



# A Big Fat Problem

**From basic science to strength-training to long-term weight-loss programs, UK researchers are working to help our kids go from fat to fit**

Written By Jeff Worley

**O**ur country's children are fat. No, make that FAT. And unless you've been living in a cave, you know this.

The Surgeon General and the Centers for Disease Control and Prevention are now using the terms "epidemic" and "crisis" to describe our children's collective waistline. Our problem is immense: our problem is immensity.

In June, *Time* magazine ran a 27-page article, titled "America's Obesity Crisis," citing a blizzard of depressing statistics for both adults and children. And though the numbers for adults are shocking—two-thirds of U.S. adults are officially overweight and about half of those have moved on to full-blown obesity—the obesity numbers for adolescents and children are mind-numbing.

Twenty years ago in the United States, 5 percent of kids were overweight; today 15 percent are and another 15 percent are headed that way. According to the American

Obesity Association, approximately 30 percent of children (ages 6 to 11) in this country are overweight, and among adolescents (ages 12 to 19), 30 percent are overweight, and nearly 16 percent are obese, as determined by the body mass index percentile. The prevalence of obesity has quadrupled in the last 25 years among both boys and girls.

In Kentucky, things are even worse. As reported by Jim Warren and Mary Meehan in a *Lexington Herald-Leader* article last June, Kentucky became the fourth fattest state in the nation this year. Nearly a quarter of Kentucky's adults pack around 30 or more excess pounds, and a quarter of Kentucky's pre-schoolers—and almost half its sixth graders—are overweight, or at risk of becoming so. More than 14.5 percent of Kentucky high schoolers are overweight, compared with 10.5 percent nationwide, according to the Kentucky Obesity Epidemic 2004 report, published by the Kentucky Department for Public Health. Kentucky, the

Tiffany Duncan, a senior at Paul Laurence Dunbar High School in Lexington, has lost 45 pounds since joining UK's Health Management Resources (HMR) program last January.



## What Is Body Mass Index?

$$\frac{\text{weight in pounds}}{(\text{height in inches})^2} \times 703$$

Example:

$$\frac{\text{weight} = 182 \text{ lbs.}}{\text{height}^2 = (71 \text{ in.})^2} \times 703 = 25.4 \text{ BMI}$$

**Note: Body mass index is a more accurate measurement than weight because it takes into account that short people tend to weigh less than tall people. But it's not perfect: The BMI of extremely muscular athletes is often in the obese range.**

BMI	Status
Below 18.5	Underweight
18.5-24.9	Normal
25.0-29.9	Overweight
30.0-39.9	Obese
40 and above	Morbidly Obese

report concluded, is raising the most unfit generation in the commonwealth's history.

Our kids weren't always so fat. What happened?

"The statistics out there for kids and adolescents are just frightening," says James Anderson, longtime professor of internal medicine at the University of Kentucky and a weight-loss expert. "I think one major factor contributing to the explosion of obesity in children in this country is the ready availability of inexpensive, tasty foods. You know, you go into homes and you see snack food all over. You see candy. You see chips. You see crackers. You see all these high-fat foods that are just hard to get away from."

In a sense, we're the victims of our own abundance. Food, both nutritious and non-nutritious, falls easily into our grocery carts and is literally at our fingertips. All we have to do is punch up a pizza number, and minutes later someone's at the door with a steaming pie.

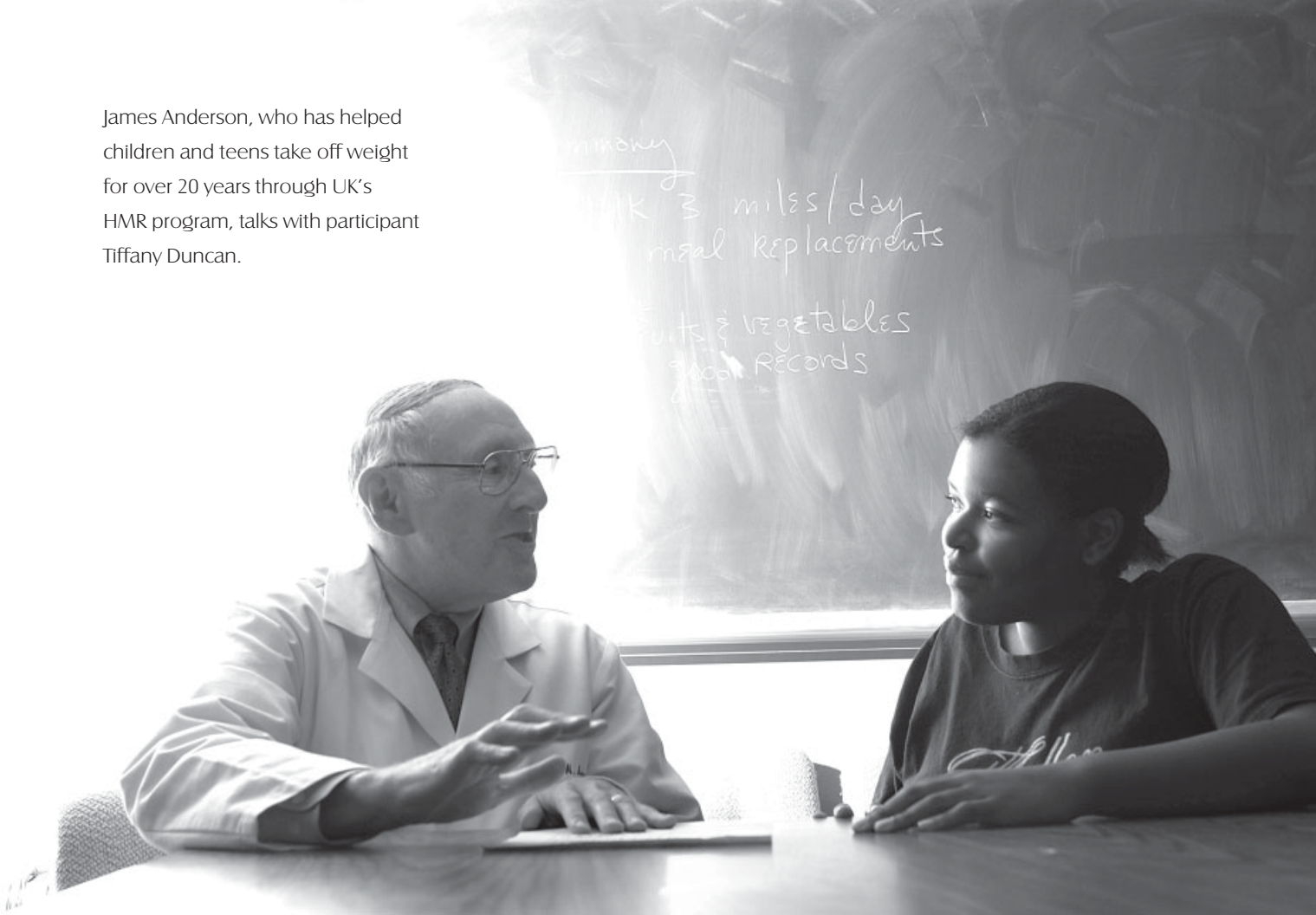
Secondly, Anderson says, there has been a systematic reduction in physical activity. Kids rarely walk to school anymore—parents will drive their kids a half-block with the excuse that walking isn't safe. Add to this the fact, as reported by *Time*, that in 1969, 80 percent of kids played sports every day; today 20 percent do. In most gym classes in our public schools, kids are aerobically active for just three minutes. *If* they have gym at all. In one Lexington public school, some seventh and eighth graders take no gym classes at all.

"The third thing that impacts on the first two factors is the electronic age," Anderson continues. "Children are watching 2½ hours of television a day. Teens are on the Internet for hours instant messaging. Then, there are video games. I think these things are the magnets that have contributed to the lack of physical activity and also, of course, these passive activities enhance the appeal of snack food."

But these are children and teens. They live at home under rules made by their parents, right? So, why are kids being allowed to do things that set them on the road to obesity?

**More than 14.5 percent of Kentucky high school students are overweight, compared with 10.5 percent nationwide.**

James Anderson, who has helped children and teens take off weight for over 20 years through UK's HMR program, talks with participant Tiffany Duncan.



Too many parents, directly or tacitly, give their children permission to stay riveted to various screens for long periods of time and to forego exercise, says Sharon Barton, an associate professor of nursing at UK who has worked with school-age children for 25 years. And Barton, an expert in infants' and children's nutrition, has a lot to say about parental permissiveness and how it leads to obesity among kids and teens.

"I've found that in working with children who are overweight or have eating issues, parents often think that children *deserve* particular food items. They need popsicles. They need ice cream. They need Little Debbie Snack Cakes. One physician I know who works with overweight kids will pull parents aside and say, 'Would you purchase cigarettes and give them to your five-year-old? Well, you're essentially doing the same thing by giving them Little Debbies.'"

The problem is not only parental passivity, Anderson says. In addressing the obesity problem, even professionals on children's and teens' health tend to drop the ball.

"Unfortunately, in our current mind-set, we are giving children permission to become obese," says Anderson. "We're so worried about traumatizing them by saying they're overweight. Too many of our 'experts' in children and adolescent behavior and nutrition say, 'Let's just watch. Let's not make a diagnosis right now. Let's just watch.'"

"The current authorities, the experts at the NIH and the

American Pediatric Society, for example, say, 'Well, if you label a child obese, you may trigger anorexia. You may cause an eating disorder, so let's just not mention it.'" Ignoring the problem, Anderson adds, is no solution because it's fairly easy to predict which obese teens will become obese adults. If a teen is above the 85th percentile on the body mass index profile, that teen has about a 95 percent chance of being an obese adult.

Then there are the schools. Fifty years ago, very few schools around the country had vending machines. If you wanted to have a Coke with lunch, you had to bring it with you from home. Now, flashing like a row of Las Vegas slots, vending machines beckon from the hallways of our schools. And the products in these machines, their allure to a captive audience enhanced by billions of dollars of advertising each year, tend to contain only empty calories that translate into fat.

Schools in particular "have become nutritional disaster areas," says David Ludwig, a Harvard pediatrician who directs the obesity program at Children's Hospital in Boston. "We as a society have abdicated responsibility for teaching kids how to eat right and how to have an active lifestyle." Ludwig's research shows that for every additional daily serving of a soft drink, a child's risk of becoming obese rises 60 percent.

"There are lots of societal factors contributing to obesity,

and since children are so vulnerable and change the most rapidly, they are the most visible in our country's obesity explosion," Anderson says. And there are societal costs.

## What Are the Costs of Obesity?

Remember the fattest kid in fourth grade? The one who was the butt of practical jokes and the target of ugly nicknames? The one always picked last on the playground? Obesity, clearly, can be a boulder in the road to a child's socialization and self-esteem. The slings and arrows of words directed toward an overweight kid can leave permanent

psychological scars.

It wouldn't be such a big deal if the problem were only a kid's confidence or looks. But there's a lot more to it than that. According to the CDC, our nation spent an estimated \$75 billion last year treating health problems of children and adults related to obesity. In 2003, 6.2 percent of all Kentucky's medical expenses went to treating obesity-related health problems. As reported in the *Lexington Herald-Leader*, Medicare picked up about \$270 million of that tab, and Medicaid, which serves the poor, shelled out another \$340 million. This works out to a cost of about \$85 for every

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man, woman and child in our state.

And as we've known now for a long time, obesity is a fertile breeding ground for chronic diseases like type 2 diabetes, cardiovascular disease and arthritis. It is causally connected to cancers including endometrial cancer, some breast cancers, colon and kidney cancer; and obesity also instigates sleep apnea, gall bladder disease, back and joint disorders, and depression.

“And this is just the short list for where obesity can lead,” says Anderson, who thinks that in his work with overweight children and teens, diabetes is the most important concern. “We used to see very few children or teens with type 2 diabetes, but now it's alarming how many adolescents are developing type 2.” The obesity-diabetes link is so strong that his colleague L. Raymond Reynolds, an associate professor of internal medicine at UK, often uses the term “diabesity” to convey how interrelated they are.

Type 2 diabetes results from insulin resistance, a condition in which the body fails to use insulin properly, combined with relative insulin deficiency. (Type 1 diabetes results from the body's failure to produce insulin, the hormone that unlocks the cells of the body, allowing glucose to enter and fuel them.) Most Americans diagnosed with diabetes have type 2. Get this: Prior to 1990, of all cases of diabetes in children, just 4 percent were type 2; now, type 2 diabetes in children and adolescents accounts for a whop-



Health Management Resources (HMR), headquartered in Boston, specializes in meal-replacement products that are low in calories.

ping 45 percent of cases, according to the American Diabetes Association.

Leslie Scott, a pediatric nurse at the University of Kentucky Medical Center who earned a Ph.D. in nursing from UK earlier this year, is an expert on type 2 diabetes in children. “I’ve always loved working with kids,” says Scott, who has been a clinical pediatrics faculty member here since 1998. “When I became a nurse practitioner in 1995, the children we followed in the pediatric endocrine clinic primarily had type 1 diabetes. But even then we were seeing significant increases, almost year-to-year, in the number of children with type 2 diabetes.”

Scott, who became a pediatric diabetes nurse educator in 1994, was inspired to dedicate herself to a career of diabetes-related work for a reason very close to home. Her mother had diabetes from the age of 10 and lost her sight at 32 as a complication of the disease. Scott, in living with her mother’s disease and being in regular contact with diabetes educators through the years, learned that education really can make an impact on how people manage the disease.

“I wanted to try to prevent kids from suffering complications like my mother did at such a young age. I thought that if we could affect a family at that level, at a young age, and implement good habits and good management skills, we could prevent complications down the road.”

Preventing health problems. This is the goal of dozens of clinicians and researchers at UK working to better understand childhood and adolescent obesity. This work involves

disciplines, departments and colleges all across the UK campus. Here are a few of the projects and programs currently under way.

## Special Meals to Melt Away the Pounds

James Anderson has been helping children and teens take off weight for over 20 years, and he admits he and his staff have had their share of challenges.

“I’ve seen 10-year-old, 200-pound children. I’ve seen an 11-year-old, 300-pound girl, a 350-pound 12 year old, and a couple of adolescents who weighed 500 pounds,” Anderson says. “And it’s been very gratifying to work with these kids through our HMR program and see them shed significant weight.”

HMR is the acronym for Health Management Resources, a national health-care company in Boston that specializes in programs for weight and health management. HMR provides programs to health-care professionals in more than 400 medically supervised weight-management programs nationwide. Anderson heads up UK’s HMR program, which began in 1985.

“The great thing about using these products,” Anderson says exuberantly, “is that this way we don’t have to put anyone on a liquid diet, and there are quite a few meal choices.” Entrees, with vegetables, include chicken creole, turkey chili and chicken pasta parmesan, and are typically 220 calories. Bars (160) and milkshakes (120) are also

available. “This is the easiest diet to follow, because it requires so few decisions about what to eat.”

Here’s how the program works. Each week while on this low-calorie diet, the patients attend a 90-minute group session led by a trained health educator. In these sessions, some of the basic program fundamentals are taught: specific “how to’s” of weight loss, including easy ways to lower fat and calories in the diet without feeling hungry, and

attend weekly class during this time.

“The results were really impressive,” Anderson says. “Weight loss in this group averaged 33.6 pounds, with 31 of the teens losing more than 10 percent of their initial body weight and 16 kids losing more than 20 percent.” For 16 of the adolescents who had BMIs over 40, which put them in the morbidly obese class, weight loss averaged right at 50 pounds. One adolescent lost 176 pounds during this 18-

## **Twenty years ago in the United States, 5 percent of kids were overweight; today 15 percent are and another 15 percent are headed that way.**

simple strategies to build physical activity into the daily routine.

The weight-loss phase of the program comes next. This typically lasts for around 18 weeks. The last stage is maintenance, during which participants attend weekly classes to continue to receive support while learning additional, simple strategies for successful long-term weight management. A personal “coach,” Anderson or one of his staff, works closely with each patient to practice healthy weight-management skills until they become second nature. The cost to participate in this program depends on the level of medical supervision required.

Anderson is pleased at the results of the most recently completed program, in which UK partnered with weight-loss experts in HMR programs at the University of Kansas Medical Center in Wichita, in Dallas-Fort-Worth, and Springfield, Illinois.

This study included 49 adolescents—11 males and 38 females—age 12 to 18. The participants averaged BMIs of 36.8, which put all of them in the “obese” and “morbidly obese” categories. After attending weekly education classes and getting information about HMR meal replacements as described above, the participants began the weight-loss phase of the program. For 18 weeks, they were allowed from 1,000 to 1,500 calories a day from the meal replacements, vegetables and fruits, and the teens continued to

Cody Stone, 13, works off excess weight in UK’s PEP program at the Seaton Center. See Cody in action on page 13.



week program and subsequently, after she went into the maintenance phase, lost another 75 pounds.

“The ringing, self-evident conclusion,” Anderson says, “is that self-motivated adolescents can lose substantial amounts of weight in an intensive weight-loss program such as this.” These results were presented at an annual nutritional conference in San Diego in 2002.

Self-motivation is the number 1 indicator of a teen’s, or

behind his neck, and says, “Let me share an anecdote with you.

“In 1986, we enrolled a 13-year-old girl in our program. She weighed 340 pounds. I had never treated anyone that young who weighed so much. We designed a safe nutrition program for her using our meal replacements, giving her about 800 to 900 calories a day. She lost 180 pounds—let me repeat that: 180 pounds—in a little over a year. She went

**“A parent can be an asset or a saboteur. Think about it: Somebody buys the groceries, somebody brings the food into the house, somebody cooks the food. I want to get the family to the point where they say, ‘We as a family will make changes.’”—Joan Griffith**

child’s, probability of success, Anderson adds. “You absolutely have to be disciplined. You have to”—and here Anderson sounds like a baseball coach telling a kid how to get a hit—“stay in the box, meaning that you have to stick strictly with the HMR offerings and vegetables and fruits. If kids and teens stay in the product box, we can guarantee that they’re going to lose weight.”

This may sound easy; oftentimes, it’s not. Peer pressure is one obstacle. What if you’re trying to stay in the box, but a friend sitting across from you at Dairy Queen taunts you into having a couple of bites of his hot fudge sundae? “It’s tough to turn away from temptation like this,” Anderson says, “and the problem isn’t really a couple bites of ice cream as much as a teen then saying, ‘Well, I’ve already blown my diet today, so I may as well have a few bites more.’”

Parental involvement is a huge factor, too, in a teen’s success at belt-tightening. Even though parents are encouraged and coached to be weight-loss partners in this program, that can sometimes be psychologically tricky. “Usually, if a child or adolescent is obese, one or both parents and grandparents are also obese,” says Anderson. “So when the teen wants to break out of that mold, it’s an affront to the parent. ‘So you don’t like the way we are? You don’t want to be like us?’ It’s tough.”

Asked why, at the ripe retirement age of 68, Anderson continues to do this work, he smiles, clasps his hands

from 340 to about 160. That flabbergasted me. I happened to run into her in Winn-Dixie two weeks ago. She’s 32 now and her usual weight, she told me, is about 210 pounds. OK, it’s not 160, but she’s still keeping off more than two-thirds of the weight from when she was 13. I think we did alter the course of her life, and, yes, that makes me feel pretty good.”

For information about UK’s HMR program, call 859/422-4671.

## **Want to Lose Weight? Here's a Radical Idea: Eat Less and Exercise More**

Joan Griffith, who strikes you immediately as direct and knowledgeable, is a soft-spoken woman. But she carries a loud message: She wants the kids and teens she works with to “own their bodies.” And she’s formed a team to help them do exactly that.

No, make that TEAMS.

“We started a clinic here last January that we call TEAMS—Teens Enjoying Active Management Systems,” says Griffith, who came to UK two years ago after a distinguished career as an inpatient and outpatient pediatrician in the U.S. Air Force (she wound up being a colonel). The clinic, dedicated to helping children, adolescents and young adults find healthy weight



solutions, is run out of the UK Department of Pediatrics.

The clinic is for all teens. Patients may be self-referred or referred by their primary-care physician, Griffith explains. “The cornerstones of the program are lifestyle changes, physical activity, counseling, and dietary adjustments.” So far, the program has enrolled 50 patients, some from as far away as 2 1/2 hours from Lexington.

When teens are referred to this program, here’s what happens. Griffith talks with them in the initial session, asking the most basic questions about their reason for wanting to join the program. She also gathers additional information, completes a physical examination, and, when indicated, suggests lab screening for thyroid, lipid profile and blood sugar. The patient and family meet with a dietician who provides nutritional counseling. Other clinic consultants include an exercise physiologist and psychologist who assist in developing individually tailored exercise plans and assessment of emotional issues that may be affecting eating habits and self-image.

“After this screening, we have the boy or girl come back in two to four weeks with only one goal: no weight gain,” Griffith explains. “From there on, we want them to lose a pound a week.”

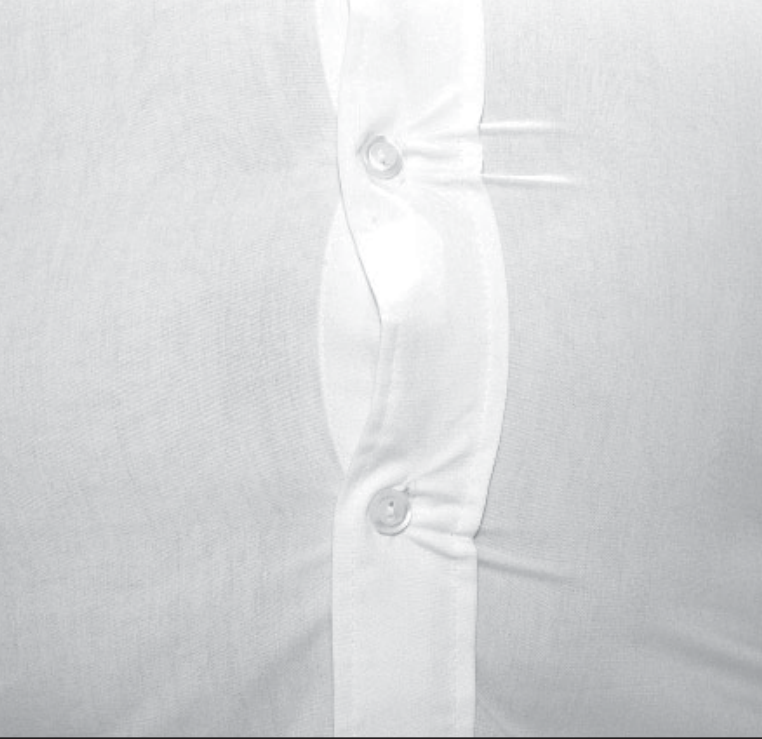
The participant’s parents, who also come to the meeting with the dietician, are absolutely crucial to any weight-loss success, Griffith says, and so are involved from the start. “A

Joan Griffith, who joined UK’s Department of Pediatrics two years ago, heads up the new TEAMS clinic—Teens Enjoying Active Management Systems. “The cornerstones of the program are lifestyle changes, physical activity, counseling, and dietary adjustments.”

parent can be an asset or a saboteur. Think about it: Somebody buys the groceries, somebody brings the food into the house, somebody cooks the food. I want to get the family to the point where they say, ‘*We as a family* will make changes.’”

Although no weight-loss statistics have yet been generated from the current group of participants, Griffith says that TEAMS has been so well-received that program hours, beginning last September, have been extended.

“We know that obesity represents the merger of many factors,” says Griffith. “There’s an energy imbalance. We have to watch calories, but also have to watch how we expend the energy those calories give us.” She believes one of the most important things she and her staff can do, especially in concert with colleagues like Jody Clasey, an associate professor in UK’s Department of Kinesiology and Health Promotion who is the primary exercise physiologist in the TEAMS program, is to get kids and teens to realize that exercise is fun. “Exercise is obviously essential to weight



one young man back at Andrews Air Force Base who was overweight and despondent when he first came to see me. Then after nine months of working hard to lose weight, he stopped in the clinic. ‘Dr. Griffith, do you know what the other students are calling me now?’ he said. ‘No, what?’ I said. ‘They’re calling me “slack butt.” ‘Cause I’ve lost so much weight.’ He’d lost so much his clothes didn’t fit anymore. He lit up my room with his smile. So my theory is:

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loss,” Griffith says. “We’ve got to do what we can to make these kids enjoy exercise. Repeating the words of a young teenager involved with the local Health Department TWEENS Program, Griffith says her motto is ‘Make it fun and they will come.’”

Along with encouraging physical activities the girl or boy already enjoys, Griffith referenced the book titled *Forgotten Neighborhood Games: Get Kids Back Outside and Loving It* by Scott Strother, as an excellent source of neighborhood games that kids used to play after school or after dinner. She hopes the book will spark some interest in “being outdoors and moving.”

Griffith, a board-certified pediatrician since 1985, admits that she once had a more passive attitude toward childhood and adolescent obesity.

“My theory used to be, if the family didn’t come to me asking for my help, there was no reason to do anything because without family involvement and support, it wasn’t going to work. I no longer believe that. I believe now that legally and medically, we as a society have to get involved. We would never think of turning our eyes if we saw a kid who was malnourished, and we need to realize that severe obesity is a form of malnutrition, too.”

Over the years, Griffith has seen her share of happy results from the children and teens she’s worked with. “I remember

One slack butt at a time.”

Anyone 21 years of age or younger is eligible to participate in the TEAMS Program. To join, a child or adolescent can be referred by the primary-care provider, or parents can contact the program directly at 859/323-5643.

## **A Gym of Their Own**

Not so long ago, common wisdom said that kids shouldn’t pump iron. This was also the long-stated policy of the American Academy of Pediatrics (AAP). Kids just weren’t developed enough and could be easily injured by this type of activity, the reasoning went. They needed to wait until muscle and bone developed.

Now, that’s changed. Three years ago, the AAP revised its policy, stating that if proper techniques are used and precautions taken, preadolescents can benefit from strength training. This reversal was music to Jody Clasey’s ears, especially since she already knew a little about kids and strength training.

“What we have in place at UK now in the newly developed Pediatric Exercise Physiology (PEP) Lab located in the Seaton Center are special kid-sized exercise machines. We have the gold standard in this equipment,” says Clasey, an unabashed cheerleader for exercise. She comes across as the type of woman who, if she were your morning jogging

Jody Clasey, an associate professor of kinesiology and health promotion, hopes to expand UK's Pediatric Exercise Physiology lab in the Seaton Center so even more overweight kids can slim down through this exercise program.

partner and you tried to beg off, would pull you out of bed anyway and make you go running with her.

"Using these smaller machines, the preadolescents in our program can do leg presses, leg curls, bicep curls, lat pull-downs, bench presses, shoulder presses, and a seated row. Sits ups are also a part of the regimen," says Clasey, who teaches undergraduate and graduate courses in exercise physiology.

"Children aren't just small versions of adults—they're physiologically and metabolically unique." This equipment was purchased over two years ago with funding provided by the Building Interdisciplinary Research Centers in Women's Health fellowship program and UK large-equipment grants.

These aren't just any kids who show up in the PEP lab to huff and puff for three one-hour sessions a week for 10 weeks. The children Clasey works with in this study are all 7 to 11 years old and have a body mass index greater than the 95<sup>th</sup> percentile based on age- and sex-specific norms. According to a screening requirement, none of the children can show any signs of puberty. In Clasey's program, diet is being monitored but no diet is prescribed—only programmed exercise.

The children in this study don't have far to go if they need help or advice. The training ratio is no greater than one instructor to two children, though Clasey says, happily, that often the children get one-on-one supervision: "We make sure the kids are going through proper breathing technique and proper lifting technique when they're being tested or during training." Other key experts assisting with this study include Kent Adams, associate professor of health promotion, physical education and sports studies at the University of Louisville, and UK grad student Chris Holian.

All children recruited for the study first undergo a physical examination performed by a pediatrician and a body composition analysis involving underwater weighing, total body water analysis and bone scans to measure the relative compositions of muscle, fat, water, and bone in their body. "We need these measurements, and we've done everything we can to make them kid-friendly," Clasey says. "Rather than taking blood samples for the total body water analysis, for example, we just have the kids breathe through a tube submerged in methanol and dry ice that freezes the moisture in the breath. We can get plasma concentrations that way without having any needle sticks involved." Among



other things, these measurements allow Clasey to track changes in the children's body composition.

Though this study isn't complete and she and her staff haven't crunched the final numbers, Clasey says physical changes in the obese kids are noticeable.

"Truthfully, I'm amazed at the body composition changes. Even though one child has gained eight pounds while he's been in the study, he went from a husky 14 pant size to a regular size 11. Another child had completed the intervention study and been away from us for several months. When we called him back for another study, I expected to recruit him as an obese child, but now he fits the lean criteria. I said to his mother, 'What have you been doing?' She said, 'Your program jump-started my whole family. We now grocery-shop together, the children read product labels, and we eat dinner together. Exercise has become a part of our daily routine.'"

Clasey knows that this program works. The PEP lab currently has several ongoing studies involving both lean and obese children, and she's excited about its potential in the years to come. The hobgoblin is funding for the lab. There are, she says, some efforts under way to seek endowment funding so that the lab can continue and grow.

To spread awareness of what the lab offers, Clasey leapt at the chance recently to meet with the governor's wife, Glenna Fletcher, who has made a commitment to support efforts to combat childhood obesity. "Mrs. Fletcher has publicly stated her concerns about obesity in general and the related health problems and health-care costs associated with obesity [Glenna Fletcher is a registered nurse and has devoted much of her time to encouraging and promot-

obesity, will also participate in this program.

"I'm pleased that the work Kent and I have been doing regarding prevention and intervention strategies related to childhood obesity is receiving attention and will increase awareness. It's an honor to be able to represent UK in this way and bring some focus to the research programs ongoing in our state," Clasey commented.

Anyone in the Lexington area interested in information

**"The mother of one of our kids who'd lost significant weight said, 'Your program jump-started my whole family. We grocery shop together, the children read product labels, and we eat dinner together. Exercise has become a part of our daily routine.'"—Jody Clasey**

ing healthier life styles for all Kentuckians], so we wanted to tell her about our efforts at UK." Fletcher met with Clasey and several faculty members from the College of Education and, according to Clasey, it was a fruitful meeting.

"We discussed our past, current and future plans to fight childhood obesity. She was very interested in helping to facilitate efforts across the state to combat obesity by expanding our knowledge and providing resources to assist both children and adults. Perhaps, with the first lady's help and support from others, that can become a reality," Clasey says.

In the meantime, she is pleased with recent news that she has become a HERO.

In September, the Louisville Science Center announced that Clasey has been chosen as one of its KY-HEROS (Kentucky Health Education Rural Outreach Scientists). As a result, her collaborative research into health issues associated with childhood obesity will be transformed into an educational exhibit at the Louisville Science Center for the next two years. The HEROS program is funded by a Science Education Partnership Award from the National Institutes of Health.

Clasey will be one of four Kentucky scientists whose work will be featured at the science center. Kent Adams, a frequent collaborator with Clasey on a number of research initiatives concerning children's physical development and

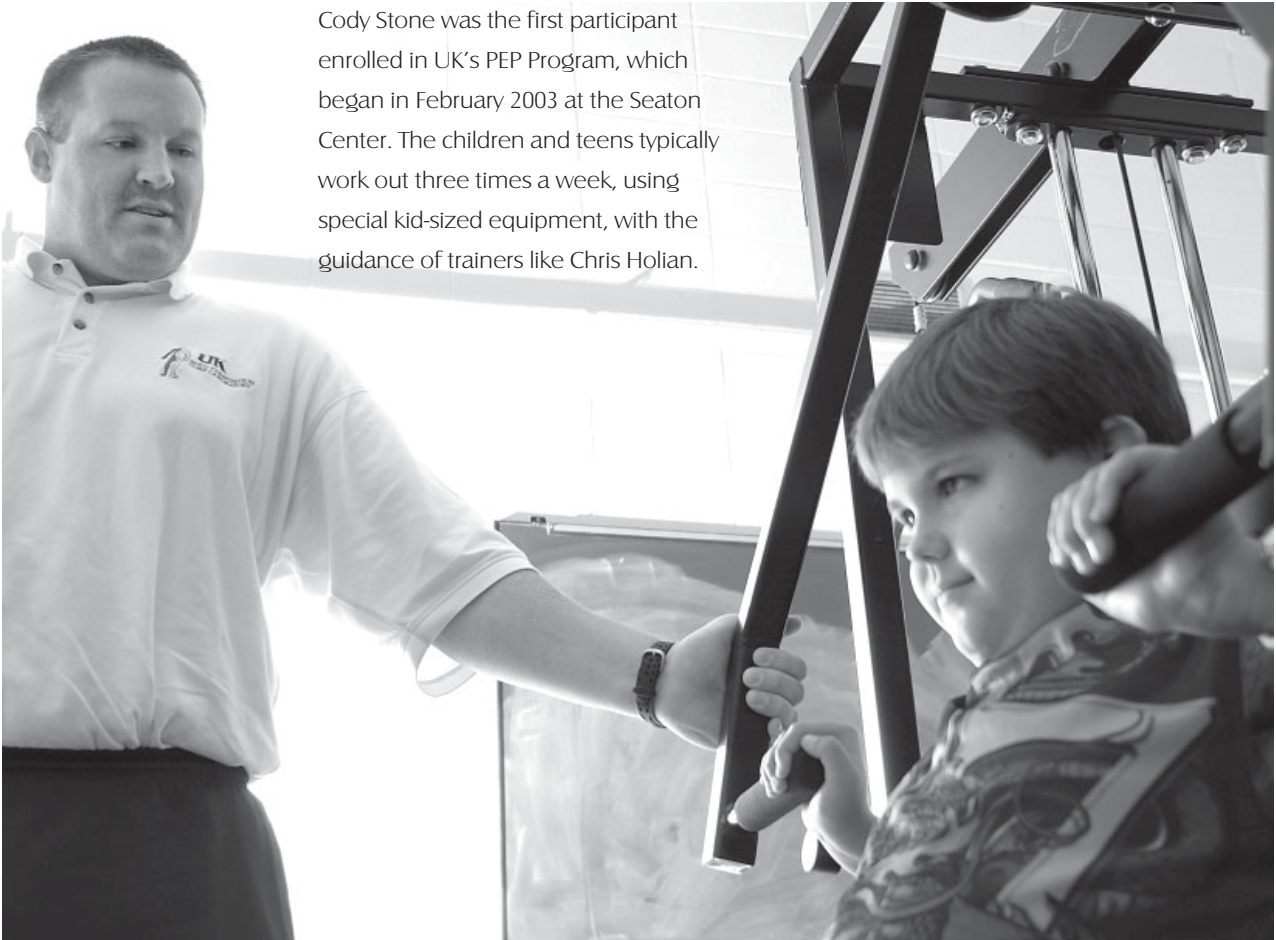
on Clasey's studies should call the UK PEP lab at 859/257-4867 or 859/257-1597.

## **Detecting Type 2 Diabetes: A New Approach**

With type 2 diabetes in children on a rampage, wouldn't it be helpful if there were a clear marker for a kid's propensity to develop type 2? Well, there is. And UK's Leslie Scott in the College of Nursing has completed a study on this telltale mark and its potential as a screening tool for the disease.

"I've been looking at what's called Acanthosis Nigricans," says Scott, who recently completed her Ph.D. in nursing at UK and has been a pediatric diabetes nurse educator at UK since 1994. "And unless you have diabetes or know someone who does, you may have never heard of this. It's a skin condition that is symptomatic of high insulin levels in the body and is frequently associated with obesity. It's a darkening and thickening of the skin that can appear where skin-to-skin contact is made, but is found most often on the back of the neck." Parents often try to wipe this mark off, thinking it's dirt. Some studies indicate that certain populations such as African-American, Pima Indian and Mexican-American children are tagged with this mark more often—and have a higher prevalence of type 2 diabetes—than the national norm.

Cody Stone was the first participant enrolled in UK's PEP Program, which began in February 2003 at the Seaton Center. The children and teens typically work out three times a week, using special kid-sized equipment, with the guidance of trainers like Chris Holian.



It is important to note this condition, Scott says, because these markings can help identify children and adolescents who run the risk of developing diabetes. Once young people at risk are identified, the necessary measures to lower insulin levels and reduce the risk of developing type 2 diabetes can be taken. “The only way this mark will fade is through exercise and proper nutrition.”

Scott's idea of intervention grew into quite an ambitious project. “Elementary school nurses do height and weight screenings annually as part of regular school-based health, so I asked the medical director of the Healthy Kid's Clinics within the Fayette County school system if he thought that looking for Acanthosis Nigricans on the back of the neck could also be included as part of these screenings,” Scott explains. The director thought it was a good idea and gave her the go-ahead.

Scott decided to focus her study on four school-based clinics, with the end goal of trying to determine by the presence of this marker how many children would benefit from further screening for type 2 diabetes. During the 2000-2001 academic year, she trained school nurses to identify Acanthosis Nigricans on the back of the neck of 4- to 12-year-old school children in these clinics. A total of 1,164 students were screened. Scott then reviewed the medical records of this group, looking for relationships between the presence of Acanthosis Nigricans, ethnicity, gender, age, family his-

tory of diabetes, and body mass index.

“In doing this work, my biggest surprise was the number of at-risk kids we found—already overweight or at risk for being overweight.” In Scott's study, 39 percent of the children screened had BMIs greater than the 85<sup>th</sup> percentile, and 22 percent had BMIs above the 95<sup>th</sup> percentile.

“No, let me replace the word ‘surprise’ with the word ‘shock,’” Scott says. “National studies were quoting that only 11 to 13 percent of kids were overweight in that age group. We found 22 percent—almost double what national studies are reporting.”

Acanthosis Nigricans was identified in 26 percent of the kids, 49 percent of whom identified a family history of diabetes. According to the American Academy of Pediatrics and the American Diabetes Association screening guidelines for type 2 diabetes in children, nearly one-third of the children evaluated were eligible for further type 2 diabetes screening.

Rates for overweight, risk for overweight, and the presence of Acanthosis Nigricans among children in this study exceeded national reported estimates, Scott says. “Students in high-risk ethnic groups had higher rates of this marker when compared to non-Hispanic white students.” Rates of Acanthosis Nigricans increased as BMI increased, regardless of ethnicity, age or gender. In discussing the importance of these stats, Scott underscores how obesity clearly

walks arm-in-arm with diabetes down the road of bad health.

Sharon Barton, now Scott's colleague in the UK College of Nursing, has been working to improve the health and well-being of school-age kids and adolescents for 25 years. In recent years, she has focused her research on nutrition and infants, trying to understand how so many children become obese in the first place.

"We're seeing younger and younger children with type 2 diabetes," Barton says. "And from studies I've done of rural Kentucky, what I've seen our kids eat really disturbs me." Infants are getting all kinds of non-nutritious, fattening foods—pizza and fast foods, mashed potatoes and gravy, desserts, and cereal in the baby bottle. Babies under six months were drinking Mountain Dew and Kool-Aid. "And though I was studying rural mothers," Barton says, "I don't know that mothers in Lexington or Louisville or in New York City aren't doing exactly the same thing.

"If you're not being fed healthy foods when you're little, it's going to be very hard to choose healthy foods as you grow up." [For more on her research, check out "Mama's Little Baby Loves Pork & Beans": [www.research.uky.edu/odyssey/fall00/mamasbaby.html](http://www.research.uky.edu/odyssey/fall00/mamasbaby.html).]

Scott's study on *Acanthosis Nigricans* was the focal point of her dissertation, and Barton was the chair of Scott's dissertation committee. So how does the mentor react to her former student's recent work?

"It's groundbreaking," Barton says. "It's the first time anyone has done such a study looking at so many children to determine how a simple, visible marker might be used to predict risk for type 2 diabetes in kids and adolescents. It's huge."

## The Basic Science of Obesity

Eric Smart's research is focused on our body's housekeeper and frontline defender—macrophages. When these cells spot an unwanted intruder, they reach out with a pseudopod, ensnare it, and gobble it up. Macrophages are the Good Guys.

Well, not always, says Eric Smart, a UK professor of pediatrics and Barnstable-Brown Chair in Diabetes. "Basically, bad nutrition can do them in. When people eat a lot of bad things, macrophages do their best at damage control by disposing of some of these things, but if they eat too much they become bad things themselves.

Leslie Scott (left) and Sharon Barton in the College of Nursing are working to teach children and their parents the value of healthy eating habits to help reverse Kentucky's alarming childhood obesity statistics.



Poor eating habits can change the function of macrophages,” Smart explains, “and obesity plays a clear role in turning macrophages bad.”

When someone is obese for a long time, he continues, macrophages begin to participate in an inflammatory process. Long-term activation of macrophages will kill the pancreas, cause plaques to form in the aorta, and increase the risk of heart attack and stroke.

**“Infants are getting all kinds of non-nutritious, fattening foods—pizza and fast foods, mashed potatoes and gravy, desserts, and cereal in the baby bottle.”**

—Sharon Barton



Smart knew that macrophages were an important piece of the obesity puzzle, and three years ago he began a study to find out exactly what roles these natural scavengers play.

In his lab at UK’s Sanders-Brown Center on Aging, Smart and his staff began by isolating macrophages from normal-weight mice, which is easily done through a blood sample. Next, the researchers fattened up the mice and took another blood sample, again isolating the macrophages. Then the mice were put on strict diets and exercised so they would return to their original weight. A third blood sample was taken.

“What we’ve been interested in all along is proteins that change at these different stages,” Smart explains, “not genes, but proteins. Lots of genes change, but that doesn’t have any direct effect on function. If proteins change, that usually causes a direct functional effect.”

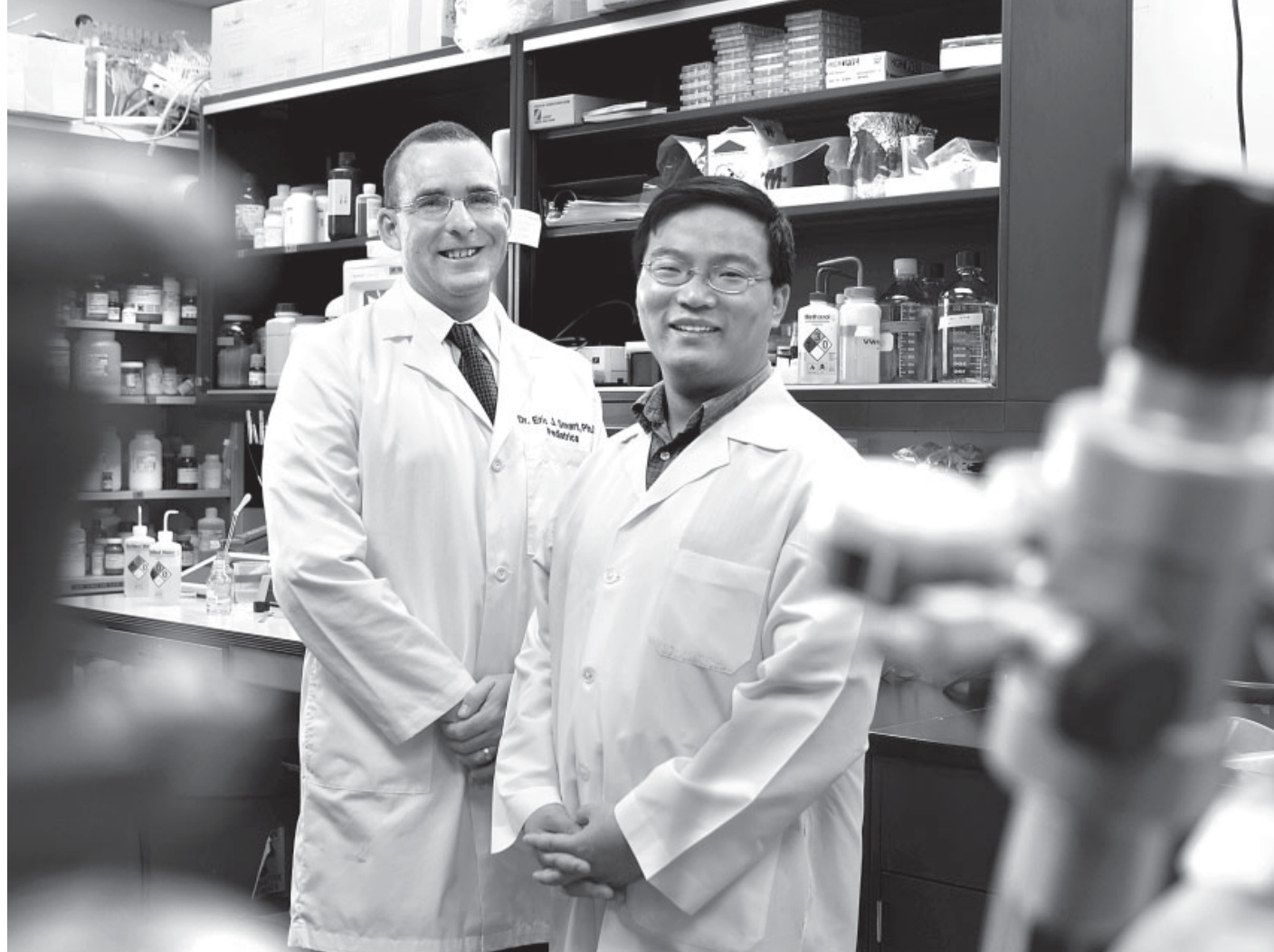
Smart and his group are looking specifically at a special piece of the macrophage membrane, called a lipid raft, which functions like an air traffic control tower. This raft moves within the membrane—it actually floats—which is how it got its name. Basically, Smart explains, a lipid raft controls signals from outside and inside the membrane, and directs them to where they should go.

*continued on p. 16*

## Couch Potatoes in Training

- Kids spend more time sitting in front of electronic screens than any other activity besides sleeping.
- Kids watch nearly 3 hours of television every day.
- The average time spent with various media (televisions, computers, video games) is nearly 4 1/2 hours per day among 2 to 17 year olds.
- The incidence of obesity is highest among children who watch four or more hours of television a day and lowest among children who watch an hour or less a day.
- 1 of 3 children ages 2 to 7 have a TV in their room.
- \$15 billion a year is spent marketing to kids, and half of all ads during children’s TV shows are for food.

Sources: The Annenberg Public Policy Center; SUNY at Buffalo; Johns Hopkins University; the National Cancer Institute; the Centers for Disease Control and Prevention; the Center for Science in the Public Interest; and the *Lexington Herald-Leader*.



“We already know that fat and cholesterol directly affect the lipid rafts,” says Smart, “and that diet will change them. What we’re doing now is looking more intensely at the functions of these rafts.”

The researchers are isolating these pieces of membrane to do a protein search. “Lipid rafts in normal animals contain around 250 proteins,” says Smart. “What we’re looking for is protein change after the mice are obese. What proteins are present now that weren’t before? What proteins disappeared?” Proteins unique to the raft when the animal is obese could possibly be harmful, which is why they are the focus of interest. The flip side of the question is also important: What proteins have disappeared? These may have been contributing to good health, so it’s important to identify them if, now, they are missing in action.

Then there’s the third stage of weight control, when the mice are returned to normal. “It’s interesting that when the animals are brought back to their original weight, the protein complex is not the same as it was initially. The difference in the proteins that show up in this stage is something very important to look at because it has important clinical implications,” Smart says. “We know, for example, that there’s a residual effect when obese people go back to normal weight; they don’t really get back to baseline ‘normal.’ They still tend to have some health

problems related to their previous obesity.”

If Smart and his staff discover that certain proteins don’t “come back” in the post-obesity phase in humans, these proteins could be targeted and replaced with a drug or a treatment. And Smart’s lab is already out in front of this.

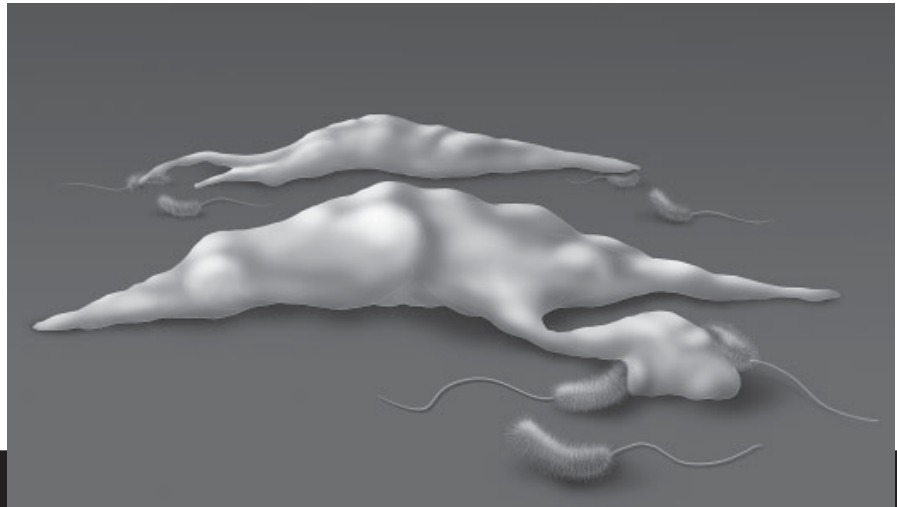
“Part of my team is working to understand the why and how of these protein changes. The other part of my lab is looking at different drugs that are known to affect particular proteins.”

Smart says that he couldn’t even attempt a project like this without the postdocs and grad students who work long hours in the lab. In addition to this team effort, there’s another “essential player” in the mix.

“Our lab does all the biology—it’s very intensive work, collecting the macrophages and going through the analysis. Then our partner, Dr. Haining Zhu in molecular and cellular biochemistry, does the chemical analysis.” Zhu is an expert in proteomics—the identification, characterization and quantification of all proteins involved in a particular pathway, cell or tissue. In his work with Smart, he characterizes the proteins found in the lipid rafts in each stage of mouse weight. “It’s a great partnership,” Smart says.

So what about clinical trials with humans? Is that part of Smart’s game plan?

Eric Smart (left) in UK's Department of Pediatrics and Haining Zhu in the Department of Biochemistry are collaborating to identify "obesity proteins." The basic science of obesity is the first step, Smart says, on the road toward human clinical trials.



Tom Dolan, UK medical illustrator

When macrophages, the body's frontline defenders, spot unwanted intruders such as these bacteria, the cells reach out with a pseudopod, ensnare the intruders and gobble them up.

"Yes, absolutely. What our animal studies will do is give us good candidates for drugs that can be used in therapy, and then we need to set up our own human study to see if what we've discovered is applicable to kids," he says, clearly excited by this prospect. "And because we have people here like Joan Griffith, Jody Clasey and Jim Anderson, we can do that, right here at UK.

"What's crucial is to get kids to lose excess weight as quickly as possible, because the shorter the time you're obese, the less damaging the long-term effects are." ■

