K-State Biochemistry Molecular Biophysics
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Alumna Provides for Updated Research Labs

Karen L. Nickel, Ph.D.

In the Spring of 2013 K-State graduate Karen L. Nickel, Ph. D., the retired Chief of Laboratory Field Services for the California State Department of Health and the former president of the American Association of Clinical Chemists (AACC), visited BMB and lectured graduate and undergraduate students on "Career Opportunities for Biochemists: Clinical Chemistry, Biochemical Genetics, & Molecular Diagnostics." This seminar was of great benefit for all in attendance: a wonderful opportunity for a successful K-State BMB alumnus to enlighten current students about potential career directions. During her visit and interactions with present and emeritus BMB faculty, Dr. Nickel toured our facilities and learned of our efforts to refurbish the Burt Hall laboratories (of now retired Dr. Tom Roche) for one of our newest faculty members, Dr. Brian V. Geisbrecht (see accompanying article below). Through her subsequent generous donation of $100,000, we completed the desired renovations before the Geisbrechts' arrival for the Fall, 2013 academic term. K-State BMB extends a hearty "Thank You" to Dr. Nickel; we will soon dedicate these labs in her name.

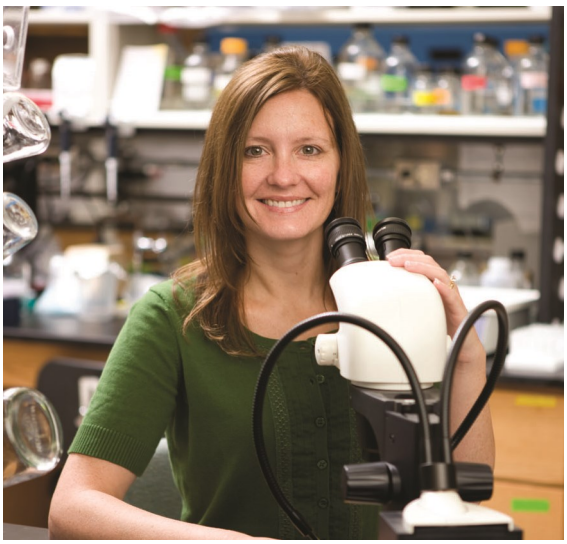
After her BS degree in chemistry from Oregon State, and her MS and PhD in biochemistry and analytical chemistry from K-State (in 1968; doctoral dissertation: "Studies on uterine peroxidase"), Karen taught for 4 years at the university level. She then completed postdoctoral training and qualification for licensure in California as a Clinical Chemist Scientist. She was certified as a Clinical Chemist by the National Registry of Clinical Chemistry in 1975, became a Diplomat of the American Board of Clinical Chemistry, and received licensure as a Laboratory Director by the California Department of Health in 1978. Over the ensuing years Dr. Nickel was highly active in California laboratories, specializing in radioimmunoassay development and steroid endocrinology. She also assumed several national administrative and supervisory roles for the AACC, including election to the Board of Directors (1982), election as national Secretary (1986) , editor of the AACC newsletter, and President-Elect of the AACC (1989). She served as AAAC President in 1991.

In 1993 Dr. Nickel became Chief of Laboratory Field Services for the California Department of Health Services, the first woman to fill this position. It was a tremendous challenge because this program oversees 17,500 laboratories in California and 27,000 licensed clinical laboratory personnel. During her tenure as Chief she analyzed programs, changed laws, made new regulations, and documented all these actions to the federal government. She established a career ladder for laboratory personnel, giving recognition to phlebotomists, technicians, genetic scientists, Master's level supervisors, and nontraditional directors. Dr. Nickel established licensing and examination standards for such laboratory scientists, and as a result California now licenses over a dozen groups of baccalaureate- and doctorate-level scientists, phlebotomists and technicians. Dr. Nickel took a lead role against laboratory fraud and established enforcement actions for violations of laboratory law. Ensuing regulations made California law both clearer and easier to enforce, resulting in the closure of approximately 100 labs involved with billing fraud, and denial of new licenses to laboratories guilty of billing irregularities.

Dr. Nickel remembers her beginnings at K-State BMB, that led to her career of laboratory involvement the California Department of Health. Her kind gift to K-State renovated the laboratories in Burt Hall, but Dr. Nickel has also gave her expertise to K-State in other ways. In 2002, she was a College of Arts and Sciences alumni fellow, and she currently serves on the advisory committee of the College of Arts and Sciences. Her career spans four decades as a clinical chemist. Although she's retired, Karen still serves California as a consultant in public health. She is an outdoor enthusiast (biking, hiking), who loves travel, woodworking and gardening.

"We are tremendously proud of Dr. Nickel's accomplishments."
Dr. Phillip E. Klebba

Erika Geisbrecht, New Associate Professor



Training Background:

As science was my favorite subject in high school, I always assumed I would attend Medical School. However, I chose a different path after my first semester as an undergraduate at the University of Wisconsin-Madison. Soon after I started classes, I had the opportunity to help set up a new plants genetics laboratory. By the end of the semester, I was hooked on research and knew I would be attending graduate school to pursue a Ph.D. My decision to join Dr. Denise Montell's laboratory at the Johns Hopkins University School of Medicine was an easy one as I was impressed with the elegant genetic approach being taken to identify genes required for cell migration in the fruit fly *Drosophila melanogaster.* After completion of my graduate studies, I aimed for further post-doctoral training where I could continue to study cell signaling and development using a combination of genetics and biochemistry. I was lucky to find this combination in Susan Abmayr's lab at the Stowers Institute for Medical Research in Kansas City where we focused on muscle development, once again using the genetically amenable fly model. In contrast to other well-studied developmental processes, fewer genes had been characterized in the process of muscle development. Thus, it seemed an ideal system for long-term studies, with the overall goal of understanding how muscle diseases arise.

Current Interests:

We are broadly interested in how muscles are formed and how healthy muscle tissue is maintained in adult animals. Defects in the formation and/or function of muscles results in progressive muscle weakness in humans and is an obvious detriment to long-term health and quality of life. The proteins required for muscle formation in humans and invertebrates, such as the fruit fly *Drosophila melanogaster*, are evolutionarily conserved. Our lab focuses on characterizing new genes essential in two types of muscle: the somatic, or skeletal muscles, and the dorsal vessel, or heart muscle.

Future Directions:

My laboratory uses genetic, biochemical, and microscopy approaches to understand two main processes in muscle biology. First, how do muscles stably attach to tendons and how do they maintain this strong attachment during muscle contraction? This is an important question as the inability of muscles to remain attached results in immobility and progressive myopathies, or muscle diseases. To date, one important group of proteins, called the integrins, is essential for muscle attachment and link defects in muscle attachment to congenital myopathies. Seminal studies in *Drosophila* uncovered the role of integrins in muscle attachment over 20 years ago. Since this initial discovery, our lab and others have capitalized upon the genetic approaches available using the fruit fly model to identify more genes essential for muscle attachment. Consequently, we aim to understand how and where these new protein complexes function in addition to the known integrin components in hopes of eventually treating certain types of congenital myopathies.

Another goal in our research is to determine how healthy muscle tissue is maintained in aging organisms. In addition to congenital muscular dystrophies, which are present at birth, muscle atrophy (or muscle wasting) is a problem in elderly adults or in those who are compromised as a result of other illnesses, such as diabetes or cancer. It is already known that a proper balance between making and getting rid of certain proteins in muscle cells is essential for the maintenance of healthy muscle tissue. We have identified evolutionarily conserved, but uncharacterized proteins in the fly model, which are essential for regulating other muscle proteins. Current and future studies involve biochemical approaches to isolate other proteins whose levels need to be tightly regulated in muscle and subsequent genetic approaches to dissect their function in muscle homeostasis.

Brian Geisbrecht, New Professor

Training Background:
My undergraduate training from St. Vincent College was primarily in Chemistry, which prepared me very well for my graduate studies in Biological Chemistry at the Johns Hopkins University School of Medicine. I did my dissertation research on various aspects of peroxisome formation, function, and disease in the laboratory of Steve Gould. I next obtained postdoctoral training in structural biology from Dan Leahy's laboratory in the Department of Biophysics and Biophysical Chemistry also at Johns Hopkins. My time in Dan's lab represented a true turning point in my career. Not only was I in a completely foreign area in terms of experimental approach, but it was there that I became exposed to 'life outside the cell'. Since then, my interests have focused almost exclusively on the extracellular aspects of what I believe to be medically significant host/pathogen interactions. Yet without regard to the specific project, my underlying scientific goals remain constant: (i) obtain structural insight to molecular recognition events, (ii) understand the consequences of these events at a mechanistic level, and (iii) determine how we can capitalize upon the information gained in (i) and (ii) toward future applications in treating either infectious and /or inflammatory human diseases.

Current Interests:
A large majority of my laboratory's interest lies in understanding the structure, function, and mechanism of various microbial proteins that function as virulence factors and toxins during the initiation and propagation of infection. Topically, our research is often combinatoric and depending upon one's perspective may fall under categories such as Innate Immunity, Molecular Basis of Infectious Diseases, Host-Pathogen Interactions, Structural Biology, and Molecular Recognition. Specific projects include (but are not limited to) structure/function analysis of pathogen-derived inhibitors of complement proteins, coagulation factors, and related components of the innate immune system, and activation of type-III secretion systems in Gram-negative organisms.

Future Direction:
My laboratory is taking a multidisciplinary approach toward a better understanding of the events which lay the foundation for initiation and propagation of bacterial disease, with particularly emphasis on staphylococci. The ultimate goals of this research program are two-fold. The first is to use a structure-based approach to expand our basic knowledge of the various host/pathogen interactions that occur between S. aureus and human physiological systems. If we are to provide sufficient measures against S. aureus infection in the future, we need to further our basic understanding of how it interacts with and defends itself against the human body. Our second goal is to capitalize upon the information obtained from analysis of these host/pathogen interactions toward developing new treatments for human inflammatory diseases. We believe that naturally-occurring staphylococcal complement inhibitor proteins may be useful templates for new types of anti-inflammatory drugs. Other work has shown that S. aureus actively blocks a number of other disease-associated defense and repair processes, including coagulation, neutrophil transmigration, and angiogenesis. All of this suggests that important breakthroughs for treating a number of non-infectious human diseases may actually be found by studying the biology of this important pathogen.

Biochemistry Foundation Funds

F17870	BMB General Fund Account
F66998	Hageman (Richard/Elizabeth) Discretionary Account
Q53097	Hedgcoth Biochemistry Graduate Scholarship Account Outstanding Graduate Teaching And Graduate Research Awards Graduate Student Travel to Scientific Meetings
Q17100	Hughes (J.S.) Memorial Scholarship Account Undergraduate Scholarships
F79431	Merrill (Fred/Virginia) Biochemistry Discretionary Account Undergraduate Scholarships
Q03227	Wanda Bates Undergraduate Scholarship Account Undergraduate Scholarships for Students with financial need
N85330	Willard & Ora M. Ruliffson Memorial Scholarship Account Scholarship for pre-dentistry or Pre-veterinary students
F81556	Philip Nordin Memorial Awards for Graduate Student Research Travel
F51745	W. Mack Barlow Memorial Scholarship
Q55486	R. Kenneth Burkhard Scholarship for Women in Biochemistry Scholarship for Outstanding Female BMB Juniors and Seniors

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Provost's Lecture on Excellence in Scholarship
Hageman Lecture in Agricultural Biochemistry
The Unusual Origins of PCR
Kary B. Mullis
Nobel Laureate in Chemistry, 1993

While developing analytical tools for DNA, Dr. Mullis imagined the polymerase chain reaction (PCR). He reduced the idea to practice and obtained patents for it. A decade later the Nobel prize followed. PCR set off a chain reaction, an explosion in DNA research. It unleashed unimaginable possibilities in medical diagnosis, a deeper understanding of evolution from relationships between genomes and a radical transformation of genetic methods in plants and animals. PCR spawned techniques too numerous to count and novel breakthroughs: is identified long-buried kings and viruses, traced our lineages and recued hundreds wrongly sentenced to prison.

What a vision!