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NUTRITION & YOUR CHILD

STUDY DIGS DEEPER IN TO MOBILE HEALTH TO HELP PREVENT OBESITY

Obesity is a significant public health concern in the United States. Pre-adolescent African-American girls, a group that is impacted by obesity, experience the epidemic in greater numbers than their non-Hispanic white peers. A study conducted by experts at the USDA/ARS Children's Nutrition Research Center at Baylor College of Medicine reports the feasibility and acceptability of an obesity prevention program using text messages designed to help parents of African-American girls create a home environment that promotes and supports obesity prevention. The study appears in the journal *Children*.

"Obesity prevention programs are needed to help parents create a home environment that promotes and supports child obesity prevention," said Dr. Deborah Thompson, research nutritionist at the CNRC and professor of pediatrics-nutrition at Baylor.

The study consisted of sending text messages designed to help parents create a healthy home environment for their 8- to-10-year-old African-American daughters. Text messages focused on ways to create a positive physical activity environment, provide healthy food choices, limit sedentary time, promote adequate sleep and reduce stress. The texts were grounded in self-determination theory to help parents develop autonomous, or self-directed, motivation to make changes in the home environment.

Parents received 36 text messages over 12 weeks, or 3 per week. The feasibility and acceptability of the program was assessed through parent surveys, a poststudy interview and staff logs.

All parents who participated in the study were mothers. They had positive reactions to the program and reported liking the text messages and using them to make changes. They also reported liking the website links in the text messages. Many also reported sharing the text messages with others.

In conclusion, researchers found that a theoretically grounded mobile health child obesity prevention intervention is feasible and acceptable to mothers of 8 to-10-year-old African American girls.

"This study showed that a simple approach may be an effective way to promote child obesity prevention. Mobile health interventions are convenient because parents don't have to travel to a particular location at a specific time to participate," said Thompson, "and they are available 24/7. Given the time demands faced by busy families in today's world, the results of this study suggest that mobile health interventions may provide a simple and convenient way to help parents make positive changes in the home environment."

REGULATING ASPROSIN LEVELS MIGHT HELP CONTROL APPETITE, WEIGHT

Obesity affects about 40 percent of adults and nearly 20 percent of children and adolescents in the United States and is considered to be a primary contributor to heart disease, stroke, type 2 diabetes and certain types of cancer. Not surprisingly, identifying innovative approaches to treat obesity is high in the list of national research priorities.

Less than two years ago, researchers led by Dr. Atul Chopra, a medical geneticist at Baylor College of Medicine and a member of the Dan L Duncan Comprehensive Cancer Center, discovered a new hormone called asprosin that opens an intriguing possibility for developing novel treatments for overweight people.

"We discovered asprosin when studying individuals affected by a rare medical condition called neonatal progeroid syndrome," said Chopra. "We found that individuals with neonatal progeroid syndrome produce a version of a protein called fibrillin-1 that is shorter than the one produced by people without the syndrome. We called asprosin the small piece missing in people with the syndrome."

One of the key features that defines neonatal progeroid syndrome is extreme thinness or very low body weight. To understand the cause of this issue, Chopra and his colleagues assessed the food intake pattern and metabolic rate of the subjects.

"Compared with individuals with normal weight, individuals with neonatal progeroid syndrome expend less energy. We also found that they have an abnormally low appetite and eat fewer calories. Because these individuals have low blood asprosin levels due to their mutations, we wondered whether asprosin was in fact necessary to maintain normal appetite in people." Chopra said.

What does asprosin do?

To investigate how the neonatal progeroid syndrome mutation affected the individuals' appetite, the researchers genetically engineered mice to carry the same genetic mutation the human subjects have. The result was mice that mimicked the human condition: they had low blood asprosin levels, low appetite, and were very thin.

"In this mouse model we were able to reverse the low appetite simply by administering asprosin to the mice," Chopra said.

To understand how asprosin controls appetite, the researchers turned to colleagues at the USDA/ARS Children's Nutrition Research Center (CNRC) who specialize in studying brain circuits that control appetite.

"In collaboration with Dr. Yong Xu's lab, we found that in the brain asprosin interacts with neurons in the appetite center of the hypothalamus," Chopra said. "There are two types of neurons involved in appetite control. One type, the AgRP neurons, stimulates appetite while the other type, POMC neurons, suppresses it. Asprosin works on both types of neurons in an opposite manner; it activates appetite-stimulating AgRP neurons and it deactivates appetite-suppressing POMC neurons."

"The effects of asprosin on AgRP and POMC neurons appear to be quite unique, as we did not find asprosin changing the firing activities of other appetite-regulating neurons," said Xu, CNRC associate professor of pediatrics - nutrition and of molecular and cellular biology at Baylor and corresponding author of this work.

The resulting effect of these two asprosin actions in the brain is an increase in appetite, a phenomenon that is deficient in individuals and mice with neonatal progeroid syndrome.

Asprosin and obesity

In addition to studying individuals with neonatal progeroid syndrome who have low levels of asprosin, the researchers also studied individuals with obesity and found that they had increased levels of blood asprosin.

"We developed an antibody against asprosin that can neutralize asprosin function completely. We administered this antibody to obese mice and found that the mice ate less and lost weight. Significantly more work remains; however, these results potentially open the door on a completely new way to treat obesity." Chopra said.

Research also suggests that asprosin immunotherapy also can be used to treat diabetes.

Other contributors to this work include researchers affiliated with one of more of the following institutions, Baylor College of Medicine, the CNRC, the National Institutes of Health (NIH) and the University of Texas Health Science Center at Houston.

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IRON DEFICIENCY STUDY

Iron deficiency and its associated anemia can have negative health impacts, and this is especially true for breast-feeding mothers and their infants. The concentration of iron and other minerals in the mother's breast milk supplies the minerals for her infant, which can impact their development. Researchers at the USDA/ARS Children's Nutrition Research Center at Baylor College of Medicine wanted to determine if the concentration of these minerals in breast milk was related to mutations in specific genes. Their latest research, which used mouse models to further understand this concept as it relates to humans, was published in the journal *Mammalian Genome*. The study's first author, Dr. Darryl Hadsell, associate professor of pediatrics at the CNRC, discusses the study methods and significance of the findings.

What did the study focus on?

Breast milk is an important source of minerals for the nursing infant. Previous work has demonstrated that the presence of certain genetic mutations in human populations can negatively affect the concentrations of key minerals in milk. This can have serious negative consequences for the nursing infant. In some cases, these same mutations also have been observed in mouse models of lactation, supporting the suggestion that a broader study on the genetic regulation of milk minerals in mice could lead to insights about the role of common genetic variation in the regulation of milk minerals in mice, humans or even other lactating mammals. The study focused on measuring the amounts of nine different minerals in milk from several different mouse strains. Among the more important minerals measured were calcium, zinc and iron. It is well-established that these three minerals are extremely important to normal infant development. The overall goal of the study was to determine if variations in the concentrations of these minerals could be associated with specific regions in the mouse genome and, consequently, with specific genes. Such an association would suggest that these regions or genes could play a role in regulating milk mineral concentrations

How was it conducted?

The study was conducted by collecting milk samples from more than 300 different nursing female mice in 32 different genetic backgrounds. We simultaneously measured milk concentrations of calcium, magnesium, iron, copper, sodium, potassium, sulfur, iron and zinc. By combining the results of these measurements with publically available data for a type of genetic variation known as single nucleotide polymorphisms, or SNPs, we were able to test different regions of the mouse genome to determine if there exists statistical association between SNP genotypes and the concentrations of the above minerals in milk.

What did you find?

There were several findings from this work.

- Firstly, we found that all of the minerals studied varied considerably among milk samples depending on genetic background or strain of the mouse. In particular, we found that for milk iron there were two strains whose milk contained on average more than 30 percent more iron than all the other strains.

- Secondly, we detected 15 different locations across the mouse genome that were associated with differences in the concentrations of the milk minerals. Among the more interesting of these was a region on the mouse chromosome that was associated with milk iron concentrations. This genomic region, known as a locus, was also found to contain several genes that encode for proteins that transport minerals across cell membranes. In particular, this was found in a specific protein known as ferroportin and a second known as Slc9a2, which has been previously shown to be important for iron absorption in the small intestine. By comparing the expression of this gene and other transporter genes located nearby in both the small intestine and the mammary gland, we also found that mouse strains that carry different SNP genotypes in this iron-associated region display different levels of gene expression. This last finding supports the idea that genetic mutations in the DNA near ferroportin and the other transporter genes located in this iron-associated region may regulate the expression of these genes and thereby control milk iron concentrations.

What are the implications of the findings?

Iron deficiency and the associated anemia are known to be important problems on a global scale. In addition, although iron deficiency is frequently observed in both breastfeeding mothers and their infants, the deficiency is not always corrected by dietary supplementation. This supports the suggestion that other factors like the mother's genetics could also play an important role in regulating the availability of minerals, like iron, for her infant. Our findings demonstrate that specific locations in the genome contain genes that are important to the genetic regulation of milk iron secretion and could be targeted with drugs or other therapeutic strategies to help increase the concentrations of this mineral in breast milk.

Where do you go from here with the research?

There are mainly two avenues of research that we would like to pursue. The first is to research in more detail the importance of ferroportin and Slc9a2 to the transport of iron by mammary cells. To do this we plan to use genetically engineered mouse models to determine if loss of one or both of these genes from mammary cells decreases the iron concentrations in milk. Conversely, by overexpressing one or the other of these two proteins in the lactating mammary tissue of genetically engineered mice we could determine if milk iron concentrations can be increased. The second avenue is to study milk from breast-feeding moms to determine if, like the mouse, there are specific regions in the human genome that control variation in milk mineral concentrations.

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VOLUNTEER FOR A CNRC NUTRITION STUDY

Houston-area residents are invited to participate in the following nutrition research projects designed to help CNRC scientists learn more about the nutritional needs of children. Free parking is provided. For most studies financial compensation is provided.

For questions about our studies, call Noemi Islam at 713.798.7002 or email nislam@bcm.edu.

Abdominal Pain Study H-34372 Children aged 7 to 17 with stomach pain related to diet are needed for a research study. Participants will be provided food to begin a specific diet on two separate weekends to determine whether this will help the pain. Providing blood samples is optional. Financial compensation provided and parking is compensated. Apply directly by completing an online survey. For more information, please contact Vanessa Thyne at 832.822.3621 or vanessa.thyne@bcm.edu.

Adult Volunteers Needed H-34291 Volunteers aged 18 to 65 who are either healthy and overweight, or have been diagnosed with type 2 diabetes within the last three years are needed for a metabolic study. The study will investigate whether healthy volunteers, type 2 diabetics and ketosis-prone diabetics make an important compound called arginine in different amounts. Healthy, overweight volunteers should have no chronic medical conditions, and all who reply should consume a diet adequate in calories and protein. Women must not be pregnant.

Baylor Infant Orometer Study H-40416 Researchers are conducting a study to examine infants' (4 months old) feeding behaviors and their overall behavior. The study requires two visits to the CNRC. Financial compensation is provided. For more information, contact Mackenzie Senn at 713.798.0355 or mackenzie.senn@bcm.edu.

Healthy Pediatric Volunteers Needed H-43759 Researchers are looking for healthy boys and girls aged 10 to 18 for a study that compares the microbiome of children with primary sclerosing cholangitis (PSC) and ulcerative colitis (UC) to that of healthy children. Those interested must be declared healthy by their pediatrician, speak English fluently, and not be taking any medications, including antibiotics or hormonal birth control, for at least 6 months prior to participation. Eligible volunteers would collect stool and saliva samples at home five times througout one year and send completed samples using a pre-paid mailing package. They also would answer a brief online questionnaire at the time of sample collection. Participants will be compensated. If interested, please email ckovvali@bcm.edu.

Survey for Fathers H-38237 Fathers with children ages 5 to 11 are needed to answer an online questionnaire about their interactions with their child to promote physical activity and eating behaviors. Compensation provided. If interested, call Alicia at 713.798.0503, email healthydads@bcm.edu (subject: Fathers' Study) or visit www.healthydads.net.

Teen Heart Health H-30665 Adolescents and young adults aged 12 to 21 (normal weight and overweight) with and without type 2 diabetes are needed for a research study investigating risk for heart disease in youth. Study involves body composition, scan and blood tests. Financial compensation provided.

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