

# SCIENCE, **NOT** FICTION

CENTRAL FLORIDA BIOMED.  
CLUSTER TAKES HOLD.

By Steve Blount



»» The future of medical care is being invented right here. In the middle of the last century, jet packs and wrist radios were science fiction. Central Florida companies like NASA, Harris Corp. and Lockheed Martin were key players in turning those fictions into fact. Now local leaders have embarked on a new quest, one that may seem similarly far-fetched, but one that promises to benefit every person on earth.

## BIORESEARCHER TAKES ON BIOTERRORISM

"We've taken the top ten diseases outlined by the World Health Organization — malaria, cholera, cancer — and we're working on all of them," says Dr. Henry Daniell of the University of Central Florida (UCF).

That may sound pretty ambitious but consider this: Daniell's lab has already found a way to produce enough anthrax vaccine from a single acre of tobacco plants to protect everyone in the United States and has grown lettuce that cures diabetes in mice.

Anxious to get these discoveries to people who can be helped, Daniell has spun off his successes into a biomedical company, Chlorogen, that uses plants to produce vaccines and therapeutic proteins, like insulin.

"Our first goal was to produce vaccine at low cost, and anthrax was our first vaccine because of bio-defense concerns," Daniell explains. "The Department of Defense had given a contract to another company for \$975 million to buy only 35 million doses."

Conventional vaccines are costly because the pathogens — the bugs that do the dirty work — are grown inside of yeast or bacterial cells in very expensive fermenters. The bacteria are then extracted, killed, and the dead pathogens made into a vaccine that, when injected, prompts your immune system to make antibodies to that pathogen. You then develop immunity.

Instead of using whole, killed pathogens, Daniell's method places copies of the antigen — the part of the

bacteria responsible for creating the immune response — and puts up to 10,000 copies of the antigen in each cell of a plant.

In his initial study, the antigen was extracted and injected into mice, who were then exposed to extremely large doses of anthrax. Every one of them survived.

Because the actual vaccine is already proven effective and available, this advance doesn't need to go through the usual lengthy process to which new treatments are subjected before they can be widely used. The tobacco produces the same vaccine that's already in use, but does it better and more cheaply.

Daniell has built on that success by perfecting a process using whole plants, instead of extracts that must be injected. The plants are harvested, dried, powdered and put into capsules that can be swallowed. The plant cells protect the vaccine until bacteria in the human digestive system break down the plant cells and release it to be absorbed.

In addition to being far less expensive, the powdered vaccine can be shipped and stored without refrigeration, thereby overcoming a key stumbling block to delivering vaccines in the Third World.

Producing vaccines in plants has one other critical advantage, Daniell says: they don't contain toxins or human pathogens.

Vaccines made from bacteria grown in fermenters are not often pure, free of such contaminants. They all contain some contamination. That contamination took a heavy toll on soldiers vacci-

PHOTO COURTESY OF THE BURHAM INSTITUTE



**“We’ve taken the top ten diseases outlined by the World Health Organization — malaria, cholera, cancer — and we’re working on all of them.” — Dr. Henry Daniell**

nated against biological agents before the first Gulf War. The Department of Defense has paid compensation to more than 110,000 of the 696,000 who fought in the war.

“Part of the Gulf War Syndrome was traced back to lethal factors [in vaccines] that weren’t found when the Federal Drug Administration tested some of the batches,” Daniell says.

The lab has ventured well beyond bio-terror to produce vaccines for amoebiasis, a debilitating water-borne disease common in underdeveloped countries, and for rotavirus, which affects children throughout the world, including the United States.

Vaccines are just the beginning, Daniell says. Plants can also be used to produce therapeutic proteins, like the insulin-infused lettuce or interferon — which can cost a patient \$25,000 - \$45,000 per year — for pennies.

And while AIDS is still out of reach because there’s no single effective treatment, Daniell’s lab has been able to grow a protein that blocks the transmission of HIV and can be used in a topical cream. Daniell’s hope is that this protein can help slow the spread of HIV and AIDS.

## A BIOTECH CLUSTER

Daniell’s work alone has generated enormous media attention for UCF’s molecular biology research, including a Discovery Channel documentary. But there’s more. Much more. Daniell is just one of more than a dozen researchers working to improve human health at UCF. That’s impressive progress for an effort that’s less than a decade old.

Pappachan Kolattukudy (known as Dr. P.K.) is dean of the Burnett College of Biomedical Science at UCF and one of the prime movers behind the emerg-

ing Central Florida biotech cluster.

Kolattukudy was recruited to come to UCF from Ohio State University where he had spent 17 years setting up and managing OSU’s biotech center. For Kolattukudy, the lure was the chance to help build a young university almost from the ground up.

“The 20th century was the time of advances in physical sciences,” Kolattukudy says. “In the 21st century the major advances will be in life sciences.

“Henry Daniell was here when I arrived, but most of the folks in the department have been hired since then. We hire a group of people each year and that will continue until we reach our goal of about 50.”

That’s 50 researchers, plus graduate and undergraduate students, technicians and others, most funded by grants from the National Institute for Health (NIH) and philanthropic organizations.

“Nationally, the major part of federal funding for research and development is through NIH, almost \$30 billion annually. When the science journal *Nature* analyzed how that money is distributed among the 50 states, Maryland was a big winner — in part because of Johns

Hopkins — and there were a few states including Florida, that they considered weren't getting their share of the funds," Kolattukudy says.

"That situation is unhealthy for the state, and the biomedical cluster we're trying to develop will help change it. Florida will soon be the third largest state, and we have a long way to go to catch up."

If Kolattukudy has anything to do with it, that could happen comparatively fast. It took decades to build other major bio-tech centers, but Kolattukudy sees Central Florida emerging as a leader in less than 20 years.

"I still see myself as a newcomer," he explains, "and this state has the economic opportunity and unrealized potential to become a major biotech hub — it can be, and it should be."

## BEYOND THE LAB

To do that requires more than university labs, though, and Kolattukudy is working on that, too.

"We have quite a few patents being applied for coming from the research in our labs, and we hope to increase that number," he explains. "Those have already been spun off into local biotech companies, including Henry's company, Chlorogen."

Other companies have relocated to Orlando to work with the UCF spin-offs. One of those, VaxDesign, received a large grant from the DARPA to create a living laboratory model of the human immune system.

Each researcher and company relocation adds to the overall power of the cluster.

"We collaborate with scientists all over the world — Japan, France, Germany, the U.K. — but when something comes into our neighborhood, the interaction is better and there's the chance to share facilities," Kolattukudy points out. "Biomedical research involves very expensive equipment — we have some microscopes that cost a million dollars each — and the best way for researchers to have access to that kind of equipment is to share it. We call those core facilities.

"The arrival of The Burnham Insti-



**"What's being offered is the chance to make a difference, not to come into an established bureaucratic system that's been in place for 30 years and where your suggestions aren't needed. There's a real emphasis on working together, and everyone's opinion matters."**

— Dr. Cheryl Baker, M.D. Anderson Cancer Center Orlando Research Institute

tute, for example, will help with that." [see *Off the Wire*, "The Burnham Institute," page 10 for more information]

The missing piece of the puzzle was a medical school — so Kolattukudy proposed one.

"When I looked at this place it was obvious the biggest impact we could have was to build up bio-medical research in a way that would end up in a medical school. In 2003, I put out the hope and dream that UCF could have a medical school at a meeting with local leaders downtown. [UCF President] John Hitt picked up on it."

In 2006, the medical school was approved by the state and the very first building erected at the new med school will be a 195,000-square-foot home for the Burnett College of Biomedical Sciences.

Having doctors and clinicians co-located with the researchers is an extension of the work UCF is already doing with local hospitals.

Dr. Cheryl Baker is the director of the M.D. Anderson Cancer Center Orlando Research Institute, and she and her staff

collaborate with UCF's researchers constantly, she says.

"You can't live in a silo anymore," Baker says. "I'm always out at UCF. We have a special niche and can offer services to others, but we also need collaboration to improve what we do."

Baker echoes Kolattukudy's call for expanding the core facilities in the area. Baker completed her undergraduate degree at Rollins, but, in looking around for a high-end research university, she left the state, first going to the University of Texas and later to Harvard, where she also taught courses. Her research took her back to Texas, to the main campus of M.D. Anderson Cancer Center in Houston.

"Development of core facilities is key. Houston is very attractive because it has those core facilities, as do Harvard and MIT. Orlando has the hospital systems, now they're building core facilities for multidisciplinary research."

Founded in Houston in 1941, M.D. Anderson itself is a major piece of that landscape and is considered one of the nation's top cancer research institutions.

# “Rippe-d”

One of the nation’s most comprehensive health assessment teams is right here in Central Florida.

Getting state-of-the-art medical advice too often requires navigating an archipelago of specialists, each one an island that can’t communicate with the others, leaving you to sort out what it all means and how the various findings fit together. That’s especially true of preventive medicine, where parsing the complex interactions of lifestyle, medications and underlying physiology take a different set of skills than those needed to treat an acute illness like cancer or heart disease. Add in the high-stress, fast-paced lifestyle led by business owners and executives and it’s not surprising that many high-performance individuals do a better job taking care of their companies than taking care of themselves.

**Dr. James Rippe (above right)**, a renowned Harvard-trained cardiologist, saw this challenge and tackled it head on. He created the **Rippe Lifestyle Institute**, and his **Rippe Health Assessment** is a one-day, 360-degree review of your health status conducted at Florida Hospital’s Celebration Health campus just south of Orlando.

The program has been called the best high-tech, high-touch health assessment program in the world. It

puts the latest technology — including heart and lung CT scans — into the hands of nationally known physicians and practitioners but then goes beyond the boundaries of conventional “exams” to include an extensive lifestyle assessment with a full nutritional workup, analysis of your activity level and the effect and interactions of any medications you’re taking.

There are three levels of assessment keyed to your age — 30 to 39, 40 to 49 and over 50 — with those 50-plus getting the most extensive battery of tests along with two specialty consults of their choice and a spa

treatment.

Rippe Health’s practitioners integrate the results to give you a holistic picture of your state of health in both summary form, delivered one-on-one by a Rippe Health physician, and in a comprehensive 50-page report. The report includes in-depth recommendations on lifestyle, diet and medications that can be used by you and your primary physician to maximize your health.

High-profile clients from all over the country fly in to take advantage of the world-class medical talent Rippe Health brings to bear on their well-being; all you have to do is step into one of the program’s town cars and take a short drive to better health.



When looking for a place to expand, Anderson chose Orlando and Baker was one of the first of the Houston staff to sign up for the move.

Baker was intrigued by the same opportunity as Kolattukudy — the chance to build something new from the ground up plus, in her case, the chance to come home.

“What’s being offered is the chance to make a difference, not to come into an established bureaucratic system that’s been in place for 30 years and where your suggestions aren’t needed. There’s a real emphasis on working together, and everyone’s opinion matters.

“Orlando is an easy place to live. You

can get to M.D. Anderson from UCF in twenty minutes. Even though it looks like our facilities are very spread out, try living in Houston for a few years,” she chuckles. “There it takes a half-hour to get to the grocery store. Orlando is very easy to get around, whether it’s to go to work or a Magic game, the beach or parks. There’s a lake on every corner.”

According to Baker, that quality of life has helped M.D. Anderson recruit a solid group of medical oncologists, researchers, statisticians, physicists and surgeons.

“We’re using every available resource to defeat cancer, taking it from the DNA all the way up to a pill that we

give to a patient,” Baker explains. “We design individualized cancer therapies — specifically for individual patients — rather than global cancer strategies.”

Unlike diseases such as viral infections which act virtually the same way from patient to patient, Baker says that cancer is individual because the cancer cells interact with the particular genetic and chemical makeup of each patient: “There’s a constant conversation between the host cells and the tumor.”

While global treatments, like radiation, work on most patients, more targeted treatments can achieve better results and eradicate more of the cancer cells.

"We pick a disease site — I specialize in pancreatic and kidney cancer — then build a multidisciplinary team around it: radiation, oncologists, surgeons, pathologists, nurses, basic and translational researchers.

"We study the biology of the disease in animal models and old-school, tissue culture studies. Then we move those findings into the clinical setting. We hand off the baton to clinicians to find out how our treatments work in actual patients. The clinicians then hand the results back to the researchers asking for modifications and improvements."

Baker is enthusiastic about the potential for collaboration with The Burnham Institute and UCF's new medical school. She's already seen results from existing local relationships and with the pharmaceutical industry.

"Pharmaceutical companies are now recognizing our abilities and are starting to drop their agents in our laps, asking us to test, modify and validate their treatments and get them into clinical

use," Baker points out. "Our radiation department is studied by people from all over the world. Patients receive very advanced technology-based radiation — very individualized — so we have a vehicle to incorporate radiation therapy into our research models that not many institutions have the ability or the willingness to do."

Willingness and cooperation seem to be the hallmarks of the Central Florida bio-med initiative.


"The advantage here is that you're talking to CEOs, presidents and big donors directly about what needs to be done," Baker says. "Central Florida is going to be an incredible place, not just for what exists now, but for what will exist in wellness, sports medicine and research."

How does that affect you? Even if you never get injured or suffer from diabetes or cancer, the economic impact of biomedical research on Central Florida is already enormous: 9,000 plus workers in 155 bio-technology and life

sciences companies with an estimated \$2.5 billion in earnings.

As Cheryl Baker points out, that will only increase, offering opportunities for local residents and new arrivals to train as lab technicians, nurses, research associates and researchers.

"I think Central Florida will be a huge place for recruitment," Baker says. "The state is bringing in top notch scientists and companies. Families want to settle here because there's a future for their children. It's going to become a teaching environment."

Pappachan Kolattukudy agrees that teaching and training are the keys to success in the fight against disease and the fight for research grants: "In the San Francisco Bay area the University of California system supplies undergraduates to do technical services, and many of their undergrads find jobs in the biotech industry. Without that manpower, biotech companies can't survive. We're now generating that manpower for Central Florida." 

*We are honored to welcome  
the Burnham Institute  
to the Central Florida community  
and to their temporary home  
at Florida's Blood Centers' headquarters.*



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