Baylor College of Medicine

USDA/ARS CHILDREN'S NUTRITION RESEARCH CENTER

Office of Communications & Community Outreach
Baylor College of Medicine
One Baylor Plaza, Suite 176B
Houston, Texas 77030-3411

Non-Profit
Organization
U.S. Postage
PAID
Houston, Texas
Permit 2597

NUTRITION & YOUR CHILD
is published quarterly by Baylor College of Medicine as a research and information update for the general public and Center volunteers and supporters. Send comments or change of address information to

Children's Nutrition Research Center
1100 Bates Street
Houston, TX 77030-2600
cnrc@bcm.edu
www.kidsnutrition.org

Center Director
Dennis M. Bier, M.D.

Publication Advisors
Janice C. Baranowski, M.P.H., R.D.
Nancy E. Moran, Ph.D.
Marta L. Fiorotto, Ph.D.
Karen W. Cullen, Dr.P.H., R.D.
Teresia Margareta O'Connor, M.D., M.P.H.
Stephanie Sisley, M.D.
Jayna M. Dave, Ph.D.
Robert A. Waterland, Ph.D.

Editors
Dipali Pathak and Dana Benson
Office of Communications & Community Outreach
Baylor College of Medicine

The Children's Nutrition Research Center is operated by Baylor College of Medicine, in cooperation with Texas Children's Hospital, for the Agricultural Research Service of the United States Department of Agriculture.

Join 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. Financial compensation is provided for most studies.

FOR MORE INFORMATION ON ANY OF THE FOLLOWING CNRC NUTRITION STUDIES, CONTACT
Noemi Islam at 713-798-7002 or nislam@bcm.edu

VOLUNTEERS

Adult Volunteers Needed H-34291

Healthy, overweight volunteers aged 18 to 65 and volunteers diagnosed with type 2 diabetes within the last three years, also aged 18 to 65, 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 Twin Study (BITS)

H-36097 Are you expecting twins or have twins less than 4 months of age? Twin infants are needed for a research study on twins from 4 months through 3 years of age. The research is to learn more about infant and child feeding and behavior. Two visits are required at the Children's Nutrition Research Center, and other visits are conducted by mailed questionnaires.

Fatty Liver H-31469

Does fat in the liver increase the future risk for heart disease? 11- to 21-year-old overweight adolescents and young adults with and without fatty liver disease are needed for a research study investigating the risk for early heart disease in youth. Study involves body composition, liver scan and blood tests. Compensation provided. If interested, call 713.798.6791 or 713.798.6715.

Teen Heart Health H-30665

Normal and overweight 12- to 21-year-old adolescents and young adults 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. Compensation provided. If interested, call 713.798.6791.

Baylor Infant Orometer Study H-40416

We are seeking infants 1 to 4 months old for a one-visit study at the CNRC to examine infants' feeding behaviors and their overall behavior. Financial compensation provided. For more information, contact Maria Papaioannou at 713.798.7054 or papaioan@bcm.edu.

Satiety Regulation Study H-40538

Researchers are seeking 4 and 5 year olds for a one-visit study at the CNRC to measure the levels of certain hormones that influence fullness in preschool children. Lunch and financial compensation provided. For more information, contact Sandra Lopez at 713.798.6779 or slopez@bcm.edu.

GC80811

VOL 3 ▪ 2017

NUTRITION & YOUR CHILD

THE ROLE OF ACCULTURATION IN WEIGHT GAIN FOR ASIAN AMERICAN CHILDREN

The role of acculturation, the process of becoming adapted to traits from another culture, has been studied for its impact on many aspects of a person's health, including nutrition and risk for diseases such as diabetes and cancer. Researchers at the USDA/ARS Children's Nutrition Research Center at Baylor College of Medicine recently looked at how acculturation impacts weight in Asian American children. Their report appeared in *Preventive Medicine*.

"There have been studies showing that with more time in the United States, with greater acculturation levels, Asian American children's obesity rates begin to rise, and there have been studies showing their obesity rates can become equivalent to those born in the United States," said Cassandra Diep, who was a researcher at the CNRC at the time of the study and is now on faculty at Rice University.

An Asian diet is typically lower in meat intake and higher in fruit and vegetable intake. Therefore this traditional Asian diet is considered to be healthier than the Western diet which is consumed in the U.S.

While most of the previous studies that have been cross-sectional, meaning that they study one point in time, Diep and colleagues wanted to look at weight change across several years. Their study focused on weight change in Asian American children from kindergarten to second grade and how it was related to acculturation.

They used data from the Early Childhood Longitudinal Study, sponsored by the National Center for Education Statistics. The organization sampled more than 18,000 children and followed a cohort of these children from kindergarten to fifth grade. For their study, Diep focused on a sample of 1,200 Asian children from kindergarten to second grade.

Researchers looked at the children's height and weight to calculate body mass index (BMI) and classify them into four weight change groups:

- Consistently healthy weight: healthy weight in kindergarten as well as in second grade
- Consistently overweight or obese: overweight or obese in kindergarten as well as in second grade
- Healthy weight change: overweight or obese in kindergarten and healthy weight in second grade
- Unhealthy weight change: healthy weight in kindergarten to overweight or obese in second grade

Researchers also measured acculturation among each child's mother using proxy measures because there is no scale to measure acculturation in the Early Childhood Longitudinal Study. Proxies included English proficiency and percentage of the mother's life spent in the U.S.

CONTINUED ON PAGE 3

RAP1, A POTENTIAL NEW TARGET TO TREAT OBESITY

Scientists at Baylor College of Medicine, the National Institutes of Health and Virginia Tech Carilion Research Institute have discovered a new mechanism in the mouse brain that regulates body weight. The study, which appears in *Cell Reports*, shows that this new mechanism potentially can be targeted to treat obesity.

"It's well known that the brain is involved in the development of obesity, but how a high-fat diet changes the brain so it triggers the accumulation of body fat is still unclear," said senior author Dr. Makoto Fukuda, assistant professor of pediatrics at the USDA/ARS Children's Nutrition Research Center at Baylor College of Medicine.

Fukuda and his colleagues studied the mouse Rap1 gene, which is expressed in a variety of tissues, including the brain where it is involved in functions such as memory and learning. Little was known, however, of the role the brain Rap1 gene plays in energy balance. To explore this in a mouse model, the scientists selectively deleted the Rap1 gene in a group of neurons in the hypothalamus, a region of the brain involved in regulating whole-body metabolism.

The scientists had two groups of mice. In one group, the mice were genetically engineered to lack the Rap1 gene, while the control group had a functional Rap 1 gene. They fed the mice in both groups a high-fat diet in which 60 percent of the calories came from fat. As expected, the control mice with a working Rap1 gene gained weight. However, the mice that lacked Rap 1 gained less weight and body fat. Interestingly, when both groups of mice were fed a normal, low-fat diet, both had similar weights and body fat.

The scientists then looked more closely at why the mice lacking the Rap1 gene had not gained as much weight, despite eating a high-fat diet.

"We observed that the mice lacking the Rap1 gene were not more physically active. However, they ate less and burned more body fat than mice with Rap1," said Fukuda. "These observations were associated with the hypothalamus producing more of a specific hormone, called POMC, that reduces appetite and less of the hormones that stimulate appetite, called NPY and AgRP."

CONTINUED ON PAGE 3

THE FIGHT AGAINST CHILDHOOD OBESITY TURNS TO VIDEO GAMES?

When it comes to fighting the childhood obesity epidemic, researchers at the USDA/ARS Children's Nutrition Research Center at Baylor College of Medicine are tackling the problem from all angles, including utilizing video games as a way to impact children's healthy eating behaviors, particularly fruit and vegetable consumption.

"Consuming adequate amounts of fruit and vegetables is part of a healthy lifestyle and has been associated with decreased risk of chronic diseases, including diabetes, but few children are meeting the guidelines," said Dr. Debbe Thompson, USDA/ARS nutritionist and associate professor of pediatrics. "Increasing and maintaining consumption could have important, sustained public health benefits, and we believe that online video games may be a familiar and convenient method to reach youth with health-enhancing programs."

It may seem a little curious that researchers are examining videogames as a way to help fight the child obesity epidemic, Thompson acknowledged.

"Video games are a sedentary activity, so it may seem a little odd that they are being studied as a way to help fight child obesity," she said. "However, studies suggest that a special type of video games, called 'games for health,' may reach children in a way that attracts and holds their attention long enough to help them develop important behavior-change skills."

"We believe that online video games may be a familiar and convenient method to reach youth with health-enhancing programs."

Games for health are video games designed to entertain, but to also change behavior, Thompson explained. While video games are a promising tool, researchers don't fully understand how best to design them so that players achieve and maintain behavior change. Recent research by Thompson published in the *Games for Health Journal* set out to understand just that. She examined the actual use of the behavior change components embedded in Squire's Quest! II, a 10-episode online video game developed by CNRC researchers focused on increasing fruit and vegetable consumption among fourth and fifth grade children, roughly 9 to 11 years old.

"We had already evaluated the game and published its effect on fruit and vegetable consumption, but wanted to go back and take a deeper look at information and components within the game that could inform design of future games," Thompson said.

The game was grounded in behavior-change techniques that included having the children set goals for eating fruit and vegetables and making simple fruit and vegetable recipes, planning how to accomplish their goals, self-monitoring their success at meeting their goals, reviewing how they could meet goals that were not met, and receiving feedback. The game also offered the child choices, connected goals to personal values, and taught important knowledge and skills, such as the difference between fruit and vegetable "imposters" and "real" fruit and vegetables – for example carrot cake vs. carrots. These techniques were integrated into the game to enhance self-efficacy, or confidence in the ability to successfully perform a behavior, and autonomous, or internalized, motivation, both of which have been shown to be key to behavior change in children.

"We can be motivated for a lot of reasons, like a parent saying if you eat your fruit and vegetables, you can have dessert, which is a form of external motivation. But if motivation is internal – in other words, you do it because it's part of how you see yourself – you're more likely to continue that behavior," Thompson said. "That's the type of motivation we wanted to increase."

Here's how the game worked: The children began the game as squires who were attempting to become knights in the Kingdom of Fivealot. To demonstrate their worthiness to become knights, the players received two challenges (goals) each episode that had to be met in the real world – one was to eat more fruit and vegetables and the other was to make a fruit and/or vegetable recipe that had been demonstrated in the game. The challenges were issued by a wizard who served as a mentor in the game as the players attempted to gain the knowledge and skills required to become knights.

As part of the game, children were to create behavioral action plans and/or coping plans as part of goal setting. The action plans were specific plans of how to meet their goals, while the coping plans were if/then plans to overcome barriers to meeting their goals

Ninety-one percent of the children in the study completed all 10 episode of the game. Use of the behavioral components also was high across all children in the study; however, only the children who created action plans increased and maintained their fruit and vegetable consumption for three months after the game ended.

"Although more research is needed to figure out why this occurred, it may have been because action plans gave children guidance in how to attain their goals, which gave them experience at successfully adding fruit and vegetables into their meals and snacks," Thompson said. "On top of this, the game components helped them develop internal motivation for eating fruit and vegetables and confidence that they could eat more fruit and vegetables each day. Additionally, an expert panel of kids helped create the game by vetting characters, storylines and even the behavior change components. This likely led to a child-friendly game that presented the behavior-change components in a developmentally-appropriate way. Since the children in the action group increased and maintained their fruit and vegetable consumption, future research can explore what specific factor or combination of factors led to this."

"When asked to grade the game, like in school, most children gave it an 'A' or 'B.' We were excited to see this," Thompson said. "For game designers, this suggests that integrating behavior-change techniques into an entertaining video game can be successfully achieved without detracting from child participation or appeal. This may ultimately provide important information about how to develop effective games to help children adopt healthy behaviors like eating fruit and vegetables."

The research was supported by the National Institutes of Health, National Institute of Child Health and Human Development and the USDA/ARS.

THE ROLE OF ACCULTURATION

(CONTINUED FROM PAGE 1)

Other demographic variables were considered, including child's age, gender, household factors such as living with two biological parents and socioeconomic factors such as poverty status.

A secondary aim of the study was to look at differences across Asian ethnic groups, because many studies have grouped Asian Americans together; however, there are cultural differences between the ethnicities. Researchers categorized the children into five categories: children with at least one parent born in China, Hong Kong or Taiwan were classified as Chinese; those with at least one parent born in India, Pakistan, Bangladesh, Sri Lanka, Nepal or Bhutan were classified as South Asian; and the three other groups were Vietnamese, Filipino and other.

Researchers found that children of more acculturated mothers were more likely to be a healthy weight in kindergarten and second grade than to change their weight status or be overweight or obese.

They also found lower levels of acculturation were protective against BMI change for children from lower socioeconomic groups. For mothers who had a lower socioeconomic status, the likelihood of their child being consistently overweight or obese increased with more acculturation.

"With less acculturation, the lower socioeconomic status group may be retaining the healthier food intake patterns," Diep said, which may protect them from gaining excess weight. "The rest of the sample may have healthier behaviors, such as seeking medical care, having higher levels of healthcare utilization or a higher quality of healthcare, as demonstrated by other studies. Diep also cautions that by relying on proxy measures for acculturation, some important aspects of acculturation may have been missed.

Finally, they found that among the different ethnic groups that they compared, Filipino children had not only the highest prevalence but also statistically the highest odds of being overweight or obese in kindergarten and second grade.

"That indicates that as researchers, especially if we're interested in Asian Americans, perhaps we need to focus on Filipino Americans because they are of the Asian ethnic groups at the highest risk compared to the other groups," Diep said.

"Our main takeaway is that the relationship between acculturation and weight change is not as clear as it seems. There are a lot of factors that may be involved. Understanding the variables that might influence the relationship between acculturation and obesity, such as healthcare utilization, is important," she said. "This work addresses the national, ethnic and cultural differences known to exist among different Asian populations."

Others who took part in the study include Dr. Tom Baranowski from Baylor and the CNRC and Dr. Rachel Kimbro from Rice University.

Baranowski was funded in part with federal funds from the USDA/ARS under Cooperative Agreement No. 58-6250-0-008.

"This work addresses the national, ethnic and cultural differences known to exist among different Asian populations."

RAP1, A POTENTIAL NEW OBESITY TARGET

(CONTINUED FROM PAGE 1)

The mice lacking the Rap1 gene also had lower levels of blood glucose and insulin than controls.

The scientists also were interested in studying whether leptin changed in mice lacking Rap1. Leptin, the 'satiety hormone' produced by fatty tissue, helps regulate body weight by inhibiting appetite. Obese people, however, do not respond to leptin's signals of satiety, and the blood levels of leptin are higher than those in lean people. This 'leptin resistance' is a hallmark of human obesity.

Interestingly, mice that lacked Rap1 had higher sensitivity to leptin regardless of diet types, and leptin sensitivity was increased before the mice significantly gained weight after consuming a high-fat diet. Perhaps increased leptin sensitivity contributes to its anti-obesity effects.

Fukuda and colleagues also tested the effect of inhibiting Rap1 with drugs instead of deleting the gene on mice on a high-fat diet. The scientists inhibited Rap1 action with an inhibitor, ESI-05.

"When we administered ESI-05 to obese mice, we restored their sensitivity to leptin to a level similar to that in mice eating a normal diet. The mice ate less and lost weight," said Fukuda. This inhibitor likely will be of interest to drug companies to treat obesity.

The study shows a new mechanism by which the brain can affect the development of obesity following consumption of a high-fat diet. Consuming a high-fat diet results in changes in the brain that increase Rap1 activity, which in turn leads to a decreased sensitivity to leptin, and this sets the body on a path to obesity.

"This new mechanism involving Rap1 in the brain may represent a potential therapeutic target for treating human obesity in the future," said Fukuda.

Other contributors to this work include Kentaro Kaneko, Pingwen Xu, Elizabeth L. Cordonier, Siyu S. Chen, Amy Ng, Yong Xu and Alexei Morozov. This work was supported by USDA/ARS 6250-51000-060-02S, AHA-14BGIA20460080, NIH-P30-DK079638 and NIH R01DK104901, AHA-50515POST22500012 and the Uehara Memorial Foundation 201340214.