AV fistula is a point of entry and exit to the blood vessels that also allows large amounts of blood to flow uninterrupted. This portal serves as a connection between an artery and a vein in the patient's arm and allows the vein to grow large and strong providing reliable access to blood vessels each time.

AV fistulas are a complex and imperfect solution, even when performed by an expert team of surgeons and support staff. The problem with creating AV fistulas

The problem with creating AV fistulas is that they require weeks to months to develop, or mature, and strengthen before a patient can undergo hemodialysis. Many patients undergoing dialysis are never able to mature a large fistula.

A better, more reliable way to create AV fistulas seems like a good idea.

UNMC surgeon, Marius Florescu, M.D., has a new device that represents the first major improvement for the AV fistula in more than 40 years. His device promotes better AV fistula creation and maturation for hemodyalisis.

Dr. Florescu also made a critical discovery during his proof-of-concept work: Identifying the first known animal model in which AV fistulas can mature.

- First major improvement for the AV fistula in more than 40 years
- Medical device that promotes fistula maturation
- Capable of maturing AV fistulas in an animal model
- Inexpensive, single use
- Multiple applications beyond fistula maturation

J.J. Fatent

2017 ANNUAL REPORT

FEATURED TECHNOLOGIES

Sympathetic vasomotion monitoring New device will improve outcomes in renal denervation procedures

Researchers at UNMC developed a device capable of making high blood pressure more treatable by accurately measuring the rhythmic constriction and relaxation of blood vessels, known as sympathetic vasomotion.

The sympathetic nervous system controls the body's automated functions such as digestion, heart rate and the vasomotion of blood vessels. Disruption of the sympathetic nervous system can contribute to a variety of chronic diseases, including high blood pressure.

One potentially effective way to treat high blood pressure is to destroy, or ablate, all or parts of the sympathetic nerves of the kidneys. The problem, however, is until now there has not been an accurate tool that helps clinicians in realtime determine if the procedure is targeting the proper areas of the kidneys.

UNMC's detection system noninvasively monitors sympathetic nerve activity in real time and determines if a renal denervation procedure was successful. This technology will help significantly increase the success rate of renal denervation procedures.

UNMC researchers have shown that the sympathetic vasomotion

RUNDOWN

- Detects small changes in vasomotion
- Can be used to determine if a renal denervation procedure was successful
- Will increase the success rate of renal denervations
- Can also be used as a screening tool for blood pressure-related fainting and non-invasive hemodynamic monitoring

detection system can accurately detect renal denervation in rat and rabbit models. A current study in pigs is expected to further validate the system's ability and accuracy.

The sympathetic vasomotion detection system is a versatile tool that can also monitor and detect other diseases or conditions associated with the sympathetic nervous system.

In addition to their work with renal denervation, UNMC researchers are also investigating the device's use as a screening tool for blood pressure-related fainting and noninvasive hemodynamic monitoring.



Doctoral candidate, medical student and co-inventor Peter Pellegrino presents the sympathetic vasomotion monitoring system for renal denervation during UNeMed's 2017 Industry Partnering Summit.

Motion capture system Use a smartphone for true motion capture system

Motion capture is a growing and versatile tool. From 3D animation to physical therapy, the data from motion capture is gaining wider and wider usage. Unfortunately, motion capture requires multiple high-speed cameras and a variety of active or passive reflectors. Expensive and complicated equipment limits wider use.

Mobile motion capture technologies exist but lack versatility. Current systems only record video, which must be processed at a later date. Even then, the information from the motion capture systems is not always at the same level of quality, which limits the utility of the motion capture data.

Doctors Ka-Chun Siu and JC Chien invented new algorithm that allows for true mobile motion capture using a smartphone. Unlike other mobile motion capture systems, their invention makes it possible for real time motion capture, without expensive equipment—just a camera and some disposable markers. In laboratory tests, the mobile motion capture system captured motion just as precisely as a state of the art motion capture laboratory system.

- Capture motion anywhere, using only mobile devices and proprietary software
- Novel algorithms extract motion capture data in real time
- Inexpensive sensors require no special equipment or skills

2017 ANNUAL REPORT

FEATURED TECHNOLOGIE

Reduce diabetic complications, lower blood sugar

An exciting new development at the University of Nebraska Medical Center helps mitigate the disastrous effects of diabetes—particularly degenerative and destructive brain complications more often seen in the elderly.

Research on diabetic animals show that an enzyme, Glyoxalase-1, could be used to treat common diabetes complications such as blindness, heart disease, kidney failure, and erectile dysfunction.

Even more promising, the therapy also helps improve brain function and minimizes the amount of brain tissue affected by a stroke, all while significantly helping reduce blood sugar levels.

Glyoxalase-1 targets and degrades the suspected cause of these complications—a naturally occurring chemical, methylglyoxal, which is created by damaged cells when blood sugar levels are high.

Currently there are no FDAapproved treatments that target brain complications in diabetes and also help manage blood sugar levels. But with a committed partnership, Glyoxalase-1 could be the first.

RUNDOWN

- Prevent cognitive dysfunction
- Reduce cerebrovascular complications
- Minimize affected brain tissue following stroke
- Treats other diabetic complications
- Reduce brain complications
- Manage blood sugar
- Targets damaged cells

COPD Monitoring Platform Wearable device warns of worsening COPD symptoms...before they happen

Chronic obstructive pulmonary disorder, or COPD, is one of the largest and fastest growing causes of death in the world.

People that live with COPD suffer chronic breathlessness and the risk of exacerbations: A sudden worsening of symptoms. Exacerbations are deadly, and are often only treatable in the intensive care unit.

A new invention from the University of Nebraska warns people with COPD about worsening symptoms, before they happen.

The device monitors the synchronization between breathing and walking. In laboratory studies, patients with COPD were less able to synchronize their breathing and walking. The worse the disease got, the worse their ability to synchronize.

Initial results from a national clinical study matched laboratory results. The inventors are currently

RUNDOWN

- Wearable technology makes possible remote monitoring
- Novel algorithms allows prediction of symptom worsening
- Enables preventative treatment
- Powerful data analysis is inexpensive, scalable

working to further refine the device and improve the analysis.

For the first time ever, a wearable device has the potential to predict the worsening of COPD symptoms, even exacerbations. Early detection opens the door to new treatment protocols focused on preventing worsening symptoms, exacerbations and costly hospitalizations.

Long-acting antiretroviral therapy New delivery method opens powerful option for HIV treatment

Managing HIV treatment may never be the same.

Researchers at the University of Nebraska Medical Center have discovered a way to revolutionize the treatment of HIV. Early studies show UNMC's novel approach could reduce the regimen to a single treatment once every month, eliminating the need for current strategies that require daily administration of medicine.

Antiretroviral therapies, or ART, are also ineffective at reaching viral reservoirs such as the lymph nodes and the central nervous system. These viral reservoirs essentially serve as a bunkers that shelter HIV from current medications. But UNMC researchers overcame this obstacle with a new nanoformulation called NanoART.

NanoART harnesses the power of the patient's immune system to store and deliver ART medications throughout the entire body in a sustained release formulation. NanoART targets the immune system's hunter cells, or macrophages, which roam the body on a perpetual seek and destroy mission looking for foreign invaders. NanoART piggybacks on the macrophages, which have full access to all parts of the body, including the central nervous system—a particularly difficult system to hack for most modern medicines.

Early tests on mouse models and large animals show that NanoART produces a sustained release with long-lasting antiretroviral activity.

With further development NanoART could have a dramatic impact on the estimated 34.2 million people on the planet who are affected by HIV. The Centers for Disease Control estimates 1.1 million Americans are living with HIV infection.

- Sustained delivery of antiretroviral drugs
- Increased penetration into viral reservoirs
- Decreased dosing for ART therapy
- Less frequent dosing for ART therapy

U.S. Patent

Dec. 30, 1997

Sheet 1 of 2

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technology transfer for unmc



