



For

PORTRAITS BY STEVE PUPPE



the Home Team

BY JULIE METTENBURG

*With the new drug **Nanotax** entering clinical trials, KU's Cancer Center reaches a milestone toward achieving national status while bringing life-saving cures closer to Kansans*

For Kansans battling advanced cancer, the best chance for survival may be many miles away, in Houston, Omaha or St. Louis. These are the nearest cities that offer National Institutes of Health-recognized comprehensive cancer centers.

How much would it mean if Kansans could travel to Kansas City, Hays or Wichita for the highest level of care? Cancer disrupts life enough; perhaps treatment within Kansas would allow more precious time with family, less lost work and income, less wear and tear on an already ravaged body—and a greater chance of survival. For 2007, NIH reports that cancer death rates nationwide declined by 2.1 percent, but the Kansas rate dropped by only an abysmal .6 percent.

For patients with ovarian cancer, the survival rate could soon improve. The University of Kansas Cancer Center has announced that this fall it will begin Phase I clinical trials of a cancer drug called Nanotax, developed through a

partnership between KU researchers and a private Lawrence company, CritiTech Inc.

For all cancer patients in Kansas, Nanotax could herald a new era of treatment—and a future with a much greater chance of survival.

Nanotax is the story of a breakthrough success for KU in its quest to gain NIH Comprehensive Cancer Center status. Developing new drugs and testing them in Phase I trials, demonstrating “bench to bedside” cancer research capability, was perhaps the highest hurdle for KU to overcome, requiring mammoth efforts of cross-campus and public-private coordination, cooperation and money, with doses of visionary brilliance along the way.

Comprehensive status “would have significant impact on the state because it would mean that Kansas patients could be treated more quickly and more efficiently than they’ve ever been treated before,” says Chancellor Robert E. Hemenway. “Clearly, the promise of the cancer center is in the University joining

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with other health care providers, hospitals and doctors to bring to the people of Kansas the best possible care. We need to make sure that a cancer patient in Kansas is going to receive the same potential treatment as a patient in a larger urban environment.”

Roy Jensen, director of the Cancer Center, says KU is on track to apply in 2011 for NIH designation. “One of the most important things to understand is what a critical endeavor this is for the University, that this really is a quality metric of unparalleled importance,” he says. “It establishes us as a world-class center for cancer research that takes a back seat to no one. Just as an NCAA tournament victory or an Orange Bowl victory helps validate the quality of an athletics program, this designation helps establish the quality of the research program for the University as a whole.”

With Nanotax, KU has proven it can operate in the big leagues. Can it repeat the achievement with more drugs? And will new drugs coming through KU’s pipeline enhance its chance of becoming one of the nation’s comprehensive cancer centers?

CLOSE TO HOME

To Jensen, a breast-cancer researcher and native Kansan, the fact that Kansans die of cancer at a higher rate than the national average is simply unacceptable. Having helped Vanderbilt University achieve Comprehensive Cancer Center status, Jensen was hired in 2005 to lead KU’s efforts to do the same. “Having been at a university that was able to attain designation and understanding

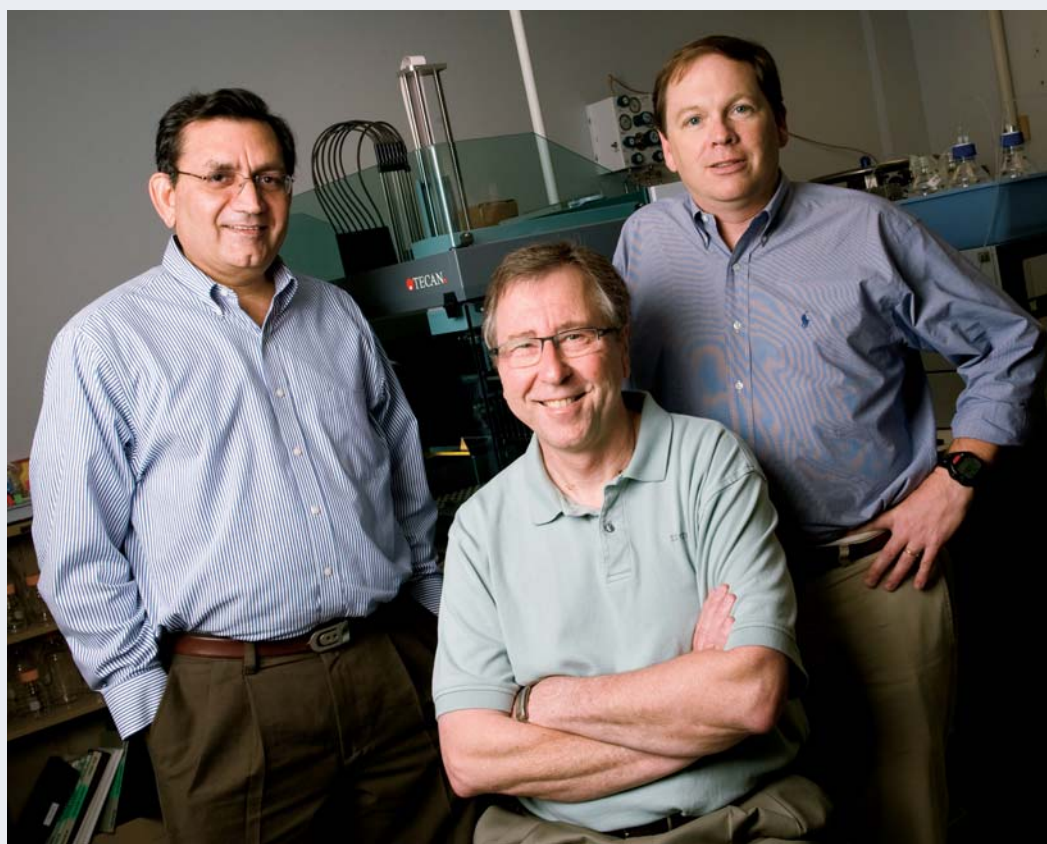
what a difference it made in terms of patients’ quality of care and the quality of research that you can do after designation, I think the opportunity to come back and do it in your hometown is a pretty powerful motivating factor.”

The National Cancer Institute (a division of NIH) evaluates potential comprehensive centers according to several criteria: institutional and regional com-

mitment, organizational capabilities and leadership, facilities, a research focus on cancer, and collaboration among scientific disciplines. KU Cancer Center’s plans and investments include initiatives on all of these fronts.

Once designated, KU would join 41 Comprehensive Cancer Centers nationwide, including Baylor College of Medicine in Houston, University of Nebraska Medical Center in Omaha and Washington University School of Medicine in St. Louis. In addition, a multi-year grant would recognize that the center provides the highest level of care available—and provide rewards: millions of dollars of additional research funding and support.

“The whole idea of the [comprehensive] program is to provide the infrastructure to both basic science and clinical



■ The three minds behind Nanotax: Chemical and petroleum engineering Distinguished Professor Bala Subramaniam discovered the technology that would allow for delivery of cancer drugs in extremely small “nanoparticles.” Pharmaceutical chemistry Distinguished Professor Valentino Stella, known for his work in improving drug stability and solubility, leads KU’s drug discovery research program and holds an NCI contract for drug development. Roger Rajewski obtained his PhD, with Stella as his adviser, nearly two decades ago, and now leads KU’s program for developing drug delivery products.



investigators to do outstanding research,” Jensen says. “It is huge in terms of attracting the best people. Outstanding cancer researchers want to be at NCI designated cancer centers, because of the resources that designation provides and the patient population that it provides.”

In its quest for NCI status, KU has chosen not to try to house a cancer center on one sprawling campus but to pull together a number of local and regional institutions and resources. KU has formed collaborative relationships with other institutions, including The Stowers Institute for Medical Research, Truman Medical Center, Children’s Mercy Hospital, and Saint Luke’s Hospital—all on the Missouri side—along with Kansas State University, Via Christi Regional Medical Center in Wichita, Stormont-Vail in Topeka, Hays Medical Center, Mt. Carmel Regional Medical Center in Pittsburg, Hutchinson Hospital and Goodland Regional Medical Center.

Despite political challenges regarding the involvement of Missouri institutions, KU’s quest for NCI designation already is bringing improved treatment opportunities to patients in these other medical centers in Kansas and has gained the support of the Kansas Legislature, Gov. Kathleen Sebelius, g’80, Kansas Masons

and the Kansas Bioscience Authority. In addition to the promise of closer-to-home cancer care, biotechnology—including pharmaceutical development—is a targeted growth area for Lawrence, Kansas City and the state.

Enter Nanotax: proof that the collaborative approach works. Even better, Nanotax success may have vaulted KU and the Kansas City-Lawrence biotech corridor closer not only to NCI status but also to a new era of pharmaceutical research, development and delivery.

THE NANOTAX STORY

Nanotax came about thanks to a discovery from, of all places, the School of Engineering. Developed by Bala Subramaniam, Dan F. Servey distinguished professor of chemical and petroleum engineering, the technology uses supercritical carbon dioxide to dissolve substances into incredibly tiny “nanoparticles,” which seemed especially suited to improving drug delivery.

Three researchers in the mid-1990s began to work together on commercial applications for Subramaniam’s technology. Joining Subramaniam were

■ Born in Kansas City, Roy Jensen returned home to guide the KU Cancer Center to NIH Comprehensive Cancer Center status, having done the same for Vanderbilt University.

Valentino Stella, PhD’71, distinguished professor of pharmaceutical chemistry, and Roger Rajewski, c’84, g’87, PhD’90, director of the KU Biotechnology, Innovation and Optimization Center. The three had been examining ways of manipulating the sizes of drug particles to achieve more effective drug delivery.

Stella had been involved with the cancer drug Taxol at KU since the 1970s. He knew it was a particularly harsh drug for patients to tolerate. Delivered into the bloodstream, it could be debilitating. Plus, “one of the problems with disseminated cancer in the peritoneal cavity, especially from ovarian cancer, is you get these tumors that spread throughout the cavity, and those tumors often don’t have a very high blood supply, so intravenous treatment doesn’t always get to all those little metastasized sites,” he says.

Stella recalls that Rajewski had the breakthrough idea: Why not use Subramaniam’s engineering discovery to deliver Taxol? As Stella explains, Subramaniam’s technique could introduce



■ Sam Campbell (left) specializes in life sciences company start-ups and oversees the business operations of biotechnology company CritiTech Inc. As executive director of Higuchi Biosciences Center for nearly 20 years, Charles Decedue oversees programs that enhance KU's basic biomedical research plus translate discoveries into private-sector technologies.

the drug into the abdominal cavity “in a way that produces a solution of a slowly dissolving suspension, that treats the local tumors that are very hard to hit by the current treatment.” Size of particle would be critical: the smaller the particle, the better, “like powdered sugar versus big crystals in your coffee,” Stella says.

By 2000, the researchers had helped form a private company, CritiTech Inc., to find marketable applications for the technology. Sam Campbell, c’71, g’73, an original investor who was named CEO in late 2003, says KU’s Higuchi Biosciences Center was instrumental, as was KU Cancer Center, which was just beginning its quest for NCI status.

After development work was done by Stella and Rajewski in making small particles of the Taxol-containing drug Paclitaxel, Nanotax was tested in mice by KU Cancer Center member Katherine Roby, PhD’89, m’90, research associate professor of anatomy and cell biology. “She was able to use the drug in an ovarian-cancer

mouse model that showed exceptionally good results, and that is what we then advanced off of to move the whole effort forward,” says Campbell.

In structuring Crititech, Campbell says he “put together a good strategic planning group made up of people in this region who have excellent experience in this type of business and business strategies.” Key players included Matthew McClorey, g’99, l’99, of the Lawrence Regional Technology Center and Charles Decedue, Higuchi executive director. By 2006, KU had created its Office of Therapeutics, Discovery and Development at the KU Cancer Center, under director Scott Weir. The office oversees KU projects, moving new drugs through the development pipeline. “They have been supportive in every way you can imagine,” Campbell says.

CritiTech created a manufacturing and production process and shepherded the drug through the FDA approval process; this summer, the FDA approved

testing of the drug in Phase I trials at KU Cancer Center.

As Stella describes it, Nanotax, then, is a very small, very fine particle of drug that provides a rapid dissolution of a rather insoluble drug directly into the abdominal cavity, bathing the cancer with enough of the drug to be effective, perhaps capturing those cells that otherwise would not have been reached by other treatment. “So we’ve played with Taxol probably over 30 years. Always looking at improving the original mouse-trap—this came along and seemed definitely worth trying,” Stella says.

Jensen says, “Nanotax is a great poster child for exactly what we are trying to do—to take an idea that was developed at KU and turn it into a critically important therapeutic advance that saves people’s lives.”

Adds Hemenway: “Nanotax to me demonstrates the way that first-rate scientists work. It shows you what happens when KU combines all of its forces to focus on something that really has a positive effect on patients.”

A NEW DRUG MODEL

Nanotax represents not only a potentially successful drug-development channel for KU, but also a possible model for the way pharmaceutical development will head in the future. And it could perfectly position KU for many more drug discoveries to come.

“Ten years ago there were many people who felt that academic medical centers and universities really had no role whatsoever in drug discovery and development; that was totally the domain of the pharmaceutical industry,” Jensen says. “What’s become apparent is that big pharma is really an industry in crisis, in terms of its fundamental business model, and there’s a great deal of uncertainty in that industry as far as what direction it’s going to take.”

Big pharma’s incentive is to develop drugs to treat large populations, but today’s era of personalized medicine calls

for therapies that target small subsets of diseases. For example, drugs that target specific hormone receptors, such as herceptin for certain breast-cancer tumors, are being hailed as “miracle drugs” that turn previously devastating diagnoses into highly treatable and curable forms of cancer, and often without the toxic side effects. Great news for cancer patients; not necessarily for the major pharmaceuticals, whose profit structure seeks broader populations.

“That strategy just has absolutely no future whatsoever,” says Jensen. “What distinguishes us from a number of other cancer centers or emerging cancer centers across the country is the fact that at this university and region, we have tremendous expertise in drug discovery development and delivery. And much of what we are trying to do in the cancer center is to put ourselves in a position where we can leverage that expertise for new cancer drug development.”

In addition, Campbell adds, pharmaceutical development such as CritiTech’s should boost employment in the area, which could in turn help KU recruit renowned researchers and their spouses, who might work in similar fields. “We as a region are trying to grow the life sciences, and this is one more step and one more company that can contribute to

that overall regional effort.”

Even if Nanotax doesn’t fare well in clinical trials, Stella says, it still provides tremendous benefit by helping the KU Cancer Center gain experience with Phase I trials: “Nanotax will have developed the protocol or paradigm for how this needs to be done.”

Campbell expects Nanotax to be in the Phase I trials until next spring, and, pending good results, it will then go into a Phase II trial, requiring more preparations and applications to the FDA. He also reports that CritiTech has another cancer drug under development “that shows very good promise at this point.” In the event that Nanotax becomes a commercially viable drug, profits would return funds to KU in the form of licensing of the technologies developed at KU—an incentive in itself for KU to continue to assist private firms in moving technologies to market.

Also, Subramaniam’s

base technology offers additional broad applications in the pharmaceutical industry, from small-particle drugs to coatings of implantable devices like cardiac stents. CritiTech was founded to move the technology into products for the consumer market. Campbell adds that the manufacturing process developed at CritiTech could affect the way certain drugs are

produced in the pharmaceutical industry.

And Stella says there’s more exciting research to come in the KU drug development pipeline, through young researchers coming up in engineering, pharmaceutical chemistry and medicinal chemistry.

To Hemenway, Nanotax and other drug developments signal a future in which the stature of KU’s scientists continues to attract partners for drug development. Alumni “can take great pride in the fact that there are cures for cancer being

developed at their university, without any compromise,” he says. “We will put significant resources and human effort into making sure that the war against cancer gets a full enlistment from the University of Kansas.”

And patients in Kansas may find more of what will save their lives right here at home, as beneficiaries of the ultimate quest of Jensen and colleagues at the KU Cancer Center: “to be the place where the end of cancer begins.”

—Julie Mettenburg, j’91, writes about health and medical research for national publications. Her family has benefited from life-saving treatment at KU Cancer Center.



■ After 20 years in the pharmaceutical industry, Scott Weir leads KU’s drug-development program at the Cancer Center, bringing University resources together in a pipeline of new therapies.

Cancer Collaboration

