

Active Site News

Department of Biochemistry - Alumni and Friends Newsletter

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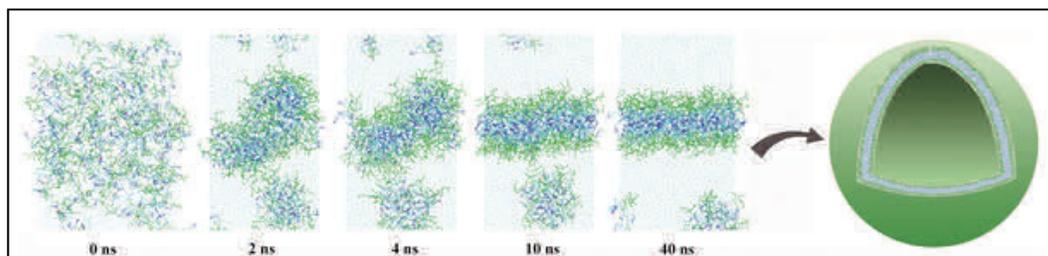
And more:

The Short-List of de-
partmental accom-
plishments

Dear Alumni letter, by
new Department Head,
Phillip E. Klebba

& A few new ways to
keep in touch with K-
State Biochemistry!

SCIENCE NOTICES K-STATE PROFESSOR JOHN TOMICH



A coarse-grained simulation of bis(h₅)-K-K₄ bilayer self-assembly.

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rofessor John Tomich received a little more attention than he was expecting when Science featured some of his research this September. Here's what they had to say:

“Newly Discovered Molecule Could Deliver Drugs to Treat Diseases”

ScienceDaily (Sep. 24, 2012)

Kansas State University researchers have discovered a molecule that may be capable of delivering drugs inside the body to treat diseases.

For the first time, researchers have designed and created a membrane-bounded vesicle formed entirely of peptides -- molecules made up of amino acids, the building blocks of protein. The membrane could serve as a new drug delivery system to safely treat cancer and neurodegenerative diseases.

A study led by John Tomich, professor of biochemistry at Kansas State University, has been published in the journal *PLOS ONE* in September, and a patent for the discovery is pending.

The peptides are a set of self-assembling branched molecules made up of naturally oc-

curing amino acids. The chemical properties of a peptide create a vesicle that Tomich describes as a bubble: It's made up of a thin membrane and is hollow inside. Created in a water solution, the bubble is filled with water rather than air.

The peptides -- or bubbles -- can be made in a solution containing a drug or other molecule that becomes encapsulated as the peptide assembles, yielding a trapped compound, much like a gelatin capsule holds over-the-counter oral remedies. The peptide vesicles could be delivered to appropriate cells in the body to treat diseases and minimize potential side effects.

"We see this as a new way to deliver any kind of molecule to cells," Tomich said. "We know that in certain diseases subpopulations of cells have gone awry, and we'd like to be able to specifically target them instead of attacking every cell, including healthy ones."

The finding could improve gene therapy, which has the potential to cure diseases by replacing diseased cells with healthy ones. Gene therapy is being tested in clinical trials, but the biggest challenge is how best to deliver the genes.

Methods include cells with a virus being injected into the body, and liposomes -- fatty

compounds -- carrying the genes. However, these methods may present some problems.

When a virus is used, the body's immune system can attack the virus or cause a tumor. Lipid-based systems may cause inflammation and may not properly bind to cells. The peptides created by Kansas State University researchers have advantages over their lipid counterparts. The peptides have improved stability and durability, are easier and quicker to create, and they could be delivered to a specific area in the body. The peptides can be designed to have the ability to target cells, tissues, tumors or organs, and to encapsulate chemical reagents, antibodies, toxins and inhibitors, Tomich said.

Partial funding for the study came from the Kansas State University Johnson Cancer Research Center, National Institutes of Health and Japan Society for the Promotion of Science. Kansas State University collaborators include Sushanth Gudlur, May 2012 doctoral graduate in biochemistry, who first published the results in a dissertation; Pinakin Sukthankar, doctoral student in biochemistry; Jian Gao, former postdoctoral fellow in the department of biochemistry; Luz Adriana Avila Flores, graduate research assistant in the department of biochemistry; Yasuaki Hiromasa, research assistant professor of biochemistry; and Jianhan Chen, assistant professor of biochemistry. Takeo Iwamoto from the Jikei University School of Medicine in Japan also was a collaborator.

Article courtesy of K-State Division
of Communications and Marketing
Reprinted in *Science Daily*
09/24/2012

Jeff Fabrick Wins Young Alumni Award from A&S

Jeff Fabrick, a 1995 bachelor's graduate in biochemistry and a 2003 doctoral graduate in biochemistry, received the Young Alumni Award in Science from the College of Arts and Sciences last October.

Fabrick is a research entomologist at the Pest Management and Biological Control Research Unit in the U.S. Department of Agriculture-Agricultural Research Service's U.S. Arid-Land Agricultural Research Center in Maricopa,



Fabrick (right) with USDA lab members

Ariz. He was nominated for the Young Alumni Award by Mike Kanost, University Distinguished Professor and former Department Head.

"Jeff has made significant contributions to the area of insect immunity. His published journal articles are among the very few biochemical papers in that field that deal with a significant pest species," Kanost said. "Jeff has excelled as an independent scientist, continuing to work on basic studies of insect biochemistry with important implications for agriculture, particularly in insect pests of cotton."

Not a stranger to recognition, in 2010 Fabrick was named the Agricultural Research Service's Pacific West Area Early Career Research Scientist of the Year. This award from the USDA recognized Fabrick for his innovative application of insect biochemistry and molecular biology in understanding and sustaining transgenic crop technology and integrated pest management.

The award was presented at the second annual Eisenhower Circle Celebration, a special event recognizing loyal alumni and friends who give \$250 or more to the college annually.

Information courtesy Kansas
State Alumni Association

The Short List:

Beibei Li (undergraduate, Muthukrishnan) received the Star Trainee Award from the Kansas IDEA Network of Biomedical Research Excellence (K-INBRE) to conduct research on the role of cuticular proteins with peritrophin A domains in the red flour beetle.

Sarah Duhachek Muggy (graduate, Zolkiewska) received the 2010-2011 Biochemistry Graduate Teaching Award from the department.

Sujata Chaudhari '11 (Ph.D. Muthukrishnan) and **Sam Molina** (graduate, D. Takemoto) received the 2010-2011 Biochemistry Graduate Research Award from the department.

Kanost No Longer Department Head, Still Busy

Joining the K-State faculty in 1991, Dr. Michael Kanost is an international authority in insect biochemistry in the areas of innate immunity and synthesis of the insect exoskeleton. He has been the principal investigator of studies supported by more than \$15 million in federal grants. He is the author of more than 150 publications and his research has been cited more than 5,900 times in other publications. Kanost also has been the research mentor for 20 graduate students, 17 postdoctoral assistants and 37 undergraduate students, and until recently the Department head for Biochemistry.

A fellow of the American Association for the Advancement of Science, Kanost has helped uncover answers to questions about insects' biochemistry that have eluded scientists since the 1940s. In 2005 Kanost was a member of a small research team

that discovered that silencing the enzyme laccase-2 in a beetle prevents cuticle tanning, the process of hardening and pigmenting the insect's exoskeleton. A hardened exoskeleton keeps insects safe from chemical and biological injuries. Weakening it opens up the possibilities for pesticides. Understanding the exoskeleton's chemistry may also help develop ideas and methods for future synthesis of durable and lightweight materials for aircrafts, prosthetics and military armor.

For this work, the last school year has seen Kanost receiving not one but two major awards: the Iman Outstanding Faculty Award for Research awarded by Kansas State, and the Olin Petefish Award in Basic Science, one of the Higuchi-University of Kansas Endowment Research Achievement Awards. For the Iman Award for Research Kanost received \$5,000 in recognition of his outstanding research. The Olin Petefish Award included a plaque and a \$10,000 grant to be used for research materials, summer salaries, fellowship matching funds, hiring research assistants or other research support.

*Information gathered from K-State Alumni Association and Division of Communications and Marketing.

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ear alumni and friends,

Greetings from KSU Biochemistry! I was delighted to accept the position of Department Head shortly before the beginning of the Fall 2012 academic term. I will do my best to meet the high standard of administrative guidance set by Dr. Mike Kanost, my predecessor, over his distinguished 10 years of service as Head of Biochemistry. As you likely know, Kansas State University has ambitious plans for the development of research and education on our Manhattan campus and throughout the State of Kansas. In Biochemistry we are excited to pursue these goals; we are a small but energetic group of researchers dedicated to providing a rich educational experience for our undergraduate and graduate students, as well as advanced training for post-doctoral fellows, while keeping faculty research at the highest level of achievement. As a community the department contains 12 regular faculty, 4 research faculty, 32 graduate and 95 undergraduate students, supported by 6 staff members, housed in two buildings. We're located in Chalmers and Burt Halls on the Manhattan campus.

It's a challenging, dynamic time to undertake studies in biochemistry. We are endeavoring to advance our undergraduate and graduate programs so that students will profit from breakthroughs in biophysics, bioinformatics and molecular biology in this postgenomic era. Biochemistry is evolving, and we are striving to position our department to provide training for the future. Please stop by and visit us!

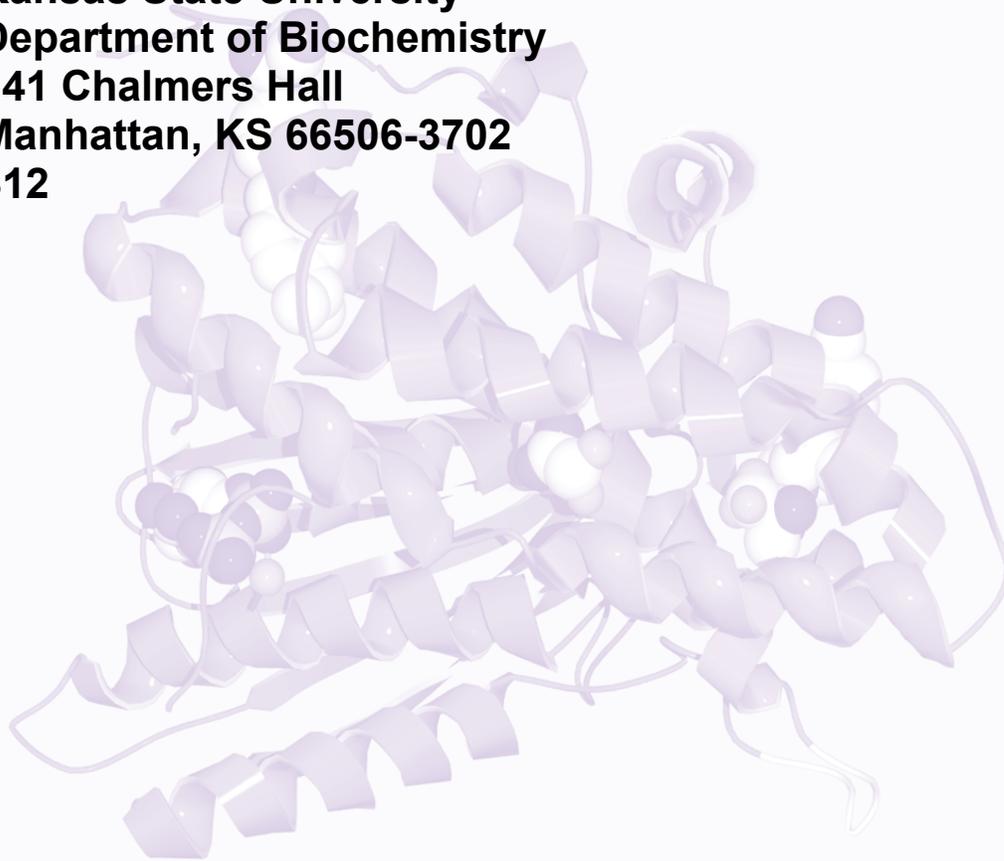
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Biochemistry Foundation Funds

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|--------|---|
| F17870 | <u>Biochemistry General Fund Account</u> |
| F66998 | <u>Hageman (Richard/Elizabeth) Distinguished Lectureship</u> |
| F68342 | <u>Havley (David/Tim) Biochemistry Discretionary Account</u> |
| Q53097 | <u>Hedgcoth Biochemistry Graduate Scholarship Account</u>
Outstanding Graduate Teaching and Graduate Research Awards Graduate Student Travel to Scientific Meetings |
| Q17100 | <u>Hughes (J.S.) Memorial Scholarship Account</u>
Undergraduate Scholarships |
| F79431 | <u>Merrill (Fred/Virginia) Biochemistry Discretionary Account</u>
Undergraduate Scholarships |
| Q03227 | <u>Wanda Bates Undergraduate Scholarship Account</u>
Undergraduate Scholarships for students with financial need |
| N85330 | <u>Willard & Ora M. Ruliffson Memorial Scholarship Account</u>
Scholarship for pre-dentistry or pre-veterinary students |
| F81556 | <u>Philip Nordin Memorial</u>
Awards for Graduate Student Research Travel |
| F51745 | <u>W. Mack Barlow Memorial Scholarship</u> |
| Q55486 | <u>R. Kenneth Burkhard Scholarship for Women in Biochemistry</u>
Scholarship for Outstanding Female Biochemistry Juniors and Seniors |

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Our homepage contains information on the Department of Biochemistry, faculty, undergraduate and graduate programs, courses, seminars, and core facilities. Other K-State related pages that might be of interest:

K-State Alumni Foundation <http://www.k-state.com>

E-Collegian Newspaper <http://www.spub.ksu.edu>