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unemed

the science of innovation

Startup • Technology Transfer • Consulting • Licensing • Patent Protection • Material Transfer • Intellectual Property

Annual Report | FY 2013



Unemed

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

Cover: In 2006, Doctors Dmitry Oleynikov and Shane Farritor developed mini surgical robots that decrease the size of surgical incisions. The robotic surgical device enters a patient's body using a single incision, which should be much less invasive than traditional surgery – meaning shorter recovery time for patients and reduced-cost hospital stays. The patented technology is licensed to Virtual Incision (see page 7), a startup company that has attracted more than \$3 million in private investments so far.

(Photo: University of Nebraska-Lincoln Office of Research)

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From the President & CEO



Michael Dixon, Ph.D.
President and CEO

It gives me great pleasure to present the UNeMed 2013 Annual Report.

As the technology development and commercialization entity for the University of Nebraska Medical Center (UNMC), UNeMed Corporation is focused on improving healthcare by fostering innovation, advancing biomedical research and engaging entrepreneurs and industry to commercialize novel technologies.

UNeMed was established in 1991 and has amassed a diverse portfolio of intellectual property that represents significant advances in biomedical and clinical technology areas such as therapeutics, diagnostics, medical devices, research tools and software. However, UNeMed is more than a technology portfolio. We are a diverse staff with significant expertise in science, business and law. Our teaming approach allows us to offer both researchers and industrial partners unique solutions to complex problems.

As a testament to UNMC's commitment to the development and translation of research into biomedical products, UNMC consolidated all technology transfer activities into UNeMed in 2007 — along with substantial financial support which has sparked significant growth in all of our major metrics.

Biomedical and translational research at UNMC doubled in the last decade. Last year, research spending at UNMC grew to more than \$140 million, generating 66 new innovations. UNeMed evaluated each invention for patent and market potential, and worked with inventors to secure appropriate U.S. and international patent applications. Through our significant network of marketing contacts, we ran international marketing campaigns for each technology to help identify the right commercial partners. We signed a record number of license and option agreements (22), including four startup companies and three international agreements. Out-licensing, co-research, and/or new company creation were just a few of the many methods we employed to encourage development, and ultimately the sale of new biomedical products based on our technology. Revenue from these activities is used to fund additional translational research at UNMC.

As part of our community outreach, UNeMed has also designed programs to work with the local community of inventors, as well as regional colleges and hospitals, including the Eastern Nebraska and Western Iowa's Veterans Administration Hospital and Roosevelt University in Chicago.

We firmly believe the development of new innovations is essential to our state and national economy, and UNeMed is deeply committed to accelerating economic growth through creativity and entrepreneurship. We are enthusiastic to connect our research expertise and technology with the needs of industry, and help advance healthcare while further developing our economy.

These are the collaborations and partnerships that will change the world.

Michael Dixon

From bench to bedside

UNeMed serves the faculty, staff, and students at the University of Nebraska Medical Center and helps them identify problems and develop solutions that promote the general health and welfare of the state. Whether those solutions are new drug candidates, medical devices, or methods for treating diseases, all innovations are evaluated for their scientific and commercial potential by UNeMed's experienced group of staff, postdocs and interns.

UNMC employees first disclose their innovative solutions to UNeMed, which then works to identify and

collaborate with non-university commercial partners to fully develop those innovations into market-ready products and solutions that improve public health.

These technologies can be further developed through established companies, or used as the basis of a new company that leads to a robust startup community for the local economy. This development is supported through various university, state and federal funding programs, in addition to private investment and research sponsorship.

Throughout the process, UNeMed works to facilitate the exchange of information, rights, and assets to improve the health of all Nebraskans.



UNeMed Corporation's core function as a technology transfer office is to help make research and innovation developed at the University of Nebraska Medical Center accessible and available to benefit the general public.

MISSION

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

VALUES

- Innovative Vision
- Integrity and Stewardship
- Excellence
- Dedication

VISION

- World-class technology commercialization entity
- Best service to faculty
- Recognized by community as an entrepreneurial resource
- Help build a strong biomedical ecosystem in Nebraska

In the beginning

In 1991 the Board of Regents of the University of Nebraska saw that innovation and discovery needed help going beyond academic journals and into the hands of people who could benefit most.

In a move to protect and commercialize world-class intellectual property created at the University of Nebraska Medical Center, the Regents established UNeMed Corporation as the licensing arm for UNMC technology. As a for-profit corporation, UNeMed also administered other commercial and research contracts for UNMC. The

job of evaluating and managing new inventions fell to the Intellectual Property Office.

UNeMed eventually absorbed the Intellectual Property Office in a 2007 restructuring. The restructuring folded UNeMed into UNMC's research division under the Vice Chancellor for Research, creating UNeMed as it exists today — a world-leading technology transfer office that springboards Nebraska innovation from the research bench to patients' bedsides.

The mission today goes far beyond the modest beginnings 22 years ago.

UNeMed has since established itself as a national leader among technology transfer offices, reaching far above and beyond the traditional role of licensing technologies and filing patent applications.

UNeMed's progressive approach is infused with an entrepreneurial spirit that places the office at center stage as a major player in the startup, consulting, and conferencing communities.

Playing that role is made easier with a partner like UNMC, which has undergone a transformative period of growth that has firmly placed a large star over Omaha on the biomedical research map.



Facilities

Innovation happens here



UNIVERSITY OF
NEBRASKA
MEDICAL CENTER

UNeMed's corporate headquarters in Omaha sits in the north-west corner of the University of Nebraska Medical Center campus and its world-class research facilities.

In the last 10 years, UNMC has committed more than \$670 million toward building new or upgrading to state-of-the-art facilities that have brought in world leading researchers in fields such as cancer, drug delivery, nanomedicine, and infectious diseases.

Here's a closer look at some of the more recent facility additions, and a few that are still on the horizon for the near future:

Fred & Pamela Buffett Cancer Center

On May 7, 2013, UNMC broke ground on the Fred & Pamela Buffett Cancer Center, a \$323 million building project – the largest project in the 144-year history of the University of Nebraska. The facility is expected to fully plant UNMC's cancer research as the clear leader in the region and among the national elite.

Projected for completion in 2016, the building will be divided into 252,000 square feet of research facilities and 325,000 square feet for a clinical outpatient treatment facility and a 108-bed inpatient hospital. Nearly 100 labs will be dedicated to researching a multitude of cancers, including breast, brain, pancreatic, prostate and lung cancers.



UNMC Rendering



UNMC Photo

Durham Research Center

Fully completed in 2009, the Durham Research Center is an imposing two-tower facility with half-a-million square feet and more than 200 lab facilities. Researchers in these two buildings alone brought in \$177.2 million in research funding in 2009.

Stanley M. Truhlsen Eye Institute

UNMC joined the ranks of elite eye research and care centers such as those at Johns Hopkins Hospital and Harvard Medical School with the grand opening of the Stanley M. Truhlsen Eye Institute on May 22, 2013. The \$20-million facility features the Ocular Imaging Research and Reading Center and the Center for Innovative Clinical Trials in Ophthalmology. There are already plans for future expansion with the expected addition of a surgical wing.



UNMC Photo

Lozier Center for Pharmacy Sciences and Education and Center for Drug Discovery

With construction set to begin in early 2014, the new College of Pharmacy building will house laboratory and research support space with an emphasis on infectious diseases and dedicated to three key areas: drug discovery and development, drug delivery, and clinical and translational research. Completion of the \$35 million construction project is expected in 2015.



UNMC Rendering

RESEARCH CENTERS

- Center for Advanced Surgical Technology
- Center for Biopreparedness Education
- Center for Clinical and Translational Research
- Center for Collaboration on Research Design and Analysis
- Center for Drug Delivery and Nanomedicine
- Center for Environmental Health and Toxicology
- Center for Health Services Research
- Center for Humanities, Ethics and Society
- Center for Neurodegenerative Disorders
- Center for Research in Leukemia and Lymphoma
- Eppley Cancer Center
- Center for Integrative and Translational Neuroscience
- Nebraska Center for Cellular Signaling
- Center for Staphylococcal Research

MAJOR PROGRAMS

- Gastrointestinal Cancer (SPORE)
- Mass Spectrometry in Clinical Diagnosis of Nerve Agent Exposure
- The Molecular Biology of Neurosensory Systems (COBRE)
- Nebraska Center for Cellular Signaling
- Nebraska Center for Nanomedicine
- Nebraska Research Network in Functional Genomics (INBRE)
- Nebraska Regenerative Medicine Project
- Neural Immunity in HIV Dementia
- Proteomic Strategies for AIDS and Drug Abuse - HIV and METH CNS Synergy
- Staphylococcal Biofilm and Disease
- Chronic HIV Infection and Aging in NeuroAIDS (CHAIN) Center

UNeMed Staff



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



Steve Schreiner
**Vice President & Director of
Licensing and Marketing**
Ph.D., Pathology and Microbiology,
University of Nebraska Medical Center
M.A., Microbiology, University of
Nebraska Omaha
Joined UNeMed: **2006**



Jason T. Nickla
**Vice President & Director of
Intellectual Property**
J.D., Law, Creighton University
School of Law
LL.M., International Intellectual Prop-
erty Law, Chicago-Kent College of Law
Joined UNeMed: **2009**



Joe Runge
Director of Business Development
M.S., Molecular Biology, University
of Iowa
J.D., Intellectual Property Law,
University of Iowa
Joined UNeMed: **2005**



Matthew Boehm
Senior Licensing Specialist
Ph.D., Cancer Biology, University of
Nebraska Medical Center
Joined UNeMed: **2009**



Jack Mayfield
Contracts Manager
J.D., Law, University of Tennessee
M.S., Education-Instructional Media,
Kansas State University
Joined UNeMed: **2012**



Cori Harsh
Finance Manager
Joined UNeMed: **2009**



Valerie Gunderson
Office Manager
Joined UNeMed: **2007**



Mindy Ware
Patent Associate
Joined UNeMed: **2010**

BOARD OF DIRECTORS

Donald Leuenberger
Chair
Vice Chancellor for Business and
Finance
University of Nebraska Medical
Center

Michael Dixon, Ph.D.
President & Chief Executive Officer
UNeMed Corporation

Richard Spellman, Esq.
General Counsel for Healthcare
University of Nebraska Medical
Center

Mike Pallesen
Board Secretary and General
Counsel
Cline Williams, Wright, Johnson &
Oldfather



Charlie Litton
Communications Associate
Joined UNeMed: **2013**



Qian Zhang
Licensing Associate
Ph.D., Cancer Biology, University of
Nebraska Medical Center
Joined UNeMed: **2011**



Caronda Moore
Licensing Associate
Ph.D., Medical Science, University of
Nebraska Medical Center
Joined UNeMed: **2013**



Deepak Madhavan
Physician in Residence
M.D., University of Nebraska Medi-
cal Center
Joined UNeMed: **2013**



Gary L. Madsen
Entrepreneur in Residence
Ph.D., Medical Microbiology, Creigh-
ton University School of Medicine
M.S., Medical Microbiology, Creigh-
ton University School of Medicine
Joined UNeMed: **2012**



Agnes Lenagh
Licensing Associate
Ph.D., Pharmacology and Experi-
mental Science, University of Nebraska
Medical Center
Joined UNeMed: **2012**



Anne Rivas
Office Associate
Joined UNeMed: **2013**



Jack A. Hartwigsen
Senior Licensing Consultant
Ph.D., Molecular Biology, Iowa St. Univ.
M.S., Molecular Biology, Iowa St. Univ.
M.B.A., Finance, University of Iowa
Joined UNeMed: **2006**

Startups

Many inventions disclosed to UNeMed are at an extremely early stage of development, and often industry partners require additional research data before entering into formal relationships. In such a circumstance, new corporate entities are often the most appropriate avenue for product development.

UNeMed works with entrepreneurs, investors and consultants to form new companies around disclosed technologies. UNeMed nurtures these companies – identifying early investors, grant opportunities and potential leaders – while often taking an equity stake in the business.

In fiscal year 2013, UNeMed helped establish four new startup companies, including Bohe Biotech, a new company in China that plans to develop a UNMC technology that could make things like mouthwash and toothpaste provide fresh breath all day long.

Other companies formed in 2013 are Radux Devices, LLC, ProTransit Nanotherapy, LLC, and Trak Surgical, Inc. (See related story.)

Featured startups built in FY 2013

Radux Devices, LLC

Founded by UNMC interventional radiologist Dr. Greg Gordon, Radux Devices, LLC was created in 2012 to develop two of Dr. Gordon's inventions. Both inventions improve radiation protection and decrease orthopedic stress for physicians, while also improving work-flow and operating table management in endovascular/fluoroscopy suites. Radux was recently awarded two Nebraska Department of Economic Development grants for developing and testing prototypes.



Photo by Jack Mayfield

Gary Madsen (left) and UNeMed president Michael Dixon sign on June 12, 2013, the licensing agreement that made ProTransit Nanotherapy, LLC a reality. ProTransit will use technology developed at UNMC to make things like sunscreen more effective barriers against skin cancer.

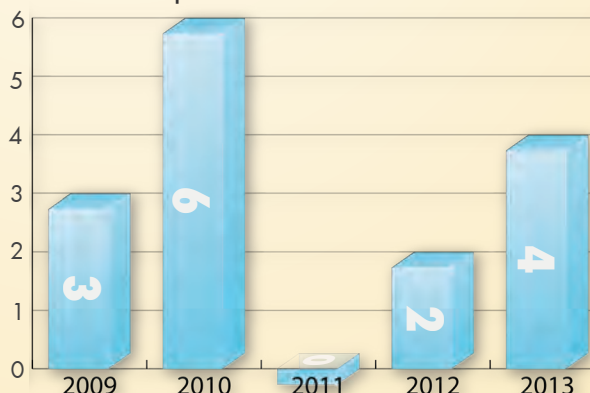
ProTransit Nanotherapy, LLC

UNeMed's entrepreneur in residence, Gary Madsen, Ph.D., built ProTransit Nanotherapy, LLC, on a drug delivery nanoparticle developed at the University of Nebraska Medical Center. ProTransit Nanotherapy will begin operations by perfecting a targeted system that will deliver powerful antioxidants to subcutaneous tissue beneath the skin. The encapsulated antioxidants could then be added to existing products such as sunscreen and cosmetics, and improve their abilities to prevent skin cancer and wrinkles. Future possible products from this platform technology include treating cancer and symptoms of stroke.

Trak Surgical, Inc.

Hani Haider, Ph.D., and his team developed a potentially transformative medical device and software that could change the way joint replacement surgeries are performed. The device is a next-generation handheld surgical tool that uses software and a guidance system that may completely eliminate the need for expensive jigs and the specialized staff necessary for current orthopedic surgeries. Dr. Haider, a mechanical engineer, founded Trak Surgical Inc., which received a \$500,000 matching capital investment from Invest Nebraska in March 2013.

New startups based on UNMC innovation



Where are they now?

Vireo Resources

Vireo Systems, a Tennessee-based nutritional supplement manufacturer, expanded operations to the Omaha area in 2009.

Vireo Systems created the subsidiary Vireo Resources in Plattsmouth, Neb., so it could be closer to UNMC, the source of its most successful and popular products. In September 2012, Vireo Resources' growth and success continued with expansion into a \$1 million facility. UNMC innovations in the Vireo product line include **Con-Cret®**, the best selling creatine HCL product in the country; **AminoActiv®**, a top anti-inflammatory and painkiller alternative to ibuprofen and naproxen; and **Rejuvenate Plus™** an anti-inflammatory product for pets with joint ailments.



Virtual Incision Corp.

Founded in 2006, Virtual Incision Corp. is the product of surgical devices developed at UNL and UNMC. The company has attracted more than \$3 million in private investments, most recently a \$500,000 match from Invest Nebraska in January 2013. Virtual Incision is developing a product line of surgical robots — including those depicted on the cover — that are expected to make surgical procedures safer, cheaper and less invasive.



Prommune Inc.

Established in 2002, Prommune Inc., recently took an option to a patent application covering the use of a synthetic protein, EP67, to treat microbial infections. Prommune will initially focus on the development of EP67 for the animal health market, and has received \$100,000 from the State of Nebraska to investigate its use for bacterial infections in pigs. Prommune was one of 15 companies selected to present its business plan at the KC Animal Health Investment forum in Kansas City, Mo., on Aug. 27, 2013.



Innovation Week

Every fall, UNeMed sponsors Innovation Week, a popular series of events that honor innovators at UNMC, and helps educate and inform faculty, staff, and students.

In addition to an awards ceremony, Innovation Week also raises awareness about technology transfer relevant subjects, including intellectual property, sponsored research opportunities, collaborating with industry partners, and research funding opportunities.

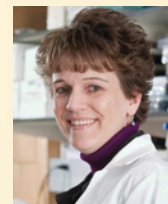
The week begins with an open house, where UNMC employees can register for giveaways, take home UNeMed T-shirts, Koozies, pens and other items, and meet with UNeMed staff — all while enjoying a free smoothie or latte. Various events occur throughout the rest of the week, including seminars and workshops presented by both local and national experts.

The week culminates when more than 300 people turn out from the wider Omaha-Lincoln metro area for the Innovation Awards ceremony and reception. The ceremony honors innovators from the previous fiscal year who have

developed a new technology, secured a patent or produced a technology that resulted in a licensing agreement for further development.

At the 2012 ceremony, UNeMed presented two major awards, the Most Promising New Invention and Emerging Inventor Awards.

Tammy Kielian, Ph.D., earned the 2012 emerging inventor award for her work with *Staphylococcus aureus*, device-related biofilms and neurodegenerative diseases in children.



Dr. Kielian

Gregory Oakley, Ph.D., earned the 2012 Most Promising New Invention award for research that could lead to greater understanding of damaged DNA and how it might be better targeted for new therapeutic treatments.



Dr. Oakley

UNeMed Seminars



Activities

Education

Academic research institutions are charged with missions concerning not only the pursuit of knowledge through research, but also with the education of students in areas such as scientific disciplines and the management of ideas, money and time so they may be successful in their future careers. Many of those careers will impact public sector areas such as economic growth and public health, so the education of campus investigators in the effects of developing, marketing, and transferring novel technologies to the market falls within UNeMed's core mission.

Campus education provides investigators with the knowledge to contact UNeMed when initial discoveries are made; and ensures that the University has the best chance of developing and successfully licensing a technology that leads to significant and sustained revenue.

To aid in the education of the campus community, UNeMed engages in different types of outreach programs, including those that aim to educate the campus in general, and specific programs focusing on individuals who show an interest for a career in transferring technologies to the commercial sector. UNeMed's postdoc and intern programs serve to educate individuals, while open seminars and UNeMed's Innovation Week activities provide general exposure and education to all campus personnel.

Through these efforts, UNeMed seeks to create a culture of innovation, where all UNMC faculty, staff, and students are both knowledgeable and conscious of the possibilities of developing and transferring valuable technologies from UNMC to the private sector.

Win-Win

UNeMed grows with postdocs, interns

There are few opportunities for students to gain cross-functional training and experience in areas such as science, law, and marketing — critical functions in technology transfer, a highly multidisciplinary profession that encompasses technology evaluation, patent law, licensing, marketing, contract negotiation, contract enforcement, business development, and many others.

UNeMed's internship and postdoctoral fellowship training programs provide qualified candidates with opportunities to gain exceptional experience in these functions while in a highly collaborative and entrepreneurial environment.

Not only have these programs benefited students and young professionals, but their insights, expertise and perspectives have also contributed significantly to operations at UNeMed. These programs have also been a means for attracting and training exceptional UNeMed staff.

Dr. Matthew Boehm, senior licensing specialist at UNeMed, began his career as an intern before moving up to a postdoc and finally his current position.

As postdoctoral fellows, their primary duty is to use their expertise as technology licensing associates, which involves technology evaluation, marketing, and licensing. But postdocs have served multiple added functions at UNeMed including blog writing, website development, various legal functions, and business development.

Agnes Lenagh, a pharmacology and experimental neuroscience Ph.D., joined UNeMed in 2012 as an intern and now serves as postdoc licensing fellow. In addition to typical marketing and licensing work, she is also using her past experience in web development to revamp the UNeMed website into a much more effective and user-friendly interface for researchers, industry partners, and the general public.

"If you have other skills, they are willing



Photo by Matt Miller

UNeMed president and CEO Michael Dixon (left) and Bohe Biotech founder Wang Jiang sign a technology licensing agreement earlier this year as Qian Zhang looks on. Zhang, a UNeMed postdoc, played a critical role to help close the deal.

to entertain the ideas, and see how you can help the office grow at different levels," Dr. Lenagh said.

Qian Zhang, another current postdoc licensing fellow at UNeMed, is also fluent in Chinese. A cancer biology Ph.D., she has spent part of her postdoc training helping UNeMed broaden its scope to include partnerships in the booming Chinese market.

"It's a great opportunity since China is emphasizing so much on biotech and

innovation," Dr. Zhang said.

Since 2007, UNeMed has employed 39 interns from backgrounds such as science, engineering, systems integration, marketing, law, finance, and business. Interns work closely with experienced staff and are typically assigned projects related to their educational backgrounds while also seeing the whole picture of how technology transfer works.

UNeMed has had seven postdoctoral licensing fellows since the program started in 2008, and six began as an intern, including Dr. Lenagh.

"It was good to work with different people in the office and see the whole process," she said.

This open and collaborative nature of UNeMed also allows interns to contribute to various other projects and explore areas outside their expertise to further expand their horizons and gain a better understanding of where they want their careers to go.

Postdoctoral Program

Postdoctoral Research Associates since the program began in 2008.

- Tara Scrogin, J.D., 2008
- Russell Nelsen, J.D., 2009-2010
- Matt Boehm, Ph.D., 2009-2010
- William Hadley, J.D., 2011-2013
- Qian Zhang, Ph.D., 2011-current
- Agnes Lenagh, Ph.D., 2012-current
- Caronda Moore, Ph.D., 2013-current



Sizzling steaks drew a steady stream of visitors to Nebraska's booth during the international BIO conference in Chicago. UNeMed representatives used the opportunity to build new relationships in the global biomedical community.

World meets Nebraska at BIO

UNeMed joined 13,594 biomedical industry leaders from 62 countries for the massive, weeklong BIO conference in Chicago. UNeMed staff that attended the international conference used the opportunity to interact face-to-face with potential industry partners while showcasing the world-class research at the University of Nebraska Medical Center. Among the more valuable features at BIO 2103 was the business-partnering program that gave UNeMed access to more than 2,800 participating companies. UNeMed scheduled many partnering meetings during the convention, which generated no less than 19 new opportunities.



Ben Yoskovitz (left), author of "Lean Analytics" and a featured speaker at Intersect 2013, meets with a conference goer during a short break at the all-day event.

Consulting services offered at Roosevelt University

UNeMed uses existing personnel and capabilities to provide outside institutions with invention evaluations, market potential analysis, intellectual property landscape analysis, and marketing efforts, if applicable.

Most recently, UNeMed has worked with Roosevelt University, a sprawling campus of 6,343 students in downtown Chicago and nearby Schaumburg, Ill. UNeMed will serve as Roosevelt's "back office" for technology transfer, helping them establish intellectual property policy and procedures, evaluate new inventions and establish and pursue a marketing plan to discover industry partners.

UNeMed leads Intersect 2013

UNeMed assumed a leadership role for Intersect 2013, one of the largest entrepreneur networking conferences in the state.

UNeMed personnel helped plan the conference, aligned financial sponsors, produced promotional materials, issued press releases, built a new website, managed social media interactions and volunteered as conference staff on the day of the event.

With more than two dozen speakers, many of them highly regarded in the national startup community, Intersect 2013 proved to be a valuable experience to the nearly 400 people who attended.

Services

As a regional leader in technology transfer, UNeMed is establishing itself as more than a mere extension of the University of Nebraska Medical Center.

In addition to consulting services for smaller institutions, UNeMed also expends a fair amount of energy building and maintaining its reputation as a valuable resource within the intellectual property, small business and biotechnology communities.

UNeMed has executed agreements with external institutions, takes a leadership role in the local entrepreneur and startup community, offers educational seminars and is a visible member of the international biotechnology industry.

UNeMed's effectiveness in these services is largely due to the make-up of its talented staff and personnel. In addition to a staff of biomedical and intellectual property experts, UNeMed has also added the business and clinical perspective with a physician- and entrepreneur-in-residence. (See page 15.)

Expanding reach

Breakthrough malaria drug will treat millions

■ UNMC, UNeMed gift cutting edge treatment to developing world

One of UNMC's greatest achievements in recent memory splashed across international headlines in July 2012.

In the last days of the fiscal calendar, UNMC announced the approval of a new breakthrough treatment for malaria, which kills an estimated 655,000 people every year.

Before the drug could be developed into the life-saving treatment it is today, UNeMed facilitated the transfer of the discovery to Medicines for Malaria Venture, which is mostly backed by the Bill and Melinda Gates Foundation.

The new drug, Synriam™, was developed by Indian firm Ranbaxy Pharmaceuticals Limited, but was invented by a team of researchers led by Jonathan Vennerstrom, Ph.D., at UNMC's

College of Pharmacy.

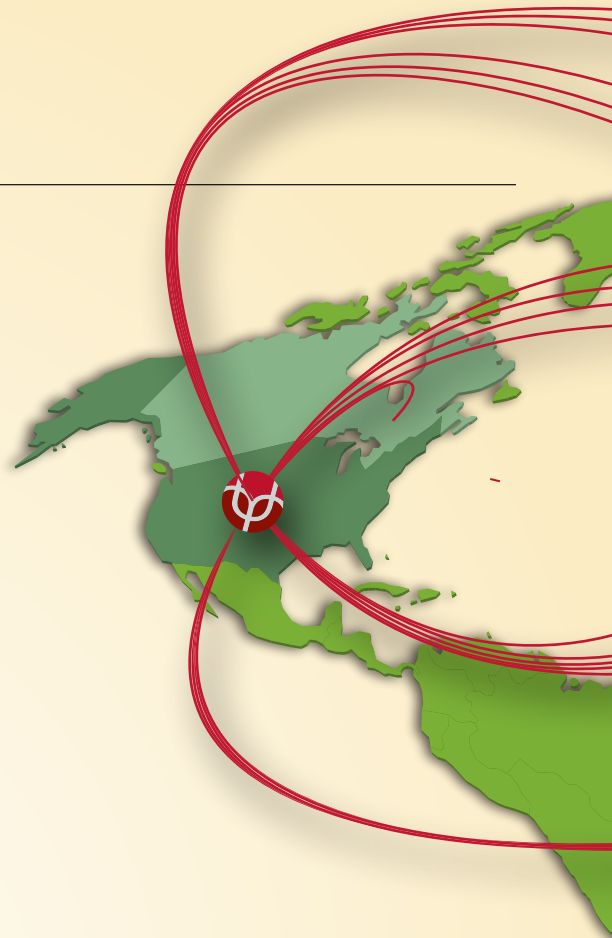
Dr. Vennerstrom is now working on improving the already powerful compound, which now requires malaria sufferers to undergo a three-dose regimen over three days.

Currently in Phase II studies, the improved version could reduce the number of treatments to one, effectively curing a malady that strikes 200 million people worldwide with a single pill.



UNMC Photo

Jonathan Vennerstrom, Ph.D., continues to work on his ground-breaking malaria treatment, and hopes to have a one-dose version ready before the end of fiscal 2014.

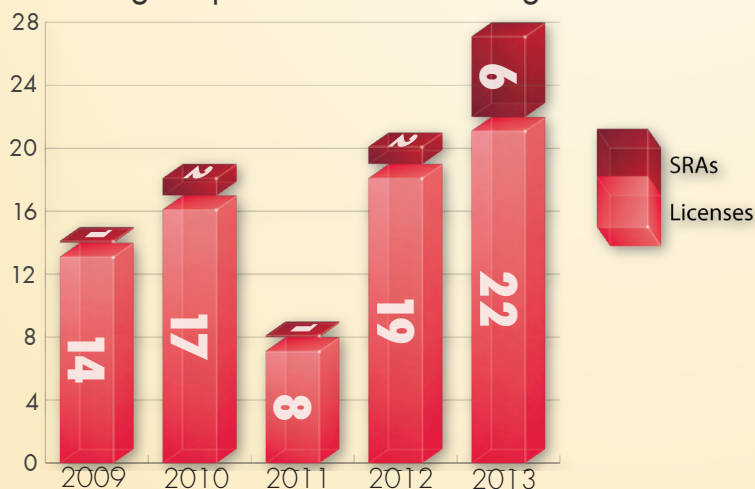


THE WORLD

UNeMed's grasp on the world. In fiscal 2013, UNeMed received 66 notices of new inventions from foreign countries.

- Australia
- Belgium
- Canada
- China
- Czech Republic
- Denmark
- England

Licensing & Sponsored Research Agreements



The process: From invention to market

UNeMed receives an annual average of 78 new invention disclosures, and evaluates them for scientific and commercial potential.

In fiscal 2013, UNeMed received 66 notices of new inventions, down from a peak year in 2012, which saw 106. Despite the lower number, UNeMed filed 29 United States patent applications, a five-year high. And international patent applications reached an all-time high at 18, eight more than in the previous year (see graphs.)

For a certain set of these inventions, the appropriate form of intellectual property protection is established whether it's a patent, copyright, or trademark. The technology is then marketed nationally and across the planet as UNeMed expands its reach beyond the United States and into foreign

UNeMed Metrics

UNMC Patents

A look at the cumulative number of patents from research at the University of Nebraska Medical Center.

U.S. Patents.....	345
Pending	228
Foreign Patents.....	157
Pending	90

2013 BY THE NUMBERS

\$141.62 million

research expenditures in 2012

\$1.46 million

gross revenue

299

material transfer requests

104

confidential disclosure requests

66

new inventions

64

educational seminars

22

licensing agreements

6

sponsored research deals

5

U.S. patents issued

4

startup companies formed

3

foreign patents issued

WORLD IS FLAT

reaches far beyond Nebraska's borders.
UNeMed pursued opportunities in 21

- Finland
- France
- Germany
- India
- Ireland
- Israel
- Italy
- Japan
- Malaysia
- North Korea
- Russia
- South Africa
- Spain
- Switzerland

From bench to bedside

strongholds such as Europe, China and Japan.

Once UNeMed finds a commercial partner that can continue to support the development of the technology, UNeMed negotiates a licensing agreement to ensure that the innovation is developed, and that UNMC is compensated for its support in the development of the technology.

Compensation may include licensing fees, equity, running royalties, milestone fees and other contractual obligations. In the case of Synriam™, the malaria treatment featured on page 10, UNeMed waived compensation to ensure the technology would reach its full potential and benefit those who need it most.

In addition, commercial partners often continue to work with UNMC through the use of sponsored

research or collaborative development agreements designed to pursue advanced development activities by using the expertise found on campus. UNeMed has historically out-licensed 15-20 technologies annually over recent reporting periods.

Despite the lower number of invention disclosures, UNeMed increased the number of sponsored research agreements threefold in 2013; and increased the number of licensing agreements to 22, compared to the 19 agreements signed in 2012.

Other collaborative metrics (Confidential Disclosure Agreements and Material Transfer Agreements) and patent applications all show that UNeMed is actively moving UNMC research toward the marketplace.

UNeMed Metrics

Stretching the research dollar

A strong testament to the amount and quality of research at the University of Nebraska Medical Center can be seen with a careful look at data provided by the Association of University Technology Managers or AUTM. In fact, UNMC is dollar-for-dollar one of the most creative and innovative universities in the nation, if not the world.

In 2012, UNMC accounted for \$141.62 million of the \$394.74 million the University of Nebraska spent on research. Research heavyweights such as Johns Hopkins University and Stanford University spend five to 10 times more on research, yet UNMC compares favorably across the board when research activities are viewed in proportion to the amount of money spent. UNMC leads a group of selected "peers" and even the national elite by most measures.

For example, UNMC researchers developed 7.48 new inventions for every \$10 million spent in 2012, well beyond the peer group average of 4.05, and more than double the national average of 3.56.

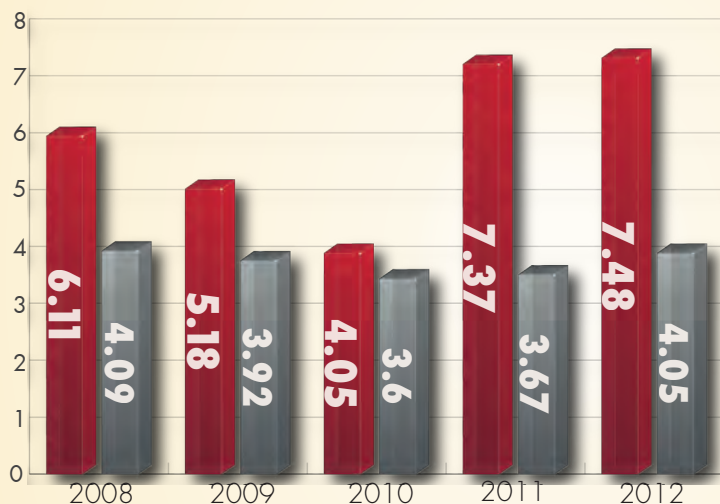
Elite schools and other selected notable institutions — including Stanford, Johns Hopkins, Harvard, Columbia and most Big Ten schools — reported an average of just 0.16 new inventions for every \$10 million spent.

UNMC's trend as a research leader can also be seen by using the same approach to view licensing agreements.

UNeMed helped secure 1.34 licensing deals for every \$10 million in research spent, more than five times the national average (0.24). The peer group averaged 0.94 licensing agreements for every \$10 million spent.

How UNMC compares to the peer group average per \$10 million in research expenditures in 2008-2012, according to data provided by the Association of University Technology Managers.

New Inventions/\$10 million in research (2012)

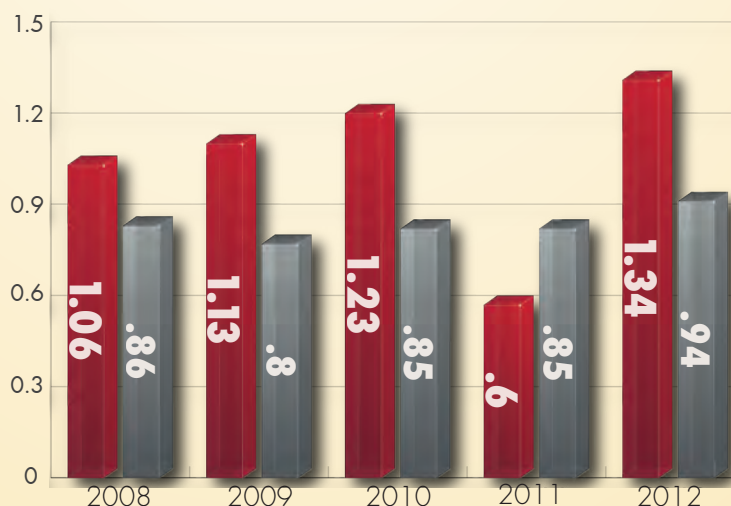


Selected Peer Group

- Kansas University
- Northwestern University
- Ohio State University
- Oklahoma University
- Oregon Health & Science University
- University of Arizona
- University of Cincinnati
- University of Colorado
- University of Florida
- University of Illinois (Chicago-Urbana)
- University of Iowa
- University of Kentucky Research Foundation
- University of Tennessee
- University of Utah

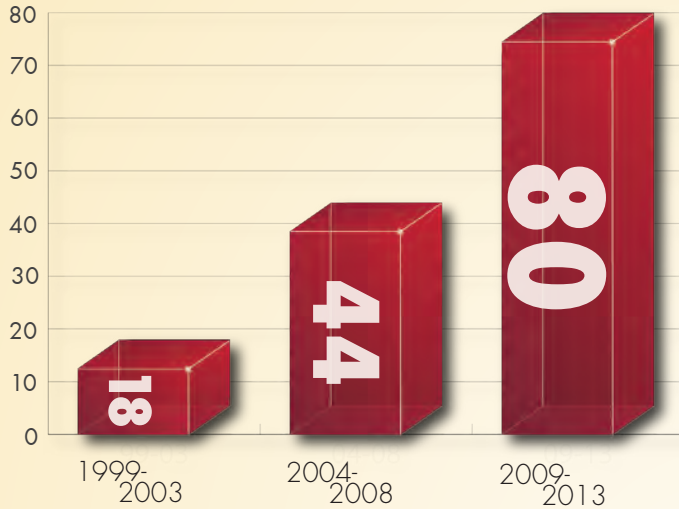
■ UNMC
■ Peer Group Avg.

Licenses/\$10 million in research (2012)

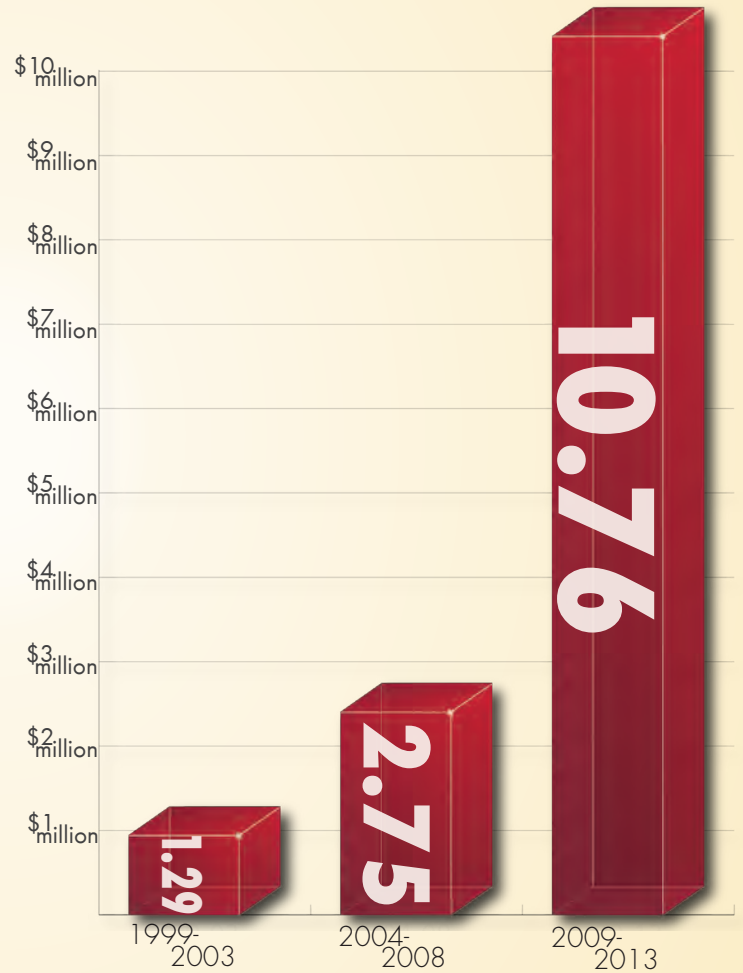


UNeMed Metrics

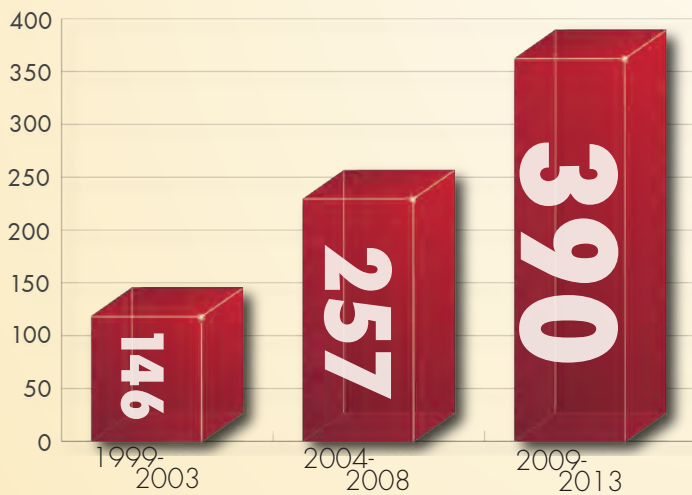
UNeMed Licensing Agreements (1999-2013)



Total Revenue in millions (1999-2013)

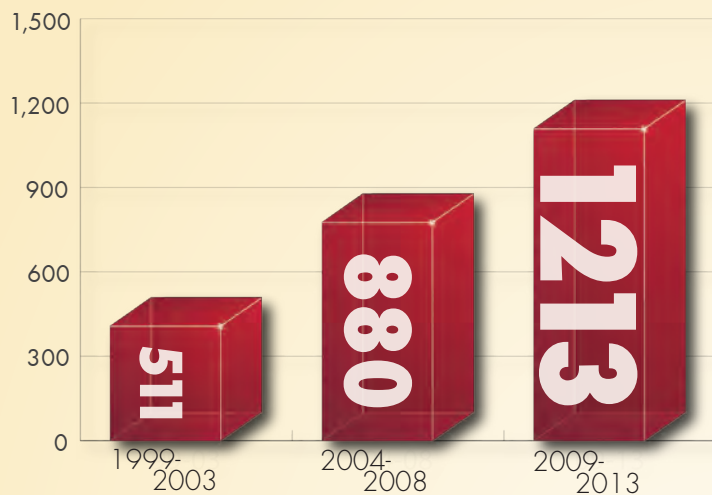


New Invention Notifications (1999-2013)

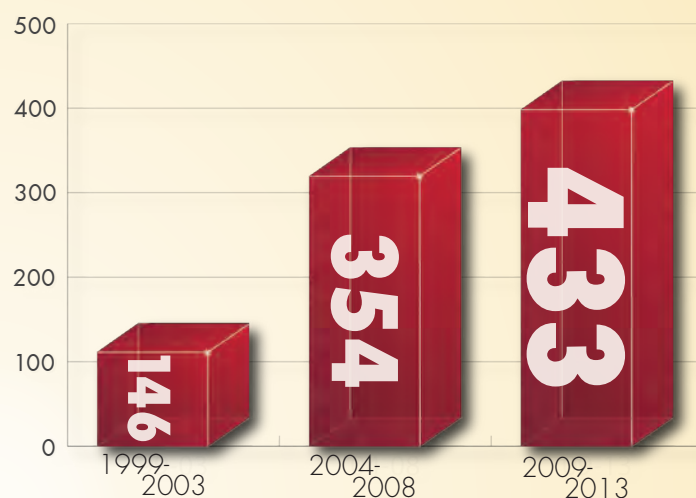


UNeMed Metrics

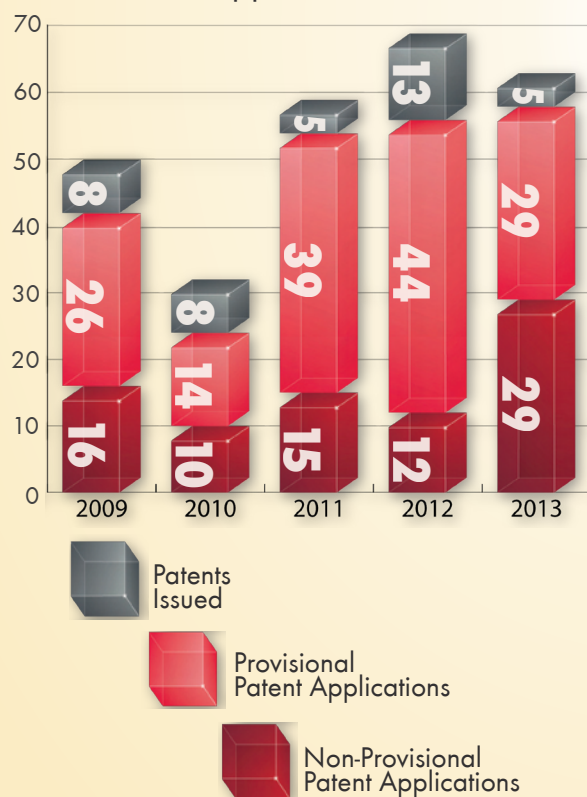
Material Transfer Agreements (1999-2013)



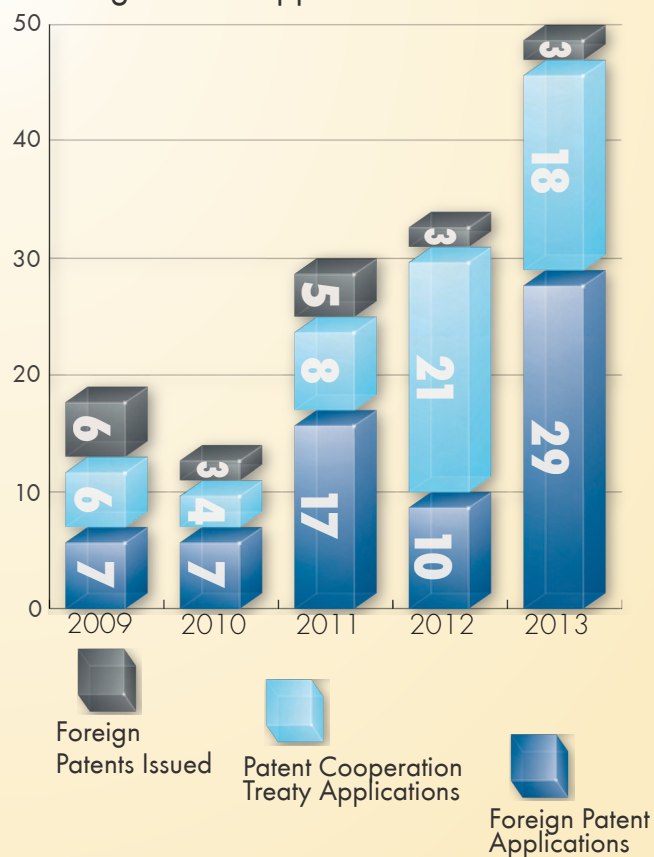
Confidential Disclosure Agreements (1999-2013)



U.S. Patent Applications



Foreign Patent Applications



Residence Programs

Entrepreneur-in-residence

UNeMed has enjoyed the benefits of an entrepreneur-in-residence since Gary Madsen, Ph.D., joined the staff in June 2012.

He was brought in to help identify promising UNMC technologies that have the potential to form the basis of new startup companies.



Dr. Madsen recently signed a one-year extension, and also established ProTransit Nanotherapy, LLC, a company based on technology invented at UNMC. (See page 6)

He joined UNeMed following a successful, three-decade career in biotechnology product and business development. Previously, he worked in several biotech companies in Madison, Wisc., including Gilson, Third Wave Technologies (Hologic), Promega and EraGen Biosciences. He began his biotechnology career at Abbott Laboratories, then served as vice president of research and development at IDEXX Labs in Westbrook, Maine.

Physician-in-residence

In May 2013, UNeMed created a physician-in-residence position, and signed Deepak Madhavan, M.D., to the role.



Dr. Madhavan is the director of The Nebraska Medical Center's comprehensive epilepsy program and an assistant professor at UNMC's Department of Neurological Sciences.

As researchers develop new ideas on campus, Dr. Madhavan will bring his rare experience as a businessman and practicing physician to help get those innovations closer to patient bedsides.

Before joining UNMC, Dr. Madhavan founded in 2009 a private practice focused on treating epilepsy, Midwest Regional Epilepsy Associates. He is also the president of Lifestyle Innovations for Epilepsy, or LIFE, an Omaha-based nonprofit dedicated to the wellbeing of people living with epilepsy.

Media specialist joins UNeMed roster

UNeMed planned to expand its staff by redefining a vacant office associate position as a communications associate.

"As new, cutting edge technology is created, UNeMed is in the unique position to help communicate the potential of that technology to the world," UNeMed president and CEO Michael Dixon said.

The new position carries the main responsibility of creating and distributing information to internal and external clients, while promoting UNeMed and its marketing and licensing activities.

More specifically, the communications associate is expected to create press releases of significant events, develop presentations for entities engaged by UNeMed, and produce an annual report of UNeMed activities.

In addition, the communications associate position was built to aid the marketing and licensing staff in creating marketing materials, and any other journalistic materials required.

"The communications associate will play a vital role in our office as we work to help publicize the many great innovations that occur on campus everyday," Dr. Dixon said.

All of these functions were previously performed by interns with experience in these areas.

UNeMed hired Charlie Litton in January 2013 as its first dedicated communications associate. Litton recently completed his master's degree at the University of Nebraska-Lincoln's College of Journalism and Mass Communication. He has experience in both print and broadcast journalism, with his work appearing in *The Washington Post*, ABC News and MSNBC.

Between February and July 2013, more than 50 news items have appeared in local, regional, national and international media that were generated from the communications associate's desk. Most, if not all, media stories also prominently featured UNMC, adding to the university's already enormous prestige.



Litton

Developing an overall communications strategy and plan will help determine the value of these media placements, and is among UNeMed's goals for FY 2014.



UNMC researcher Dan Anderson (center) interviews with a local television reporter in early July about a new coronary artery disease blood test he and his co-inventors, Dr. Geoff Thiele and Michael Duryee, are developing.



Featured Technologies

Double Threat

Diagnose, kill cancer 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 iso-



Dr. Baranowska-Kortylewicz

Photo: UNMC

tope 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 cancer.

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.

Vitals

Rundown

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

Inventors

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

*Investigation New Drug application has been filed with the FDA.
UNMC plans to start a clinical trial in prostate cancer patients soon.*

New treatment for old foe

■ Wage war against pancreatic cancer with minimal side effects

Vitals

Rundown

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

Inventors

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

There may finally be an answer to pancreatic cancer.

Every year, roughly 45,000 people are diagnosed with pancreatic cancer, the most lethal form of cancerous disease. 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



Dr. Natarajan

Photo: UNMC

able to increase the odds for those who receive the grim news. Researchers at UNMC are working on a novel drug called "13-197" that has shown promise in mouse models with relatively few side effects.

"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.

Novel Biofilm Therapy Fight device-related infections

More than a million cases of hospital-acquired infections can be traced to biofilm, a slimy coating of microbes that settle on medical devices and implants.

Biofilm infections are notori-

ously difficult to treat without removing or replacing the medical device. Treatment is further hindered by the development of antibacterial-resistant strains of microbes. But researchers at the University of Nebraska Medical Center discovered a new way to combat device-related infections.

Rather than pursue traditional routes of treatment with antibiotics, UNMC researchers developed a novel method that treats, controls and even prevents biofilms.

The method is a cell-based therapy that uses a patient's own immune cells, specifically macrophages. The immune cells are isolated and activated outside the body, then used as needed to prevent or treat a biofilm infection.

The cell-based therapy has been tested to show significant effective-

ness. By using a patient's own immune system rather than antibiotics, this approach also decreases the likelihood of developing antibiotic resistant bacteria.



Photo: UNMC

Dr. Kielian

Vitals

Rundown

- Innovative therapy
- Personalized meds
- Use patient's cells
- Prevent biofilm formation
- Treat established infections
- Reduce risk of developing antibiotic resistant bacteria

Inventors

- Tammy Kielian, Ph.D.
- Mark Hanke, Ph.D.

Intuitool Do More through the Keyhole

As the world pushes to make minimally invasive surgery easier and safer, surgical procedures need smaller and smaller incisions.

Engineers and surgeons at the University of Nebraska Medical Center found a way to meet those needs, while making those procedures safer for patients and easier for surgeons—a groundbreaking new surgical tool called "Intuitool."

Minimally invasive, or laparoscopic, surgery is difficult for any surgeon. During a procedure, a surgeon must hold the instrument, often at awkward angles, for hours at a time. The surgeon can't see the tools directly, instead relying on two-dimensional video displays. And everything must fit through an opening about the size of Abraham Lincoln's head on a U.S. penny.

Intuitool is the next generation of laparoscopic tools, with robust articulation and superior ergonomic design and feel. Its rod-driven system conveys the maximum amount of



Photo: The Nebraska Medical Center

Dr. Oleynikov

power with minimal exertion. Multiple publications over eight years demonstrate how Intuitool is safer, easier, and quicker to learn.

UNeMed is seeking a partner to license a portfolio of international patient applications teaching multiple aspects of the Intuitool; or an entrepreneur eager to arm surgeons with better tools.

Vitals

Rundown

- Intuitive interface
- Ergonomic design
- Shorter learning curve
- Shorter procedures
- Shorter patient recovery
- Better Patient Care

Inventors

- Dmitry Oleynikov, M.D.
- Susan Hallbeck, Ph.D.

Featured Technologies

Cancer Vaccine

Use the immune system to treat prominent cancers

Cancers of the colon, breast, ovary, lung and pancreas have at least one thing in common: A lack of treatment.

Researchers at the University of Nebraska Medical Center have found another common problem, a protein known as MUC1. Certain cancers produce too much MUC1, which causes rapid growth in cancer cells, and puts the brakes on the body's natural immune cells, preventing them from attacking the tumor.

But those same immune cells react differently when short MUC1 fragments are used for treatment. The fragments trigger an anti-tumor response, making vaccination against tumor formation an effective cancer treatment option.



Dr. Hollingsworth

Vitals

Rundown

- Tumor-specific immunity
- Vaccine for all MUC1 cancers
- Increase anti-tumor response
- Use the body's own immune cells
- Halts tumor growth
- Will not create an autoimmune response
- Extend patient survival

Inventors

- Tony Hollingsworth, Ph.D.
- Karl Kohlgraf, M.D.
- Tom Caffrey

Develop new, better antimicrobial agents with peptide database

Vitals

Rundown

- Search over 2,000 peptides
- Broadly effective antimicrobials
- Fight antibiotic resistant bacteria
- Peptides from bacteria, fungi, plants, and animals
- Work with UNeMed to develop your own molecules

Inventor

- Guangshun Wang, Ph.D.

Guangshun Wang of the University of Nebraska Medical Center spends his time developing the next generation of antibacterial molecules, and he finds them in some unlikely places.

Dr. Wang uses naturally occurring proteins in everything from bacteria and fungi to plants and animals to find promising protein fragments. He then engineers the fragments for greater antimicrobial activity. These protein fragments are known as antimicrobial peptides, which act as broadly effective antibiotics that fight infections.

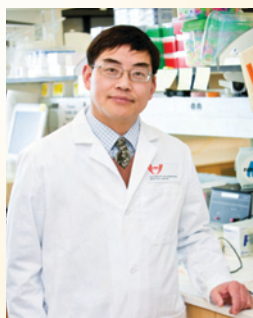
To share his knowledge and promote research, education, and information exchange, Dr. Wang created and manages

the Antimicrobial Peptide Database and data analysis system.

The database is a comprehensive online resource with detailed information on more than 2,000 antimicrobial peptides. The data-

base, which continues to grow, can be used for naming, classification, statistical analysis, search, prediction, and design of antimicrobial peptides covering all life kingdoms.

Guided by the database, Dr. Wang has already developed novel peptides against specific organisms, including methicillin-resistant *Staphylococcus aureus*—a potentially dangerous bacterial infection that is resistant to most antibiotics.



Dr. Wang

Reduce diabetic brain complications

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.



Dr. Bidasee

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 FDA-approved 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.

Vitals

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

Inventor

- Keshore Bidasee, Ph.D.

Featured Technologies

Research from Dr. Dong Wang

Detect, stop brain injury immediately after head trauma

Diagnosing and effectively treating a traumatic brain injury has been nearly impossible.

But thanks to researcher Dong Wang, Ph.D., at the University of Nebraska Medical Center, the 1.7 million people who suffer head trauma each year might finally receive effective treatment.

Sooner or later, patients with traumatic brain injuries develop irreversible neuro-degenerative disease, which can include memory problems, mental decline, and full cognitive dysfunction leading to dementia. Traumatic brain injury can also lead to significant personal, social and economic losses.

Unfortunately, there is no way to detect and stop a traumatic brain injury after the actual head trauma occurs.

But the novel prodrug P-Dex carries imaging agents and potent anti-inflammatory

Vitals

Rundown

- Diagnostic imaging prior to symptoms
- Minimizes permanent brain injury
- Delivers anti-inflammatory to injury
- Image, treat simultaneously
- Safe, non-toxic
- Proof of concept in animal models
- Comprehensive patent rights available

drugs into the brain to help visualize and treat the affected area.

Both imaging and therapeutic agents are directed to the precise area of inflammation and injury by the system's unique targeting chemistry.

Kill bacteria, enjoy fresh breath all day

Dr. Wang has developed a particle that binds to the tooth surface for an extended release of antibacterial agents that results in less oral bacteria and longer-lasting fresh breath.

In current applications, antibacterial agents are commonly added to toothpaste and mouthwash to help control the bacteria that cause gingivitis and cavities. The added agents coat the tooth surface and are effective for short periods of time, but the effect is temporary.

The antibacterial agents are quickly washed away by food, drinks and saliva. This leaves teeth vulnerable to bacterial build-up and bad breath.

UNMC's long-lasting formulation solves that problem.

It is non-toxic, and can be modified to have additional agents including fragrances, whiteners, analgesics, and tooth strengthening compounds such as fluorides.

Vitals

Rundown

- Chinese rights unavailable
- Prolonged protection against oral bacteria
- Prolonged fresh breath
- Single daily use
- Versatile
- Comprehensive patent protection
- Proof of concept studies in tooth & saliva models

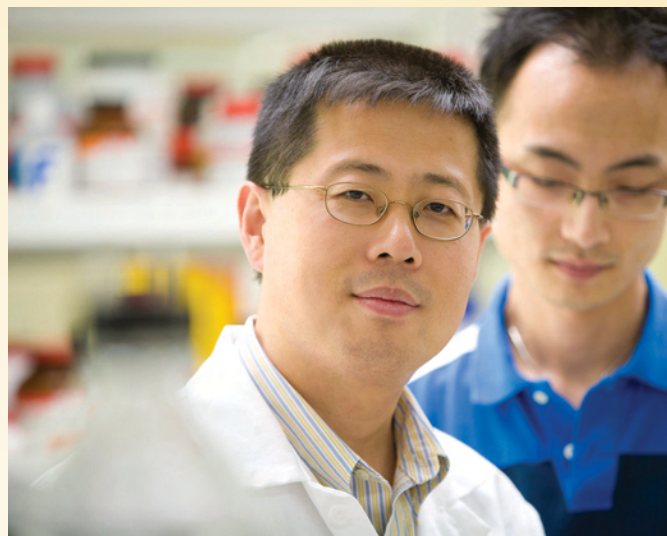


Photo: UNMC

Improve treatment for lupus and drastically reduce side effects

Nearly 2 million people suffer an incurable disease where the body's immune system attacks itself: Systemic lupus erythematosus.

Treatment often involves inefficiently managing the symptoms, but research by Dr. Wang at the University of Nebraska Medical Center has found a new, targeted approach that promises to be more effective over a longer period of time.

Current lupus treatments only help control symptoms that grow more severe over time. And treatments can only be used for a short time because the risks of adverse side effects grow with increasingly larger doses.

Dr. Wang recently developed a novel polymer that releases an anti-inflammatory drug at the site of inflammation.

The polymer, or P-Dex, improves the effects of a common lupus treatment, dexamethasone—a synthet-

ic version of a steroid that is usually produced by the human adrenal gland. The polymer's unique targeting mechanism allows special delivery to specific areas of inflammation and minimizes the effects on the whole body.

The result is a more potent therapy with fewer side effects.

Proof of concept studies have been completed in animal models, and comprehensive patent protection is in place. Exclusive rights are available for lupus and other inflammatory diseases.

Vitals

Rundown

- Novel composition
- Reduce dexamethasone side-effects
- Reduce renal damage
- Better efficacy
- Less frequent dosing
- Less expensive

Featured Technologies

Neuronal Freezing Media Kit

Vitals

Rundown

- Novel formulation
- Maintain high viability (75-90%) upon thawing
- Freeze primary hippocampus and cortical neurons
- Works with rat and mouse neurons
- Save cells from wild type or genetically-engineered animals
- Never again waste leftover cells
- Reduce costs

Inventors

- Jyothi Arikath, Ph.D.
- Dipika Singh

■ Retain up to 90 percent viability in frozen brain cells

When researchers need primary rat or mouse brain cells, they typically isolate new cells each time, a long and expensive process.

When a researcher obtains more cells than needed, there is no good way to store the surplus. Often the extra cells are discarded, because current methods of storing brain cells—freezing in liquid nitrogen—destroy as much as 70 percent of the neurons.

Inventors at the University of Nebraska Medical Center found a way to preserve as much as 90 percent of frozen mouse and rat brain cells with a novel freezing medium, the Neuronal Freezing Media Kit.

Studies show neurons frozen in this

unique formulation maintain 70-90 percent viability upon thawing. The thawed brain cells show all the expected characteristics of primary neurons, including appropriate cell structure and intact markers.

The Neuronal Freezing Media kit is a proprietary combination of four components that are mixed on site. The kit can be used to freeze and preserve primary neurons of rats and mice for long-term storage. Recommended freezing and thawing protocols are also included.



Dr. Arikath

Photo: UNMC

Lifespace Monitoring System

Cost-effective, reliable care for independent elderly

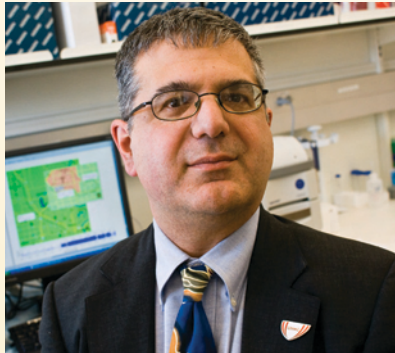
One of the largest challenges facing elderly care is striking the proper balance between monitoring health while maintaining independence.

Solutions exist, but they are generally expensive and have limited applications.

Stephen Bonasera, a researcher at the University of Nebraska Medical Center, found an elegant solution: A wireless system that caregivers can use remotely to track patients around the clock with little more than a modern cell phone and a few well-placed transmitters in the home.

The cost-effective solution, called the Lifespace Monitoring System, measures a person's movement patterns around the home to develop a baseline of regular activity.

With minimal intrusion, Lifespace can then detect minor changes in activity, which could indicate the onset of several mental or physical conditions.



Dr. Bonasera

Photo: UNMC

The system allows caregivers to immediately intervene when a change in routine is detected.

Because the system monitors the movement patterns of an individual, it can easily be adapted to other applications, such as patients with mental or psychiatric limitations.

Vitals

Rundown

- Novel
- Inexpensive
- Accurate, non-intrusive collection of patient info
- Real-time information
- Reduce intervention costs
- Better information, better results
- Constant and continuous monitoring
- Improve response times

Inventor

- Stephen Bonasera, M.D.



Unemed

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

UNeMed VALUES

- Innovative Vision
- Integrity & Stewardship
- Excellence
- Dedication

UNeMed VISION

- World-class technology commercialization entity
- Best service to faculty
- Recognized by community as entrepreneurial resource
- Help build a strong biomedical ecosystem in Nebraska

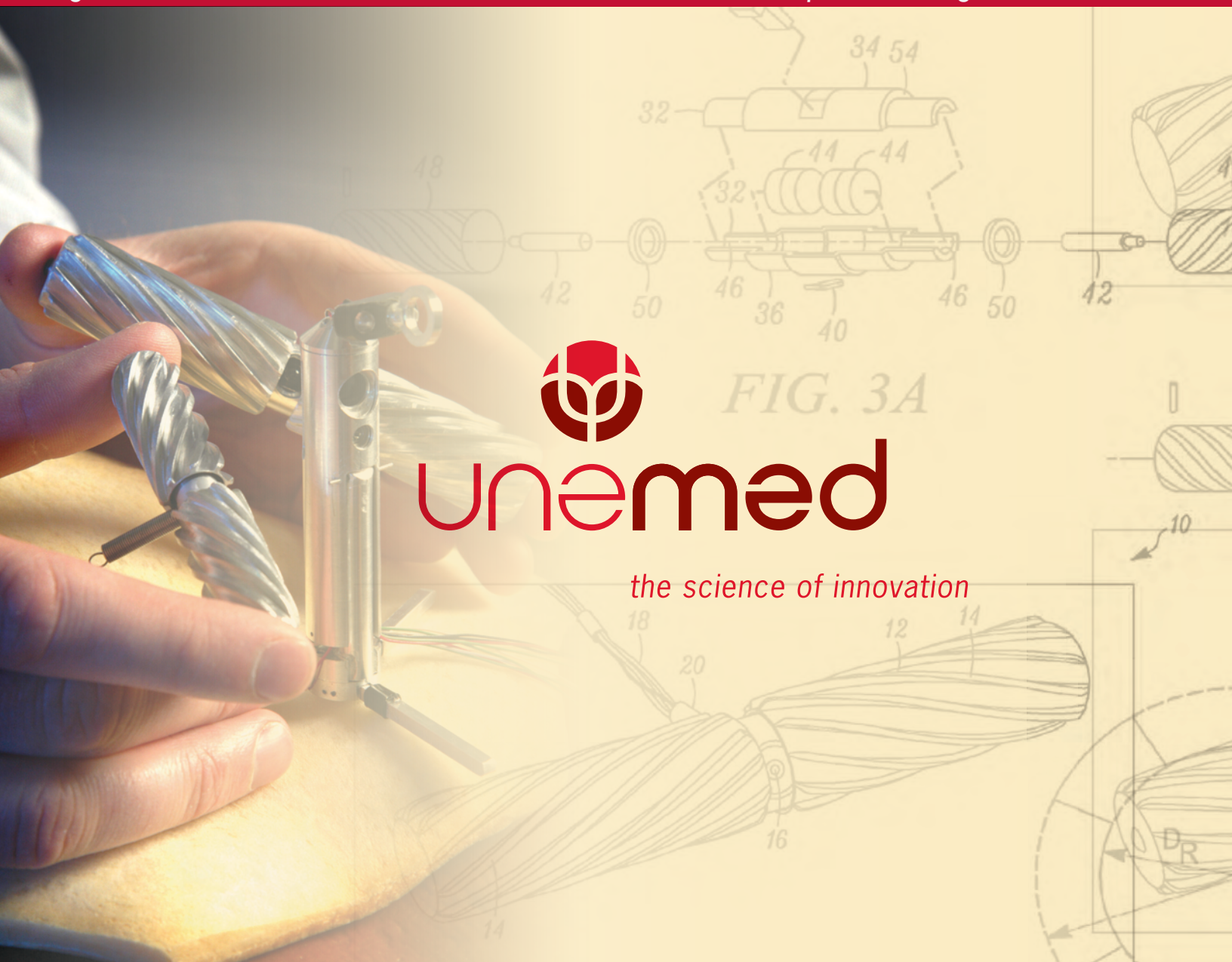
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