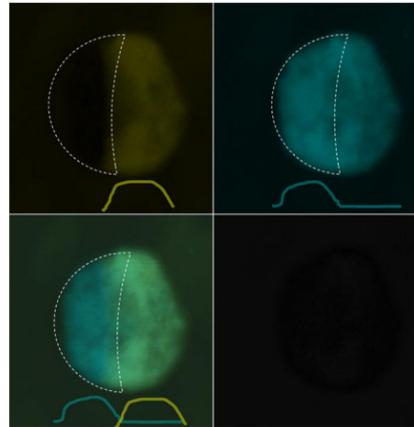


This image is an example of how the Spectra-Physics Mai Tai DeepSee near-infrared laser at the Integrated Biomedical Imaging Core Facility at Creighton University can probe deep into tissue to determine if two proteins known to be involved in a biological process work directly or indirectly to achieve a given outcome or function. In this image energy is transferred from one fluorescent donor to another fluorescent acceptor showing that the proteins do indeed interact.



INBRE INROADS

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New grant studies link between methamphetamine use and HIV infection

Infrared laser boosts imaging ability of core facility

Self-described average INBRE Scholar is nothing but average

The INBRE program is funded by the National Center for Research Resources. NCRR is part of the National Institutes of Health, U.S. Department of Health and Human Services.



INBRE program attracts biology professor to UNO

Biology professor Paul Davis, Ph.D., had a choice to make – he had six job offers in six different states. His choice became clear though, when he visited the University of Nebraska at Omaha.

The focus on undergraduate research, bright, talented students and the INBRE program, all appealed to Dr. Davis, who is the newest assistant professor of biology at UNO.

“The INBRE program was especially key for me when I chose this position,” he said. “It covered a portion of my start-up package and demonstrated to me that there was an established program which focused on undergraduate research.”

“The INBRE program was especially key for me when I chose this position,” said Paul Davis, Ph.D. “It demonstrated to me that there is an established program which focuses on undergraduate research.”

The best part about the job, Dr. Davis said, is that he gets to share his research with undergraduate students – already he has a dozen undergraduates working on individual projects in his lab.

Dr. Davis is studying *Toxoplasma gondii*, a parasite that can cause birth defects or miscarriage in humans. He also uses *T. gondii*, a cousin of *Plasmodium falciparum* (the causative agent of malaria), as a model to study agents that can affect the growth of the malaria parasite. He wants to make a dent in malaria’s global death toll.

“Malaria is growing resistant to current drug therapies, so the need to identify new compounds to fight malaria increases as well,” he said.

As a faculty associate in the INBRE program, Dr. Davis is able to readily collaborate with

other researchers at any of the 12 participating institutions, including the University of Nebraska Medical Center, where Jonathan Vennerstrom, Ph.D., is a leading malaria researcher.

“He is a world expert on anti-malarial compounds, and working together would produce an exciting amount of synergy,” Dr. Davis said.

He shares this enthusiasm with his students.

“I have a very global health perspective and hope to pass that on to my students,” Dr. Davis said.

The world needs future thinkers and the INBRE program makes it easy for him to recognize those students, he said.

“The INBRE program has already identified who those individuals are: the future leaders, researchers and physicians of tomorrow. INBRE seeks out, attracts and aids those types of students.”



From the director

As many of you may know, we have been through a period of uncertainty with regard to the Institutional Development Award (IDeA) program and the reorganization taking place at the National Institutes of Health (NIH).

I want to thank each and every one of you who responded to our request that you contact your senators and congressmen.

I also want to thank you for contacting the presidents of your campuses and asking them to sign a letter to our congressional representatives advocating support for the IDEA Program. A letter drafted by U.S. Senators Patrick Leahy and Jay Rockefeller was sent to Francis Collins, M.D., Ph.D., director of the NIH.

The letter reflected strong support for the IDEA program and asked that it remain intact and be placed in an institute rather than in the director's office. At this time it appears that these requests have been honored and the IDEA Program will continue to provide opportunities to faculty and students in Nebraska.

On behalf of all of us in the various Nebraska IDEA Programs, I would like to extend a heartfelt thank you to U.S. Senators Ben Nelson and Mike Johanns for their support of the IDEA Program during these unsettled times. Their work on our behalf is very much appreciated.

Scholar inspired by researchers to pursue graduate studies

Although he describes himself as just an average college student, Dhananjay "D.J." Nawandar is nothing but average.

He's presented his research at conferences in Washington D.C., India and earned a grant from the Nebraska Academy of Sciences. The senior biotechnology student might be humble but his work shines before him.

Nawandar has applied to 10 different professional schools across the country in search of the perfect fit for his graduate studies. He will graduate from the University of Nebraska at Omaha in May.



The INBRE scholar is particularly interested in studying molecular virology.

"It's fascinating research," Nawandar said. "Viruses are the most intelligent creatures I have ever seen. They are determined to live by evolving to fight the defense system of their hosts. I would like to study the mechanism of how they evolve and use it for the welfare of human beings."

Nawandar first became interested in this field after taking a molecular genetics class with Mark Swanson, Ph.D., an assistant professor of genetics and molecular genetics and a virology class with Bill Tappich, Ph.D., a professor of biology at UNO.

But it was the Nebraska INBRE program that really inspired Nawandar to pursue a career in research.

Through INBRE Nawandar has been able to work alongside such top researchers as Rakesh Singh, Ph.D., an associate professor of pathology and microbiology at UNMC, Dr. Swanson and Dr. Tappich.

Those professors, Nawandar said, provided the guidance and inspiration he needed to pursue graduate school.

"Whatever I have achieved today is because of the INBRE program," he said. "I don't think I would have applied for graduate school without the encouragement of the professors I've encountered through this program."

Study asks if methamphetamine use increases risk of HIV infection

A sad consequence of methamphetamine abuse is the increased risk of HIV infection. Researchers at the University of Nebraska Medical Center are investigating the damage to the human body from the combined effects of meth use, HIV and the antiretroviral drugs used to treat the disease.

With a \$3.3 million grant from the National Institute of Drug Abuse (a division of the National Institutes of Health), the researchers will use a unique systems biology approach to analyze how these three elements interact and react with each other and the human immune system.

Pawel Ciborowski, Ph.D., director of the mass spectrometry and proteomics core facility at UNMC, and Howard Fox, M.D., Ph.D., senior associate dean for research in the UNMC College of Medicine, are co-investigators on the grant.

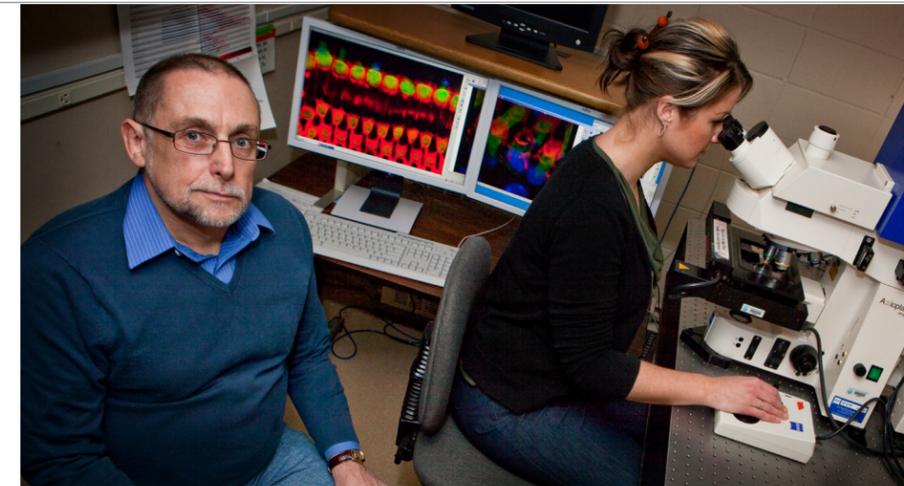
"The question is how does exposure to the HIV virus, antiretroviral drugs, methamphetamine or any combination of the three together, affect immune cells," said Dr. Ciborowski.

They hope to find answers by looking for new and unexpected relationships in gene expression and in the nuclear protein of the macrophage, an immune cell, that represent new therapeutic targets for a number of diseases, he said.

But making sense of these huge and inter-related data sets is a problem. To address this they will utilize multiple computational and mathematical models through collaboration with Hesham Ali, Ph.D., and Kiran Bastola, Ph.D., in the College of Information Science and Technology at the University of Nebraska at Omaha, and Jim Rodgers, Ph.D., associate professor of mathematics at UNO.

"We hypothesize that the systems biology approach will provide unique information that will lead to identification of new paradigms on how the human macrophage is regulated in the complex environment of HIV infection, meth and antiretroviral drug therapy," Dr. Ciborowski said.

"This type of research project shows that the support for infrastructure at UNMC, such as the mass spectrometry and proteomics core facility, and bringing interdisciplinary investigators together to solve problems lets us successfully compete on the national stage for large grants, enabling our cutting-edge biomedical research," Dr. Fox said.



New infrared laser at Creighton enhances research

The Integrated Biomedical Imaging Core Facility at Creighton University has a new weapon in its arsenal – a Spectra-Physics Mai Tai DeepSee near-infrared laser.

This new laser will be used to generate multi-photon excitation that penetrates deeper into the tissue without dispersion. Living cell experiments benefit from this technique because infrared radiation excites a smaller number of cells and produces less toxic byproducts, said Richard Hallworth, Ph.D., director of the core facility and Professor of Biomedical Sciences at Creighton.

"You can image living cells a lot longer without destroying them or compromising your experiment," Dr. Hallworth said.

The laser works by generating very brief pulses of infrared light at a very high rate, less than a trillionth of a second. With conventional lasers of this type, the pulse gets degraded as it goes through the optics of the microscope. The DeepSee compensates for that degradation.

"Users can thus use less power and get the same or better imaging results. The less power the less damage you do and the better your images," Dr. Hallworth said. "Those who use it have noticed considerable improvements in sensitivity and quality of images."

For pathology and microbiology professor Tammy Kielian, Ph.D., the laser has been helpful with deep brain imaging for her research. Dr. Kielian studies the mechanisms underlying brain abscesses due to staph infections in mice.

"The laser has enabled us to assess interactions between Staphylococcus aureus and immune cells within the brain in real time," Dr. Kielian said. "This is very cutting-edge methodology and we hope will allow us to identify ways for the immune system to better recognize and kill bacteria, effectively reducing the severity of brain infections."

INBRE INROADS

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