



## BORN TO RUN? STUDY SUGGESTS LOVE OF EXERCISE MAY START IN THE WOMB

Baylor College of Medicine researchers have discovered that female mice that voluntarily exercise during pregnancy have offspring that are more physically active as adults. The research appears in the *FASEB Journal*.

Dr. Robert A. Waterland, associate professor of pediatrics – nutrition and of molecular and human genetics at the USDA/ARS Children's Nutrition Research Center at Baylor and senior author of this work, noted that although their research studied mice, "several human studies have reported results consistent with ours."

For example, observational studies have found that women who are physically active when they are pregnant have children who tend to be more physically active. But these results could be attributed to the mothers' influence on the children after they were born. Or, mothers could pass to their offspring a genetic predisposition to be physically active.

"Our study in a mouse model is important because we can take these confounding effects out of the equation. We studied genetically identical mice and carefully controlled the amount of physical activity of the mothers before pregnancy," said Waterland.

The Baylor team selected female mice that enjoyed running. Then they divided them into two groups. One was allowed access to running wheels before and during pregnancy, and the other was not.

During early pregnancy, the females with running wheels ran an average of 6.2 miles a night. They ran less as pregnancy progressed, but even by the beginning of the third trimester they ran (or walked) about 1.9 miles each night.

The researchers found that the mice born to mothers that exercised during pregnancy were about 50 percent more physically active than those born to mothers who did not exercise. Importantly, their increased activity persisted into later adulthood, and even improved their ability to lose fat during a three-week voluntary exercise program.

This study supports the idea that movement during pregnancy influences fetal brain development, making the offspring tend to be more physically active throughout life. "Although most people assume that an individual's tendency to be physically active is determined by genetics, our results clearly show that the environment can play an important role during fetal development," Waterland said.



## STUDY SHINES MORE LIGHT ON IMPORTANCE OF PARENTAL FEEDING STYLES ON OBESITY

Obesity among children is a major health concern in the United States, and as researchers try to understand this epidemic, some work has turned to investigating the impact of a parent's feeding style on their child's weight status. In a recent study in the *Journal of Obesity*, researchers found that the indulgent feeding style was associated with higher weight status among Hispanic preschoolers.

"This study is the first to investigate the impact of feeding styles on child weight status over time in low-income Hispanic children. An indulgent feeding style, as initially reported by the mother, was associated with increased child measures of height and weight (adjusted for child age and sex) 18 months later compared to other feeding styles. Our results also suggest that there may be an interplay between feeding styles and food parenting practices in influencing the child's weight status, which needs to be further explored," said Dr. Sheryl Hughes, associate professor of pediatrics at the USDA/ARS Children's Nutrition Research Center at Baylor College of Medicine.

The study included 129 Hispanic mothers and preschool children recruited from Head Start childcare programs in Houston. The mothers provided demographic information, including birth dates (parent and child), ethnicity, gender, education, marital status and immigrant status, and they completed questionnaires about their feeding styles and food parenting practices. The children's height, weight and body mass

## NANCY BUTTE MAKES IMPACTFUL CONTRIBUTIONS TO MATERNAL AND CHILDREN'S NUTRITION

For 36 years, Dr. Nancy Butte has called the USDA/ARS Children's Nutrition Research Center at Baylor College of Medicine home. Her long-standing interest in maternal and infant nutrition led her to join the center just two years after it was founded, in 1978.

Butte studied at the University of California, Berkeley, where she focused her dissertation on the effects of energy intake on lactation performance. Prior to that, she spent three years in Guatemala at the Institute of Nutrition of Central America and Panama where her work focused on the effects of malnutrition on infant nutrition.

**“At the CNRC, I had the ability to do long-term research studies, because we had the staffing, infrastructure and resources of the metabolic unit to follow the growth and development of children,” said Butte, professor of pediatrics at Baylor.**

As director of the calorimeter facility, Butte oversaw the construction and operation of the four room-sized respiration calorimeters and one infant calorimeter. This unique facility allowed Butte and her colleagues to study the energy (caloric) metabolism of infants, children and women during reproduction.

“In order to determine energy and nutrient requirements for growth, you need the child to be measured repeatedly. Also, pregnancy and lactation are dynamic stages of life where the mother is going through significant biological changes. The only way to get an understanding of the changes is to measure them longitudinally,” she said.

The metabolic unit at the CNRC allowed Butte and colleagues to study children and mothers in a controlled environment where it was important to control their food intake and physical activity level, as well as take precise measurements in a comfortable setting.

“Our early studies identified mothers during pregnancy and followed the mother and her newborn child frequently throughout the first two years of life,” she said, noting that these studies were fundamental and have not been reproduced in the years since.

Butte and colleagues worked to define the energy requirements of children from birth up to 24 months of age, then childhood through adolescence.

“The CNRC has a staff that is very talented in working with children and that enabled us to get the food intake, energy expenditure and body composition measurements needed to define energy requirements of those age groups,” said Butte.

As the obesity epidemic was beginning, Butte and her team received their first grants from the National Institutes of Health to look at childhood obesity, and her work has

focused on this issue for the last 15 to 20 years.

One such study, the Viva La Familia study, focuses on identifying genetic and environmental factors influencing childhood obesity in the Hispanic population. Using sophisticated genetic approaches and techniques that focus on gene regions, Butte's research findings include:

- A quantitative genetic analysis showed the heritability of body mass index and obesity-related traits to be significant.
- A genome-wide linkage study successfully detected 14 quantitative trait loci for waist circumference, total energy expenditure, sleeping energy expenditure, physical activity and other obesity traits including fasting serum levels of glucose, monocyte chemoattractant protein-1, ghrelin, insulin and IGFBP1.
- A genome-wide association study detected 27 genome-wide significant loci that replicated genes implicated in other studies, localized novel genes in plausible biological pathways and revealed novel genes with unknown function in obesity.
- A current study is using whole exome sequencing data in Hispanic children from the Viva cohort to identify rare and common variants associated with childhood obesity.

In addition, Butte also led the Texas Childhood Obesity Research Demonstration project with colleagues from the University of Texas, which was designed to address childhood obesity among low-income, ethnically diverse children between the ages of 2 and 12. The goals of this study were to implement and evaluate a primary obesity prevention program and to implement and evaluate the efficacy of a 12-month family-centered secondary obesity prevention program embedded within the primary program. This study was successfully executed in local preschools, elementary schools, primary care clinics and YMCAs and currently is being disseminated.

Upon her retirement, looking back at all of the important work that has been done in the field, Butte said that there is still work to be done when it comes to understanding and tackling childhood obesity. She credits the CNRC for the range of research in this area.

“Ultimately, we're trying to improve children's nutrition and the CNRC has the capability to conduct studies from the animal model to the human model,” she said. “It makes the CNRC quite unique since there is potential for interaction at all levels. I've had a very fruitful career because of those types of collaborations.”



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(CONTINUED FROM PAGE 1)

If a similar effect can be confirmed in people, it could represent an effective strategy to counteract the current worldwide epidemic of physical inactivity and obesity.

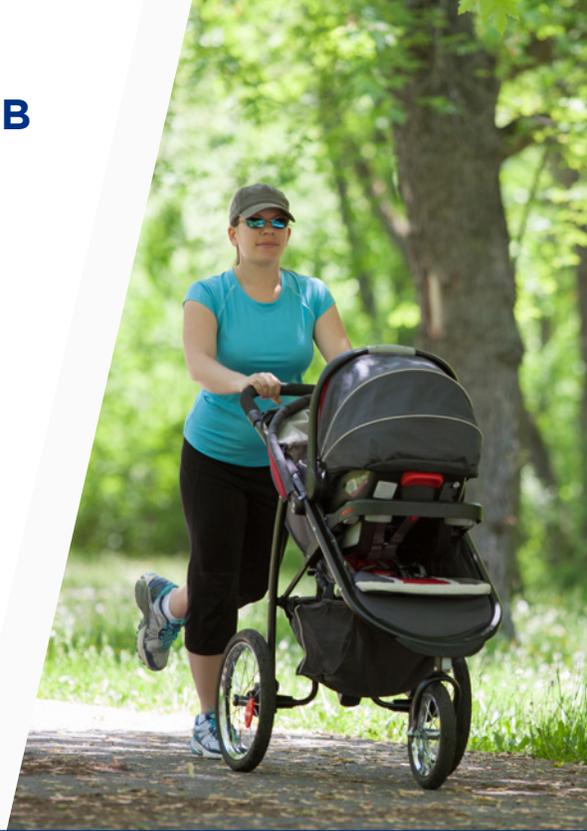
Increasing physical activity has major health implications. According to the World Health Organization, insufficient physical activity is one of the 10 leading risk factors for death worldwide.

Several expert groups including the American College of Obstetricians and Gynecologists already recommend that, in the absence of complications, pregnant women get 30 minutes or more of moderate exercise a day.

“I think our results offer a very positive message,” said Waterland. “If expectant mothers know that exercise is not only good for them but also may offer lifelong benefits for their babies, I think they will be more motivated to get moving.”

Jesse D. Eclarinal, Shaoyu Zhu, Maria S. Baker, Danthasinghe B. Piyarathna, Cristian Coarfa, and Marta L. Fiorotto, all from Baylor, also contributed to this work.

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(CONTINUED FROM PAGE 1)

index were measured. Additional tasks were completed by the study participants at the CNRC lab. This protocol was completed again 18 months later.

### Parent feeding styles include:

**Indulgent** – high responsiveness to child’s needs; low on demandingness of rules around food and eating

**Authoritative** – high on demandingness and responsiveness

**Authoritarian** – high demandingness; low responsiveness

**Uninvolved** – low demandingness and responsiveness

Authoritative, authoritarian and uninvolved feeding styles were not significantly associated with increased child BMI z-score, Hughes said.

“In the construct of feeding, indulgent parents are those whose children have less optimal eating habits,” Hughes said. “They often allow their children to have foods low on nutrients and high on calories. They believe it will make them happier, and it’s less of a struggle for them as parents because it’s easier.”

The authoritative feeding style is optimal, Hughes noted. Parents provide structure and expectations about what their children should eat but they also are very nurturing, so they are aware of

their child’s likes and dislikes and foster autonomy. An example of this is that parents offer vegetables with dinner and give them a choice of which veggies to eat. Parents also respect children’s indications that he or she is full.

This study is important from the viewpoint of parents, Hughes said, because it’s important for parents to know how feeding styles impact their children. “It’s difficult to work and get everything done in life and also make sure children eat healthy. It’s OK to periodically have a fast food meal or dessert but doing this regularly is not the best approach. Providing nutritious foods and allowing your child to choose from nutritious foods – parents need to keep this practice in mind.”

For researchers, the study is important as it’s the first that shows that, over time, the indulgent feeding style predicts children’s weight gain.

Others who contributed to this research include Thomas G. Power, Washington State University; Teresia M. O’Connor and Tzu-An Chen, USDA/ARS Children’s Nutrition Research Center; and Jennifer Orlet Fisher, Temple University. Funding was provided through a grant from the Eunice Kennedy Shriver National Institute of Child Health and Human Development.

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## 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  
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### Adult Volunteers Needed

**H-34291** Healthy, overweight volunteers ages 18 to 65 and volunteers diagnosed with type 2 diabetes within the last three years, also ages 18 to 65, are needed for a metabolic study to help researchers understand 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? We are seeking twin infants for a research study being conducted on twins from 4 months through 3 years of age 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** 11- to 21-year-old overweight adolescents and young adults with and without liver disease are needed for a research study investigating risk for early heart disease in youth. Study involves body composition, liver scan and blood tests.

## VOLUNTEERS

### Games for Health (G4H) H-29172

Children ages 10 to 12 years old are needed for a six-month long study to understand how to help them eat healthier and be more physically active. Must play two "Games for Health" video games and provide three blood samples. Sign up at [www.g4hstudy.org/s3/Eligibility](http://www.g4hstudy.org/s3/Eligibility). Watch game trailers at <https://www.youtube.com/watch?v=K89f7lqFJ-w> and [https://www.youtube.com/watch?v=3e2zOL\\_bpZM](https://www.youtube.com/watch?v=3e2zOL_bpZM).

### Teen Heart Health H-30665

12- to 21-year-old adolescents and young adults (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. If interested, please call (713) 798-6791 or (713) 798-6715.

### Parents Needed H-38771

Are you having trouble getting your preschooler to eat his or her vegetables? Parents of children 3 to 5 years old are needed for a one-week study to test practices for parents to help their preschool child like and eat vegetables. Before selecting the parenting practices, parents will answer questionnaires, and after will be interviewed about their thoughts and feelings about food parenting and their experience using the practices.

If interested, visit <http://www.surveygizmo.com/s3/2748242/VegetableParenting> or call Courtney at 832-786-0763 and mention the Food Parenting Study or email [foodkids@bcm.edu](mailto:foodkids@bcm.edu).

