



NUTRITION MATTERS

FALL 2005

PENNINGTON BIOMEDICAL RESEARCH CENTER AND FOUNDATION • LSU SYSTEM

DID YOU Know?

- Obesity tends to speed the aging process in humans. The findings suggest that many health problems associated with being overweight -- heart disease, cancer, diabetes, arthritis -- may result from fat cells hastening the natural aging process.
- Now predominantly taken by diabetics with daily needle injections, insulin may soon be available in a much more comfortable, inhaled form. The manufacturer of the inhaled insulin, called Exubera, is using data from successful trials performed by Dr. William Cefalu's team to apply for FDA approval to bring the drug to market. A powder form of insulin is delivered by a hand held inhaler, and is absorbed in the lungs and lining of the throat.
- Not everyone benefits equally from exercise. Dr. Claude Bouchard and his team have determined some of us are just genetically wired to benefit from exercise more than others. The benefits include lower heart rate, lower blood pressure and cholesterol, and improved blood sugar.
- The Pennington Biomedical Research Center is the largest academically-based nutrition research center in the world, with the greatest number of obesity researchers.

LIFE WITH A PURPOSE

- A CLINICAL PURSUIT -

The summer of 2001 began normally for the Bella family: Grace, her husband V.J., and their children. There were baseball practices and exciting games for Brad, who was the second of three children in the Bella household, carefree afternoons spent enjoying time off from school and work as well as preparations for the traditional summer vacation to Navarre Beach, Florida. With bags packed, eleven-year-old Brad, his siblings and parents geared up for another exciting vacation.

Not long after arriving, Grace and V.J. noticed characteristics - mostly physical - in Brad that seemed strangely different. Realizing that something was "not quite right," Grace was unable to pinpoint exactly what

seemed so foreign about the appearance, behavior and demeanor of her son. Attributing his recent weight loss, continual thirst, tired feelings and swift changes in mood to the hot summertime season, the Bellas continued with retreat plans. However, on the Thursday before returning to Baton Rouge, Brad began to vomit, and his condition worsened. After visiting the local clinic, his parents were told not to worry; Brad just had a virus.

With intentions of leaving for home the next morning, the Bella family decided to stay one more night and wait for dawn to reevaluate Brad's condition. Recalling the day's events, Grace remembers preparing a big breakfast - toast, eggs and coffee with all the trimmings. With



Grace Bella (right) talks with clinic volunteer

delectable smells lingering in the air, she sent her husband to wake the still sleeping Brad. There was a scream, there was a surge of fear, and then there was a confrontation with the reality that would forever change so many lives.

"We knew he was gone," said Grace, "but our hope was to revive him." Brad had passed away from an undiagnosed illness or disease - diabetes.

continued on page 11

TRACKING "SECRET" MESSENGERS FROM BLOOD TO BRAIN

Treating a brain disease or disorder with a drug seems simple enough. Take the drug, wait for the effect. The trouble is the brain protects itself very well from foreign substances; drugs just don't enter the brain easily. Pennington Biomedical Research Center researchers would like to change that; and to do so they are learning how the brain learns about the state of the body.

Cell-to-cell, vessel-to-vessel, organ-to-organ. That's the manner of internal biochemical communication within the extraordinary human body and brain. This network of internal

communications must function smoothly, because survival often depends on the body's quick reaction to pain, infection, hunger, thirst or blood sugar levels.



Pan and Kastin in the lab

For years, some have used the brain-as-computer comparison to understand the gathering and processing of bodily data sent to our

brain from the nervous system. Now, however, details are slowly emerging of a very different and perhaps equally important data stream to the brain that must pass through a major barrier. The Blood Brain Barrier, also called the BBB, is a complex area of nerve cells and blood vessels where the bloodstream comes into contact with the brain. Like a complicated network of security checkpoints, the BBB screens a steady flow of chemical messengers arriving through the bloodstream, trying to gain clearance to the brain's various command centers. Only safe, known messengers are allowed to pass.

continued on page 8

Message from the Executive Director of the Pennington Biomedical Research Center



Dr. Claude Bouchard
Executive Director

Greetings. I hope you, our supporters, are having an enjoyable summer. Activity here at the Center seems to show no summer break, and I'd like to share news on several fronts.

We are six months into our new strategic plan, *Vision 2010*, and I am pleased to report we have already achieved one of our 10 priorities (please see *Vision 2010* at www.pbrc.edu). We have grouped our 12 neurologists into a new division called Nutrition and the Brain, now headed up by Richard Rogers, Ph.D. According to Dr. Rogers, The research effort generated by the Division addresses the basic neural mechanisms involved in how the brain measures nutritional status, regulates feeding behavior, controls digestion and modulates energy consumption. The work of this division is applicable to brain-nutritional interactions ranging from obesity and diabetes to brain and spinal cord injury, cancer and infection. There is so much to learn about how our brain reacts to nutrients, including enhanced function, as well as the role our brain plays in our body's detection and use of nutrients.

Also, we have enjoyed the fruits of our scientific labor in a variety of notable publications and media attention. Dr. William Cefalu's team of diabetes researchers has determined that an inhaled form of insulin, under the name Exubera, works quite well to control blood sugar. This gives the promise that one day diabetics may well be able to control blood sugar without the physical and psychological discomfort of daily self-injection. Instead, patients can use a hand-held device that resembles a large asthma-type inhaler. The manufacturer of the drug, a partnership between Pfizer and Sanofi-Aventis, is using data generated here at the Center to apply

for approval from the Food and Drug Administration to get this drug to market. Dr. Cefalu's team has also shown that chromium – available at retail stores – works well to fight the weight gain that is common among early-stage diabetics who are taking oral medication.

Our gratitude goes to all those who supported us and to the members of the legislature who believed in the value of PBRC.

In a fascinating piece of research, our work in the Heritage Study has determined exercise has differing results on clinical participants showing insulin resistance – a precursor to diabetes. Some participants showed marked improvement in insulin sensitivity others did not. These differences, tracked across family lines, allowed us to identify specific genetic sites that may play a role in insulin resistance.

And in early trials here at the Center, data show that an experimental drug can suppress appetite by acting on the region of the brain that creates appetite, leading to its attenuation and weight loss. The drug, by Arena Pharmaceuticals, has no name yet, only the experimental designation... APD356. The Center will also be involved in the next phase of human trials of this promising drug.

Findings like these at the Center have prompted our local business community to take notice. The Greater Baton Rouge Chamber of Commerce, I am proud to report, has made our Center one of its priorities, paying for and issuing a report touting the economic benefits – now and in the future – of the Center and its

researchers. The Chamber took a strong lead in our last legislative session, working to gain new funding for the center. The Chamber issued its report at a meeting of the Baton Rouge Press club, generating substantial local news. I truly appreciate the Chamber's role, under the guidance of President and CEO Stephen Moret, and look forward to its support in the future.

The positive news about our Center came at an opportune time, during a legislative session in which we faced two significant issues. First was a request for an increase in our annual funding. As you may be aware, we request only 20% of our funding from the legislature. It is important seed money that allows us to recruit and hire promising faculty who will one day generate their own revenues through federal, state and private research grants. We were able to gain a \$500,000 increase in our annual funding. Our gratitude goes to all those who supported us and to the members of the legislature who believed in the value of PBRC.

The second important issue was a debate on stem cell research. The LSU System, PBRC, other campuses in the system, and Tulane University support a ban on human cloning, continued research on human adult stem cells, and on adult and embryonic stem cells of animals, and on cells generated by transfer of the genetic material from an adult donor. We will continue to be a source of objective information on this issue and expect the discussion to continue for some time as we all learn more about this important area of research.

Claude Bouchard, PhD
Executive Director

Economic Impact of Pennington Center Reaps Broad Benefits to Louisiana

CHAMBER OF GREATER BATON ROUGE BACKS CENTER

In line with its commitment to growing the capital region's economy, The Chamber of Greater Baton Rouge recently commissioned a study to determine the potential economic impact of increased state funding to support the strategic growth plan for the Pennington Biomedical Research Center. Loren C. Scott & Associates, Inc. estimated the impact of an additional state investment of \$15 million over five years, beginning with \$2 million per year in 2006 and 2007. The study found that increased funding would yield additional research dollars for the Center, hundreds of new quality jobs, considerable household earnings for the capital region's economy, and significant new sales for Louisiana businesses.

RETURN ON INVESTMENT

\$3.00-\$4.00



Federal/Private Funding

\$1.00



State Allocation

"This economic impact study proves that the Pennington Biomedical Research Center is a wise investment for the state as it will not only grow our economy but will also increase the likelihood of continued cutting-edge health research findings," said Chamber President and CEO Stephen Moret. "We hope that state lawmakers will take a long look at this potential impact and offer the necessary support," said Moret.

Since beginning operations, the Pennington Biomedical Research Center has received

continued on page 9

PBRF Welcomes Elizabeth Shaw Nalty to its Board of Directors

We welcome to the Board of Directors of the Pennington Biomedical Research Foundation a longtime supporter and friend, Elizabeth "Betsy" Shaw Nalty of New Orleans. Betsy is a highly regarded civic leader, devoting remarkable time and energy to dozens of worthwhile organizations.



Most notably, she has served as president of the Edward G. Schlieder Educational Foundation since 1998. The Edward G. Schlieder Educational Foundation has provided vital support to many Louisiana educational institutions since 1945. Through the years the foundation has funded numerous projects, including the establishment of two chairs at the Pennington Biomedical Research Center.

Betsy also has been personally involved in many aspects of the New Orleans community. She is a member of the Board of Governors for the Tulane University Health Sciences Center, and serves on several other boards related to Tulane University. Her commitment and interest in healthcare and the arts is tremendous as evidenced by her leadership involvement on the boards of Ochsner Pediatrics, the Hermann-Grima/Gallier Historic Houses, the Ogden Museum of Southern Art, and the Greater New Orleans Foundation, just to name a few.

Betsy's husband, Donald, served on the Board of Directors of the Pennington Biomedical Research Foundation from 1998 until his death in 2003. Donald was tireless in his work to better the community. We are glad to have Betsy on the Board to continue the Naltys' longtime commitment to the Pennington Biomedical Research Center and Foundation.

PBRF Honoree
Kevin P. Reilly, Sr.



Dr. Claude Bouchard, honoree Kevin P. Reilly, Sr., and John Noland

The Board of Directors of the Pennington Biomedical Research Foundation (PBRF) recently honored Kevin Reilly, Sr. for his outstanding leadership as chairman of the board from 2002-2004. Reilly, who has been instrumental in the Pennington Biomedical Research Foundation efforts since its inception, was honored at a reception held in March at the Pennington Biomedical Research Center.

As a state senator, Reilly helped to create the 8G program formulated from oil and gas proceeds and earmarked for K-12th grade funding and higher education enhancements, including a matching grants program for Chairs and Professorships. Since that time, the Pennington Center has received more than \$11 million in private and state matching funds, which includes 10 endowed chairs and 3 professorships. Then, as Secretary of the Louisiana Department of Economic Development, he was instrumental in recognizing the Center as an economic force, showing that for every \$1 the state dedicates to the Center, \$3 to \$4 dollars are generated in additional economic revenues.

Reilly continues to serve on the Pennington Biomedical Research Foundation board of directors.

PENNINGTON SCIENTISTS ON CUTTING EDGE OF STEM CELL RESEARCH

One way to think about stem cells is this: they are generic cells waiting for orders to become muscle, nerve, bone, cartilage or any of our body's other functional cells. Scientists worldwide view stem cells with tremendous hope, learning to direct stem cells to become specific tissue to cure ailments or injury in suffering patients. The hope is that one day, a patient in need of a liver or bone repair or a properly functioning gland will receive new tissue grown from stem cells under the direction of his or her own genetic code. However, research in this field is still somewhat new, so debate goes on about what it is and what it means. Physicians, researchers, politicians and the general public are all working to shape the scientific and ethical issues of stem cell use. Yet, the world of stem cells is invisible to most of us and not very well understood.

Three Pennington Biomedical Research Center investigators are trying to understand stem cells and what their ultimate place may be in the world of health and medicine. Interestingly, mention stem cells, and they may probe a bit; "exactly what do you mean?" Even after reams of media exposure on scientists prodding stem cells to turn into bone, cartilage, nerve cells, skin, and the like, scientists still honestly debate among themselves what is or is not a stem cell, where stem cells are located, and how researchers know for sure when they have found and isolated one.

Jeff Gimble, M.D., Ph.D., made international news recently when stem cells he harvested from adult human fat – with a little prodding from him - turned themselves into human bone. He separated the stem cells from regular fat, grew them in the lab until he was satisfied they were healthy, and placed them on a small chip of bone which he then slipped under the skin of a mouse. The stem cells took their cues from the bone chip on which they were attached and from the normal chemical messages they received from a living organism and did what they were "told" to do.... They turned to human bone and started growing.

Ken Eilertsen, Ph.D., on the other hand, is scrutinizing stem cells that form well before adulthood; his mouse and cow cells may have the potential to form any cell in an

animal, and under the right conditions, produce a new, live animal. These are referred to as totipotent stem cells, and here the story gets a bit more complicated. Under normal circumstances, when a sperm fertilizes an egg, that resulting single cell is totipotent, meaning it has the potential to form the total range of cells and, ultimately, an entire animal. Every animal starts off, quite literally, as a single, totipotent stem cell. That one stem cell then multiplies into the first cells of an embryo, each of which is still totipotent.

However, the ability to form into a complete animal (totipotential) is lost in further cell multiplication. Totipotent cells give way to cells with lesser ability, destined only to become specific tissue types.

Eilertsen spends his time trying to understand and document the specific genetic and molecular processes that yield totipotency and how they are turned off or suppressed as the embryo matures. If he learns what turns totipotency off, he may find the key to turning it back on as needed. If so, researchers may have a way of creating stem cells by artificially re-programming adult cells back to totipotency.

The question driving most of stem cell research now is, can scientists isolate stem cells and coax them into the tissue they want. Gimble's conversions of adult, fat stem cells to bone offers one example. One day, those cells may lead to a source of bone tissue to repair bone-crushing injuries where not enough bone is available to graft. The injured person could donate his or her own fat stem cells to grow new bone, thus avoiding tissue rejection associated with transplants. Suggesting similarly promising results, the scientific literature now seems to carry a steady stream of work like Gimble's in which researchers announce their latest results of coaxing stem cells to become bone, cartilage, muscle and other tissue.

But Gimble's cells are not totipotent. Described as pluripotent, they seem to be restricted to forming a narrow range of cells

types. His fat stem cells may never become anything other than fat, cartilage and bone. Not a problem, really, just a fact.

"You can repair many types of tissue with this type of stem cell," Gimble said.

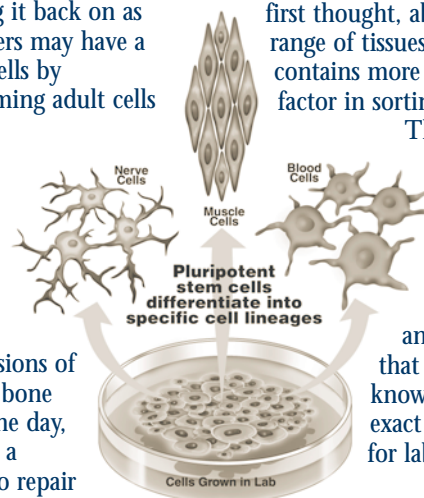
Blood marrow is an example of how adult cells can form multiple tissues. Bone marrow contains cells called hematopoietic cells, those which form blood, primarily. However, Gimble and others can mark these marrow cells with special dye, and also find them later in the brain, nervous system, liver and muscle.

In the midst of such a large range in potential to form different cells, and multiple sources of cells, lies the search for understanding: exactly what is a "stem cell?" and how do you know you have one? It is not as simple as peering through a microscope and identifying one. And, to make the matter more intriguing, Gimble has recently seen evidence that his fat stem cells might actually be more potent than he first thought, able to convert to a wider range of tissues. Bone marrow also contains more potent cells, a complicating factor in sorting out the stem cells there.

These and other layers of complexity are leading researchers into a wide field of cells, each with some potential to convert to specific tissue, but hard to define and describe in an exact manner – a manner that will allow all scientists to know they have isolated the exact type of stem cells they need for laboratory or clinical use.

Eilertsen likens the search for stem cells to throwing a handful of similar looking seeds into the garden. You may not know which are the red flowers (representing stem cells) until after they bloom. In both Eilertsen's and Gimble's work, the scientists may be capturing and manipulating stem cells and non-stem cells alike, knowing the result only after a tissue conversion takes place.

Both scientists are trying to understand the range of cells and develop the means to positively identify them. And, more subtly, identify the original stem cells used to grow



continued on page 7

Unearthing Success

\$8 million in grants launch botanical research center

Cures from plants and plant extracts are certainly not new. While most have not risen much above home remedies or traditional cures passed from generation to generation, the promise of chemical compounds in plants, often called botanicals, is great. From the earth's huge variety of botanical extracts, Pennington Biomedical Research Center scientists hope to dig up new and promising medicines to treat some of our toughest ills, including diabetes, cardiovascular disease, and other complications of the growing obesity epidemic. Botanicals may be effective on a condition called "metabolic syndrome," which is a clustering of risk factors such as obesity, hypertension, abnormal lipid levels, blood sugar abnormalities, and predisposition to heart disease. Currently, it is estimated that more than 40 percent of Americans may have this disorder by the time they are 50 years old.

Dr. William Cefalu, chief of the Center's Division of Nutrition and Chronic Disease, and his team have begun work under two new research grants. One is a prestigious National Institutes of Health grant of about \$7.9 million during the next 5 years; the other is a two-year grant provided by the Coypu Foundation. Cefalu will use those grants to establish a botanical research lab, allowing him and his colleagues to evaluate scores of compounds in plants. That lab is called the John S. McIlhenny Laboratory of Botanical Research. In addition, PBRC scientists will also investigate the validity and effectiveness of various herbal supplements.

The goal of the NIH grant is to evaluate the scientific reasons why humans develop such medical conditions and secondly, to distinctively evaluate the role of specific plants (botanical extracts) that have been identified as being effective in preventing or delaying the progression of metabolic syndrome. Researchers aim to isolate and characterize specific components of these natural products in the hopes of someday testing their effectiveness in humans.

Work under the grants is a collaborative effort among nearly two dozen scientists at the Center. Dr. Cefalu will lead the project and direct the clinical studies. The grant includes a Botanical Research Core lab, which will connect researchers at the LSU Ag Center, PBRC and Rutgers University and will work with all investigators in characterizing the specific components. Early work is focusing on the actions of Russian tarragon on insulin action and the anti-obesity

potential of Shilianhua (a wild plant from a province in China famous for the longevity of its residents.)

Dr. Aamir Zuberi will oversee the Animal Research program which will test the multiple components in various models; Dr. Jianping Ye will be project leader for an exciting compound he and Dr. Xiaotuan Liu have identified that is effective on weight loss and insulin action; Dr. Michael Lefevre will analyze components of grape skins on carbohydrate metabolism; and Dr. Phillip Brantley will direct the training program.

In addition to the NIH grant, grant funding from the Coypu Foundation will provide testing of literally thousands of botanical compounds for their ability to effect specific abnormalities. In the recent past, these compounds needed to be tested on an individual basis in the lab and in animal models first. This approach was slow and tedious. However, with the Coypu Foundation funding, botanical extracts will first be evaluated in the lab on how they affect specific metabolic pathways that contribute to "metabolic syndrome." Specifically, investigators will use lab tests that will evaluate the effect of the extract on genetic or metabolic pathways contributing to the clinical condition. This high throughput and rapid screening will hopefully provide many more candidate agents for ultimate testing by the NIH investigators.

Dr. Cefalu graduated from the Louisiana State University Medical School in New Orleans and attended the University of California in Irvine, California for his residency. He has served as Director of the Diabetes Comprehensive Care Program of Wake Forest University School of Medicine and now at PBRC. Dr. Cefalu conducts important clinical and basic research relating to cellular means of insulin resistance as well as the role of insulin resistance regarding heart disease. In addition to serving as a reviewer for seven journals, Dr. Cefalu is on the Editorial Boards of Diabetes Research and Clinical Practice and the American Journal of Physiology. He is an Associate Editor of Diabetes Care. Among his many other achievements, Dr. Cefalu has authored or contributed to over 60 publications in the past 10 years and lectures both nationally and internationally.



Dr. Cefalu with Coypu Foundation board member, John Hernandez and wife Polly. Dr. Cefalu discusses new laboratory techniques and findings demonstrating natural plant substances now underway in research trials in the new John S. McIlhenny Laboratory of Botanical Research.

PBRF Salutes John S. McIlhenny and the Coypu Foundation



John S. McIlhenny

The late John S. McIlhenny, founder of the philanthropic Coypu Foundation, was an avid conservationist and also serious collector of botanical and ornithology books and paintings. His love for natural history was passed down from his father and grandfather, but particularly from his uncle, Edward Avery, who developed the botanical gardens, bird sanctuary, and the lush gardens that draw thousands to Avery Island every year. Edward Avery McIlhenny spent as much time developing the lush marsh landscape at Avery Island as he did developing, planting and marketing Tabasco™ sauce. His nephew shared many of those same interests.

The young McIlhenny, trained as a chemist, spent the majority of his time working on preservation and conservation issues throughout his life. "Mr. Jack" was an ardent supporter of PBRC during his lifetime, often visiting the Center and faculty. After his death in 1996, he bequeathed the remainder of the family's priceless collection of paintings, drawings and collected natural history works to LSU. Some 600 rare books are now in the McIlhenny Collection.

The Coypu Foundation continues to keep John McIlhenny's work at the forefront by supporting grants in the fields of science, natural history, and education. The recent commitment of \$200,000 has established the John S. McIlhenny Laboratory of Botanical Research to support major testing of natural plants and their effects on insulin resistance in the laboratory of Dr. William Cefalu (see story this page on Dr. William Cefalu, chief of the division of nutrition and chronic diseases at the Center).

Last year, the Coypu Foundation established, through the Louisiana Board of Regents Support Fund for Chairs and Professorships, an Endowed Chair in Health Wisdom at the Pennington Biomedical Research Center. The Coypu Foundation donated \$600,000 and the Board of Regents provided matching funds of \$400,000 to establish the endowed Chair.

"The Coypu Foundation welcomes the opportunity to enhance this exceptional research now underway at the Center," said John Hernandez, Coypu board member.

FOUNDATION HONORS AND RECOGNITION

Scientific Dinner Features Author of "The Color Code"



Many individuals, companies and foundations have earmarked funds and are continuing to provide important guidance and donations to the Center for nutrition research. These supporters were recognized in a newly created donor recognition "wall" placed at the entrance to the C. J. Pennington, Jr. Conference Center main auditorium. It was unveiled at a recent dinner honoring donors. Among the many guests at the event were (left to right) Kevin Reilly, Sr., Polly and John Hernandez, and Terrell Brown.



Pennington Biomedical Research Center Executive Director Claude Bouchard, standing next to the new donor wall, thanked the donors for their gifts to the Center, talking briefly about the importance of a dedicated group of community leaders and philanthropists who are helping the Center with vital funding. He also gratefully acknowledged the gift made by C. B. and Irene Pennington which helped to construct the facility some 17 years ago.

The Pennington Biomedical Research Foundation (PBRF) kicked off its 2005 Scientific Dinner Series in April, honoring special supporters of the Pennington Center and unveiling a new donor recognition wall signifying their gifts.

Terrell Brown, a member of the PBRF board of directors, served as the emcee for the unveiling of the new recognition displays, now prominently located in the C. B. Pennington, Jr. Conference Center. Included in the new display, which was created in brushed aluminum

and glass, is an etched sepia-toned photo of "Doc" and Irene Pennington, as well as a description of their gift and its purpose in establishing the Pennington Center. More than 125 major donors were also recognized in a booklet presented at the dinner.

In a message to donors, PBRF Chairman John Noland, noted that C.B. "Doc"

*Without ad
sources of r
the Center woul
to contin
attract leading
and conduct cutting*

A Dinner with Nutritious "Color"

After the donor recognition ceremony, guests dined on a special four-course dinner served in the lower reception area. James Joseph, Ph.D., lead scientist, laboratory chief, Laboratory of Neuroscience, at the USDA /ARS Human Nutrition Research Center on Aging at Tufts University in Boston, spoke on "Can What You Eat Save Your Brain in Aging." Dr. James is also co-author of the nutrition book, "The Color Code" published in 2002 by Hyperion.

Catherine Champagne, Ph.D., chief, Dietary Assessment and Food Analysis at the Pennington Biomedical Research Center, selected the evening's special menu based on the nutritional values of each selection, demonstrating the importance of foods highlighted in Dr. James' research on nutrition and aging.

In a special visual presentation, Dr. Joseph shared data and information on the specific benefits of anti-oxidants and other nutrients in fruits and vegetables, particularly berries, and their effect on memory and motor skills. He outlined some foods that alter behavioral deficits in aging: memory boosters such as spinach, strawberries, cranberries, black currant, purple grape juice and blueberries, and motor skills boosters such as cranberries, grape juice and blueberries. After the presentation, Dr. Champagne, who had selected a menu of salmon fillets, wild rice salad, and spinach greens, shared the nutrients in those selections. The dessert was an almond tuile cup with strawberries, blueberries and blackberries.

Dr. Joseph has conducted numerous studies on the intervention in brain aging, including Alzheimer's Association, and the National Institute for Longevity Sciences. He presented a following his evening presentation to PBRF guests.

Dr. Claude Bouchard, executive director of the Pennington Biomedical Research Center, Pennington Biomedical Research Foundation, welcomed the guests. Janet Rack, vice president and underwriter of the 2005 Scientific Dinner Series, was also recognized during the evening.



*Guest s
Dr. Jam
research
ability
event v
who we
chief, P
Analysis
Rack, v
underw
and Dr.
the PBR*

GNIZES DONORS

Color Code"

Additional revenue, and not be able due to aging scientists cutting edge research.

Pennington, Sr. bestowed a major gift to the LSU System in 1980 to create the finest nutritional research center in the world. Since that time, the state of Louisiana, federal health and nutrition agencies, foundations, corporations, and benefactors have continued to provide vital operating funds. Yet, an important ingredient to the Center's ongoing



Speaker and co-author of "The Color Code" Dr. Joseph (center) shared his nutritional research data on highly nutritious foods and their role to slow the aging process. Attending the event were PBRF President/CEO Jennifer Winstead, welcomed guests, Dr. Catherine Champagne, PBRF Dietary Assessment and Food Safety Director, and faculty host of the event; Janet Winstead, vice president of Hibernia National Bank, author of the 2005 Scientific Dinner Series; and Claude Bouchard, executive director of PBRF.

projects funded by NASA, the scientific presentation to the faculty

and Jennifer Winstead, CEO of the President of Hibernia National Bank,

mission is "bridge" funding to enhance promising new discoveries into a fast track process. "This is an important time for the Center as we seek to meet the needs of the growing research institution. It is through the generosity of many that we are able to continue to keep Doc's dream alive," added Noland.

Board member and PBRF supporter Terrell Brown noted in his remarks that the Center is at the forefront of discovery as it relates to understanding the causes of the obesity epidemic and the life-threatening diseases of diabetes, cardiovascular disease, and cancer that are associated with it. The Foundation provides vital funding for nutrition-based research which aims to prevent premature death from chronic diseases. "This is why it is so important to have the continued support from the philanthropic community. Without additional sources of revenue, the Center would not be able to continue to attract leading scientists and conduct cutting edge research. This donor wall, which will continue to evolve and grow as others join our efforts, will serve as a visible and lasting marker that represents the kindness and generosity of so many."

The recognition wall includes donations in the categories of

- Pennington Society \$1,000,000+
- President's Circle \$500,000+
- Preeminent Benefactor \$250,000+
- Premier Benefactor \$100,000+
- Philanthropist \$50,000+
- Partner \$25,000+
- Patron \$10,000+
- Pacesetter \$5000+

All of the donors will be published each year in the Annual Report of the PBRF and on the website of the Center and the Foundation.

Stem Cell Research

continued from page 4

new tissue, so a researcher might harvest the exact cells a second time, or third, and coax them into a different tissue type.

A third Center researcher, Barbara Kozak, Ph.D. is beginning to discover the role of stem cells in natural healing, and wonders if scientists will be able to take advantage to eliminate scars on skin and other tissue. Kozak has observed a difference in healing among mice that have had their ears pierced, similar to piercing by humans for earrings. The ears of some mice produced scar tissue to heal the small piercing. Other mice healed invisibly. Kozak believes that stem cells, when present at the wound site along with key chemical signals, form new skin in a flawless replica of the original— no scars.

Currently, however, scientists' success rate in guiding stem cells to become specific tissue types or to become whole animals is very low. That's because researchers don't know all the molecular and genetic steps of stem cell growth and differentiation, although they are homing in and have learned nutrition is a key process in stem cell formation.

Like everything else in the body, stem cells need food to replicate and differentiate. This is true for both adult and embryonic stem cells; what they "eat" can determine what they will become. For example, in fat tissue, when stem cells are fed glucose or sugar, the cells use it to form new fatty acids which are stored as triglyceride (fat) droplets. When these same cells are exposed to molecules like adrenalin, they can metabolize their triglyceride stores and release it in the form of free fatty acids.

These same processes also regulate the behavior and function of embryonic-like stem cells. Normally, the developing embryo is not exposed to high glucose concentrations, however in the presence of high glucose levels, the structure of the DNA within embryonic cells changes and can lead to changes in the "inheritance" of certain traits. Thus, the way a stem cell "eats" can have a profound effect on what its daughter cells will look like and how they will behave.

Thus, the hope of stem cell research lies in the very tedious, daily experiments in stem cell formation, development and nutrition that help scientists like Gimble, Eilertsen and Kozak to discover the mystery of stem cells and how to harness their full promise of healing.

DIGESTIVE HEALTH

"White Linen Nights"

The 4th Annual Digestive Health Foundation of Louisiana wine tasting, "White Linen Nights," was held in early May at C.B. Pennington, Jr. Conference Center as a fundraising event to benefit the Pennington Biomedical Research Center and its work in nutrition research. The mission of the Digestive Health Foundation of Louisiana (DHFL) is to provide opportunities to aid in research and community education in the area of digestive health.



(l to r) Richard L. Lucas, III, Dr. Claude Bouchard, Jennifer Winstead, and Dr. William Anderson

The corporate sponsors for the event were Roche Hepatology, TAP Pharmaceuticals, and John W. Barton, Sr. Select wines were donated by Las Palmas Restaurant, Magnolia Distributors, and Ruffino's Restaurant. Flowers were donated by Billeann's Flowers and Gifts, Cut Flower, Four Seasons Flowers and Gifts, and Marino's Florist. Catering services were donated by Bonanno's Fine Catering, Chef KD Louisiana Legends, Cleaver & Paring Catering, Culinary Productions, Chef John Folse-White Oak Plantation, Louisiana Bayou Bistro, Margo E. Bouanchaud and Shelby & Company. This year's event was coordinated by Richard L. Lucas, III of DHFL, and the staff of the Pennington Biomedical Research Foundation.

DHFL board members and Dr. William Anderson, president of DHFL, made a donation during the event to Jennifer Winstead, president/CEO of the Pennington Biomedical Research Foundation, and to Dr. Claude Bouchard, executive director of the Pennington Biomedical Research Center.

"Secret" Messengers

continued from page 1

A pair of physician-scientists are intent on understanding the nature, quantity and manner of that extremely rich information flow through passages of the BBB. The tale of the struggle to understand this barrier is also a tale of the character of the scientists who work in both wonder and delight over its secrecy. Abba J. Kastin and Weihong Pan seem an unlikely pair. Calm, soft-spoken, Harvard trained Kastin (M.D. '60) and fast-moving, engaging, Shanghai Medical University/ Tulane post-graduate Pan, (M.D., '90/Ph. D. '97), met earlier at Tulane University. Both were highly coveted researchers, well-funded, publishing new work and making waves in their field when they arrived at the Center late last year: Kastin, a highly regarded, senior researcher with a career of recognized work, and Pan the shooting star.

Kastin and Pan are unlocking the hidden secrets of the BBB, and have made important discoveries along the way. Among them, that the BBB is not the static, or motionless barrier it was thought to be. It is a very active, regulatory crossing point between blood and brain, a lively area, deserving of more attention. Kastin explained that the BBB is a region of the brain comprised of a protective network of thin-walled blood vessels (capillaries) and tissue designed to protect the brain's sensitive periphery against harmful and toxic substances while allowing passage of critical chemical messages. In their searches, Kastin and Pan have found key molecules that are quite adept at negotiating with and moving through the checkpoints of the BBB.

"We have focused on small proteins called peptides and polypeptides," said Kastin. "We are finding that for some peptides entering the brain, there must be a by-passage based on chemical properties." That is, the BBB recognizes specific molecules or their properties – secret codes, if you will - and allows passage from the blood stream through the BBB to the brain or spinal cord.

According to Kastin, there are also active transport mechanisms that push polypeptides and peptides into the brain while allowing little transport out of the brain. This is important, because if drug researchers can develop compounds that follow the lead of these peptides, potentially life-saving medicines can be delivered into the brain and would remain there to do their work.

"The better the delivery, the better the chances," said Pan. In dealing with CNS [Central Nervous System] disorders and side-effects of drugs, one should consider how much of the drug crosses the BBB."

Afflictions like stroke, spinal cord injuries, and even brain tumors are difficult to treat, because current drugs lack the messages to trick the BBB into allowing them access. To help molecular messengers, including medicine, pass through the BBB to the brain, investigators will have to act as biochemical negotiators, placing themselves between molecules and the BBB, learning the codes and passing them on to gain passage. The ultimate reward is that if affordable medicines are able to pass through the BBB and make their way into the brain and spinal cord, doctors could have better treatments for many of today's most debilitating illnesses.

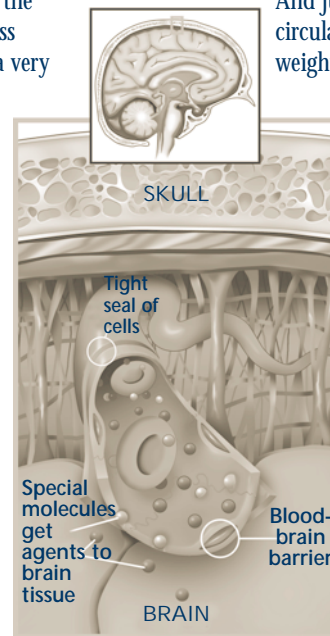
And just as nutritional signals in blood circulation are important to regulate body weight and keep one healthy; they are also essential to nourish the cells inside the brain and spinal cord. Many of these signals are carried by peptide and protein messengers, which make it across the blood-brain barrier to nourish sick brain cells found in neurotrauma, stroke, and degeneration (Alzheimer's disease, Parkinson's disease, etc.). Dr. Pan is working to understand how the blood-brain barrier transports these "nutrients" to facilitate regeneration of nerves. Dr. Kastin Lab is focusing on feeding-related peptides at the blood-brain barrier level.

Tracking and understanding how chemical messengers and signals cross the BBB could also lead doctors to more efficiently monitor conditions of the brain like Alzheimer's and Parkinson's diseases.

So how do these distinguished scientists undertake such a complex task? In light of his significant professional stature, the answer is surprising.

"I like to take the simple approach, being that I am simple-minded," said Kastin.

Some could argue that one simple approach is to get help. Kastin and Pan are doing that, building their lab staffs, creating a dedicated blood-brain barrier group (<http://labs.pbrc.edu/bloodbrainbarrier/>) designed specifically to work step-by-step to open up the mysterious passages of the BBB.



Chamber of Commerce

continued from page 3

\$92 million from the state. During the same time period the Pennington Medical Foundation has contributed more than \$110 million. The state currently invests \$10 million per year of general fund revenues in the Center. At current funding levels, Pennington would receive \$50 million during the next five fiscal years. The Center's strategic plan, however, calls for a \$15 million increase during this period to boost research efforts in obesity, diabetes and nutrition-related illnesses, expand research facilities, significantly increase community and population research, and enhance training programs.

The Scott study suggests that every additional dollar of state funding invested in the Center attracts \$1.75 in additional federal funding and \$1.25 in additional

private funding. This implies that each dollar of new state operating funds yields \$3.00 of new research funding. As a result, the study found that the proposed \$15 million in additional state funding would garner \$45 million in additional research dollars, by generating \$26.3 million in federal funding and an additional \$18.8 million in private investment.

In terms of job creation and impact on the state's economy, the study found that the \$15 million would translate into 164 new jobs in 2006, increasing to 328 new jobs by 2010. The average annual employment impact is 246 jobs per year for the five-year period. During this time, workers would then add \$43.2 million in new earnings to the economy and businesses in the state would also see \$115.4 million in

new sales. In addition, the study found that the average job created would pay more than \$35,000 annually, which compares favorably to the recent state funded Union Tank Car project, which prior Scott studies show would generate jobs with an average salary of \$32,000.

Scott also pointed out that for every dollar of state support, \$7.69 in new business sales is created through the Pennington Biomedical Research Center. In addition, for every dollar of state support, \$2.88 in new household earnings is created, and for every one million dollars of state support, 16.4 jobs are created via the Center.

Moret recently said the Center will continue to be an economic development priority of the Chamber.

IRENE W. PENNINGTON WELLNESS DAY FOR WOMEN

FREE

Saturday, October 8th — Relax and Spend the Day with Us!

Are you at risk for heart disease? What foods provide the highest nutritional values for the lowest calories? You can learn the answers to these health questions at the Irene W. Pennington Wellness Day for Women, a fun-filled day focusing on women, health, and nutrition. The Irene W. Pennington Wellness Day for Women 2005 is a health and nutrition expo open free to the community.

The event, now in its sixth year, is sponsored by the Women's Nutrition Research Program at the Pennington Biomedical Research Center. This year's event, scheduled Saturday, October 8, at the C. B. Pennington, Jr. Conference Center, 6400 Perkins Road, will focus on healthy living through education, health promotion, cooking, and exercise and fitness demonstrations. This year's event will include a Wellness Walk, coordinated by Club South Runners. It begins at 7 a.m.



The Wellness Day event gets underway at 8 a.m. and continues through 2 p.m.

Also, complimentary salads from McDonald's will be provided with reservations and while quantities last.

Reservations must be made by calling 763-3099 or online at www.pbrc.edu/wnrp.htm. This year we welcome author and

cooking celebrity Holly Clegg, who will present the keynote address on "The Trim and Terrific Commandments of Healthy Living."

This year's Presenting Sponsor is Our Lady of the Lake Regional Medical Center, who will provide several free medical screenings, including blood pressure, blood glucose, waist circumference, weight/BMI and a heart health risk factor assessment tool. Many of the OLOL staff, including physicians, will be on hand to talk about your screening results. An understanding of these assessments will be provided along with recommendations for improving heart health.

This year's Pavilion sponsor is Blue Cross and Blue Shield of Louisiana, who will share information on an exciting educational program designed for children. Contributing sponsors are the Irene W. and C. B. Pennington Foundation, the Reilly Family Foundation, and McDonald's. We'd like to thank the following contributors for their products and services: Whole Foods, Coca-Cola, City Social, Lamar, Club South Runners, and CC's Coffee House. Many companies will be on hand with information and products of interest to women. For information on booth exhibits and sponsorships, call 763-2511.

So, mark your calendar now for a great day dedicated to you...from the Women's Nutrition Research Program at the Pennington Biomedical Research Center.

NEW FACULTY



Alok Gupta, M.D. — Dr. Gupta, previously a part-time researcher at the center, has joined the faculty full-time. His interests are in the area of Metabolic Syndrome as an entity that is characterized with hypertension, low HDL cholesterol, high triglycerides, hyperglycemia, and central obesity.



Nikhil Dhurandhar, M.D., Ph.D. — Dr. Dhurandhar joins the Center as Associate Professor. His interest is in obesity of an infectious origin. Seven viruses have been reported to cause obesity in animal models by various research groups. Dr. Dhurandhar and his team reported the first human virus to cause adiposity (overweight) in chickens, rodents and non-human primates and which shows association with human obesity. Dhurandhar is currently investigating the molecular mechanism involved in the fat promoting effect of the virus.



Vijay Hedge, Ph.D. — Dr. Hedge is being promoted to an Instructor in the DNA Damage and Repair Laboratory. Dr. Hedge originally began working at PBRC in 1999 as a post-doctoral fellow in the lab of Andy Deutsch. He received a B.Sc. and M.Sc. from the University of Bombay in India and then was awarded his Ph.D. in Molecular Biology and Biotechnology in the United Kingdom at the University of Sheffield. Dr. Hedge will continue working in the DNA Damage and Repair Lab in an effort to develop his own independent research funding.



Valerie Myers, Ph.D. — Dr. Myers joins the faculty as Instructor in the area of Behavioral Medicine. Dr. Myers has been working as a post-doctoral fellow with Dr. Phillip Brantley in the Behavioral Medicine Laboratory and the Division of Education for the past two years. She will continue to be mentored by Dr. Brantley and serve as a key staff member on the NIH-funded, multi-center Weight Loss Maintenance Trial and develop over time her own independent research focus and funding. As a certified clinical psychologist, Dr. Myers will also continue to be available in the clinic for emergencies.



Dr. Ronald Horswell — Dr. Horswell joins PBRC as an Associate Professor-Research in Biostatistics. He will develop his own independent research program, as well as participate in multi-faculty and/or multi-center projects. Dr. Horswell received his Ph.D. in Business Administration, Department of Quantitative Business Analysis, from LSU. He has been working in the Department of Public Health and Preventive Medicine at LSU-HSC in New Orleans since 1999.



Advancing -- Jennifer Rood, Ph.D. — Dr. Jennifer Rood has been appointed as Assistant Director of the Mass Spectrometry Core Laboratory. Dr. Rood will ensure the supervision of the entire unit. Additionally, Dr. Rood will continue to serve as Director

FACULTY RECOGNITIONS



Claude Bouchard, Ph.D., executive director of the Center, is now a Chevalier (Knight) of the National Order of Quebec. He received the honor in a ceremony presided by the Prime Minister of Quebec in the Quebec Parliament. This is the second time Dr. Bouchard has been knighted, the first as Knight of the Order of Canada.

Bouchard also visited Guelph, Ontario where he received the Past President's Award of the Canadian Federation of Biological Societies. Bouchard gave the opening plenary lecture to that group.



Phillip Brantley, II, Ph.D., was among a dozen scientists named as Fellows at the Annual Meeting of the Society of Behavioral Medicine held in Boston in the spring. Dr. Brantley was selected for his scientific contributions as well as his excellent record of training graduate students and post-docs.



Weihong Pan, M.D., has been tapped for international duties at a couple of prestigious European scientific conferences. Dr. Pan represented the entire field of Blood Brain Barrier Research; first as presenter and International Organizer of International Union of Biochemistry and Molecular Biology held last month in Budapest, Hungary. Later in the fall, Dr. Pan will represent her field as one of the featured speakers of the SENS 2 conference at Queen's College in Cambridge, England.

FOUNDATION

THANKS! Soaring to New Heights™

A GLOWING SUCCESS THANKS TO OUR SPONSORS

Soaring for Health



Soaring for Wellness



Anonymous

Gene & Sylvia Duke

Soaring for Fitness



John & Janet Young

Jim & Laura Bailey

Terrell & Mary Kay Brown



Underwriters



To get involved in next year's 2006 event,
call Patricia Serpas at 763-2511

BELLA

continued from page 1

Just months after Brad's death, Grace became involved with a local diabetes organization, and began to work very hard fundraising, outreaching and speaking to bring neighborhood awareness to the disease.

"I want parents to have a chance we didn't," said Grace. "If you are aware of the signs, you have that chance."

But despite the long hours she and her husband worked in their new pursuit, Grace wanted to do more. In the spring of 2002, Grace walked into the PBRC clinic and applied for a job as a recruiter for the clinic. Her job is to enlist qualified applicants for the Center's many studies, including diabetes research. She quickly realized that this was a prime outlet to combine both her missions – teaching others the warning signs of diabetes and continuing to carry on Brad's memory.

Nearly four years after her son's death, Grace is still as motivated and determined to spread the news. She is very excited about

growth at the Center, such as a recent grant awarded to PBRC's researcher, Irina Obrosova. This donation leads the way for future investigation into nerve damage brought on by diabetes and possibly to implement pharmacological approaches for its prevention and treatment. Grace sees this as a step in the right direction, but hopes to see more.

"The cure is the big picture," said Grace. "The small, difficult, day-to-day is what the Center is doing. That's so important."

"I will continue to try to reach people," said Grace. "We know that this is what our son would have wanted."

Help us "Unlock the Secrets" by volunteering

Center researchers are currently seeking citizen volunteers for the following clinical studies.

Chromium — 28-week Diabetic Research Study

The Pennington Biomedical Research Center is recruiting Type 2 Diabetics for a 28-week Diabetic research study. We will be testing Chromium, a natural element, which may improve your sensitivity to insulin and help better manage your glucose levels. There will be one screening visit, 11 clinic visits, two 18-hour inpatient stays and a muscle biopsy over the course of the study.

To qualify:

- Control Diabetes with diet only
 - Type 2 Diabetic
 - Age: 30-70
 - Overweight: BMI range: 25-40
 - Females may not be pregnant, planning to become pregnant or breastfeeding
- (Some medications may exclude participation)*

Participants compensated \$400

CETP — Cholesterol study

The Center is conducting a five-year study testing the effects of a combination medication to see if it can decrease the risk for cardiovascular problems in those who have or are at risk for heart disease. There will be one 3 hour-long screening visit and a total of 20 clinic visits.

To qualify:

- Have Type 2 Diabetes controlled with oral medication or insulin
- Have had a stroke with symptoms lasting at least 24 hrs
- Have had a heart attack within the past 5 years
- Have had angioplasty within the past 5 years
- Have been diagnosed with coronary artery disease or have had any blockage in your vessels
- Have been diagnosed with vascular disease
- Age: 45-75
- Not taking any cholesterol medications
- Are not allergic to Lipitor
- Do not have a chronic disease

Participants will be compensated \$250.

Pounds Lost — 2-Year Weight Loss Study

The Pennington Biomedical Research Center introduces a new weight loss program, Pounds Lost. It is a 2-year program using lifestyle and behavioral changes to help you lose weight and live healthier.

Time commitment:

- 6 1/2 month weight-loss period: 1-hour dietary counseling 1 time per week for 6 1/2 months
- 1 1/2 year weight maintenance: 1 hour group sessions twice a month

To qualify:

- Age: 30-70
- Overweight: BMI range 25-40
- Cannot be a vegetarian
- Cannot be taking medication for Diabetes
- Females cannot be pregnant, planning to become pregnant or breastfeeding.

For more information on the above trials, contact the Center at:
(225) 763-2596 or (225) 763-2597
or visit www.clinicaltrials@pbrc.edu

NEWS



At Left: (l to r) Supporters Gene and Sylvia Duke, Bill Borne of Amedisys, Inc., Chris Blackstone, representing the Irene W. and C. B. Pennington Foundation, and John Noland, chairman of the Pennington Biomedical Research Foundation. The event raised over \$100,000 for the Pennington Biomedical Research Center in its quest to change the health of future generations.

Below: Faculty and staff of the Pennington Biomedical Research Center supported the event.



At Right: Special thanks to Annette Barton, far left, 2005 Soaring to New Heights Committee chairperson, and to committee members Sylvia Duke, Rhonda Ruffino, Lori Bertman, Buddy Tucker, and Mary Jo Mayfield. Not shown are Pat Cheramie, Paula de la Bretonne, Mary Delarosa, Jan Hill, Margo Kadair, Gretchen Kantrow, Sunny McCoy, Dana Ortego, Page Silvia, Carmen Williams and Julie Wright



Above: The great grandchildren of Irene and C.B. Pennington, Sr. brought many friends and family to this year's ballooning party. (left to right) Chris, Kelly, Shannon and Kristin Blackstone with their grandmother, Peggy Pennington Cole.





Pennington Biomedical Research Foundation
 6400 Perkins Road
 Baton Rouge, LA 70808-4124
www.pbrf.org
www.pbrc.edu
 225-763-2511

Non-Profit Org.
 U.S. Postage
 PAID
 Permit NO. 664
 Baton Rouge, LA



PENNINGTON BIOMEDICAL RESEARCH CENTER
 LOUISIANA STATE UNIVERSITY SYSTEM

PBRF BOARD OF DIRECTORS

Chairman, John B. Noland

Immediate Past Chair, Kevin P. Reilly, Sr.

Vice Chair, Paula P. de la Bretonne

Treasurer, C. Brent McCoy

Secretary, Pat Cheramie

Directors

James J. Bailey, III

Tim A. Barfield

Annette D. Barton

Madhu Beriwal

J.S. "Si" Brown, III

J. Terrell Brown

Joseph H. Campbell, Jr.

Maxine Cormier

Dr. Roy G. Kadair

J. Gerald "Jerry" Jolly, CPA

Charles A. Landry

Kevin R. Lyle

Betsy S. Nalty

James M. Nolan

Nanette Noland

Bert S. Turner

William H. Wright, Jr.

Ex-Officio, Claude Bouchard, Ph.D.

Executive Director, PBRC

Ex-Officio, Dr. William L. Jenkins,

President, LSU System

CEO, Jennifer G. Winstead

CFO, J. Brad Jewell, CPA

Printing compliments of

Blue Cross and Blue Shield of Louisiana



CALENDAR OF EVENTS

Mark Your Calendar - Upcoming Events

SEPTEMBER

September 11

Club South's Banana Relay

<http://www.lawired.com/csr/entry.htm>

September 29

Visiting Scientist Dinner

Sponsored by Hibernia National Bank

OCTOBER

October 8

Irene W. Pennington Wellness Day for Women

Free Admission, 7 am - 2 pm

For sponsorship and booth information call

225-763-2511

<http://www.pbrc.edu/wnrp.htm>

NOVEMBER

November 16

Pennington Scientist Dinner

Sponsored by Hibernia National Bank

November 17-19

Bioinformatics: A Calculated Discovery Conference

DECEMBER

December 6

The Prevention of Obesity and Weight Regain Symposium

FACTS ABOUT THE PENNINGTON CENTER

The Pennington Biomedical Research Foundation provides the Pennington Biomedical Research Center with vital funding for nutrition-based research which aims to prevent premature death from chronic diseases.

Mission: To promote healthier lives through research and education in nutrition and preventive medicine.

Size: Main research facility: 575,000 square feet; conference facilities: 96,000 square feet; grounds: 234 acres.

Staff: 70 faculty members, 50 post doctorates, and more than 500 technicians and support personnel.

6 Research Divisions: Functional Foods, Experimental Obesity, Clinical Obesity and Metabolic Syndrome, Nutrition and Chronic Diseases, Health and Performance Enhancement and Education, and Nutrition and the Brain. The center also has an Education Division.

Laboratories: 13 laboratories and 16 core service laboratories including genomics, proteomics, clinical chemistry, mass spectrometry, cell culture, comparative biology, transgenics, body composition, and food analysis laboratories.

Clinic: Outpatient examination and interview rooms, inpatient rooms for 11 research volunteers, metabolic kitchen, metabolic procedure room, two whole-room indirect calorimeters, dual energy X-ray absorptiometry, and ultrasound imaging.