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Children's Nutrition Research Center
at Baylor College of Medicine

RESEARCHERS STUDY THE LONG-TERM EFFECTS OF PARENTERAL NUTRITION

Total parenteral nutrition, or TPN, is a life-saving therapy used to feed premature infants intravenously, because their gut is too immature to handle food. Although TPN is used regularly, limited information exists on the metabolic impact of TPN compared to normal formula feeding. Experts at the USDA/ARS Children's Nutrition Research Center at Baylor College of Medicine recently compared the metabolic impact of TPN compared to normal formula feeding in animal models. Their findings were published in *The Journal of Nutrition*.

"Premature infants who are born at less than 30 weeks gestation, only 75 percent of the normal gestational period, receive parenteral nutrition for periods of one to three weeks," said Dr. Douglas Burrin, ARS research physiologist and professor of pediatrics at BCM. "This form of feeding may have adverse effects on liver function, but the general metabolic effects have not been well characterized."

Along with other researchers, Burrin and his colleague Dr. Barbara Stoll, instructor of pediatrics at BCM, compared two groups of newborn animals used as models of the human condition. One group was given TPN and the other group was given cow's milk formula for two weeks. At the end of the two weeks, researchers measured insulin sensitivity, the ability to metabolize glucose and body composition in the two groups. The researchers also examined the fat content and the extent of inflammation in the liver in the two groups.

They found that the group on TPN deposited more fat in the liver and less lean tissue, or muscle. The animals were also insulin-resistant, meaning that the ability of insulin to stimulate glucose metabolism in body tissues was defective, a state that sometimes contributes to the development of diabetes.

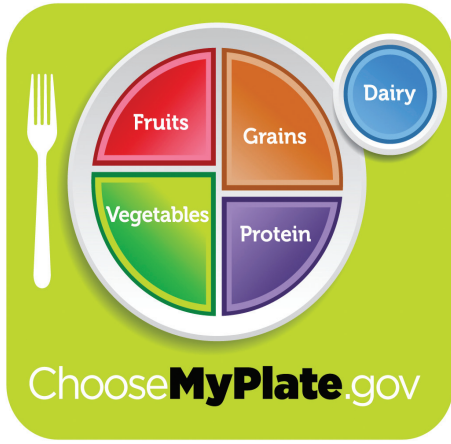
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New "MyPlate" icon

REMINDS AMERICANS TO MAKE HEALTHIER FOOD CHOICES

First Lady Michelle Obama and the U.S. Department of Agriculture recently

released *MyPlate*, a new food icon that replaces the food guide *MyPyramid*.



The intent of *MyPlate* is to prompt consumers to think about building a healthy plate at meal times. The new *MyPlate* icon emphasizes the fruit, vegetable, grains, protein and dairy food groups.

The new guidelines, in the shape of a plate, recommend half of the plate be filled with fruits and vegetables, a quarter of the plate with whole grains and another quarter of the plate with lean protein.

For more information about *MyPlate* and for other healthy eating recommendations, visit: www.ChooseMyPlate.gov

DHA supplementation

IN MOTHERS HAS POSITIVE OUTCOME IN INFANTS

The children of mothers who received a DHA supplement while breastfeeding performed better on a test of sustained attention at age 5, according to results of a study led by Dr. Craig Jensen, associate professor of pediatrics at Baylor College of Medicine and a member of the USDA/ARS Children's Nutrition Research Center faculty.

DHA, or docosahexanoic acid, is critical for brain development and some nutritionists wonder if children are receiving enough in their diet. Previous studies have assessed aspects of the children's neurodevelopment during infancy, at 18 months and at 30

months. From those studies, researchers reported better psychomotor development at 30 months in the group whose mothers received the DHA supplement.

Jensen's results, along with results of the previous studies, suggest that DHA intake during early infancy may result in long-term benefits on certain aspects of neurodevelopment. The study results were published in the December issue of the *Journal of Pediatrics*.

"At least in mothers consuming a typical U.S. diet, there is a benefit to supplementing with DHA," Jensen noted.

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INCREASING THE ACCURACY OF PERCENT BODY FAT DETERMINATIONS IN YOUNG ADULTS

Physicians and others have relied on two primary ways to determine a person's percentage of body fat—skin fold tests and body mass index (BMI) calculations. But as obesity becomes an increasingly serious health issue, it is important to evaluate the validity of those measurements and determine the best way to measure body fat.

A recent study has shown that a more accurate assessment of body fat percentage can be obtained by continuing to use skin fold measurements and factoring in BMI information, but also including information on an individual's ethnicity and gender, said Dr. Ken Ellis, professor of pediatrics at Baylor College of Medicine and a researcher at the USDA/ARS Children's Nutrition Research Center. He was one of the authors of the study, published in October 2010 in *Medicine and Science in Sports and Exercise*, the journal of the American College of Sports Medicine.

Measuring the thickness of the fat layer under the skin at multiple locations on the body, called skin folds, has been used for more than 50 years to estimate body fatness. More recently, the body mass index (BMI), a measure of body weight while adjusting for a person's height, has become the preferred field method to assess body fatness, Ellis said.

In this study, the two methods were combined, along with information about a person's gender and ethnicity/race, to develop new equations that more accurately predict an individual's body fatness than using either of the methods alone.

Previous studies had shown that using only skin fold tests or only BMI were not accurate measurements of body fat percentage for Hispanics and African Americans. However, these same studies verified the locations on the body from where the skin fold tests measurements should be taken.

"We know that weight and height ratios are different in different ethnic groups," Ellis said.

"For example, African Americans tend to have higher muscle mass and that affects BMI. Using this new model, we can improve the estimate of body fat percentage in these groups."

The study included 705 women and 428 men ages 17 to 35. They were part of the TIGER study, an ongoing research project led by Dr. Molly Bray, formerly of the USDA Children's Nutrition Research Center at BCM, to determine how genetic variations may alter people's response to exercise and diet interventions.

Skin fold thickness and body mass index were measured three times over a 30-week period. During this time, study participants engaged in 30 minutes of exercise, four days a week and were presented with nutritional information weekly.

A separate technique—DXA—provided an independent measurement of body fat for comparison. This technique is commonly used to measure bone mass in older women, particularly during menopause, but it can also be used to measure the amount of muscle and fat a person has. DXA is very accurate, said Ellis, who uses this technique in his studies at the CNRC. The technique, however, requires a large, specialized device that is not found in most physician offices. Because of its accuracy, DXA was used as the reference for the TIGER study and allowed Ellis and colleagues to validate the new equations.

It was shown that these equations could be used to examine groups of young adults or to monitor changes over time for an individual, such as during a weight loss program.

"This new approach using both skin fold thickness and BMI is easy to use and offers a more accurate estimate than using either alone, so it really could become a standard when trying to determine a person's body fatness," Ellis said.

Others involved in this research include Dr. Daniel O'Connor and Dr. Brian McFarlin, Texas

Obesity Research Center and the department of health and human performance at the University of Houston; and Dr. Molly Bray and Dr. Mary Sailor, department of epidemiology, University of Alabama-Birmingham.

This work was supported by a grant from the National Institute of Diabetes and Digestive and Kidney Diseases and from the USDA, Agricultural Research Service.

EFFECTS OF PARENTERAL NUTRITION

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Additionally, researchers examined the cells in the pancreas that make insulin, called beta cells. Although the number of beta cells was the same in both groups, the number of cells that were actively dividing and growing, was significantly lower in the TPN group, said Stoll and Burrin.

The TPN group had qualities similar to what is known as the metabolic syndrome in humans. They exhibited mild inflammation, hyperglycemia and insulin resistance, and also had increased fat deposits in the liver and adipose tissue in the body.

Researchers will now conduct additional studies to determine if this otherwise life-saving form of nutritional support has unintended long-term consequences on metabolic health. Using animal models, they will provide TPN after birth and follow the animals' subsequent growth and metabolism to see if diabetes, obesity or liver disease develops during adolescence.

Others who took part in this study include Dr. David A. Horst, Liwei Cui, Xiaoyan Chang, Dr. Kenneth J. Ellis, Dr. Daryl Hadsell, Dr. Agus Suryawan and Dr. Teresa Davis of BCM and the CNRC, and Dr. Ashish Kurundkar and Dr. Akhil Maheshwari of the University of Alabama.

Volunteers

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.

For most studies, financial compensation and free parking are provided, and transportation may be available.



HEALTH STUDY **New!**

Outgoing 5th graders and a parent are needed to fill out a questionnaire and be weighed and measured for a national health study. Stipend. Call Marilyn, 713-798-7002.

PROBLEM SOLVERS NEEDED **New!**

14- to 17-year-old teens fluent in English are needed for the development of a questionnaire to measure physical activity problem solving ability. Fill out questionnaires online once and wear a physical activity monitor for seven days. Stipend. Contact Marilyn, 713-798-7002 or rilynn@bcm.edu.

LACTATION STUDY

Are you 18 to 35 years old, healthy and exclu-

sively breastfeeding? Is your baby less than 10 weeks old? If so, you are needed for a study investigating factors that affect breast milk production. The study includes a 24 hour stay at Texas Children's Hospital with your baby. Financial compensation provided. Call Marilyn, 713-798-7002.

LI'L CAL – A CALORIE AND PHYSICAL ACTIVITY STUDY FOR PRESCHOOLERS

Healthy 3- to 5-year-old children are needed for a study on the caloric needs and physical activity of preschoolers while resting and playing. The study includes two visits to the Children's Nutrition Research Center. Financial compensation provided. Call Marilyn, 713-798-7002.

U.S. CHILDREN MEET NUTRIENT REQUIREMENTS, BUT OVER-SUPPLEMENTATION COULD BE A CONCERN

Overall, most children in the United States consume diets with adequate nutrients; however, some infants are at risk for inadequate iron and zinc intake, according to a study by experts at the USDA/ARS Children's Nutrition Research Center at Baylor College of Medicine.

Their findings were published in the *Journal of the American Dietetic Association*, and also indicate that over-supplementation in young children may be a concern.

Dr. Nancy Butte, professor of pediatrics at BCM, was involved in the initial design phases of the 2008 Feeding Infants and Toddlers Study (FITS). It examined the dietary intakes of 382 infants from birth to five months of age, 505 infants from six months to 11 months of age, 925 toddlers from 24 to 47 months of age and 1,461 preschoolers from 24 to 47 months of age. Parents or primary caregivers were asked to complete a 24-hour dietary recall. Butte and colleagues later analyzed the nutrient adequacy of the diets of the children.

They found that most children met or exceeded energy and protein requirements and had low risk of vitamin or mineral deficiencies. The intakes of antioxidants, B vitamins, bone-related nutrients and other micronutrients were also adequate.

However, in a small group of older infants, the iron and zinc requirements were not adequate, and neither were intakes of vitamin E and potassium in toddlers and preschoolers. In toddlers and preschoolers, dietary fat exceeded the acceptable range, while dietary fiber was low in the vast majority of toddlers and preschoolers.

Some toddlers exceeded the upper limits of synthetic folate, preformed vitamin A, zinc and sodium, which is a concern, said Butte. Upper limits are set for various

micronutrients because intakes beyond those levels may pose a risk for adverse health effects. Because many foods for children in this age group are now fortified, parents should be cautious about using vitamin/mineral supplements so they don't go over the upper limits, said Butte.

"Always consult with your pediatrician when you are considering giving your children vitamin/mineral supplements," said Butte.

Butte said that additional research is needed on the nutrient requirements for

vitamin E, potassium and fiber in the diets of young children. Overall, they found a minimal risk of vitamin and mineral deficiencies for children in the U.S. population due to the combination of food fortification and supplement use, but there needs to be vigilance since there is over-supplementation of certain vitamins and minerals.

Butte also points out that in the diets of toddlers and preschoolers the consumption of sugar-sweetened beverages, desserts and salty snacks was of concern.

"The energy needs of these young children are not that great, so the consumption of low-nutrient, energy-dense foods

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DHA SUPPLEMENTATION (continued from page 1)

DHA is an omega 3 fatty acid found in fish. The amount of DHA intake in the United States is among the lowest in the world because most Americans don't eat a lot of fish, Jensen said.

In Jensen's study, breastfeeding mothers were given a daily capsule containing either a high-DHA algal oil or a placebo from the day of their infant's birth until four months postpartum. Neuropsychological and visual tests were performed on the children when they were 5 years of age.

There were no differences in visual function in the children whose mothers took the DHA supplement compared to those who did not, Jensen said. There were also no differences in gross, fine, or perceptual motor development, verbal skills, emerging executive function, and many other subscales of the Leiter International Performance Scale.

However, the children, particularly girls, whose mothers received the DHA supplement performed significantly better on a test of sustained attention as measured by the Leiter test. Sustained attention is the ability to maintain a consistent behavioral

response during a continuous and repetitive activity. It was noted that both groups were within the normal range. The long-term practical consequences of this single measured difference in the Leiter test to children's academic performance or their functional behavior as adults is unknown.

"DHA is not considered an essential nutrient and there are currently no universally accepted recommendations concerning DHA intake," Jensen said.

Others involved in this research include Dr. William Heird and J. Kennard Fraley, also from the CNRC, Dr. Robert Voigt, Mayo Clinic; Dr. Antolin Llorente, University of Maryland School of Medicine; Dr. Thomas Prager and Dr. Yali Zou, University of Texas Health Science Center at Houston; Dr. Sarika Peters, Judith Rozelle and Marie Turcich, Baylor College of Medicine; and Dr. Robert Anderson, University of Oklahoma Health Sciences Center.

The research was supported by grants from Martek Biosciences Corp. and the U.S. Department of Agriculture, National Institute of Food and Agriculture.

EXERCISE STUDY

13- to 17-year-old overweight Hispanic teens who are not involved in any school or after school sports are needed for a study on the effects of a 12-week exercise or exercise plus diet program. Call Marilyn, 713-798-7002.

BREAKFAST STUDY

Children who are 8 to 10 years old are needed for a study on breakfast consumption and mental abilities. The study includes a prescreen visit and overnight visits to the CNRC. Financial compensation provided. Call Marilyn, 713-798-7002.

COMMERCIALS CAN INFLUENCE CHILDREN'S VEGETABLE PREFERENCE



Interested in getting your kids to eat more veggies? Research has shown that two commercials promoting fruit and vegetables had a positive impact on getting youngsters to choose broccoli and carrots.

The commercials were developed by researchers at the USDA/ARS Children's Nutrition Research Center, and a study on the effects of the commercials was published in the *Journal of Nutrition Education and Behavior*.

Check out "Judy Fruity" and "Reggie Veggie," the stars of the commercials, online at:

<http://www.bcm.edu/cnrc/faculty/nicklas/judyeng.mp4>

<http://www.bcm.edu/cnrc/faculty/nicklas/judyasp.mp4>

OVER-SUPPLEMENTATION *(continued from page 3)*



and beverages should be limited," said Butte. "Parents shouldn't depend on vitamin and mineral supplements, but aim for a varied diet with good protein sources, whole grains, low-fat dairy products and lots of fruits and vegetables."

Others who took part in this study include Mary Kay Fox and Dr. Ronette R. Briefel with Mathematica Policy Research, Dr. Anna Maria Siega-Riz with the University of North Carolina, Dr. Johanna T. Dwyer with the Jean Mayer USDA Human Nutrition Research Center on Aging at Tufts University, Dr. Denise Deming and Dr. Kathleen C. Reidy with Global Meals & Drinks and Nestlé Infant Nutrition.

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