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NUTRITION FRONTIERS

A newsletter of the Nutritional Science Research Group

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Dear Colleague,

Welcome to the Winter 2014 issue of the *Nutrition Frontiers*, a quarterly newsletter from the Nutritional Science Research Group (NSRG), Division of Cancer Prevention, NCI. In this issue, we focus on the microbiome, from twins' microbiota transplanted into mice to the differences between the microbiota of obese-prone and obese-resistant rats to the links between diet and the human microbiome. Plus, learn about our spotlight investigator, announcements and more.

RESEARCH UPDATE: WHAT'S NEW IN BASIC SCIENCE

Microbiota Transfer and Obesity



Investigators have recently discovered the link between the microbiota and the development of obesity-related metabolic dysregulation. [Duca and colleagues](#) studied the differences in the gut microbiota of obese-prone (OP) and obese-resistant (OR) rats,

and the strength of these microbiota profiles in inoculated germ-free mice. After 12 weeks on a high-fat diet, OP rats had increased food consumption, weighed more, and had increased adiposity relative to OR rats. Mice inoculated with the OP microbiota had greater adiposity during high-fat, but not chow feeding. The transfer of OP but not OR microbiota to germ-free mice replicated the characteristics of the OP phenotype, including reduced intestinal and hypothalamic satiation signaling, hyperphagia, increased weight gain and adiposity, and enhanced lipogenesis and adipogenesis. Results suggest that obesity may be associated with an unfavorable microbiome which may predispose the host to weight gain, adiposity, and metabolic alterations.



Announcements

The *Stars in Nutrition and Cancer* lecture, *Links Between Metabolism and Cancer* by Dr. Chi Van Dang is available for viewing, view [here](#).

Upcoming Events

April 05-09, 2014
[American Association for Cancer Research Annual Meeting](#)
San Diego, CA

April 26-30, 2014
[Experimental Biology](#)
San Diego, CA

May 02-03, 2014
[Oncology Nutrition Symposium](#),
Oncology Nutrition Dietetic
Practice Group of the Academy
of Nutrition and Dietetics
Orlando, FL

Quick Links

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Nutrition Frontiers

Gut Microbiota from Twins

To study the interrelations between obesity, diet and the gut microbiota, [Ridaura and colleagues](#) collected fecal samples from same sex human female twins, who were discordant for obesity, and transplanted them into germ-free mice. Mice that received an obese co-twin's microbiota had an increase in adipose mass and metabolic abnormalities



associated with human obesity, compared to mice that received her lean twin's microbiota. These differences were not attributable to differences in total food intake. Cohousing mice harboring an obese twin's microbiota with mice containing the lean co-twin's microbiota prevented the development of increased body mass and obesity-associated metabolic phenotypes in mice with the obese twin's microbiota: this prevention was associated with invasion of bacteria from the lean donor into the guts of mice with obese donor's community. The observation was dependent upon the human diets these mice received, occurring with a diet low in saturated fats and high in fruits and vegetables but not one with high saturated fats and a deficiency of fruits and vegetables. These findings reveal transmissible effects of diet-by-microbiota interactions.

RESEARCH UPDATE: ON THE CLINICAL FRONT

Diet Alters the Human Microbiome



Past dietary interventions in human cohorts measured microbial changes in the human microbiome within weeks and months. [David et al](#), investigated how rapidly and reproducibly the human gut

microbiome responds to short-term macronutrient changes in two diet interventions, an animal-based diet or a plant-based diet. The animal-based diet had a greater impact on the gut microbiota with increased bile-tolerant microorganisms and decreased Firmicutes metabolizing dietary plant polysaccharides within a day of the diet reaching the distal gut microbiota. Significant increases in fecal secondary bile acid concentrations and *Bilophila wadsworthia* bacterium associated with inflamed intestinal tissue, and the abundance of microbial DNA and RNA encoding sulfite reductases on the animal-based diet support that diet-induced changes to the gut microbiota

may contribute to inflammatory bowel disease. These results emphasize the need to better understand the links between diet and the microbiome in diseases.

SPOTLIGHT: RICHARD B. VAN BREEMEN



Richard B. van Breemen, PhD, is the Matt Lu Professor of Medicinal Chemistry and Pharmacognosy at the University of Illinois College of Pharmacy. He is the Director of the UIC/NIH Center for Botanical Dietary Supplements Research and leads the Mass Spectrometry, Metabolomics and Proteomics Facility for the University

of Illinois Cancer Center. Dr. van Breemen received his BA in chemistry from Oberlin College and PhD in pharmacology and experimental therapeutics from the Johns Hopkins University. His research focuses on the discovery and development of natural products as chemoprevention agents and the investigation of botanical dietary supplements as alternatives to conventional estrogen replacement therapy. He has studied translational research culminating of phase I and phase II clinical trials of lycopene for the prevention of prostate cancer. He was recently awarded an R01 entitled, *[Rapid Identification of Active Agents and Metabolomics of Botanical Supplements](#)*.

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DID YOU KNOW?

Beet juice adds color, you may be surprised!




Legendary Russian centenarians ate beets and today many people report beet juice gives them more energy. This root vegetable is rich in folate, potassium, vitamin C, fiber, betanin, and naturally occurring nitrates, which may improve blood flow and potentially lower blood

pressure. More natural nitrates are found in juiced, rather than cooked beets. The wild beet, the ancestor of today's known beet root vegetable, was initially grown for the beet greens which to this day tastes delicious, chopped, steamed and drizzled with olive oil and lemon juice. You may enjoy the entire beet from the leaves to root, cooked or juiced.

Consider sipping beet juice as you start your day. Start with 1/4 cup beet juice mixed with strawberries, apples and even parsley or other variations that appeal to you as you build your way up to 1 cup. Don't be surprised if the dark carotenes and betalain pigments of beet juice add some red color to your urine and stool!

References

- <http://preventcancer.aicr.org/site/News2?page=NewsArticle&id=13679>
- <http://www.webmd.com/food-recipes/features/truth-about-beetroot-juice?page=2>

- <http://www.whfoods.com/genpage.php?tname=foodspice&dbid=49> 

Sincerely,

Your friends at the Nutritional Science Research Group

Division of Cancer Prevention
National Cancer Institute
National Institutes of Health
U.S. Department of Health & Human Services

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