



INROADS

A newsletter of Nebraska's Institutional Development Awards (IDeA) Networks of Biomedical Research Excellence (INBRE)

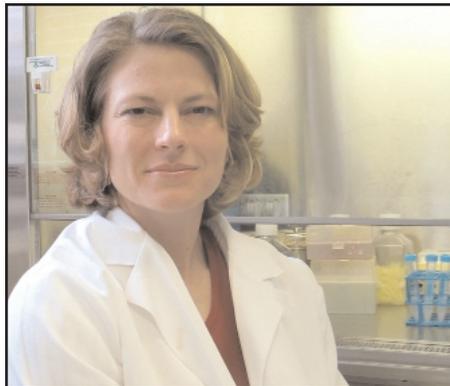
Crabtree seeks to help 'entire populations'

As a nurse, Kay Crabtree carefully took care of her patients, treating the symptoms of their illness and managing their pain with ease.

But what she really wanted to do was understand other aspects of the patient's illness, examine lab reports, research histories and study the pharmacology involved in their care. Things she had little time to explore.

That's when Crabtree decided to return to school and pursue a Ph.D. in biology.

In the fall of 2001 she enrolled in science courses at the University of Nebraska at Kearney. A non-traditional student with a child in kindergarten, Crabtree wasn't sure what she wanted to pursue. She considered studying medical technology but a professor told her about the INBRE program and suggested she apply. Crabtree was accepted into the program in 2003.



Kay Crabtree was a nurse before returning to school to pursue a doctorate.

Her goals became clear after working in the lab of Dr. Richard Hallworth, Ph.D., a professor in the bio-medical sciences department at Creighton University. Crabtree would follow suit and enter the

field of research.

"Infectious disease has always fascinated me," Crabtree said. "Research allows me to look at what causes disease and find solutions. In this way I hope to be able to help more than just one person at a time but affect entire populations."

Today Crabtree is a graduate research assistant working in the lab of Charles Wood, Ph.D., who is the director of the Nebraska Center for Virology and the Lehr/3M professor in the department of biological sciences at the University of Nebraska-Lincoln.

There, she is studying the epidemiology of the Human Herpes virus 8 known as HHV-8 or Kaposi's Sarcoma Herpes virus, among the people of Lusaka, Zambia.

The HHV-8 virus causes Kaposi's Sarcoma (KS), a form of skin cancer,

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Work with undergraduate students essential component of INBRE

The major goal of the INBRE project is to increase the research capacity and infrastructure at institutions of higher education in Nebraska. Although this goal has many components, one essential element of our research capacity involves human resources. This aspect is specifically addressed by the work we are doing with undergraduate students on our network campuses.

The INBRE has implemented a long-term intervention that will increase the scientific workforce for our state. Our approach has been the development of the "BRIN Scholars Program". Each year, the network undergraduate campuses in our network select two to three promising sophomore students to participate in this pro-



James Turpen, Ph.D.

gram. Selection is based on academic achievement, aptitude, and an interest in learning about research opportunities. The students are supported for two years with Scholarship funds and gain hands on research experience in research laboratories on both the research-intensive campuses and the undergraduate network campuses. This experience includes experience in all elements of the use of the scientific method as well as practical experience in the use of cutting edge

technologies. All of the Scholars gain experience in making scientific presentations at both the regional and national levels, and many of them are co-authors on scientific publications at the time of their graduation. Each year, we have over 50 Nebraska students participating in this program.

The program contributes to the scientific workforce of the state in several ways. First, the research enterprise at the research universities critically depends on the influx of new students and the training of the next generation of scientists. The best way for a student to learn if they have the aptitude for research is to do it and experience the

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Dr. Shull provides meaningful experience for Scholars

For Jim Shull, Ph.D., the Nebraska INBRE program came along a couple of decades too late.

Upon graduating with a master's degree from the University of Nebraska-Lincoln in 1977, the Chapman, Neb., native wanted to pursue research as a career. He chose to go to the University of Wisconsin-



James Shull, Ph.D.

Madison, not knowing that similar opportunities were available in his home state.

"I knew that I wanted to go into biomedical research, but I didn't think that there were opportunities for me to pursue in Nebraska," Dr. Shull said. "Because of INBRE, in part, students today know that these opportunities exist in Nebraska."

Dr. Shull is professor and chairman of the UNMC Department of Genetics, Cell Biology and Anatomy. He is an NIH-funded researcher whose research is helping to lay the groundwork for identifying the genes that are responsible for breast cancer in humans, as well as defining the role of estrogen in breast cancer.

"I think it's important to support these types of initiatives," Dr. Shull said.

"Nebraska is a small state, and we've got our work cut out for us to keep talented students in the state, especially in health care and biomedical research. Our young people are not bound here, and they'll go where the jobs are.

"As a lab director, I have to find the time and resources to bring these students in. It's really a modest investment for the payoff."

The BRIN Scholars who perform research in Dr. Shull's lab are paired with

a lab partner, whom they work with on a daily basis.

"We identify a piece of work that is possible for them to understand and to make progress on over the 10-week period," Dr. Shull said. "We begin with a specific question and have an achievable endpoint, which gives them a sense of accomplishment when they're finished."

Dr. Shull's first BRIN Scholar, Erin Hughes, plans to enter nursing school. His second, Megan Campbell, will return to UNMC this summer for her second 10 weeks in Dr. Shull's lab.

"We're helping these students identify careers that they possibly may want to pursue," Dr. Shull said. "Even if they don't choose biomedical research, we still have given them another means to make that decision. If they do choose research, then they have experience that will serve them well in graduate school."

Dr. McKinney-Williams opens lab with INBRE funds

For as long as she can remember, Angela McKinney-Williams, Ph.D., has been fascinated by developmental biology, specifically how cells communicate with one another.

She pursued her passion and eventually became an associate professor of biology at Nebraska Wesleyan University (NWU) in Lincoln.



Angela McKinney-Williams, Ph.D.

But Dr.

McKinney-Williams wanted more, her ultimate goal – to develop her own research program at NWU.

In January, Dr. McKinney-Williams met her goal when she opened her own lab.

"I couldn't have done it without the INBRE-BRIN program," said Dr. McKinney-Williams, who joined the program in 2001 as an associate.

"INBRE funds have allowed me to purchase the supplies and equipment needed to establish my own lab and continue the research I was doing in Dr. Jeffrey Cirillo's lab," she said.

Through the INBRE program Dr. McKinney-Williams spent most of last year working in the lab of Dr. Cirillo at the University of Nebraska-Lincoln, conducting research on cell signaling.

"Dr. Cirillo's work focuses on tuberculosis and its causative agent

Mycobacteria tuberculosis," Dr. McKinney-Williams said. "I'm specifically researching cellular communication between different species of *Mycobacteria* and the related species *Streptomyces*."

Not only is the work fascinating, she said, but the opportunity to develop relationships with other scientists who are part of the INBRE program has also been very valuable and has provided great networking opportunities.

Along with the goal of developing her own research program at NWU, Dr. McKinney-Williams also wants to have undergraduate students work with her.

"Being a part of the INBRE-BRIN program and working with Dr. Cirillo has made it much easier to achieve both goals," she said.

Participation in the program has also afforded Dr. McKinney-Williams the opportunity to travel in order to obtain additional training.

In October, she spent a week at Hofstra University in Hempstead, N.Y., working with Joanne Willey, Ph.D., an expert in *Streptomyces*.

The experience gained from the training was invaluable and has given new direction to her research.

Dr. McKinney-Williams said: "Being a part of the INBRE program has contributed to my professional development in more ways than I can count. I also look forward to now being able to share the excitement of research with my students."

Turpen:

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excitement of discovery first hand. Thus, those BRIN Scholars who are intrigued by research are encouraged to consider careers in biomedical research and are financially supported as they pursue advanced degrees in a biomedical field. This influx of graduate students is essential to the growth and success of our state's cutting edge research capacity and an important investment in our future.

However, not all Scholars decide to pursue academic careers. Both the research enterprise at the universities and the success of biotechnologically related companies in Nebraska depend on scientifically trained individuals who are trained to carry out the highly intricate tasks associated with these advanced technologies. As part of the BRIN Scholars program, our students are exposed to career opportunities in the industrial sector and several scholars have pursued employment opportunities in this area. We are working on expanding this aspect of the Scholars program and are seeking opportunities to network with numerous biotechnology companies throughout the State. The Nebraska Department of Economic Development is working with us as we develop these partnerships.

James Turpen, Ph.D., is a professor of genetics, cell biology and anatomy at the University of Nebraska Medical Center. He directs the Nebraska INBRE Program. You may e-mail Dr. Turpen at jturpen@unmc.edu

Core lab possesses proteomics, bioinformatics expertise

The sequencing and three-dimensional structure of polypeptides oftentimes hold critical clues in determining how the molecules will act in various situations.

The Structural Proteomics and Bioinformatics Laboratory at Creighton University Medical Center has the equipment and expertise to provide those types of information for scientists involved in the INBRE project.

"The ultimate goal is to predict biological activity, by knowing the peptide sequence and the three-dimensional structure," said Sandor Lovas, Ph.D., the core director and an associate professor in the CU Department of Biomedical Sciences.

Dr. Lovas is an expert in structural proteomics and the biological effects of cancer-promoting peptides. Specifically, he is studying two separate peptides related to the development of breast cancer and colon cancer, blending bioinformatics and proteomics principles to study the peptides.

With INBRE funding, Dr. Lovas has purchased an ECD spectropolarimeter and the Advances ChemTech APOGEE fully automated peptide synthesizer. The lab also is equipped with an FT-IR vibrational circular dichroism (VCD) spectrophotometer Perkin-Elmer HPLC apparatus connected to a PE SCIEX API 150 EX quadrupole mass spectrometer (LC-MS) and dual AMD Athlon (1.33 GHz) file server (500 Gbyte raid) connected to 40 diskless nodes



Above: Sandor Lovas, Ph.D. stands next to the lab's computer cluster. Right: The fully automated peptide synthesizer that was purchased with INBRE funding.



(dual 64 bit AMD Opteron (2.4 GHz) cpu) with both fast internet and gigabit connections.

This equipment allows Dr. Lovas and his research team to characterize structures of the peptides with high speed and accuracy. This type of information can strengthen funding proposals of scientists who make use the equipment through the INBRE program.

"The individual items of equipment are not that rare, but having them all in one laboratory is," Dr. Lovas said.

The strength of the CUMC protein structure core is in the analysis of structural characteristics of proteins, with an emphasis on their importance in biological function. For initial structure-function studies, fragments/domains of proteins can

be efficiently synthesized using solid phase peptide synthesis. These fragments could be structural, functional domains or epitopes for raising antibodies.

In addition to the equipment purchases, INBRE also provides resources for the partial salary of a post-doctoral fellow and the full salary of a lab technician trained in protein/peptide chemistry. INBRE also provides funding for the chemical supplies and the instrument service contracts.

Equally important to Dr. Lovas is INBRE's impact on the recruitment of potential scientists for the state. Already, a BRIN Scholar who works in Dr. Lovas' lab, University of Nebraska at Omaha student Nick Palermo, has entered graduate school.

"The program definitely helps to recruit potential Ph.D. researchers for the state, and it helps scientists come together in Nebraska," Dr. Lovas said.

Crabtree:

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Crabtree said. Kaposi's Sarcoma was named in 1872 for Dr. Moritz Kaposi, who first described the lesions. The disease has been known to exist for several centuries in Mediterranean men and some equatorial African populations, but is extremely rare in children.

The virus is dormant in most people who have it, she said. However, scientists began to notice more infants with KS lesions at the same time the HIV outbreak occurred, Crabtree said. While the HIV virus is transmitted through breast milk, she

said, the HHV-8 virus is not but the theory is that it is transmitted through saliva. And because the child's immune system is weakened from HIV infection the infant is more susceptible to HHV-8 infection.

Crabtree is working with about 3,000 samples of blood, saliva and breast milk taken from mothers and infants between 1998 and 2000. Crabtree is concentrating on the saliva samples and whether or not the HHV-8 virus is present.

Crabtree credits the moral support she has received from her INBRE mentors and the financial support that has allowed her to pursue her passion for research.

"Everyone has been very understanding and very supportive," she said.

Steering committee members receive EPSCoR grants

Two members of the INBRE steering committee received Nebraska EPSCoR grants for 2005-2006. Mathew Bateman, Ph.D., of Chadron State College and Cheryl Bailey, Ph.D., of Midland Lutheran College received the grants,

which were awarded through the Nebraska Academy of Sciences.

In all, preliminary grants totaling \$6,000 were awarded to six professors and the Nebraska Junior Academy of Sciences.



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UNO student Finch enjoys physiology aspect of research

Until the summer of his junior year in high school, Marcus Finch thought that he some day would pursue a career in law.

Then, the native of Royal, Neb., got infection in both ears, which left him, at times, in nearly unbearable pain. The care that Finch received from his family practice physician impressed him enough that a medical career became the focus of his career plans.

Now, through the INBRE program, Finch is broadening that focus to consider a career in biomedical research.

"I do really enjoy doing the research, especially culturing cells and working with the confocal (microscope)," Finch said. "The immunofluorescent images under the confocal are amazing."

Finch, a Scott Scholar majoring in bioinformatics at the University of Nebraska at Omaha, is performing his INBRE research in the laboratory of Irving Zucker, Ph.D., professor and chairman of the UNMC Department of Cellular and Integrative Physiology. Much of the time, Finch works with Lie Gao, MD, Ph.D., a postdoctoral fellow in the department.



Marcus Finch was heading for a career in law until ear infections in high school led to multiple doctor visits. Now, he's considering a career in research.

In general, Dr. Zucker's research is looking to break the cycle that leads to congestive heart failure. Specifically, Finch studied the effects of Angiotensin-2 (A-2) on the Kv4.3 potassium channel in CATH.a neurons.

"We want to stop the vicious cycle of heart failure. The initial heart failure

leads to a decrease in cardiac output, which in turn leads to neurohormonal activation, which is the stimulation of the sympathetic nervous system and the renin-angiotensin system. These lead to further complications in the peripheral circulation as well as the heart itself, thus causing a worsening of the initial heart failure," Finch said. "The activation of the renin-angiotensin system leads to an increase in the level of A-2 in our body. We are looking at ways to break the cycle or perhaps prevent it from occurring."

The physiology of the research appeals to Finch. If he does pursue a research career, he would choose physiology-related research such as that performed by Dr. Zucker and Greg Bennett, Ph.D., associate professor of the UNMC Department of Genetics, Cell Biology and Anatomy.

"That would probably be where I would head, if I do choose a research career," Finch said. "I haven't really got to spread my net and see what's out there. I'll learn some other lab processes and see how it goes. I have enjoyed the research experience thus far in the program. I look forward to doing more this summer."

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