

LOUISIANA Agriculture

Assuring Our Future Through Scientific Research and Education

Vol. 51, No. 4, Fall 2008
Published since 1957



Fish on the brain

Get 'smart' with your life

Foods become 'functional'

Protecting our food industry



Writing blog helps LSU AgCenter chancellor make lifestyle change

One year later and 40 pounds lighter, the chancellor of the LSU AgCenter has changed to a healthier lifestyle.

Bill Richardson, who is 6-foot-1 and weighs just under 220, did this by methodically following guidelines prescribed by AgCenter nutrition educators.

To keep on track and to show the world – and his employees – it could be done, he went public with his experiences by writing a daily blog.

He started the “Chancellor’s Challenge” on Oct. 1, 2007, and included this reasoning for doing something so bold and risky:

I will put myself forward as a case study of one. Over the next year I will provide a daily blog, Monday through Friday, of my experience in making a commitment to the recommendations that the AgCenter espouses to the residents of our state.

His commitment was cemented when he found out his body mass index (BMI) put him in the obese range. And he was elated several weeks later when his monthly assessment showed he had finally moved down to the overweight category.

“I don’t know that I’ll ever get to the normal reading unless I can grow taller,” he joked.

He found that keeping a food log helped him stay within the 2,200-calorie per day plan the nutritionists had given him. Instead of his usual snacking in front of the TV in the evenings, he could satisfy his desire for sweets with a low-calorie ice cream “Skinny Cow” treat.

But a lifestyle change isn’t easy. It’s a continuing journey, as he calls it, and it can get quite discouraging. In the blog, he wrote about the guilt he experienced when he over-indulged and about how easy it is to come up with excuses not to go for his walks.

He also had some misconceptions about how to lose weight and live healthier. But a team of nutritionists, who wrote responses to his blogs, cleared those up for him and for his readers. The blog averaged more than 1,000 page views per month.

Only time will tell if the blog was as successful for others as it was for the chancellor. The blog was the impetus for a Live Fit for Life campaign for AgCenter employees spearheaded by a wellness committee.

The committee has sponsored many statewide activities including lunchtime seminars, which can be viewed live on the Internet, and contests.

In one contest the team that racked up the most improvement in number of steps on their pedometers – the Shreveport “Soil Brothers and Sisters” – took top honors.

The committee is sponsoring the first 5K run/walk during the AgCenter’s annual conference in December 2008.

And the blog continues. Beginning in November 2008, the wellness committee took it over and is populating it with weekly blogs from AgCenter employees who describe their experiences in changing to a healthier lifestyle. Richardson has said he will contribute occasionally.

In his last blog on Oct. 31, 2008, the chancellor said his life has been changed:

I lost weight, greatly improved my blood chemistry, changed eating habits, and made the exercise program a consistent part of my everyday activities. The most rewarding part of the entire experience for me, however, was the many positive comments I received from readers who were motivated to address lifestyle issues after reading the blog. I’m convinced the blog not only saved some lives, but also extended the length of and added quality to the lives of many others.

Not a bad claim for a chancellor to make.

All the chancellor’s blogs are still posted on the AgCenter’s Web site. Go to www.lsuagcenter.com, click on Chancellor’s Challenge and go to previous posts.

■ Linda Foster Benedict

LOUISIANA Agriculture

EDITORIAL BOARD:

David J. Boethel (Chairman)
Linda Foster Benedict
Rick Bogren
Barbara Groves Corns
Marlene E. Janes
Boyd Padgett
D. Allen Rutherford
Michael E. Salassi
Alexander M. “Sandy” Stewart
Cathleen C. Williams

EDITOR: Linda Foster Benedict

DESIGNER: Barbara Groves Corns

ASSOCIATE EDITOR: Rick Bogren

PHOTO EDITOR: John Wozniak

CONTRIBUTORS: Mark Claesgens, Johnny Morgan, Betsy Neely and Mary Ann Van Osdell

WEB DESIGN: Kathy Kramer and Megan Smith

Louisiana Agriculture is published quarterly by the Louisiana Agricultural Experiment Station. Subscriptions are free. You may also subscribe to a Web version of the magazine, which is available at www.lsuagcenter.com. Please go to the “Louisiana Agriculture Magazine” site if you would like to receive an e-mail notification when a new issue is online. For more information or to subscribe, please contact:

Linda Foster Benedict, Editor
Louisiana Agriculture
P.O. Box 25100
Baton Rouge, LA 70894-5100
tel (225) 578-2263
fax (225) 578-4524
lbenedict@agcenter.lsu.edu



www.lsuagcenter.com

William B. Richardson, Chancellor

David J. Boethel, Vice Chancellor
and Director of Research

Paul D. Coreil, Vice Chancellor
and Director of Extension

The LSU AgCenter provides equal opportunities in programs and employment.

The mention of a pesticide or use of a trade name for any product is intended only as a report of research and does not constitute an endorsement or recommendation by the Louisiana Agricultural Experiment Station, nor does it imply that a mentioned product is superior to other products of a similar nature not mentioned. Uses of pesticides discussed here have not necessarily been approved by governmental regulatory agencies. Information on approved uses normally appears on the manufacturer's label.



10



11



13



15

LOUISIANA Agriculture

Assuring Our Future Through Scientific Research and Education

Vol. 51, No. 4, Fall 2008
Published since 1957

2 Writing blog helps LSU AgCenter chancellor make lifestyle change
Linda Foster Benedict

4 What's New?

6 Functional Foods Initiative
David Morrison

8 Researchers make dairy products more 'functional'
Rick Bogren

8 Oysters can help fight breast cancer
Rick Bogren

9 Chancellor issues challenge
Denise M. Holston, Heli J. Roy, Beth Reames and Michael Zanovec

10 Smart Portions: Watch how much you eat
Beth Reames

11 Smart Choices for Youth and Adults
Heli J. Roy and Chad Eriksen

13 Smart Bodies: A Nationally Recognized Child Wellness Program
Denise M. Holston

15 Protecting Louisiana's food industry from food-poisoning bacteria
Marlene E. Janes, Miquel Gutierrez, David Bankston, John Supan and Jon Bell

16 Serving Food Safely
Beth Reames and David Bankston

17 Food ingredients can help prevent chronic inflammation
John W. Finley

19 Macronutrient-sensing mechanisms in the brain
Roy J. Martin, Michael J. Keenan, Christopher Morrison and Jun Zhou

20 Gut microflora and our health
Michael J. Keenan, Kayanush J. Aryana, Marlene E. Janes, Aixin Hou, Roy J. Martin, Richard T. Tulley, Frank L. Greenway, Nikhil V. Dhurandhar and Jun Zhou

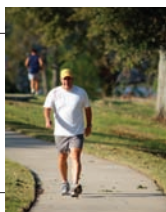
22 Preventing Diabetes
Beth Reames

24 Fish is brain food
Carol J. Lammi-Keefe

26 Adequate sleep decreases health problems
Roberto N. Barbosa and James M. Gregory

27 Farmers market food demonstrations offer people chance to try new fruits, vegetables
Annrose M. Guarino

28 Tea may be 'sweet' way to lose weight
Rick Bogren



ON THE COVER: Chancellor Bill Richardson decided to take the advice from LSU AgCenter nutrition education programs and change to a healthier lifestyle. This change involves a regular exercise routine. Here he walks around the lake next to the LSU campus in Baton Rouge. (Photo by John Wozniak)

LSU AgCenter supports new Westwego farmers market

WESTWEGO – “This is all about getting people involved in locally grown food,” LSU AgCenter vice chancellor Paul Coreil said of the newly opened Westwego Farmers and Fisheries Market.

The market, which opened on Aug. 9 in downtown Westwego, held its grand opening Sept. 20 and will be open from 9 a.m. to 1 p.m. every Wednesday and Saturday.

Designed as a replica of old Sala Avenue in Westwego, the market is the newest place in town to buy fresh fruits and vegetables, seafood, arts and crafts as well as prepared foods, according to Cathy Paillet, the market's coordinator.

“This is an opportunity for local crafts people, artisans, farmers and home growers to come and have a convenient, local area to sell all of their products,” she said.

Paillet said the market is a city project made possible with help and funding from Jefferson Parish and the state of Louisiana.

“This project actually was being planned before Katrina, then after the storm they really got going with construction,” she said.

Brent Jeansonne, the LSU AgCenter horticulture agent for Jefferson Parish, said he's been deeply involved in the project for the past four months.

“We were involved in the organization of vendors, supporters and just the general operation of the programs working with Cathy,” Jeansonne said.

The LSU AgCenter will have a permanent booth to provide information at the market, said Steve Mullen, LSU AgCenter region director.

“We have a tremendous Master Gardener association for the Greater New Orleans area, and we will have a booth here at least once a month,” Mullen said.

Mullen called the farmers market a great opportunity for the LSU AgCenter to provide timely education.

“For example, we have some hurricane recovery publications here dealing with replanting trees, which is a major issue now,” he said.

He said the LSU AgCenter has resources for “helping people to make better decisions about where to plant, so that in the future, these storms won't have such an impact on damaging homes and buildings as a result of falling branches and trees.”

Coreil said the farmers market is a natural fit for the LSU AgCenter.

He said the market is a place for consumers to learn not only about nutrition but also about the LSU AgCenter's horticulture agents, Master Gardeners and family and consumer science agents, who will be providing information.

Paillet said she could not have pulled it off without the help of people from the LSU AgCenter and the Louisiana Department of Agriculture and Forestry.

Daniel Alario, Westwego's mayor, said the idea for the farmers market came as a result of a book he wrote on the history of the area a few years ago. He explained how Westwego became a town after the devastating hurricane of 1892.

“That storm killed about half the people, and all of the houses were destroyed,” Alario said. “So they moved to Salaville, and as the population grew, they changed the name to Westwego.”

According to Alario, a railroad conductor should get credit for the name change because when the train was ready to leave the station, he would say, “All aboard. West we go.” This meant the train was headed to Texas or California.

Paillet said the market will be smaller on Wednesdays than Saturdays, with only about 20 vendors because many of them have regular jobs during the week. But, she said, Saturdays will feature more than 43 vendors – and always with live music. ■ **Johnny Morgan**

Lammi-Keefe edits book on nutrition, pregnancy

Carol Lammi-Keefe, professor and head of the Human Nutrition and Food Division in the LSU AgCenter's School of Human Ecology, is the lead editor of a new book published in 2008 – *Handbook of Nutrition and Pregnancy*.

This book is meant for clinicians and other health professionals and meets a need at the international level, said Roy Martin, director of the school.



Carol Lammi-Keefe

“Optimal nutrition is mandatory during pregnancy,” Martin said. “But there is no one-size-fits-all approach. This book provides a vital tool for the health professional working with pregnant women.”

The book includes 23 chapters written by 42 authors and was published by Humana Press. It is one in a series on

nutrition and health by that publisher. The other two editors are Sara Crouch at the University of Cincinnati and Elliot Philipson at the Cleveland Clinic.

“We put this book together to serve as a handy guide – something that can be easily referred to in answering questions,” Lammi-Keefe said.

Some of the issues addressed in the book are vegetarianism during pregnancy and obesity. ■ **Linda Foster Benedict**

Reames leads food safety team that wins national award

Ten LSU AgCenter faculty members were part of a multi-state team that received the 1st Place National and Southern Region Program Excellence through Research Award at the Galaxy III National Extension Association of Family and Consumer Sciences (NEAFCS) conference held Sept. 15-19 in Indianapolis, Ind.

Beth Reames, extension nutritionist, was the leader of the team recognized for its tri-state research study that tested the effectiveness of the “Serving Food Safely” food safety curriculum to increase knowledge and promote safe food-handling practices of staff and volunteers of food recovery agencies.



Beth Reames

Team members included family and consumer science extension agents Alexis Navarro, Bertina McGhee, Sally Soileau, Terri Crawford, Sheila Haynes and Berteal Rogers. Other members were David Bankston, professor in the Department of Food Science; Mike Keenan, associate professor, and Georgianna Tuuri, assistant professor, in the School of Human Ecology. Other team members were De'Shoyn Y. Friendship at Southern University, Melissa Mixon at Mississippi State University and Easter Tucker at the University of Arkansas.

Results indicated that knowledge and adoption of recommended food safety practices increased for both staff and volunteers participating in the workshops. The Program Excellence through Research Award cited the team's commitment to meeting the needs of individuals, families and communities.

■ **Linda Foster Benedict**

Despite storms, sugarcane harvest better than expected

Sugarcane growers are having one of their best years ever when it comes to the level of recoverable sugar per ton of cane, although yields are slightly off the early predictions of 34-35 tons of cane per acre, said Ben Legendre, LSU AgCenter sugarcane specialist.

"After the storms, the first estimates were that we would probably lose anywhere from 3 to 10 tons of cane per acre because the cane was lodged so badly," Legendre said. "We are finding that yields are not as bad as first feared."

He said many farmers are averaging about 33 tons per acre with the best cane yet to be harvested.

Bobby Morris of Morris Farms in West Baton Rouge Parish farms about 2,200 acres with his family. He said he's cutting about 700 tons per day and hopes to be finished by Christmas.

"About the only thing that we're seeing from the storms is some broken stalks, which mean lower tonnage," Morris said. He said sugar content is greatly affected when the cane is broken because it won't respond to the ripener that's applied before harvest.

Morris explained that besides slightly lower yields than they expect from the crop, high input costs also are putting the squeeze on his operation.

"Skyrocketing prices are really hurting us," he said. "A couple of years ago, we were buying liquid fertilizer for about \$90 per ton. Last year we paid \$250, and this year we paid \$350. Now they're saying we may be paying as much as \$700 per ton next year."

■ Johnny Morgan

Hanna on cover of international journal

A study on the heating of tomato plants grown in greenhouses by an LSU AgCenter scientist is the cover story of the April-June 2008 issue of *HortTechnology*, a research publication of the American Society for Horticultural Science that has subscribers in 50 countries.

H.Y. Hanna, a professor at the LSU AgCenter's Red River Research Station in Bossier City, conducts research on growing greenhouse tomatoes as productively



Sugarcane growers are having one of their best years ever when it comes to the level of recoverable sugar per ton of cane.

and efficiently as possible. The article is co-authored by Kenneth Henderson, a master repairman at the station.

They found that heating costs can be reduced approximately 43 percent for each pound of tomatoes produced when an interplant precision-heating system they constructed was used. The system delivers the warm air inches away from the root system using diesel fuel rather than blowing the warm air above plant tops from suspended heaters fueled with natural gas.

The photo taken by Hanna on the cover of the journal shows an 8-inch diameter convection tube placed between double rows of tomatoes. The released heated air raises the root media temperature and plant sap temperature to near optimum levels for tomato growth and yield, Hanna said.

Hanna said the system should be considered by smaller growers because of lower initial cost, simplicity, low heating costs and cost-effective tomato production.

"It was less costly to buy and easier to install one heater for about \$1,000 at the time of conducting the experiment for the interplant bottom-heated greenhouse than buying and installing two heaters for about \$2,000 for the above plant," Hanna said.

Feedback from growers has indicated that bottom-heated greenhouses "are the way to go," said Hanna.

For more information about grow-

ing greenhouse tomatoes, you may contact Hanna at hhanna@agcenter.lsu.edu or (318) 741-7430, ext. 1116.

■ Mary Ann Van Osdell

Smith named new Sweet Potato Station coordinator

The LSU AgCenter has named Tara Smith research coordinator at its Sweet Potato Research Station in Chase.

Smith will manage the day-to-day operations of the station as well as continue as the state sweet potato specialist and coordinator of the Sweet Potato Foundation Seed Program.

Smith's major research interests include integrated pest management of sweet potato insects, particularly soil insects, as well as collaborative research in the areas of sweet potato production and disease and weed management. ■ Mary Ann Van Osdell



Tara Smith

Functional Foods Initiative

David Morrison

Nearly 2,500 years ago Hippocrates made a profound statement that is receiving much attention today. He said, "Let food be thy medicine and medicine be thy food." Consumer interest in making food choices to manage or lower the risk of illness is probably at an all-time high. It has been reported that American consumers spent \$31 billion last year on dietary supplements and herbal food products. Indeed, the combination of consumer desires, advances in food technology and science-based evidence linking diet to disease and disease prevention has created a huge opportunity to address human health and well-being through dietary intervention.

Interest in foods or food components that might promote health has resulted in the use of the term "functional foods." Clearly, all food is functional to a certain extent. Most provide energy and nutrients needed for growth, development and normal body maintenance. Many also provide aroma and taste that make for a pleasurable eating experience. However,

functional foods are those that provide an additional physiological benefit beyond meeting basic nutritional needs.

There are some generally well-known examples of foods that have functions beyond their basic nutrition. Oatmeal contains beta glucan that has cholesterol-lowering effects. Soy has several beneficial properties, including lowering cholesterol, reducing the risk of osteoporosis, alleviating menopausal symptoms and reducing cancer risks. Lycopene in tomatoes has been found to reduce cancer risk, particularly of the prostate. Omega-3 fatty acids found in certain marine fish such as salmon and tuna may reduce the risk of coronary heart disease. These are just a few.

Food and nutrition research has contributed significantly to the dramatic increase in life expectancy over the past 200 years, but the impact of diet on health is much broader and more complex. The field of functional foods is in its early stages. And while scientific advances have been made in recent years, additional research is needed on a number of fronts. The mission of the LSU AgCenter is improving the lives of Louisiana's citizens. Conducting research and extension programs that will result in a healthier population in Louisiana and beyond is one key component of fulfilling that mission, and emphases on functional foods may be one approach toward that goal.

Interest in functional foods within the LSU AgCenter has developed as an outgrowth of individual research programs operating somewhat independently within a number of LSU AgCenter units. These include the departments of Food Science and Biological & Agricultural Engineering, the Audubon Sugar Institute, and the schools of Animal Sciences, Human Ecology, Plant, Environmental & Soil Sciences, and Renewable Natural Resources.

These programs were rather loosely organized until about five years ago. At that time, it was recognized that a Functional Foods Initiative was needed to better integrate and focus the faculty mem-

bers involved. Better communication and collaboration were needed. To help provide a catalyst for the group to come together and pursue federal research funding, LSU AgCenter Chancellor Bill Richardson funded a pilot research-grants program in the spring of 2004. Ten proposals were originally submitted, and eight received funding. The funded proposals were all collaborative projects and represented nearly all of the LSU AgCenter units previously mentioned.

In February 2006, a mini review of the LSU AgCenter's functional foods

Interest in foods or food components that might promote health has resulted in the use of the term "functional foods."

programs was conducted by a nationally recognized expert. Several pertinent recommendations were made:

- Systematically catalyze faculty research by creating critical mass clusters.
- Enhance follow-through by conducting in vivo animal studies to substantiate the health beneficial effects of bioactive compounds.
- Identify functional compounds in sweet potatoes.
- Continue to build collaborative bridges with the Pennington Biomedical Research Center (PBRC).

Significant progress has occurred during the past two years. First, three faculty cluster groups were formed:

The Macronutrients/Pre- and Probiotics Cluster includes 10 LSU AgCenter, one Southern University Ag Center and four Pennington faculty members. This group has pioneered the way in researching resistant starch, which is the starch that escapes digestion in the small intestine and passes through to the large intestine where it acts like dietary fiber. This group also is testing Louisiana products



David Morrison, Assistant Vice Chancellor for Animal & Food Sciences, LSU AgCenter, Baton Rouge, La.

containing resistant starch, such as rice and sweet potatoes.

The Bioactive Compounds Cluster includes 12 faculty members from the LSU AgCenter, one faculty member from the LSU Health Sciences Center New Orleans and three faculty members from Pennington and two researchers from M.D. Anderson Cancer Center in Houston, Texas. The main focus of this group is to identify unique sources of functional food ingredients (particularly from Louisiana) and develop optimal extraction and processing methods that will allow their use.

The Sweet Potato Cluster includes seven AgCenter faculty members. This group is moving forward on two fronts. One is determining the compounds available in both the leaves and roots and assessing their functional properties. The other relates to improving production and processing methods of the root.

In addition to the activity that has occurred within each of the three functional foods clusters the past two years, another significant accomplishment has been the development, organization and staffing of the Animal Bioassay Core Lab. This has led to much more follow-through in testing identified bioactive compounds in animal studies as recommended by the review. Five animal studies were conducted in 2007, and six more are either planned or in progress for 2008. In addition, a high-throughput biological screening bioassay is being developed that uses *C. elegans*, a small worm that shows many of the developmental responses seen in higher species. So far, *C. elegans* has been shown to be a good test for anti-obesity activity while others have shown that it can be used to screen for bioactive compounds that improve aging and longevity. These two screening systems can be used in tandem to more efficiently screen for bioactives.

The LSU AgCenter's functional foods initiative has many strengths on which to build a program of excellence.

Extension professionals will be increasingly called upon to develop meal strategies to meet preventive and therapeutic intake levels for healthy persons and those diagnosed with disease.

These include:

- Multi-disciplinary units that can address functional foods issues from a number of perspectives.
- Technology and analytical core facilities that can employ chemical extraction and analysis and food processing/engineering, evaluate sensory aspects and develop food products.
- Excellent agricultural commodity and food industry relationships.
- Clinical and other institutional collaborators.

As research provides the necessary evidence on the health benefits of functional foods, other hurdles also must be cleared. In fact, the Institute of Food Technologists Expert Report (published in 2005) "Functional Foods: Opportunities and Challenges" lists seven steps that are involved in bringing a functional food to market. These steps can be summed up by what has been called the Four D's:

Discovery – identify potentially active functional ingredients and foods.

Development – establish and apply technology to validate effectiveness and safety of potential functional products.

Delivery – provide the functional food or ingredient in the most effective usable form.

Delicious – provide the functional food or ingredient in a great tasting product.

LSU AgCenter faculty and their collaborators are involved to a greater or lesser extent in all four of these areas. In this issue of *Louisiana Agriculture*, you have the opportunity to read about some of the cutting-edge research being conducted by LSU AgCenter research faculty. In addition, you will learn about extension programs aimed at educating the public to make wise nutritional choices related to improved health.

Finally, the LSU AgCenter is working with its partners and collaborators on what is being called the Foods for Health Initiative. This initiative is broader than, though similar to, the AgCenter's original functional foods initiative. The vision statement of the Foods for Health Initiative is "to have a healthy population in Louisiana and the world through the discovery, development and delivery of health-promoting functional foods and products." Partners in the initiative include Pennington, U.S. Department of Agriculture-Southern Regional Research Center, Southern University Ag Center and food industry representatives. The overall goal is to improve human health and wellness while also fostering economic development, not only within the Louisiana foods industry but also within the state's agribusiness sector.

As consumers become more health conscious, the demand and market value for health-promoting foods and food components are expected to grow. Future research at the LSU AgCenter will focus on identifying bioactive food components that positively affect health, and developing agricultural practices that enhance these bioactive food components in plants and animals. Extension professionals will be increasingly called upon to develop meal strategies that enhance functional food intake and to evaluate the appropriateness of functional foods to meet preventive and therapeutic intake levels for healthy persons and those diagnosed with disease. ■



Researchers make dairy products more ‘functional’

LSU AgCenter researchers are testing how incorporating functional food ingredients into manufactured dairy products could improve their health-giving benefits and how these health-beneficial ingredients affect the physical, chemical and sensory characteristics of dairy products.

Milk fat is high in saturated fatty acids, and saturated fats contribute to gradual blockage of the arteries, reducing blood flow. The omega-3 fatty acids – mostly from fish and vegetable products – on the other hand, are known to have beneficial effects on cardiovascular diseases by lowering cholesterol and triglycerides, lowering blood viscosity and decreasing blood pressure.

The focus of one research project is to replace the saturated fatty acids in cheddar cheese with omega-3 fatty acids. One source of omega-3 fatty acids is a commercial product called OmegaPure, a refined fish oil that can be added to a variety of foods. Another commercial product, Benecol, contains a patented ingredient, plant stanol ester. AgCenter researchers have tested these products in cheddar cheese and evaluated them with different ratios of milk fat.

They found that Benecol and OmegaPure did not affect the overall composition or color of the cheese. Low or medium levels of Benecol and OmegaPure didn't affect the pH, but high levels of the two products lowered the pH. Neither affected protein levels.

Kayanush Aryana, a researcher in the School of Animal Sciences and the Department of Food Science, manufactured yogurt with arabinogalactan – a compound that stimulates the body's immune defense system and enhances production of natural killer cells which destroy invading microorganisms – and found no effect on many quality characteristics. He also studied how colostrum – another good source of immune and growth factors – influenced the characteristics of yogurt containing *Lactobacillus acidophilus* and determined it can successfully be added without adversely influencing yogurt characteristics.

Probiotics are live microorganisms that confer a health benefit when consumed in proper amounts. Researchers have manufactured fat-free, no-sugar-added ice creams with probiotics and developed

guidelines governing the proper levels of probiotics. This could eventually lead to the commercial manufacture of probiotic ice creams. The researchers also have manufactured probiotic weight-loss ice cream and yogurt.

Aryana evaluated the effect of various commercially available soluble fibers and found that while all did not perform in a similar manner, each had a beneficial effect on at least one characteristic of probiotic yogurt. He also incorporated several vitamins into fat-free yogurt and found that the lactic acid bacteria and sensory characteristics of the yogurts containing heart-healthy nutrients were not affected, so yogurts for improved cardiovascular health can be manufactured successfully.

Prebiotics are nondigestible carbohydrates that resist hydrolysis and absorption in the upper gastrointestinal tract and are metabolized selectively by at least one type of probiotic in the colon. Aryana's group is studying the influence of a plant sugar called inulin that's used to improve the flavor and texture of low-fat and low-sugar processed foods.

Lutein, another naturally occurring compound, may provide protection against age-related macular degeneration, but eating lutein-containing foods may not be sufficient to significantly reduce the risk. Aryana's group has fortified strawberry yogurt with lutein and studied lutein stability over the shelf life of yogurt.

Jack Losso, an LSU AgCenter food scientist, and Aryana also fortified cheddar cheese with lutein extracted from corn grown in Louisiana and studied its stability in cheese. They found lutein remained relatively stable in these dairy foods. The lutein manufacturer that supported the yogurt project shared Aryana's method with a yogurt manufacturer in Japan.

Chuck Boeneke, assistant professor of dairy foods technology, has been researching homogenizing milk under high pressure – 30,000 pounds per square inch. The result is that high-pressure homogenization makes two percent milk feel more like whole milk in your mouth. According to a test panel, the texture is the same as whole milk. ■ **Rick Bogren**

Oysters can help fight breast cancer

A compound in the fats in Louisiana oysters could be a key ingredient in treating and preventing cancer, according to Jack Losso, LSU AgCenter food science researcher. He has found that ceramide found in oysters can restrict blood vessel growth and development of cancer cells in test tubes. It can also inhibit blood vessel growth in rats.

By preventing the formation of blood vessels, called angiogenesis, the compound keeps cancer cells from multiplying because they can't grow without nutrients from the blood.

Losso said ceramide works on human breast cancer cells both in test tubes and in laboratory rats. Breast cancer cells come in two types – hormone-dependent and hormone-independent. Hormone-dependent cells appear early while hormone-independent cells appear later and are more difficult to treat, Losso said.

"They can grow on their own without hormone stimulation," he said of the hormone-independent cells. "But when put in contact with ceramide, tumors begin dying within 48 hours."

Losso gathers ceramide from oysters by blending the oyster meat and extracting the lipid with an organic solvent – the same one that's used to extract oil from corn and soybeans. After the oil is extracted, the ceramide is removed and concentrated.

"Ceramide is a novel way of treating cancer cells," said Losso, who said the compound is also found in other marine animals, including bivalves, jellyfish, abalone and menhaden.

Although it's based on cow's milk and similar to that found in oysters, the ceramide

now used is synthetic, he said. The advantage of ceramide from oysters is that it's naturally occurring and can be a preventative as well as a treatment. In addition, the compound is stable.

Losso's work is funded through the Sea Grant college program along with early funding from the LSU AgCenter.

■ **Rick Bogren**



Chancellor issues challenge

Denise M. Holston, Heli J. Roy, Beth Reames and Michael Zanovec



Louisiana has one of the highest adult and childhood obesity rates in the nation, which brings with it costs in terms of both dollars and lives. To address this problem, the chancellor of the LSU AgCenter, Bill Richardson, started a blog in October 2007 to document his experiences in making a commitment to a healthy lifestyle. In the daily Monday-through-Friday blog, known as the Chancellor's Challenge, he used educational information and recommendations that the LSU AgCenter espouses to the residents of Louisiana.

While an improvement in his overall health was important, the chancellor also wanted to be a role model for others to make positive changes in their lifestyle. Additionally, he felt it was important to stress the use of agricultural products – primarily those grown in Louisiana. In the Chancellor's Challenge, Richardson wrote about the triumphs and trials he encountered in his journey to overall wellness. The blog was popular, with an average of more than 1,000 page views per month. One reason was its humorous undertone with entries like, "The Gut Stops Here," "Omega-3 from the Sea," "Go Slow and Whoa," and "I Can't Believe I Ate the Whole Grain." Serious topics such as prostate cancer, sleep deprivation and bone health were covered throughout the series.

Nearly all of the blog entries were followed by advice from one of the Ag-

Center's experts. The responses provided practical, science-based information for Louisiana citizens to use in their own quest for a healthy lifestyle. All the blogs included links to more information.

Additionally, the chancellor wrote about the monthly assessments of his blood pressure, total cholesterol, high- and low-density lipoproteins, triglycerides, body weight, body mass index and other measurements to serve as a gauge of his progress.

To highlight wellness efforts and regimens of others, the Chancellor's Challenge also included blogs from guests such as the mayors from Baton Rouge and Oklahoma City, legislators, television personalities, registered dietitians and AgCenter employees.

The Chancellor's Challenge spawned several other health initiatives in the LSU AgCenter. Shortly after the blog was launched in October, the chancellor formed a wellness committee to plan and execute an employee wellness initiative. It started with regional kick-offs and a "Healthy Lifestyles Challenge," in which employees competed in teams to meet fitness and nutrition goals. Additionally, the employee wellness initiative includes other activities and learning opportunities such as "Lunch and Learn," where LSU AgCenter nutrition agents teach lessons from the Smart Portions and Smart Choices programs. These sessions are broadcast via the Internet to AgCenter facilities across the state so all AgCenter employees

can participate. Even though the daily blog written by the chancellor stopped in October 2008, the wellness initiative continues. ■

Denise M. Holston, Instructor; Heli J. Roy, Associate Professor; Beth Reames, Professor; and Michael Zanovec, Research Associate, School of Human Ecology, LSU AgCenter, Baton Rouge, La.

Photo by Johnny Morgan



Michael Zanovec, research associate in the School of Human Ecology, measures Chancellor Bill Richardson's waist in April 2007. A goal of the chancellor's was to reduce his waist size, and he did.

GET SMART

Journey to a healthier lifestyle
through LSU AgCenter's 'smart' educational programs.

Smart Portions Watch how much you eat

Beth Reames

The LSU AgCenter's Smart Portions Healthy Weight Program was developed to help participants learn healthy lifestyle habits to achieve and maintain a healthy weight. Smart Portions, launched in 2007, is the revised version of the Portions Healthy Weight curriculum originally launched in 2001.

Smart Portions is based on the U.S. Department of Agriculture (USDA) and U.S. Department of Health and Human Services Dietary Guidelines for Americans and incorporates research-based information from research institutions and health and nutrition organizations.

A principal resource promoted through Smart Portions is MyPyramid, which is a comprehensive Web site sponsored by the USDA. The site includes educational information in a variety of formats, including podcasts.



Smart Portions emphasizes these lifestyle changes:

- Healthy eating using MyPyramid food groups and portion sizes.
- Regular physical activity most days of the week.
- Focus on a healthy weight – not pounds lost.

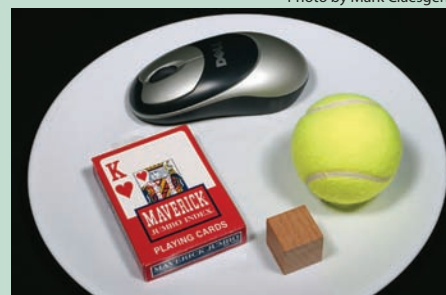
The Smart Portions curriculum includes eight lessons:

- Smart Portions Works – Discover what the plan and why it works.
- Smart Portions in Control – Break old, bad habits and start new healthful ones.
- Smart Activity Portions – Choose the type and amount of physical activity right for you.
- Smart Portions Essentials – Learn the basics of good nutrition.
- Smart Portions Made Tasty – Plan nutritious meals with good-tasting recipes.
- Smart Portions Away from Home – Dine out wisely on fast food, Tex-Mex, Italian and more.
- Smart Portions for Healthy Self-Esteem – Feel good about yourself by treating your body well.
- Smart Portions for Life – Make your new lifestyle last a lifetime.

Extension agents present the Smart Portions lesson series to participants in community workshops and collaborate with community health centers to offer health assessments including blood glucose, blood cholesterol and blood pressures screenings in conjunction with the workshops. Extension agents have conducted the Smart Portions workshops in approximately one-third of Louisiana's parishes for more than 1,500 people from various community and business organizations, city employees' offices, school boards, hospitals and community groups.

Data from participants indicate that 97 percent made at least one recommended lifestyle change. Many participants reported starting a walking or other exercise program. Some groups formed walking clubs or asked for a fitness class. Although most reported learning the im-

Photo by Mark Claesgens



To help people reduce their portion size, LSU AgCenter nutritionists recommend they think of common objects. For example, a baked potato the size of a computer mouse, a serving of meat the size of a deck of cards, a scoop of rice the size of a tennis ball and cheese the size of a 1-inch cube.

portance of moderate exercise most days of the week, many cited finding time to exercise as an obstacle.

Although the number of pounds lost was not emphasized, a healthy weight loss of 4-8 pounds was experienced by participants who chose to report their weight. But more importantly, more than 90 percent of the participants (where beginning and ending health assessments were made) improved their cholesterol, blood pressure or blood glucose levels.

Here are some comments from participants about what they learned:

- "My portion sizes of food have been much too large."
- "I've been eating too much saturated fat."
- "I've been skipping meals to lose weight."

Extension agents reported a change in the participants' attitudes and sense of well-being after participation with comments like "I feel so much better." Participants reported that the program helped them break habits that had led to

Beth Reames, Professor, School of Human Ecology, LSU AgCenter, Baton Rouge, La.

overeating and not being physically active. The discussion on fad diets revealed that participants had tried numerous fad diets. Agents observed that participants resolved never to go on an unhealthy fad diet again.

Examples of Smart Portions parish programs

Ninety-five employees at the Walmart in Minden, La., learned to eat healthier – on work time – by participating in the Smart Portions healthy weight workshops taught by Joan Almond, extension agent. Participants were not required to record weight, but for those who did, a total weight loss of 33 pounds was reported by 13 of 42 participants in the first session and in the second session, 20 people reported a total weight loss of 55 pounds. The manager was the biggest loser with a grand total of 12.2 pounds.

Almond also conducted the program for 16 Webster Parish Courthouse employees during their lunch break. The total weight loss of participants was 72 pounds and two lost 22 and 23.6 pounds respectively in 10 weeks.

In 2007, Debbie Melvin, extension agent, conducted Smart Portions workshops for employees of the city of Thibodaux and the Houma-Thibodaux Diocese.

Additionally, she presented the workshops to employees of Bollinger Shipyards and Central Boat Rentals. Amy Juneau, assistant extension agent, helped with the latter. These employers provided lunch, a pedometer, a stipend and paid for printing costs. For these two groups, post questionnaire results indicated improvements in level of daily physical activity and better choices when dining out.

To present the Smart Portions healthy weight program to 13 participants of a parenting class at Even Start in Bernice, La., extension agent Cathy Judd arranged to have a translator help students. Of the 13 participants in the class, six were Spanish-speaking. The eight-week class met weekly to learn about lifestyle changes to achieve and maintain a healthy weight.

Terri Crawford, extension agent, presented Smart Portions workshops to a community group in LaSalle Parish. Program evaluation showed that 80 percent of the participants indicated they had become more physically active since the classes began, and 80 percent said they had made changes in their food choices since starting the classes. Sixty percent of participants doubled their daily vegetable consumption. ■

Watch your portions

- Try to stick to an eating schedule. Studies show missed meals can lead to overeating.
- Don't go grocery shopping when you are hungry. This will help you avoid the temptation to buy things you don't need.
- Eat from plates, not out of a bag. It is much harder to keep track of how much you've eaten if you are snacking from the bag or carton.
- Bring low-calorie snacks with you to work or when traveling in your car.
- Because it takes about 20 minutes for your stomach to tell your brain you're full, eating slowly will help prevent overeating.
- Downsize your portions.
- Stay away from super-size, biggie-size and combo meals.
- Eat half of your restaurant meals – and take the rest home for an easy lunch or dinner tomorrow.
- Cut the calories by sharing a restaurant meal or dessert with a friend.
- Snacks and drinks can fill your body with extra, empty calories. Skip the cold drink and candy machines – and refuel and rehydrate with yogurt, string cheese, nuts, veggies, fruit and water.

Smart Choices **for Youth and Adults**

Heli J. Roy and Chad Eriksen

Our dietary patterns define our cultural identity. Asians are known for eating rice, while pasta is associated with Italy and the Mediterranean region. Louisiana is known for its seafood and rice dishes.

Our families, friends, places of worship and social networks are defined by dietary patterns and behaviors. Dietary attitudes are established early in life and continue into adulthood. Dietary patterns are associated with festivities, celebra-

tions, religious observances and certain lifecycle rites of passage.

Dietary patterns are influenced by socioeconomic, educational, demographic and lifestyle factors. In Louisiana and elsewhere, dietary patterns are linked to inequalities in education and income. Better diets are associated with affluence, whereas nutrient-poor diets are consumed by persons of lower socioeconomic status. Those in the low socioeconomic group consume more energy-

dense foods, including refined grains and added fat and less fresh fruits and vegetables and variety of foods.

Louisiana's high poverty rate contributes to chronic diseases. Heart disease, cancer and stroke are the leading

Heli J. Roy, Associate Professor, and Chad Eriksen, Graduate Research Assistant, School of Human Ecology, LSU AgCenter, Baton Rouge, La.



When you eat out, choose salads with low-calorie or no dressing. Choose entrees that include vegetables.



causes of death in Louisiana. Obesity and overweight also contribute to the increased incidence of diabetes that has reached epidemic proportions.

Louisiana is ranked fourth highest in the country in obesity. Sixty-three percent of Louisiana adults are obese or overweight. Seventeen percent of Louisiana children are overweight, and an equal amount are estimated to be at risk for overweight. Since 1990, the obesity rate increased from 12.3 percent to 30.8 percent of the population. This increased obesity has led to increases in medical expenses for the state. Obese adults have a 36 percent higher average annual medical expenditure than adults of normal weight. The cost of child obesity-associated illnesses increased from \$35 million to \$127 million in the past two decades. In addition, children today are being diagnosed with diseases that only occurred in adults a couple of decades ago.

One contributing factor to the high level of chronic diseases seen in Louisiana is the type of diet consumed. Most adults and children do not consume enough fruits and vegetables, and more than half do not participate in any physical activity. Convenience food or fast food, defined as food purchased in self-service or carry-out eating places, has become a dominant eating pattern among children and adults. Many studies show the association between high intake of fast-food consumption and increased body weight. Those who consume fast foods consume more total energy, fat, saturated fat and sodium.

Other changes in eating habits seen in the past two decades are increased restaurant food, soft drinks and salty snack consumption and larger portion sizes. Larger food portions could be contributing to the increasing prevalence of overweight and obesity seen today. Portions served by restaurants and fast-food establishments are nearly double the size of current recommended U.S. Department of Agriculture serving sizes. All of these contribute to increased total energy

intake associated with weight gain and obesity.

Louisiana cuisine is known throughout the world for its well-seasoned food and seafood creations. However, many traditional foods such as catfish, crawfish and vegetables are fried, while others are laden in thick and rich sauces. Poor eating habits can result in many nutrition-related conditions including iron deficiency anemia, osteoporosis, obesity and diabetes.

The LSU AgCenter provides education to Louisiana citizens on nutrition and health. Extension agents offer nutrition education programs across Louisiana to combat childhood and adult obesity and to reduce the chronic disease burden. LSU AgCenter specialists formulated a series of lessons for both youth and adults based on the Dietary Guidelines for Americans and MyPyramid. The lessons are known as Smart Choices and are taught in homes, schools, libraries, community centers, religious institutes and food stamp offices.



Read nutrition labels to determine which food product is giving you the most nutrients for the price. If you buy juice, is it 100 percent juice? How much sugar does it contain? Does it supply 100 percent of the vitamin C requirement?

The curriculum for youth includes 10 lessons covering topics such as healthy eating, physical activity, the nutrition labels, healthy breakfasts, snack choices, fruits and vegetables, the protein group, and information about fat, sugar and salt.

The adult curriculum consists of 17 lessons addressing physical activity, heart health, thrifty shopping, eating on the go, food safety, the food label, healthy pregnancy, feeding young children and basic food preparation techniques. The lessons include food tasting and sampling and hands-on activities to educate both adults and children about adding variety and introduce them to new fruits and vegetables.

Extension agents reach more than 200,000 individuals across the state each year teaching nutrition and healthy lifestyle skills to adults and youth at homes and in schools. Nutrition education increases the consumption of vegetables, whole grains and fruits and participation in physical activity. It decreases consumption of foods high in saturated fats. After participating in LSU AgCenter programs, adults become more physically active and a majority double daily vegetable consumption, while nearly half increase whole-grain and fruit consumption. Many individuals make healthier food choices, such as choosing lean meats, foods with less saturated fat, low-fat dairy foods and foods lower in sodium. Individuals also learn to shop better. They plan their meals ahead of time and make grocery lists before going to the store. They compare prices at the grocery store, and they read nutrition facts on labels. They also stretch their food dollars better by making their grocery money last longer.

Another important aspect of the Smart Choices lesson is food safety. Individuals learn how to thaw food safely, and they learn to store food safely. Children learn proper hand washing techniques.

Throughout the United States and around the world, Louisiana has become well-recognized for its diverse and flavorful cuisine. Louisiana's unique food culture has helped families maintain a sense of generation and cultural identity throughout the years, but it has also fostered poor eating habits and limited the adoption of variety of fruits and vegetables that abound today. LSU AgCenter extension agents have and continue to educate the citizens of Louisiana on healthy eating habits to combat the chronic disease burden. ■

Smart Bodies

A Nationally Recognized Child Wellness Program

Denise M. Holston

Obesity is a growing health care problem in Louisiana and carries with it significant costs, both in dollars and quality of life. According to former U.S. Surgeon General Dr. Richard Carmona, "We may see the first generation that will be less healthy and have a shorter life expectancy than their parents." This statement was made as a result of the startling increase in childhood obesity rates over the past two decades.

Childhood obesity rates are of particular concern because children who are overweight or obese are 70 percent more likely to be overweight or obese as an adult. Being overweight or obese substantially increases a person's risk for the development of nutrition-related chronic diseases such as cardiovascular disease, type 2 diabetes, some forms of cancer, stroke, sleep apnea, hypertension and osteoarthritis. Studies have also shown that being overweight or obese can affect school performance. For example, overweight children in one study had significantly lower math and reading test scores at the beginning of the school year than did their healthy-weight peers. These differences persisted into first grade.

In response to the epidemic increase in childhood obesity, the LSU AgCenter, in partnership with Blue Cross and Blue Shield of Louisiana Foundation, launched Smart Bodies in March 2005. Smart Bodies is a comprehensive nutrition education and physical activity program for

elementary school children, kindergarten through fifth grade, which is integrated into core curriculum objectives. The program incorporates classroom activities with hands-on learning to teach children how to build strong bodies and active minds. Smart Bodies consists of three components:

Body Walk. Students explore nine organs of the human body in a 35-foot by 45-foot, interactive, walk-through exhibit. At each of the nine stations, children participate in activities focused on the effects that different foods have on each organ. They are given a take-home activity book to share with their families.

OrganWise Guys. These 10 characters help children understand physiology and healthy behaviors. Hardy Heart, Madame Muscle, Windy the Lungs, Peri Stolic the Intestines, Sir Rebrum the

Brain, Peter Pancreas, the Kidney Brothers, Luigi Liver and Calci M. Bone are manifested as cartoons in books, games and videos and as dolls used in nutrition lessons. Participating schools receive a free kit with eight videos, dolls, books, games and puzzles.

Take 10! This classroom program is a grade-specific educational tool that encourages short bouts of physical activity integrated into academic learning objectives. Activities provided in all curricular materials are linked to the grade-level expectations of the Louisiana Department of Education.

Denise M. Holston, Program Coordinator and Instructor, School of Human Ecology, LSU AgCenter, Baton Rouge, La.



Photo by Mark Claesgens

LSU AgCenter staff set up the Body Walk exhibit at Westdale School in Baton Rouge.



The Body Walk includes nine stations. Children learn the functions of the body organs, including the intestines.

The goal of Smart Bodies was to reach 50 elementary schools each year for five years (2005-2009). Because of additional funding received beyond that provided by Blue Cross, the program has been able to reach more than 50 schools annually since it was launched. Since March 2005, more than 250 elementary schools have implemented the Smart Bodies program, and more than 125,000 children experienced the Body Walk. Seventy-five schools are expected to begin implementing the program during the 2008-2009 school year.

National Recognition

In 2007, the Smart Bodies Program was recognized as a Program of Distinction by the National 4-H Headquarters. Programs of distinction are a collection of high-quality 4-H Youth Development Programs that must meet rigorous criteria. Programs of distinction can be found at www.national4-hheadquarters.gov.

School Recruitment

LSU AgCenter extension agents recruit schools for the program and then conduct teacher training in the schools selected. Once the teachers have been

trained, a school assembly is used to kick off the program and to build excitement and enthusiasm. Following the assembly, teachers begin using the Take 10! and OrganWise Guys curricular materials in the classrooms. At some point during the program, the Body Walk exhibit is taken to the school and set up by volunteers either in the gymnasium or cafeteria. After the Body Walk leaves, teachers continue to implement the program in the classroom. Smart Bodies newsletters are sent home to parents to emphasize physical activity and healthy eating.

Because of the popularity of the program, there is a waiting list of schools who want to implement the program. We are hopeful new moneys will allow the program to continue beyond 2009. The LSU AgCenter has recently purchased a second Body Walk that will be available to schools.

Adding to the incentive to implement the program is a new federal mandate, effective in 2006, that requires school to have a wellness policy to receive federal funds. In addition, the Louisiana Legislature passed a law (Act No. 734) that requires children in grades K-6 to get at least 30 minutes of moderate to vigorous physical activity daily. The Take 10! has been a selling point because it provides the opportunity for students to be physically active during the school day without taking away from their academic learning time.

Research

Although each of the three components of Smart Bodies has been tested and evaluated separately in other states, the effectiveness of the three components together had not been tested. The purpose of the research project is to evaluate the effectiveness of Smart Bodies in promoting child wellness and preventing childhood obesity. A two-year investigation was conducted among elementary schools in East Baton Rouge Parish. Schools were stratified based on school enrollment, the number of students re-

ceiving free and reduced-price lunch, and state school performance score. After schools were clustered, they were pair-matched and then randomly assigned to a treatment (intervention) or control group. Only fourth- and fifth-grade students with parental consent were included in the research.

The primary goals of the research project were: (1) to increase consumption of fruits and vegetables served at school, (2) to increase nutrition and physical activity knowledge and willingness to participate in physical activity, (3) to increase parent awareness of their child's weight status and (4) to decrease the number of students in the at risk for overweight or overweight categories. Analysis of the formal research data suggests that:

- Students participating in Smart Bodies significantly increased their knowledge about the health benefits of eating fruits and vegetables.
- Children who participated in the Smart Bodies program increased their knowledge about the effects and benefits of physical activity.

During this project, we assessed activity levels on a small subsample of children by using accelerometers. The analysis of the pre-post test data revealed a trend suggesting that the children who experienced the Smart Bodies intervention had higher overall physical activity levels than those who did not. Additionally, there was clear evidence that children had higher activity counts during Take 10! than at lunch, during physical education lessons and during after school hours.

Body mass index (BMI) health reports were effective in increasing both school and parent awareness of children's weight status. Parents of 40 children who had been randomly selected from each of two weight categories were mailed a BMI report and compared to parents who did not. After receiving the report, parents were 4.5 times more likely to accurately identify their child's weight category.

The results of the research project suggest that, when implemented correctly, Smart Bodies is effective in teaching children about the importance of taking care of their bodies. If children learn how to adopt a healthy lifestyle, they will be less likely to experience the consequences associated with obesity later in life. ■

Protecting Louisiana's food industry

from food-poisoning bacteria

Marlene E. Janes, Miquel Gutierrez, David Bankston, John Supan and Jon Bell

Food safety is a growing concern in the United States, and the LSU AgCenter has a major commitment to helping the Louisiana food industry control bacteria that cause food poisoning. Currently, there are major projects in the alligator, oyster, shrimp and cattle industries.

Alligator

The alligator meat industry in Louisiana is becoming aware of potential market expansion and new markets. To take advantage of this potential for increased market penetration and industry viability, the final product quality of alligator meat needs improvement and control. So the industry has turned to researchers in the Department of Food Science to evaluate the effects of various post-harvest treatment applications of farmed, whole alligator carcasses for spoilage and pathogenic bacteria.

The bacterium of concern for alligator meat is *Salmonella*. Reptiles naturally harbor *Salmonella*, and cases have been reported of people becoming sick after handling contaminated reptiles. *Salmonella* food poisoning can cause many symptoms, including nausea, vomiting, abdominal cramps, mild diarrhea, fever and headache.

LSU AgCenter scientists are conducting research with several approved sanitizing treatments to control *Salmonella* on alligator carcasses. The most effective chemical sanitizers for control of *Salmonella* on the surface of whole carcasses are sodium benzoate and chlorinated water. Steam applied to the surface of the carcasses is an alternative to chemical sanitizers that gives the same results. All these sanitizing treatments reduced the natural contaminated *Salmonella* counts on the surface of the alligator carcasses from 10,000 bacteria to 100 bacteria per 2 square inches.

Oysters

Vibrio vulnificus, a bacterium that contaminates shellfish and causes food poisoning, is a concern to the Louisiana

oyster industry. *V. vulnificus* infections can cause gastroenteritis, which is characterized by fever, diarrhea, nausea and cramps; however, the bacterium also can cause primary septicemia, septic shock and often death in people with underlying medical conditions such as alcoholism, cancer or liver disease.

V. vulnificus continues to concern the Gulf Coast oyster industry because it thrives in the marine environment. Warmer waters occurring during the summer and early autumn months typically host high levels of these bacteria, which are concentrated by oysters during filter feeding. Because the organism grows at room temperature, the National Shellfish Sanitation Program requires oysters to be placed under cold storage within two hours after a dealer receives the harvest. Dealers also are responsible for maintaining oyster meat at refrigerator temperatures during points of transfer – unloading at a dock or restaurant, for example. Despite these regulations, it has been documented that a vast majority of bacterial growth still occurs during the harvesting phase of the farm-to-fork continuum, in which naturally occurring *V. vulnificus* can increase when oysters are kept on the deck of a boat.

To help the oyster industry better understand at what point the bacteria increase, Sea Grant College Program and LSU AgCenter Department of Food Science researchers monitored the changes in the levels of *V. vulnificus* and temperatures of oys-

ters in on-board, ice-treated oysters during wholesale and retail handling for two weeks after harvesting. Oysters were labeled as on-board wholesale or on-board retail samples, and measuring devices were taped on the outer shell of selected

Marlene E. Janes, Associate Professor, Miquel Gutierrez, Research Associate, and David Bankston, Professor, Department of Food Science, LSU AgCenter, Baton Rouge, La.; John Supan, Assistant Professor, School of Renewable Natural Resources, LSU AgCenter, Baton Rouge, La.; and Jon Bell, Chicken of the Sea International, San Diego, Calif.

Photo by Mark Claesgens



Marlene Janes conducts research on controlling and eliminating food-borne pathogens.

oysters to record temperature changes during shipment. To mimic dockside icing, oysters sat on the boat deck at ambient temperature until they were placed on ice approximately one hour before docking. Another set of oysters received no post-harvest icing and were labeled as non-iced. *V. vulnificus* levels were determined at harvest and one week and two weeks after harvest.

In most instances, *V. vulnificus* levels by treatment or time showed no differences. The only exception occurred in August samples, when the levels of *V. vulnificus* in dockside-iced and non-iced oysters were significantly higher than on-board retail and on-board wholesale samples. Iced oysters had higher gaping (oyster were dying) than non-iced oysters after one week in cold storage. Overall, post-harvest icing did not substantially reduce *V. vulnificus* in oysters; however, icing did prevent continued growth of this bacterium in the oysters.

Shrimp

Wild-harvest shrimp is one of the most important seafood industries in Louisiana. A majority of harvested shrimp are mechanically peeled and frozen. Because of this process, shrimp can become contaminated with bacteria that can cause food poisoning. LSU AgCenter researchers have worked with the shrimp industry to control bacteria on the surface of processed shrimp by using ozonated water. Ozone is approved as

a food-contact sanitizing agent by both the U.S. Food and Drug Administration (FDA) and U.S. Department of Agriculture (USDA). Soaking peeled shrimp in ozonated water was found to be more effective than spraying them. A concentration of three parts per million of ozonated water for 40 to 60 seconds reduced the highest level of bacteria on the surface of shrimp.

Cattle

Louisiana has a strong cattle industry with small farms of 100 cattle or less. Recent recalls and outbreaks of beef contaminated with *E. coli* O157:H7 have heightened awareness for control of these bacteria on the farm level. It is estimated that 73,000 illnesses occur each year due to *Escherichia coli* O157:H7 infection in the United States, leading to 2,000 hospitalizations and 60 deaths. Healthy cattle are considered to be the major reservoir for *E. coli* O157:H7. Preventive measures need to be developed to control this bacterium on small and large cow/calf cattle farms, which in turn will make the food supply safer. *E. coli* O157:H7 has been found in the environment of the cattle farms and isolated in cattle water troughs. *E. coli* O157:H7 contamination of cattle water troughs may occur from multiple sources, such as dust, feed, birds and wild animals.

LSU AgCenter researchers are working with a Louisiana company developing ways to control *E. coli* O157:H7 in

cattle at the farm level. Results from the study show *E. coli* O157:H7 could be killed within 5 minutes prior to cattle drinking from a water trough. From the results of this project, LSU AgCenter researchers will be able to write best management practices (BMPs) that could be implemented to control of *E. coli* O157:H7 on cattle farms.

The Food Science Department offers the food industry short courses to help them maintain the quality and safety of their food products. These courses include the Better Process Control School, an FDA-approved course for companies that process low-acid foods. Attending these short courses allows the food industries to comply with USDA and FDA regulations related to food-poisoning bacteria. The Meat & Poultry Hazard Analysis and Critical Control Point (HACCP) and Seafood HACCP courses provide companies with information on new regulations as well as developing and maintaining control of food-poisoning bacteria in their products.

The Department of Food Science Food Microbiology/Food Safety Lab also offers the food industry microbiological testing of food products for spoilage and food poisoning bacteria. It also can provide the food industry with validation testing for control of food-poisoning bacteria through using chemical sanitizing agents in or on the surfaces of food products. ■

Serving Food Safely

Beth Reames and David Bankston

Assuring the safety of our food supply is a major program effort of the LSU AgCenter. Extension agents and specialists provide research-based food safety information from the U.S. Department of Agriculture Food Safety and Inspection Service (USDA FSIS), the U.S. Food and Drug Administration (FDA), the Centers for Disease Control (CDC) and the LSU AgCenter. They do this through a variety of means including classes, personal consultation, the mass media and Web sites. When hurricanes and other natural disasters happen, AgCenter personnel step in immediately to help people understand what to do about food affected by power outages and flooding.

One food safety program of particular note is the award-winning Serving Food Safely. This program was initially developed in 2003 as a joint effort involving faculty from Southern University in Louisiana, Mississippi State University and the University of Arkansas. The curriculum covers the following topics: food-borne illness causes and prevention, temperature danger zones, personal hygiene and hand washing procedures, cleaning and sanitizing, food storage, transporting food safely, and cleaning and inspecting food.

Results from a study of nearly 200 workshop participants indicated that knowledge and adoption of recommended food safety practices increased following participation in the workshops and was sustained four months after participation. Comments from program participants indicated they enjoyed the participatory learning activities incorporated into the curriculum and found the fact sheets and other materials easy to read and understand.

The Serving Food Safely Program continues to be a resource for food safety programming. Specialists and agents have trained more than 700 food service employees and volunteers including those providing meals to hurricane victims housed in community centers, schools and churches; New Orleans Jazz Fest vendors; and staff and volunteers of commercial and governmental organizations, including the Governor's Office of Elderly Affairs, the Salvation Army, homeless centers and Head Start centers. A 2008 example is the training of 40 food handlers for Way Makers Ministries, which provides thousands of meals to summer camp programs in both Jefferson and Orleans Parishes.

The curriculum, revised in 2006, has been nationally disseminated and is being used in other states. The program has been nationally recognized with two awards from the National Extension Association of Family and Consumer Sciences – the Outstanding Curriculum and the Program Excellence in Research awards. The development team also won the LSU AgCenter Denver T. and Ferne Loupe Extension Team award in 2007. ■

Beth Reames, Professor, School of Human Ecology, and David Bankston, Professor, Department of Food Science, LSU AgCenter, Baton Rouge, La.

OBESITY BATTLE

LSU AgCenter research
helps point to solutions to national epidemic.

Food ingredients

can help prevent chronic inflammation

John W. Finley

Many diseases and conditions associated with aging and being overweight are associated with chronic inflammation. Chronic inflammation is different from the acute inflammation that occurs when we have an injury or an infection. Chronic inflammation often has no clinical symptoms initially, but over time can lead to severe incapacitation or life-threatening conditions. Chronic inflammation is associated with cardiovascular disease, Alzheimer's disease, arthritis, inflammatory bowel diseases and some forms of cancer. Figure 1 illustrates some of the conditions associated with chronic inflammation. Many of these conditions are progressive and develop over several years.

Conditions such as pre-diabetes, which can lead to diabetes and ultimately result in cardiovascular disease, can be a result of chronic inflammation. Obesity is often the trigger that starts this negative cascade of conditions. Obesity can have many side effects, but not all overweight individuals develop symptoms. Unfortunately, a large percentage of obese subjects do eventually develop one or more of the negative side effects. Deposition of fat around the organs and waist, or visceral obesity, is highly associated with risk of diabetes and subsequent cardiovascular disease. Visceral fat in this part of the body is prone to invasion by cells called macrophages, which normally help us fight off acute infection and help remove foreign substances from the body when injured. When the macrophage cells invade the visceral fat, they express genes similar to those involved

in infection, resulting in products that cause chronic inflammation.

Modern biochemistry and genomics provide us with the tools to measure changes in the expression of specific genes, which in turn help us understand the pathways involved in inflammation. Understanding the pathways allows us to predict the tools to delay or prevent the negative effects. When the macrophages invade the abdominal adipose tissue, they produce a cytokine known as TNF. This cytokine is involved in chronic inflammation and is a member of a group of cytokines that all stimulate inflammatory responses. One of the inflammatory proteins formed is Cox-2, which is directly associated with both chronic and acute inflammation. When Cox-2 proteins are expressed, it is a direct indication of inflammation.

When TNF increases, another cytokine, NFB, increases. The combination results in oxidative stress in the body. It is this oxidative stress that causes tissue dam-

age and ultimately leads to inflammatory conditions. Increases in NFB are associated with increased insulin resistance, which initiates the pathway to diabetes.

John W. Finley, Professor and Head, Department of Food Science, LSU AgCenter, Baton Rouge, La.

Figure 1. Inflammatory conditions.

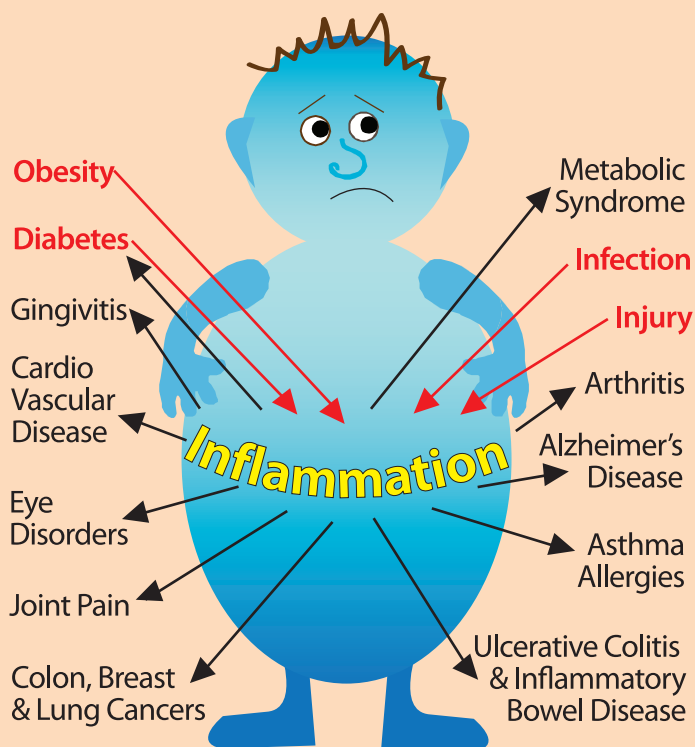


Illustration by Barbara Groves Corns

Macrophage cells kill invading bacteria by releasing oxidizing materials, which invade and kill the invading cells. This is clearly a good thing when we have microbial infection. When these oxygen radicals are produced in healthy tissue, however, it can result in unwanted damage. The end result is oxidative stress, which can result in the inflammatory conditions shown in Figure 1.

Another cause of oxidative stress in the body is chronic high levels of fatty acids and glucose in the blood. High levels of free fatty acids and glucose can result in increased oxidative stress and exacerbate the risk of chronic inflammatory conditions. High levels of free fatty acids are highly correlated with cardiovascular disease and death. Elevated levels of glucose as a result of food choices and the development of insulin resistance are directly associated with diabetes.

The message is that overeating and obesity can lead to excessive levels of free fatty acids and glucose in the blood and visceral adipose tissue deposition. Chronic high levels of glucose or fatty acids can result in oxidative stress. Deposition of fat around the waist also results in more oxidative stress. LSU AgCenter programs are identifying and developing foods rich in antioxidants that can help control oxidative stress. Currently, research is being conducted to identify antioxidants in foods and the potential health benefits of antioxidants in foods. Fruits and vegetables are foods naturally rich in antioxidants.

Antioxidants offer significant potential in reduction of oxidative stress. It must be kept in mind, however, that antioxidants alone cannot completely

overcome the stress caused by excessive levels of glucose, free fatty acids in the blood, and obesity.

Foods deliver a number of different types of antioxidants, and one of the major thrusts in functional foods research is to increase the antioxidants in foods. Fruits and vegetables are the best sources of antioxidants, although spices such as rosemary and thyme also produce high levels of antioxidants. Blueberries have captured an enormous growth in sales because they are rich in anthocyanins, which are particularly effective antioxidants.

LSU AgCenter research is focused on identifying potential new sources of antioxidants, understanding how they work, developing technology to deliver them so they are useful, and delivering them in foods consumers will like and eat.

Although the nutrition community stepped up its promotion of more fruits and vegetables in the diet 30 years ago, little has changed. A different approach is to supplement foods commonly eaten with ingredients rich in antioxidant activity. To accomplish this we must find economical sources of effective antioxidants that will help control oxidative stress and chronic inflammation.

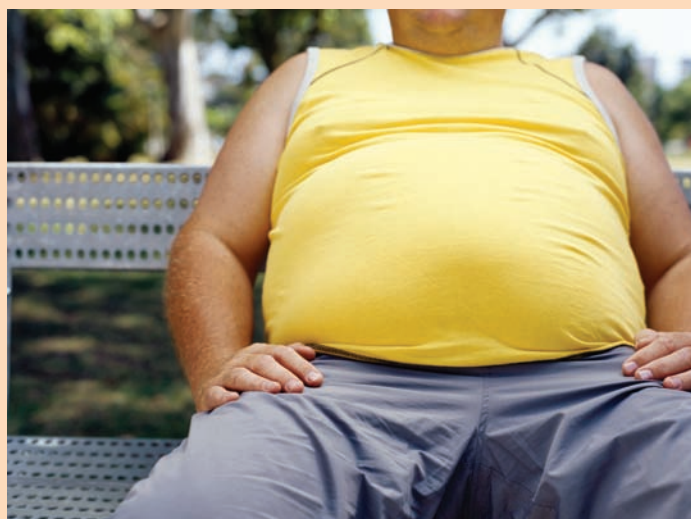
Table 1. Some common food antioxidants, their sources and the benefits that have been reported.

Food	Active Component	Benefit
citrus, pumpkin, squash, sweet potato	betacarotene	free radical scavenger, vitamin A precursor
spinach, corn, eggs	lutein, zeaxanthin	antioxidant, eye health
tomatoes, watermelon	lycopene	antioxidant, prostate health
berries, cherries, red wine	anthocyanins	antioxidant defenses
tea, chocolate, apples	catechins	antioxidants, anti-inflammation
apples, broccoli, tea, onions, blueberries	flavonols: quercetin, kaempferol	free radical scavengers, antioxidants, anti-inflammation
celery, parsley, sweet peppers	flavones: luteolin, apigenin	anti-inflammation and cardiovascular health

concentrates of antioxidants. Recovery of these materials would generate new business opportunities in the state and enhance health. For example, rice bran is rich in antioxidants, but it also contains lipids that are rapidly oxidized and can reduce the antioxidant value and result in bad flavor. Stabilized rice bran or extracts from the bran can be incorporated in baked products, pasta and food bars, which have excellent flavor and are foods that consumers will eat. Sweet potatoes unfit for market represent sources of antioxidants that can be recovered and added to foods. Lycopene, which is important for prostate health, can be recovered from watermelon not suitable for the market and from rinds.

In summary, obesity and excess fat and carbohydrate in the diet can lead to excess fat deposition and oxidative stress. Oxidative stress leads to chronic inflammatory diseases such as coronary heart disease, Alzheimer's disease, arthritis and some forms of cancer. The antioxidants in fruits and vegetables offer good protection against these conditions. Many consumers, however, are unable or unwilling to increase consumption of these foods. The LSU AgCenter is conducting research to incorporate antioxidants into other foods that will deliver the needed antioxidant protection to help delay chronic inflammatory diseases. ■

Byproducts of food processing are often rich in antioxidants if they can be economically recovered and added back to foods. Several Louisiana crops and byproducts offer opportunities to produce



Deposition of fat around the organs and waist, or visceral obesity, is highly associated with risk of diabetes and subsequent cardiovascular disease.

Macronutrient-sensing mechanisms *in the brain*

Roy J. Martin, Michael J. Keenan, Christopher Morrison and Jun Zhou

The major nutrition-related disease in Louisiana is obesity. Obesity is a result of overconsumption of food relative to energy expenditure. Protein, carbohydrate and fat are calorie-containing components of food. They also are called dietary macronutrients. Research at the LSU AgCenter is focused on how the brain senses macronutrients and how this sensing leads to a change in the control of appetite and obesity. This research has identified important links between nutrient sensing and the mechanisms by which this sensing alters the expression of neuronal genes related to hunger and satiety. The knowledge is essential to identify bioactive food components that suppress hunger-signaling after weight loss.

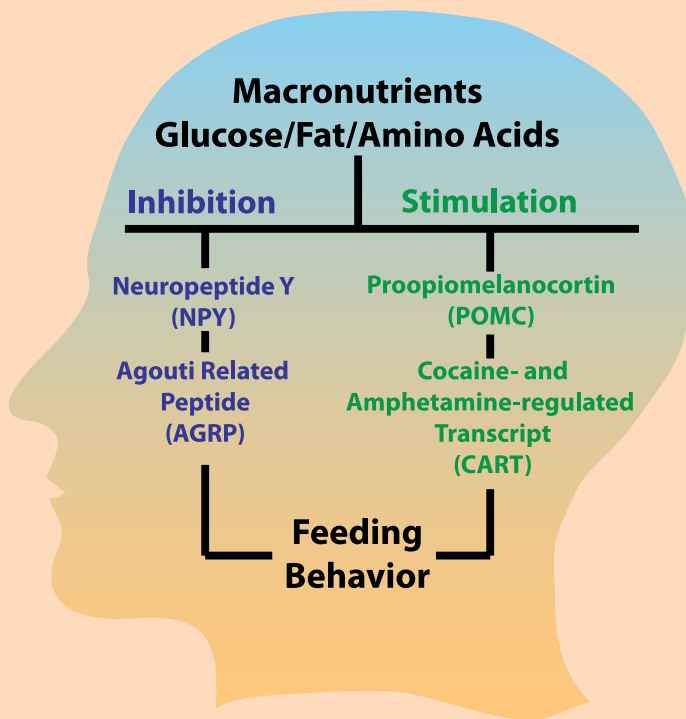
Eating behavior

People, as well as animals, usually overeat after food restriction. This is a good example of how eating behavior is linked to the body's metabolic requirements. The brain is the major integrator of metabolic signals generated from peripheral tissue, such as muscle and fat. Certain brain areas can "sense" the nutrient status, or metabolic requirement, of peripheral tissues and regulate eating behavior correspondingly. Such regulation is achieved through changes in particular expression of neuropeptides – peptides (or compounds formed from two or more amino acids) that influence activity in the brain. Current, well-established neuropeptides that directly regulate eating behavior are neuropeptide Y (NPY), Agouti-related peptide (AgRP), Pro-opiomelanocortin (POMC) and cocaine- and amphetamine-regulated transcript (CART).

LSU AgCenter researchers are studying how these neuropeptides are regulated by macronutrients – such as glucose, fat and amino acids – and how such brain macronutrient sensing changes eating behavior (Figure 1).

Researchers have systematically examined the effects of long-term macronutrient restriction on eating behavior and NPY gene expression in the brain. NPY gene expression was elevated in diet-restricted animals as well as in protein-restricted animals, while carbohydrate or fat restriction alone had no effect on NPY gene expression or on food intake. For long-term mechanisms of energy balance, both dietary-fat and carbohydrate energy sources can substitute for one another and signal adequate energy status. For short-term eating behavior, there is evidence that glucose, amino acids and lipids (or fats) are sensed and result in short-term changes. For example, intravenous infusions of glucose, amino acids and lipid emulsions

Figure 1. Macronutrient Regulation of Neuropeptide Expression and Feeding Behavior.



The macronutrients inhibit the expression of NPY and AGRP, two of the most powerful brain signals for feeding. The same macronutrients also stimulate POMC and CART, the primary brain signals for stopping feeding behavior.

Roy J. Martin, Professor, Director and Gordon D. Cain Endowed Chair, and Michael J. Keenan, Associate Professor, School of Human Ecology; Christopher Morrison, Assistant Professor, Pennington Biomedical Research Center, Baton Rouge, La.; and Jun Zhou, Instructor, School of Human Ecology, LSU AgCenter, Baton Rouge, La.

reduce food intake. Blockers of glucose and fatty acid utilization result in short-term stimulation of food intake.

Protein levels

When the protein level in the diet is below the requirement for normal growth or maintenance, animals will overeat or select a higher-protein diet to maintain protein balance. Animals can sense an essential amino acid imbalance in the diet within 15 minutes and will avoid that diet when given an adequate one.

LSU AgCenter research on amino acid sensing is focused only on diets that include all essential amino acids. The research has shown evidence for mechanisms of specific nutrient sensing and has led to a hypothesis proposing a final common pathway linked to both the energy status of the cell and stimulation of genes involved in control of eating behavior.

Carbohydrates

Eating behavior is altered by glucose status. There is significant evidence of a connection between carbohydrate, or glucose sensing, and eating behavior. Glucose-sensing mechanisms are highly conserved; some of the proteins involved are similar in yeast and mammals. Specific areas of the brain and gut are acti-

vated in this process. An elegant neural network of neurochemical signaling pathways is involved in the modification of eating behavior and glycemic control.

Lipid and fatty acids

Fatty acid sensing occurs in the tongue, small intestine, liver, pancreas and brain. Focusing on macronutrient sensing in the brain, AgCenter research has shown that fatty acid uptake, fatty acid oxidation and fatty acid synthesis in hypothalamic areas are influenced by fat intake and energy status. It also has shown that stimulation of fatty acid oxidation and suppression of fatty acid synthesis result in a decrease in eating behavior.

Brain signaling

The enzyme mammalian target of rapamycin (mTOR) is classically associated with cellular nutrient sensing and links nutrient and growth factor signaling to cellular protein metabolism. mTOR signaling is particularly sensitive to amino acids, especially the branched-chain amino acid leucine. AgCenter researchers have demonstrated that amino acids stimulate mTOR signaling in hypothalamic brain cells in vitro (in an artificial environment outside the body) and that this activation of mTOR is neces-

sary for amino acid-dependent regulation of AGRP gene expression. These data collectively establish a mechanism that couples amino acid signaling, eating behavior and neuropeptide gene expression.

The enzyme AMP-activated protein kinase (AMPK) is another cellular energy sensor that contributes to the hypothalamic regulation of food intake. AMPK is activated in settings of cellular energy depletion and acts to enhance processes that increase ATP generation and inhibit those which consume ATP. AgCenter research on the important role of AMPK in the regulation of food intake provides strong evidence that glucose regulates food intake through the interaction with AMPK pathways. Both AMPK and mTOR enzymes are potential targets for bioactive foods.

In the future

Future studies will apply this basic knowledge to identify bioactive food components that exert their effects directly on the brain or indirectly through signaling through the gastrointestinal tract. The ability to modify the most powerful brain signals that control feeding behavior will provide economic opportunities for new food crops and enhance the health of Louisiana citizens. ■

Gut microflora

and our health

Michael J. Keenan, Kayanush J. Aryana, Marlene E. Janes, Aixin Hou, Roy J. Martin,
Richard T. Tulley, Frank L. Greenway, Nikhil V. Dhurandhar and Jun Zhou

After birth, every person's gastrointestinal tract (gut) becomes filled with microorganisms, mainly bacteria. These are often referred to as our microflora. The majority of these are located in the large intestine. In fact, there are more bacterial cells in a person's gut than cells in the entire body. Bacteria feed on food components that escape digestion in the stomach and small intestine and nutrients that escape absorption. These components are mainly fibers.

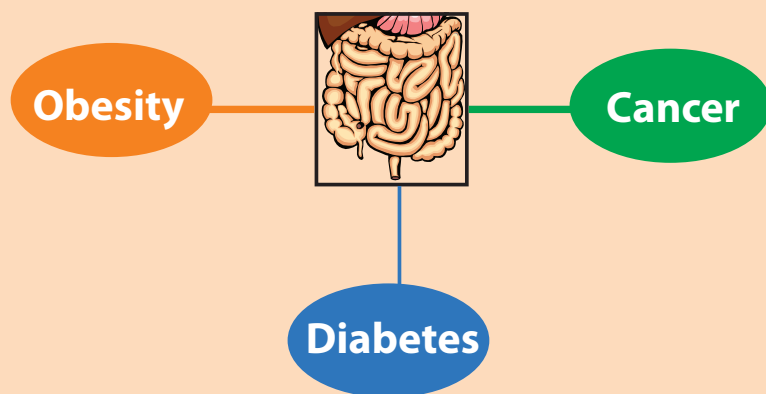
One method for categorizing fibers is into fermentable and nonfermentable. Bacteria can break down the fermentable fibers into various products. One of the most common groups of products is short-chain fatty acids. The major three short-chain fatty acids are butyric acid (four carbons), propionic acid (three carbons) and acetic acid (two carbons). The production of short-chain fatty acids is believed to improve the health of the gut by improving nutrient absorption, preventing diseases such as colon cancer

and improving the condition of patients with inflammatory bowel disease. Butyric acid is considered especially beneficial to the health of the gut.

LSU AgCenter research focuses on the interaction between bacteria and fermentable fiber food and its effect on body fat and obesity. Researchers believe beneficial bacteria in the gut can produce greater health throughout the entire body.

Probiotics are beneficial bacteria in the gut. Prebiotics are the food for the bacteria. Both probiotics and prebiot-

Figure 1. Diseases Potentially Improved by Pre- and Probiotics.



ics are fairly common in yogurt-related products. They are also sold as supplements in health food and grocery stores. Yogurt is a good vehicle for delivering beneficial bacteria to the large intestine. Once in the large intestine, the bacteria grow and impart beneficial health effects to the human host.

Prebiotics are fermentable fibers such as resistant starches – long chains of glucose molecules “resistant” to digestion in the stomach and small intestine – and chains of other types of linked sugar molecules – such as fructose in fructooligosaccharides – for which the small intestine has no enzymes to digest the link.

Resistant starch is high in one type of starch called amylose. The commonly sold starches in grocery stores are low in resistant starch because the main starch component is the other major type known as amylopectin. Amylopectin also consists of long chains of glucose molecules. But unlike amylose, amylopectin has multiple branches that make it more accessible to digestion by amylase enzymes in the small intestine.

The availability of resistant starch is increasing and is available for use in baking such products as breads, cookies or muffins. From 10 percent to 50 percent of the flour in these products can be replaced with the resistant starch product.

The prebiotic found in yogurt and also sold in supplement form is fructooligosaccharide. A variety of different types of fructooligosaccharides are composed of chains of fructose in a variety of lengths or number of fructose molecules. Both resistant starches and fructooligosaccharides are fermented by several groups of bacteria that appear to benefit

our health when they increase in number in our gut.

Researchers have reported that lean people have a different overall profile of gut microflora than overweight and obese people. When the gut microflora from obese rodents have been transferred to the gut of lean rodents, the lean rodents increase their body fat. Obese people appear to have a greater amount of the bacteria that break down the fermentable fibers and thus recover more energy from the fermentable fibers in their large intestine. The resistant starch research team at the LSU AgCenter and Pennington Biomedical Research Center, however, has demonstrated that increases in several types of bacteria that break down resistant starch result in rodents with less body fat. Research by others also demonstrates reduced body fat with the addition of fructooligosaccharides to rodent diets.

Further research is necessary to determine the differences in gut microflora among obese individuals and individuals consuming diets high in resistant starches or fructooligosaccharides. AgCenter researchers are continuing to study rodents to determine why animals fed fermentable fibers have less body fat. The hypothesis is that the short-chain fatty acids, especially butyric acid, cause endocrine cells in the gut to produce hormones that travel to the brain. The brain then signals the muscle, liver and fat tissues to burn more fat for energy.

AgCenter researchers already have demonstrated short-chain fatty acids can be increased in the guts of rodents fed resistant starch. This, in turn, resulted in increases in blood levels of two gut hormones – peptide YY and glucagon-like peptide 1 – and an increased amount

of proopiomelanocortin – an important brain signal involved in energy balance. Finally, increased body fat utilization (or burning) leads to decreased obesity.

Human feeding trials are also under way. One involves feeding children yogurt containing resistant starch to determine if the resistant starch produces the same effects on gut microflora as observed in laboratory animals. Another human study shows diets containing a resistant starch increased blood levels of the same gut peptides observed in AgCenter animal studies – peptide YY and glucagon-like peptide 1. Subjects fed resistant starch on reduced-calorie diets reported feeling less hungry and had greater feelings of fullness during the study.

In the future

The LSU AgCenter Biotechnology Interdisciplinary Team program has awarded a grant to conduct a comprehensive molecular characterization of gut microflora from animals fed a fermentable fiber that has been shown to reduce obesity and blood lipids and improve glucose clearance. Researchers will use the data collected on gut microbial diversity to do the following:

- Develop a hypothesis concerning microbial diversity and physiological outcomes including health benefits.
- Provide preliminary data for grant proposals to the National Institutes of Health and the U.S. Department of Agriculture.
- Develop dietary approaches to modify gut microflora to establish a desirable profile that reduces obesity, diabetes and cancer.
- Identify pre- and probiotics that can be introduced into the food market and enhance economic development in Louisiana. ■

Michael J. Keenan, Associate Professor, School of Human Ecology; Kayanush J. Aryana, Associate Professor, School of Animal Sciences, LSU AgCenter; Marlene E. Janes, Associate Professor, Department of Food Science, LSU AgCenter; Aixin Hou, Assistant Professor, Environmental Studies, LSU; Roy J. Martin, Professor and Director, and Richard T. Tulley, Professor, School of Human Ecology, LSU AgCenter; Frank L. Greenway, Professor, Nikhil V. Dhurandhar, Associate Professor, and Jun Zhou, Instructor, Pennington Biomedical Research Center, Baton Rouge, La.

Preventing Diabetes

Beth Reames

Diabetes Definitions

Type 1 diabetes occurs because the body can't make insulin, and sugar levels in blood get too high. Insulin is a hormone produced in the pancreas that the body needs to move glucose (sugar) from the blood into body cells to be used for energy. Type 1 diabetes used to be called juvenile diabetes and insulin-dependent diabetes. Most cases of type 1 diabetes develop in youth, but it can develop at any age. Five percent to 10 percent of all diabetes cases are type 1.

Type 2 diabetes occurs because the body either can't make enough insulin or can't use insulin properly, causing sugar to build up in the blood. Type 2 diabetes was previously known as adult-onset and noninsulin-dependent diabetes. From 90 percent to 95 percent of diabetes cases are type 2. Most cases of type 2 begin after age 30 or 40, but the number of children and teens with type 2 is increasing.

Gestational diabetes is high blood glucose that develops at any time during pregnancy in a woman who does not have diabetes.

Diabetes is a serious disease that affects the body's ability to produce or respond properly to insulin, a hormone that allows blood glucose (sugar) to enter the cells of the body and be used for energy. Diabetes is growing to epidemic proportions and is the biggest public health crisis of the 21st century, according to the American Diabetes Association. Diabetes has no cure.

Many people are unaware they have diabetes and are, therefore, not receiving recommended treatment to prevent or delay the onset of complications. Many additional persons suffer from a condition called pre-diabetes, in which blood glucose levels are higher than normal but not yet high enough to be diagnosed as diabetes.

Research shows that some long-term damage to the body, especially the heart and circulatory system, may already occur during pre-diabetes. Other studies have shown that if you take action to control your blood glucose when you have pre-diabetes, you can delay or prevent type 2 diabetes from developing. Most people with pre-diabetes develop type 2 diabetes in 10 years.

Research also shows that lifestyle practices, including a healthy diet and physical activity, may prevent or delay the development of the most common type of diabetes, type 2, occurring in about 95 percent of cases.

Youth learn signs

Each year, more than 15,000 U.S. youth are diagnosed with type 1 diabetes. Although type 2 diabetes in youth is not common, it is being diagnosed more frequently in children and adolescents, particularly in American Indians, African Americans and Hispanic populations.

The LSU AgCenter diabetes awareness program, "Help a Friend, Help Yourself – Learn the Signs of Diabetes,"

Diabetes Facts

Approximately 10 percent of Louisiana residents are estimated to have been diagnosed with diabetes by a physician.

African Americans have the highest prevalence of diabetes, with a nearly 14 percent diagnosis rate, compared to 8 percent of Hispanics and nearly 9 percent of the white population.

In 2006, the total cost of diabetes to Louisiana was more than \$2 billion. Nationwide, \$1 of \$10 for health care is attributed to diabetes.

Nearly 24 million children and adults in the United States, almost 8 percent of the population, have diabetes.

(Source: Louisiana Department of Health and Hospitals)

is targeted primarily at young people involved in 4-H. It gives the students information about the signs of diabetes, such as extreme thirst, frequent urination, increased appetite, unexplained weight loss, blurry vision, drowsiness, weakness, abdominal pain and nausea.

The diabetes awareness education program encourages children to alert an adult if they or a friend experience those symptoms. The curriculum also focuses on healthy eating and physical activity to maintain a healthy weight, which may help prevent or delay type 2 diabetes. The curriculum includes a series of four lessons with lesson plans, fact sheets, an interactive exhibit and evaluation instrument.

Approximately 1,000 youth have participated in the Help a Friend, Help Yourself Program. Evaluations from program participants show an increased awareness of diabetes, its symptoms and the importance of healthy eating and physical activity to prevent or delay the development of type 2 diabetes. An outgrowth of the program is the formation of small food and fitness groups that meet regularly to receive additional information about healthy eating and physical activity and participate in nutrition and exercise activities.

Adults manage risk

The LSU AgCenter's Diabetes Education Awareness Recommendations (DEAR) program provides information on eating healthfully to help control blood glucose levels. The DEAR program was developed to improve the health and well-being of Louisiana families by promoting the adoption of recommended diabetes self-management goals including eating healthfully, exercising regularly, monitoring blood sugar levels and visiting health professionals.

Extension agents have presented this program across the state, enlisting support from community health professionals and leaders. The DEAR program has been implemented in 64 parishes, and workshops have been conducted in 34 parishes for more than 5,400 people.

Besides the workshops, an estimated 400,000 contacts have been made statewide. These contacts received information through media outreach (television, radio and news articles) and walk-by displays at libraries, health fairs, hospitals, malls, grocery stores and congregated feeding sites. Individuals participating in the DEAR program learned to better manage their diabetes by following recommended practices.

Based on a telephone survey of DEAR participants, 80 percent reported

they were still following at least one of the diabetes self-management behaviors they committed to adopt after participating in the program. Six months following their participation in the lesson series, 128 participants who had committed to adopt at least one of the recommended behaviors were contacted. Of this number, 102 reported they were still following at least one of the behaviors they had committed to adopt.

The list of behaviors includes these:

- Visit a doctor or health professional regularly.
- Eat healthfully.
- Exercise regularly.
- Achieve and maintain a healthy weight.
- Maintain blood glucose levels as recommended by a physician. ■

Prevent Diabetes

Eat lots of vegetables and fruits, picking a rainbow of colors for variety. Eat nonstarchy vegetables such as spinach, carrots, broccoli or green beans with meals. Choose whole-grain foods over processed grain products. Try brown rice with stir-fry or whole-wheat spaghetti with pasta sauce.

Include dried beans and lentils in meals.

Include fish in meals two or three times a week. Choose lean meats like cuts of beef and pork that end in "loin" such as pork loin and sirloin.

Remove the skin from chicken and turkey.

Choose nonfat dairy products such as skim milk, nonfat yogurt and nonfat cheese.

Choose water and calorie-free "diet" drinks instead of regular soda, fruit punch, sweet tea and other sugar-sweetened drinks.

Choose liquid oils for cooking instead of solid fats that can be high in saturated and trans fats.

Cut back on high-calorie snack foods and desserts like chips, cookies, cakes and ice cream.

Watch portion sizes. Eating too much of even healthful foods can lead to weight gain.



LSU AgCenter nutritionist Beth Reames, left, has prepared a diabetes prevention program aimed at youth. The program is called Help a Friend, Help Yourself. She shares some of the materials with a family.



fish

is brain food

Carol J. Lammi-Keefe

Our grandmothers were right. A common adage for many of us when we were growing up – especially if we lived in states like Louisiana with coastal waters that provided a living for its workforce – was that fish is brain food.

Today we know that our grandmothers and their old wives' tales about fish's healthy attributes were right on target. Fish – especially fatty fish from cold marine waters – contains fats important to the development of the brain. Recent research has demonstrated that women who consume the fats of these fish during pregnancy have babies who see better and who are better able to problem solve. In short, they are smarter!

Other benefits for fish consumption include protection against cardiac events. The American Heart Association recommends the intake of two or more servings of fatty fish per week for healthy adults. Other health benefits include:

- Prevention of preterm deliveries.
- Better mental health.
- Stronger immune systems for warding off sickness and perhaps decreased body fat.
- Protection against macular degeneration, the leading cause of blindness in the elderly.

Important to southern states like Louisiana that do not border the colder

marine waters and that have fish species farmed in fresh waters is the fact that even these fish contain some of the healthy fats. Also, recent agricultural research demonstrates that the content of the healthy fats can be increased in catfish by modifying the fish meal on which they are raised.

Fish fat is different from other food fat

The fats of fish that are especially healthy are the long chain omega-3 fatty acids. The two predominant omega-3 fatty acids in fish are docosahexaenoic acid (referred to as DHA) and eicosapentaenoic acid (referred to as EPA). It is important to include sources of foods containing DHA in the diet.

Evidence for the benefit of DHA in brain and eye development has come in large part from studies conducted with infants, both term and preterm. The consumption of DHA by pregnant women has shown that their infants sleep better, have better vision and are better able to figure out baby-sized problems, such as how to get at a toy slightly out of reach or hidden.

These findings point to a role of DHA during pregnancy in the *in utero* development and maturity of the brain and the retina of the eye. Thus, even in apparently well-nourished women, nutrition can be improved and benefit the central nervous system and retina of the eye of the child.

A longer term benefit for DHA for infants is likely in improved school performance at later ages. In fact, at least one study points to a higher IQ with supplementation of DHA during pregnancy. Additionally, two studies now provide evidence that increased DHA during pregnancy can decrease fatness in the infant. This latter finding is especially interesting at this time when obesity is increasing, and early nutrition is viewed as a critical time for intervention. Can increased fish consumption during pregnancy be one answer to Louisiana's overweight and obesity statistics and the global obesity epidemic?

How much DHA should be consumed?

Currently, we do not have official recommendations for how much DHA we should consume. However, Table 1 provides expert opinion for the intake of DHA by different segments of the population. Recent studies show that pregnant women are consuming on aver-

Table 1. DHA Recommendations.

The recommended daily amount for omega-3 fatty acids, which includes DHA, is dependent on age and gender.

Age	DHA Grams
Infants	0.125
1-3 years old	0.14
Boys 9-13 years old	0.24
Girls 9-13 years old	0.2
Adult Male	0.32
Adult Female	0.22
Pregnant Female	0.32
Breastfeeding Female	0.26

Carol J. Lammi-Keefe, Alma Beth Clark Professor of Human Nutrition and Food, School of Human Ecology, LSU AgCenter, Baton Rouge, La.

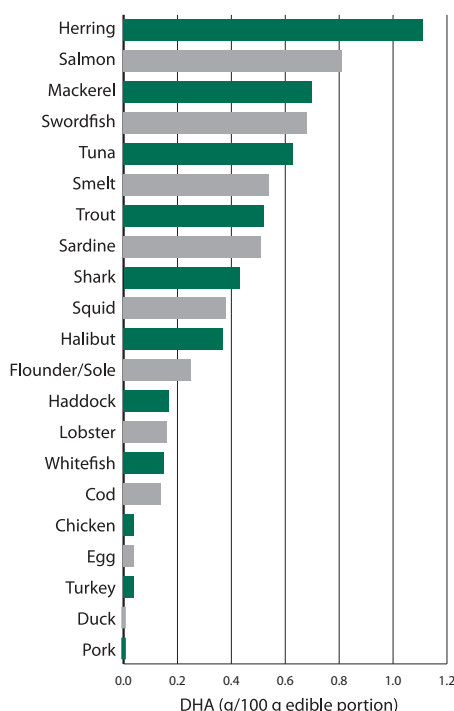
age around 54 mg DHA per day. This is much lower than the recommended 300 mg per day.

What are good sources of DHA?

Good sources of DHA are cold water marine fish such as tuna, herring and salmon. Figure 1 compares the content of DHA in a normal serving of different foods. There are also a variety of manufactured or engineered foods on the market that have added DHA.

Examples of foods other than fish that may contain DHA are eggs if the hens have been fed feed that contained DHA or milk to which the DHA has been added. Consumers should read la-

Figure 1. DHA Content in Normal Serving.



Source: USDA Human Nutrition Information Service

bels and look for DHA and not simply omega-3 fatty acids. Omega-3 fatty acids can include some shorter chain fatty acids that do not provide the same health benefits as DHA, so these two terms are not synonymous.

Infant formulas may or may not contain DHA. In the United States, DHA has been added to infant formulas since early 2002. Consumers must read the label to determine if products they are purchasing contain DHA. The addition of DHA to infant formulas underscores its importance to infant development. Breastmilk contains DHA, but amounts will vary depending on the mother's diet. Breast-feeding is highly promoted and encour-

aged for many different reasons, but the DHA content of the breastmilk is one of the reasons to encourage this practice.

A practical guideline for increasing the consumption of DHA is to include the following in a week's meal plan – two tuna fish sandwiches and one serving of a high DHA containing fish, such as salmon.

What about warnings that pregnant women should not be consuming fish?

The Food and Drug Administration (FDA) and the Environmental Protection Agency (EPA) have published a joint recommendation for the consumption of fish by pregnant and breastfeeding women and young children. The concern that underlies the recommendation that these individuals limit the consumption of specific species of large fish and fish from local streams and rivers is that the fish are highly likely to be contaminated with organic chemicals (PCBs) or mercury (technically methylmercury), both of which can be harmful to the central nervous system, including the brain.

Fish that contain higher levels of mercury are those that are larger, predatory fish. This is because these fish have lived longer, and their diet includes smaller fish that also contain mercury from the water in which they reside. The fish that women of childbearing age (including pregnant women) and children should avoid consist of shark, king mackerel, swordfish, tilefish and any locally caught fish that may be contaminated. It is recommended that tuna steaks be consumed infrequently – no more than once a month. Additionally, if tuna steak is consumed, then no other fish should be consumed in that week. Canned tuna has recently been scrutinized, and the prudent recommendation is that 12 ounces per week of the chunk light tuna is a reasonable amount to eat. The chunk light is better than the albacore tuna because mercury levels tend to be lower. PCBs are another form of contaminant that can be found in fish. PCBs are believed to cause cancer, though studies are incon-



Fish – especially fatty fish from cold marine waters such as salmon – contains fats important to the development of the brain.

clusive and more research must be done to verify this belief.

Recent attention has been focused on farm-raised salmon. This is because farm-raised salmon contain higher levels of PCBs than wild salmon. Though these levels are higher (27 ppb versus 6 ppb), the levels found in these fish are still below the levels the FDA considers safe for consumption (2,000 ppb). As long as your diet does not come only from this type of fish, the benefits should outweigh the risks. The EPA recommends that consumption of farm-raised salmon should be no greater than twice per week.

The FDA recommends that pregnant women:

- Consume 2-3 servings (about 12 ounces) of fish and shellfish per week.
- Vary the types of fish each week to decrease exposure to these contaminants.
- Limit the consumption of tuna steaks.
- Avoid shark, king mackerel, swordfish, tilefish and certain locally caught fish.

Canned tuna can be included in the diet and is a very good source of DHA. Canned tuna is convenient and contains lower amounts of mercury because canned tuna fish comes from a smaller species of tuna. There are differences in levels of mercury that can be found in canned fish. In studies done by the FDA, chunk light tuna has been found to have the lowest amount of mercury compared to chunk white and albacore tuna. Canned Alaskan salmon is also a great source of DHA and it contains low levels of mercury. ■

ADEQUATE SLEEP

decreases health problems

Roberto N. Barbosa and James M. Gregory

Sleep is essential for human life and gives the body the opportunity to repair itself. Bodily functions change during sleep: hormones are secreted, blood pressure is lowered, kidney function changes, and memory is consolidated. Good sleep is more than just a good feeling; it is an issue of health, wellness and safety.

Farming is a profession that involves long hours of work. Producing crops and securing a family's financial survival translate into long hours in the field. And long hours of tough, physically demanding labor may come at a high price. Lack of proper sleep and the associated loss of alertness are common ingredients in work-related accidents. Computer simulations with a sleep model indicate that a middle-aged farmer reducing his sleep by one hour per day during planting season will increase his risk of accidents by 20 times. The National Sleep Foundation estimates that sleep deprivation and sleep disorders cost Americans \$100 billion dollars in lost productivity, medical expenses and property damages. Also, approximately 70 million Americans are affected by sleep problems.

Sleep is a brain-operated process. Restorative or homeostatic control regulates the drive to sleep in response to how long we have been awake. The longer we are awake, the stronger the drive to sleep. Caffeine disrupts this process and temporarily alters the need for sleep. A second process controls the timing of sleep and makes it coincide with the day-night cycle – the circadian cycle. The

part of the brain that controls this timing is influenced by bedtime and light, making us naturally sleepy at night and active during the day. Adequate quantity and quality sleep refreshes the body and brain for the next day.

The exact amount of sleep a person needs depends on several factors. In general, the older we are, the less sleep we need. Infants and children need the most sleep. Infants less than 12 months of age may sleep more than 14 hours a day. A 12-year-old child needs nine to 11 hours of quality sleep. Physical exercise, such as labor-intensive fieldwork, increases the need for sleep. A physically active 60-year-old farmer may need between seven and eight hours of sleep every night after days of hard work, compared to only six to seven hours of sleep on days of less physical activity. Children often want to follow an adult schedule for sleep, but research indicates that adolescents sleeping less than 9 hours per day have elevated risks of injuries.

Sleep is cyclical and involves two states defined by brainwave patterns that alternate every 90 to 110 minutes. This process is repeated four to six times per night. The first state – called NREM (nonrapid eye movement) – is composed of four stages. Stage 1 starts as light sleep, which becomes increasingly deeper and of better quality as the stages progress. Stages 3 and 4 of NREM sleep are also known as delta sleep.

The second state of sleep is known as REM or rapid eye movement. The brainwaves in this state are similar to that of being awake. The brain is actively dreaming, and the eyes are rapidly moving back and forth.

The time spent in each sleep state and stage varies throughout life. As aging occurs, both REM and delta sleep decrease. Many inactive, older people have little or no delta sleep.

Researchers have found that sleep loss may have harmful consequences to the immune and endocrine systems – systems that are responsible for protection against diseases and the regulation of hormone secretion – and contribute to serious illnesses such as obesity, diabetes, hypertension and heart disease. Sleep apnea is a disorder in which breathing stops periodically during sleep. People with mild to moderate sleep apnea performed as badly or even worse in reaction-time tests as people with above-the-limit alcohol levels in their systems.

Mood disorders are probably the most recognizable symptom of lack of sleep. A growing number of medical tests link lack of sleep with anger, anxiety and sadness. Cardiovascular diseases – including increased blood pressure and the risk of a stroke – are associated with both long- and short-term sleep losses.

Improve sleep management by doing the following:

- Avoid caffeine, alcohol and nicotine close to bedtime.
- Exercise regularly but at least three hours before bed time. Exercise helps us to fall asleep and contributes to a deeper sleep.
- Create a sleep-conducive environment that is dark, quiet and preferably cool and comfortable.
- Maintain a regular bed and wake time, even on weekends.
- Don't eat before going to bed. Overeating and the consumption of spicy food before sleep can cause discomfort and contribute to poor sleep quality.
- Treat pain to minimize interference with sleep.
- Make up for lost sleep whenever you can, such as sleeping an extra hour on a rainy day. ■

Roberto N. Barbosa, Assistant Professor, and James M. Gregory, Adjunct Professor, Department of Biological & Agricultural Engineering, LSU AgCenter, Baton Rouge, La.

Farmers market food demonstrations offer people chance to try new fruits, vegetables

Annrose M. Guarino

Eating fruits and vegetables (5-13 servings or 2½ - 6½ cups per day based on calorie needs) is associated with a reduced risk of stroke and other cardiovascular diseases, with a reduced risk of cancers (oral cavity and pharynx, larynx, lung, esophagus, stomach and colon-rectal) and with a reduced risk of type 2 diabetes.

To encourage people to eat more fruits and vegetables, LSU AgCenter nutrition specialists offered food demonstrations and tastings at a series of farmers markets at Destrehan, La., in 2007 and Denham Springs, La., in 2008. The series was called Taste of the Season Kitchen on Wheels Food Demonstrations. Food dishes were prepared on site in the AgCenter's mobile kitchen unit, and shoppers sampled fruits and vegetables, received take-home nutrient analyzed recipes and were asked to participate in an evaluation survey.

Tasting improves acceptance

Liking a specific food is strongly associated with exposure and availability of that food. To change unhealthy behavior, public health professionals seek prevention strategies that encourage healthy habits. To increase consumption of fruits and vegetables, research recommends offering repeated exposures to these foods because when unfamiliar food is available for tasting, preference for that food increases.

Farmers' markets and farm or fruit stands

People are rediscovering the benefits of local food. Locally grown produce is fresher, tastier and more nutritious. It is also good for the local economy. In a farmers' market, groups of growers sell their products once or twice a week at a designated public place like a park or parking lot. A farm or fruit stand is a place where a single farm sells its produce, either from the back of a truck or from a roadside stand. Louisiana Department of Agriculture and Forestry indi-

Table 1. Survey at the German Coast Farmers Market, Destrehan, La., at nine monthly markets in 2007.

	Total number of survey participants	Yes	No
<i>Did you sample today's Taste of the Season recipe?</i>	402	350 (87%)	52 (13%)
<i>Did you receive a copy of recipe?</i>	376	316 (84%)	60 (16%)
<i>Will you purchase any fresh produce today?</i>	381	342 (90%)	39 (10%)
<i>Will you purchase any of the recipe ingredients today?</i>	345	184 (53%)	161 (47%)
Total/averages for all questions	1,504	1,192 (79%)	312 (21%)

cates that more than 24 farmers markets operate in Louisiana, and most accept vouchers from USDA's WIC Farmers Market Nutrition Program and Senior Farmers Market Nutrition Program.

Evaluating food tastings

To increase acceptance and consumption of health-promoting foods, the AgCenter researchers used a Rapid Market Assessment (RMA) "dot" survey during monthly farmers markets food demonstrations and tastings. Dot surveys are quick and easy and increase survey participation. Adult consumers indicate their responses using colorful, round, self-stick labels or dots.

Mobile kitchen equipment and nutrition expertise and guidance are provided to the market. Local chefs or trained volunteers prepare simple seasonal recipes for tasting and provide copies of these recipes to the participants. Consumers are invited to answer four questions written on a poster with the answers defined in a scale across the bottom on their tasting experience. The questions asked were these:

- Did you sample (taste) today's Taste of the Season recipe?
- Did you receive a copy of the recipe?
- Will you purchase any fresh produce today?
- Will you purchase any of the recipe ingredients today?

Results

In 2007, researchers conducted the survey at the German Coast farmers market at Destrehan on nine separate dates. Surveys included recipes on preparing such vegetables as turnips, cabbage, squash, cucumber, tomato, eggplant, okra, pumpkin and broccoli. See Table 1.

Participants' comments included: "I never tried it before today." "I can't believe my child is eating it." "I never thought of doing this with that vegetable." "What is this vegetable?" "What does it taste like?"

Eating patterns change slowly in response to new dietary or medical messages, changing tastes and preferences, and availability of new food products. Food tasting is an opportunity for consumers to experiment with a new flavor before making a financial commitment to purchase a food. ■

Annrose M. Guarino, Associate Professor, Nutrition, Food and Health, LSU AgCenter School of Human Ecology, Baton Rouge, La

Tea may be 'sweet' way to lose weight

Drinking tea to lose weight may not be a farfetched idea if a group of Louisiana researchers can pinpoint and quantify the functional components of Chinese sweet tea and blackberry leaves.

The compounds of interest are gallic acid and ellagic acid – two polyphenols or antioxidants – in those plants, said Zhijun Liu with the LSU AgCenter's School of Renewable Natural Resources. In the body, they apparently function to inhibit angiogenesis – the process by which new blood vessels are formed.

"All adult angiogenic processes are a cause of disease with the exception of a few physiological processes like wound healing, menses and placental-fetal formation," Liu said. "Tumors cannot grow beyond the size of a pin head without first inducing new blood vessel formation.

"Inhibiting angiogenesis can prevent cancer – and perhaps even fat tissue – from developing beyond the simple limits of existing blood vessels," he said.

Researchers have been looking at these types of compounds as cancer treatments because tumors can't grow if they can't produce blood vessels to feed them. Now, researchers believe the same process for restricting cancers can be exploited to prevent fat cells from growing.

"We're looking at foods that can influence weight loss," Liu said.

Liu has been working with a number of plants that produce functional foods – foods with benefits beyond mere nutrition. The latest, Chinese sweet tea and blackberry leaves, appear to contain

properties that can help people control their weight.

The researchers have been looking at how these components behave in rats.

Liu has extracted and powdered the compounds from the plant leaves and reformulated them for consistency in dosage. Roy Martin in the LSU AgCenter's School of Human Ecology then fed the compounds to laboratory rats.

Liu said a major challenge in identifying specific benefits from functional foods is the ability to determine accurately how much of a particular food or food component is necessary to get the desired result.

To answer that type of question, Liu has been developing a method of "fingerprinting" botanical foods to assess batch-to-batch variations so he can provide consistent samples for research or product development.

The fingerprints are in fact liquid chromatographic measurements of the various compounds in a particular sample of plant tissue.

"We need consistency to be sure investigators are testing the same thing over and over again," he said. "We need to eliminate doubt due to test sample variations."

Liu said he and his laboratory personnel exert great effort to develop standardization protocols and produce enough products for clinical trials.

"If you can't demonstrate consistency, how can you claim a benefit?" he asked. ■ **Rick Bogren**

Inside:

Learn the plan to bring more functional foods into the market.

Page 6

It's not so much what you eat as how much. Learn more.

Page 10

A traveling exhibit of the human body teaches school children about health.

Page 13

Watch your waist size; too much is not a good thing.

Page 17

Research reveals some remarkable facts about what makes us feel hungry.

Page 19



LSU AgCenter
P.O. Box 25100
Baton Rouge, LA 70894-5100

Non-profit Org.
U.S. Postage
PAID
Permit No. 733
Baton Rouge, LA