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Early detection could prevent diabetes
Fourth of five parts

BY SARAH AVERY - Staff Writer

Joe Gosselin of Raleigh is working hard to avoid becoming one of the 643,000 people in North Carolina with diabetes.

Three years ago when Gosselin was 61, his doctor at SAS, where he works as a computer programmer, told him he was overweight and pre-diabetic. The condition, marked by elevated levels of sugar in the blood, afflicts tens of millions of adults in the U.S., including an estimated 376,000 in North Carolina.
It is among the leading lethal consequences of obesity.

Gosselin, who weighed 230 pounds at 5 feet 10 inches tall, was grateful for the early warning of trouble ahead. Actually, research shows, a lot had already gone wrong inside his body over a long time, although scientists are only beginning to understand and identify some of the earliest indications of problems.

Researchers in North Carolina and elsewhere hope that earlier detection of type 2 diabetes could save lives and money. In North Carolina alone, the disease leads to 8,400 deaths a year and $5.3 billion in medical expenses. Especially at the stage of Gosselin's high blood sugar, diet and exercise can restore health.

As they delve into the origins of diabetes, scientists at UNC-Chapel Hill, Duke University and East Carolina University are following different paths, forging beyond the starches and sugars most often considered the bad actors in diabetes. Instead, they are finding that gobs of fats and proteins appear to instigate many of the early cellular malfunctions associated with diabetes, particularly when combined with little or no exercise.

The problem is excess. Even in the Atkins diet, which emphasizes eating fats and proteins over carbohydrates, calories are restricted. So a day that starts with sausage biscuits, includes a biggie burger and fries for lunch and ends with a big plate of lasagna for dinner would need to be accompanied by a similarly huge amount of exercise to balance out.

"We're living sedentary lifestyles, eating Western diets high in fat and animal protein, and it's the worst combination of things," said Dr. Svati Shah, a cardiologist at Duke who is examining early markers that signal distress in the metabolic system. "That could be explaining some of the explosion of diabetes in America."

**The gut galaxy**

At UNC-CH, researchers have discovered problems inside a world so little understood it might as well be another galaxy.

Gut bacteria - tiny microbes deep in the bowels - flourish in an ecosystem where diverse populations of organisms work in harmony to aid digestion and keep the immune system on track.
Problems can arise when one species or another proliferates, upsetting the balance.

Pauline Lund and colleagues at UNC Gillings School of Global Public Health have found that a diet of fatty foods works like fertilizer for certain populations of gut bacteria. Studies have shown that obese people have a different array of gut bacteria from lean people.

To begin to understand what that might mean, Lund's lab has studied mice. The team found that high-fat meals cause mice to grow fat while some strains of bacteria flourish. At the same time, their immune systems launch low-grade attacks that can be detected even before they develop insulin resistance. That's when the body still produces insulin, but does not use it properly, making one more likely to develop type 2 diabetes.

"There's early information in the gut that a high-fat diet and bacteria may actually have a causative role in stimulating problems," said Lund, a molecular physiologist. Diabetes and an immune system heightened into an inflammatory state have long been linked. So exploring the role of gut bacteria may shed light on how the immune system begins to flare.

As the fatty diet prompts weight gain, the immune response escalates beyond the gut and into the enlarging fat cells. These cells, scientists now know, are not just idle repositories of stored energy; they are highly active participants in metabolism, immune responses and other functions.

"Obesity is an inflammatory response," Lund said, adding that the ongoing inflammation may eventually impair the body's ability to process glucose, leading to diabetes. "The inflammatory mediators prevent insulin from working as it should."

More studies are needed to prove the correlation beyond animal models, Lund said, but testing gut bacteria in obese people could provide a very early warning that conditions for diabetes are developing.

**Markers in the blood**

A different disease pathway is being studied at Duke. Christopher Newgard, director of the Sarah W. Stedman Nutrition and Metabolism Center, heads a laboratory that specializes in analyzing metabolites, the thousands of
chemicals that are left as the body breaks down fats, proteins and carbohydrates.

Newgard's team has repeatedly found early chemical markers in the blood indicating that obese people have trouble processing fats and proteins when such foods are eaten to excess.

By measuring these metabolites, his team can predict who will eventually develop cardiovascular conditions. They are working to discover a similar metabolic predictor for diabetes and are keying in on the fats and proteins. In a recent project, Newgard's group studied a potential link between pre-diabetes in obese people and a high-fat, high-protein diet.

Using blood tests, Newgard's group found different chemical components between lean and obese people. That signals a problem in how well some obese people may process animal proteins. Some scientists suspect that a breakdown of this metabolic process is made worse when combined with a fatty diet.

To test that theory, Newgard's group fed three groups of rats different diets: One group ate standard chow, a second ate high-fat chow and the third got a reduced-calorie load, but with lots of protein and fat.

Not surprisingly, rats in the high-fat group gained weight and became insulin-resistant. But rats in the high-fat and high-protein group also became insulin resistant, even though they didn't bulk up. The implication was that the food they ate, not weight gain alone, caused problems.

Newgard said the animal studies help provide direction for future human studies. His group is exploring whether an obese individual's initial chemical "profile" can predict whether insulin sensitivity would improve with diet and exercise.

"The significance here is that we're starting to use these metabolomics tools - biomarkers - to help us predict the outcomes of interventions," Newgard said of the new study.

The Duke team suspects these tiny markers don't just passively signal future problems or benefits; instead, they may actively cause illness, setting in motion a series of events that leads to diabetes and heart disease.
"It's not just that this is a byproduct of insulin resistance," said Shah, who has collaborated with Newgard on the metabolite studies. "It looks like the branched chain amino acids [in animal proteins] could be a part of the cause of insulin resistance."

**A fat flood's effect**
The work at Duke is bolstered by findings from ECU scientists in Greenville, who have the added urgency of a patient population in Eastern North Carolina with the state's highest diabetes rates.

Funded in part by the National Institutes of Health and the N.C. Golden Leaf Foundation, which supports projects that benefit people in areas once dependent on tobacco, an ECU team has been exploring the intricate cellular workings that go awry when people consistently eat high-fat foods that dominate American diets.

Darrell Neufer, a physiologist and director of the East Carolina Diabetes and Obesity Institute at ECU, said even a single high-fat meal such as a big burger and fries floods the muscle cells if that energy isn't burned off.

Like a car getting too much gas, tiny engines inside muscle cells called mitochondria - which convert fats and proteins into energy - spew pollutants if the overload of fuel isn't countered by a brisk walk or some other form of activity.

This pollution is a form of oxygen - the so-called free radicals that women know as their enemies in the war against wrinkles - and it's highly caustic, eventually eroding the body's ability to clear glucose from the bloodstream. A body can easily handle this imbalance every now and again.

But in studies of mice, Neufer's group has found that the animals grow obese on a steady diet of fatty foods, combined with little exercise, causing the industrious mitochondria in their muscle to become damaged by the pollution. Eventually, the mitochondria are shut down.

"The cells know what they're doing," Neufer said. "They're getting rid of the bad engines to try to save themselves. But eventually you lose so many engines, you lose the whole muscle fiber."
An insidious cycle results. Diminished muscle mass can't process the overload of fats and proteins efficiently and starts spewing toxins, which diminish muscle mass, which can't clear the nutrients efficiently.

And muscle is hugely important, not only for processing fats and proteins but also for metabolizing carbohydrates. It's responsible for clearing 80 percent of the glucose out of the bloodstream.

Neufer's group, which is now studying the mitochondria in obese and lean people, is working to illuminate how the dysfunctional machinery for processing fats and proteins contributes to insulin resistance.

"It may be the appropriate thing for the cell to do is become insulin-resistant," Neufer said. "It's trying to limit more fuel from coming in, because it's already had enough."

The ECU group is already encouraged that its insights could offer new approaches to diabetes. Neufer and his team have tested a high-powered antioxidant in mice that helps eliminate the cellular pollution, protecting the animals from becoming diabetic even when they repeatedly gorge on fatty foods.

The hope is to develop an antioxidant therapy that could protect people from developing diabetes.

"We now have experiments going on to try to figure out how insulin resistance develops and whether it's something going on in all of us after we eat a big meal," Neufer said. "What's the difference between normal and a person who's insulin resistant? The difference is the amount of time spent in metabolic imbalance."

For people like Gosselin with pre-diabetes, there is a way to alter destiny. Gosselin made simple, if difficult, dietary changes, eliminating lunchtime desserts and nightly cheese snacks he said fueled his weight gain. Now 64, he gradually lost 40 pounds that he has kept off for three years, and his blood sugar levels are back to normal.

He still refuses to exercise, however, which the experts frown upon. When it comes to putting the body back into metabolic balance, Neufer said old-fashioned exercise is as close to a magic pill as modern science has to offer.
"The great thing about nature is, if you become more active, the cell has the ability to make more mitochondria," he said. "That's why exercise is so important."

Coming tomorrow:
What works?

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SHAWN ROCCO - srocco@newsobserver.com - Caroline Long has tissue removed for a study at East Carolina University. Dr. Darrell Neufer is studying how mitochondria function affects insulin sensitivity.
Visitors to downtown Greenville businesses may have to hike a little farther in the cold to reach their destinations this winter as work to transform a primary parking lot into a center-city gathering place commences.

City Planner Carl Rees said renovations were going full force Monday in the former lot at Fifth and Evans streets. The facelift is intended to brand “Five Points Plaza” as a space for events aimed to anchor the district.

Uptown Greenville, a nonprofit group that advocates revitalization, backed the project but is not playing a role now.

Construction was scheduled to begin after the close of Freeboot Friday — a festival held in the lot prior to home East Carolina University football games — and before the annual Umbrella Market reopens for its weekly run from May through September.

Rees said some concerns were expressed by local restaurateurs once two bays of parking were closed a few weeks ago. The lot is directly across from Winslow's, Starlight Cafe and Cubbie's.

“There's probably never a good time in a downtown environment to take away parking,” Rees said.
He added that the “short-term pain” will pay off down the road as new patrons and businesses are attracted by the site improvements.
Trees have been cut down, curb and gutter and sidewalk torn out, pavement removed, new boundaries set, and trenches for electrical wiring dug. Underground and grade work will continue for quite a while, Rees said, before the installation of permanent market shelters and lighting, paving, and placing new trees, signage and public art pieces.

Only two parking spaces will be lost. Greenville company Hudson Brothers Construction is under contract to develop the project for $610,600, all of which was paid following approval by the city's Redevelopment Commission.

Work should be completed by the end of May, Rees said.

Contact Kathryn Kennedy at kkennedy@reflector.com or (252) 329-9566.
I was so surprised when, one night, I witnessed a blinding eyesore at the corner of Charles Boulevard and Greenville Boulevard.

ECU (and Greenville), what were you thinking when you put up that sign? More is not always better and this sign is embarrassing.

My husband and I love ECU and support them in so many ways. But this sign needs to be toned down. If I'm not mistaken, a sign store on Greenville Boulevard was forced to take down a sign a few years back because the city claimed it was a distraction to drivers and may cause accidents. ECU's sign is not just distracting, it's blinding. What's up with this Greenville? If it has a dimmer switch, please use it.

ELAINE FLETCHER
Greenville
Video essays are a hot topic in college admissions as more schools allow them

By Jenna Johnson
Washington Post Staff Writer
Monday, January 3, 2011; 9:19 PM

To complete a half-dozen college applications, Morgan Malone lined up letters of recommendation, penned essays and - for George Mason University - carried around a video camera for several days.

The result was a nearly two-minute video essay that opens with Malone introducing herself from atop the sign outside Mountain View High School in Stafford County. There are clips of her walking the school's hallways, participating in a quiz bowl and volunteering. At the end, her assistant principal jumps on a desk and shouts, "I approve this message."

"Instead of having an application and words in an essay, they get to see me," said Malone, 17. "Hopefully, when they are watching the video, they will get a picture of what I am like. The way I talk in the video is the same way I talk every day."

This is the second year that GMU has formally given students the option to submit a video about themselves before the Jan. 15 application deadline.

Videos have been a small part of the admissions process for years, especially for students applying to arts programs. But as cameras and editing software get cheaper and easier to use, the videos have become more technically sophisticated and feature clips spliced from a number of scenes, voice-overs, music and simple special effects.

And increasingly, it's not just arts students participating - prospective English majors and engineers are using their cellphones, webcams and point-and-shoots to make their cases for admission.

A few colleges are hoping to harness that love for video and have created channels for students to submit video essays, although most schools do not accept them in place of a written one. Typically, applicants post their videos on YouTube and send colleges a link, although some send schools a DVD.

This is the second year that Tufts University in Massachusetts has given applicants the option of submitting a video along with the required written essays. St. Mary's College of Maryland has long accepted all sorts of artistic expression, and this year officials encouraged students to submit an "audition tape" instead of an essay.
In most cases, the videos do not make or break a student's chance of getting into a college. Last year, GMU received about 100 videos, and there were less than a handful of cases in which the video factored into the process and helped a student get in, said Andrew Flagel, GMU's dean of admissions.

"Some of them are awful, and some of them are phenomenal," he said. Awful, a few admissions officers said, means boring or having extremely poor sound quality or a script that was obviously written by a parent.

Last year, one of the admissions office's favorite videos featured a student sitting in front of a camera talking about why he wanted to attend GMU - except for when he spliced in clips of himself playing a variety of musical instruments and even demonstrating his unicycle-riding skills. Although the antics were amusing, the staff was most focused on what the student said.

GMU used to conduct face-to-face interviews with many of the few thousand students who applied each year. But as the number of applications multiplied - this year it's expected to reach nearly 20,000 for a class of 2,600 - the college had to phase out the program. Flagel hopes the videos will help his office put faces with names.

But the increasing popularity of video essays worries some admissions officials, including Henry Broaddus, dean of admission at William and Mary. College applications are "absolutely confidential records," and allowing students to post part of an application on an outside site such as You Tube "punches a peek hole" into the process and allows the general public to judge a 17-year-old applicant, he said.

This year at GMU, the admissions office has posted dozens of videos on a university Web site. (The video is removed if a student is rejected.)

In one, a student travels around campus and the District with posters listing the alphabet of reasons why she wants to attend GMU - such as Q for quidditch, a club that "can translate my love of books into a sport." Another student filmed an episode of "GMUpardy" that featured contestants representing all of his activities and questions about campus. And an applicant from Colorado danced to a song she wrote that includes this line: "G-M-U, G-M-U is a place where I want to be. It's the greatest university."

David Dorsey took his viewers behind the scenes of his New Jersey high school's morning announcements, which he reads with another student "every single morning." It's one of the many tasks he performs as student council president.

He said the video gives admission officials a better idea of who he is. "I'm applying to seven schools, and I feel like I've written the same essay seven times," said Dorsey, 18, who plans to study history and political science. "I thought this was a way to be different. I think my personality - well, anyone's personality - is better expressed on video."
Years ago, St. Mary's College received a long, unedited underwater video from a student who wanted to study marine biology. The admissions staff waited in suspense as they watched minute after minute of murky water until finally a blurry fish scooted by.

Video quality has increased substantially since then, and this year, one student video spoofed an Old Spice commercial and included an outtakes reel.

Although the staff would be impressed by a student with a perfect GPA and SAT score, "essays make a student memorable," said Richard Edgar, director of admissions at St. Mary's.

In addition, producing a video can be a lot more work than writing an essay; students have to develop a script and film and edit their productions. Flagel said he encourages students to use technology they already have and to have fun.

"This is just a piece of the process," he said. "This is not worth dropping your grade in physics."

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Universities Are Challenged as Demographics Shift

By REEVE HAMILTON and JON MARCUS

In August, 60 years after the University of Texas admitted its first black student, the school welcomed the first freshman class in which white students were in the minority. White students, who accounted for 51 percent of U.T.’s freshman class in 2009, made up 48 percent in 2010. Black and Hispanic students represented about 5 percent and 23 percent, respectively, with Asians and other races making up the rest.

The state’s flagship university passed the demographic milestone earlier than some had anticipated, reflecting a similar shift that is rapidly taking place at other top-level educational institutions across the country.

Although the changing demographics of college campuses may be grabbing the headlines, the more compelling issue is how the growing number of minority students presents serious social and academic challenges for financially strapped universities, even as the schools are under pressure to boost graduation rates.

Nationally, 52 percent of Hispanic students and 58 percent of black students are unable to earn a bachelor’s degree in six years, compared with 40 percent of white students, according to the National Center for Education Statistics.

“What is increasingly evident now that wasn’t evident 10 or 20 years ago is the extent to which this is a national phenomenon,” said Steve Murdock, a sociology professor at Rice University and previously the state demographer of Texas and head of the United States Census Bureau. “This is not a Texas issue. It’s not a California issue. It’s a national issue.”

For the United States to maintain — let alone grow — a college-educated work force, Mr. Murdock said, those graduation numbers will have to change.

Stan Jones, former Indiana commissioner of higher education and the current president of Complete College America, a national nonprofit group dedicated to boosting the number of college graduates, said the numbers have been telling the story for years. “But it hasn’t necessarily gotten through to policy-makers that this was going on, and clearly not to the general public,” Mr. Jones said. “All of us are seeing it happening faster than we had expected.”

For example, although their birth rate is growing at a significant clip, Mr. Jones said, Hispanics do not graduate from high school, go on to college or graduate in the same
numbers as white students. “If you look at the freshman class everywhere in this country, it is more representative than it’s ever been,” he said. “But in four years, if you look at the graduating class, it is not going to be representative of the country, because many of those students from the underrepresented groups won’t make it to graduation.”

Educators give several reasons for the disparity, including economic differences, the comparative quality of college preparation at urban, rural and suburban schools, and a sense of isolation among those who are the first in their families to go to college.

“These are terrific students,” said William Powers Jr., president of U.T. “Often, they may have gone to a high school where they didn’t have a calculus class or Advanced Placement classes. The challenges are also financial and what I call cultural. They might be away from home, and they don’t have parents and aunts and uncles who have already been here.”

In 2007, recognizing the demographic shift — and its accompanying challenges — U.T. set up a Division of Diversity and Community Engagement. With an annual budget of $30.4 million, it encourages minority high school students to apply to college and then supports them with a complex framework of programs that include tutoring and personal advising.

“The question is, can we get them the support to help them over the gaps?” said Gregory J. Vincent, vice president of diversity and community engagement.

The results, so far, have been promising. Generally, students in the division’s programs have grade point averages and retention rates as good as or better than the average in their respective classes. “The good news is that our students come highly motivated, so our challenges aren’t as great as you’d expect, despite assumptions some people might make about their backgrounds,” said Aileen Bumphus, executive director of the Gateway Program, an initiative under the Diversity and Community Engagement umbrella that works with about 300 first-generation students in each class.

Such programs have been crucial for students like Oscar Ayala, a U.T. senior from Houston who majors in biomedical engineering. Both of his parents are from Mexico, and neither attended college. “When it came time in high school to get ready for college, I didn’t know what that meant,” Mr. Ayala said.

But that success may prove difficult to maintain, depending in large part on decisions the Texas Legislature will make this year to confront a budget shortfall that could reach $20 billion or more. About $5 million of the Division of Diversity and Community Engagement budget comes from state money. Educators are particularly worried about cuts to the state’s largest financial aid program, which primarily serves minority students. Robert S. Nelsen, president of the University of Texas-Pan American, a South Texas institution that is 89 percent Hispanic, said cuts to the aid program would be “devastating” to the area.
U.T.’s main campus is not immune from the tension caused by economic constraints. In November, a faculty panel proposed deep cuts to the ethnic studies programs, including the John L. Warfield Center for African and African American Students, the Center for Asian American Studies and the Center for Mexican American Studies. Once the panel’s recommendations were made public, about 150 students and faculty members protested, many accusing the administration of racism. University administrators have since said the proposed cuts will be scaled back.

But the incident highlighted the fact that increased diversity does not necessarily mean increased harmony or interaction on a campus where you can see a statue of Jefferson Davis, the Confederate president, not far from new memorials to Mexican-American labor leader César Chávez and Barbara Jordan, the first black woman elected to Congress from the South.

Kacie Sebek, a senior from Houston, who is white, said she has seen classmates from predominantly white hometowns appear uncomfortable. “You have someone closed off in their own neighborhood, and suddenly they’re in a world where people are different,” she said.

Mr. Ayala, who was surprised by the dearth of Hispanics in his engineering programs, said students gravitate toward those with similar backgrounds. “As I started realizing who hangs out with who, I see that it’s not as diversified as it could be,” he said. “But I know it can keep moving forward.”

Still, most U.T. students hardly noticed the demographic milestone reached by the current freshman class. “If you want to take sort of a benchmark of how we’ve progressed over 20 years, it would be that this went more unrecognized than you might have expected it to,” said Mr. Powers, the university’s president. “That, in itself, is a milestone.”

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This article has been revised to reflect the following correction:
Correction: January 3, 2011
A previous version of this article had an erroneous credit for the picture. It is Spencer Selvidge, not Caleb Bryant Miller.