January 2017 Media Alert:
The Journal of Nutrition

The following articles are being published in the January 2017 issue of *The Journal of Nutrition*, a publication of the American Society for Nutrition. Summaries of the selected articles appear below; the full text of each article is available by clicking on the links listed. Manuscripts published in *The Journal of Nutrition* are embargoed until the article appears online either as in press (Articles in Press) or as a final version. The embargoes for the following articles have expired.

Iron deficiency, fitness, and grade point average - are they inter-related?

Iron is an essential mineral needed for a variety of functions in the body, including transporting oxygen to cells so that they can make ATP. As such, iron deficiency is associated with myriad complications including fatigue. It can also lead to poor academic performance in children and lower work capacity in adults. Other factors related to overall health, such as physical fitness, are also associated with overall energy, cognition, and learning. However, very little is known about whether variation in iron deficiency and/or physical fitness are related to the most common indicator of academic success in college - that is, grades earned in coursework. This question was recently addressed by a research team from The Pennsylvania State University and the University of Nebraska and led by Dr. Laura Murray-Kolb. Their findings, published in the January 2017 issue of The Journal of Nutrition and described here, suggest that young women with low iron status and poor aerobic fitness may be at higher risk for earning lower grades than those who have good iron status and good aerobic fitness.

To test their hypotheses, the researchers studied 105 healthy women enrolled at Penn State. None of the women were anemic, but almost half had mild iron deficiency, a common situation in this age group. Blood was drawn and analyzed for a variety of factors related to iron stores, and physical fitness was assessed using a standardized treadmill test. Average grade point average was 3.68 (equivalent to an A-), indicating that the participants were, in general, quite good students.

The researchers found that women with the highest levels of stored iron also had the highest grades. Those who were the most physically fit and had adequate iron stores had higher grades than less-fit women with lower iron stores. The scientists concluded that having low iron stores and low aerobic fitness "may prevent female college students from achieving their full academic potential." Randomized, controlled intervention studies will be needed, however, to evaluate whether these associations are causal or coincidental in nature.

Reference

Scott SP, De Souza MJ, Koehler K, Murray-Kolb LE. Combined iron deficiency and low aerobic fitness doubly burden academic performance among women attending university. *Journal of Nutrition* 2017;147:104-109.

For More Information To contact the corresponding author, Dr. Laura Murray-Kolb, please send an e-mail to lem118@psu.edu.

March 31. Scientific Sessions & Annual Meeting at EB special meeting rate housing deadline. The ASN headquarters hotel is the Hilton Chicago.

February 23. Scientific Sessions & Annual Meeting at EB early registration rate deadline.

Apr. 22 - 26. ASN Scientific Sessions & Annual Meeting at Experimental Biology. Chicago, IL

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Listen to your gut: intuitive eating may be healthy eating

Have you ever pondered what factors dictate your food choices, and what makes each person unique in this regard? At even a superficial level, most of us could easily compile a somewhat lengthy list of factors association with what we do (and do not) eat, such as cost, taste, convenience, social aspects, and cultural tradition. Furthermore, physical sensations of hunger and satiety can play an important role. To help understand why we eat and what we eat, researchers have developed surveys that characterize our eating motives - for example, how well we conform to "intuitive eating", eating in response to the biological sensations of hunger and satiety rather than emotional cues and not considering certain foods to be forbidden. But are these disparate motives associated with the quality of the diet people choose? In a study published in the January 2017 issue of The Journal of Nutrition, Dr. Géraldine Camilleri (Sorbonne University, Paris) and colleagues report a study they conducted to see whether intuitive eating was associated with a healthier diet.

The data used for this investigation were gleaned from the NutriNet-Santé study, which included ~41,000 relatively healthy French adults initially enrolled in 2009 and periodically studied ever since. Each participant was asked to complete the Intuitive Eating Scale-2 questionnaire, a validated survey assessing multiple dimensions of why people make their own particular food choices. For instance, participants were asked to rate the statement "I trust my body to tell me when to eat" on a scale from 1 (strongly disagree) to 5 (strongly agree). As such, a higher overall score indicated greater tendencies toward intuitive eating. These scores were then correlated with food intake.

The researchers found significant relationships between intuitive eating scores and dietary choices, but they were somewhat different between men and women and varied depending on which subset of questions was considered. For example, women with higher scores related to paying attention to biological cues of hunger and satiety consumed fewer calories than women with lower scores. Both men and women with higher scores on these questions consumed lower amounts of sweets and fatty foods; and in women, but not men, higher scores were associated with lower consumption of dairy, meat, eggs and fish. The researchers concluded that developing strategies to promote eating in response to hunger and satiety signals could be a focus of public health initiatives, and that research related to this topic should strive to further study these relationships in both men and women.

Reference

Camilleri GM, Méjean C, Bellisle F, Andreeva VA, Kesse-Guyot E, Hercberg S, Péneau S. Intuitive eating dimensions were differently associated with food intake in the general population-based NutriNet-SantÃ© study. *Journal of Nutrition* 2017;147:61-69.

For More Information To contact the corresponding author, Dr. Géraldine Camilleri, please send an e-mail to g.camilleri@uren.smbh.univ-paris13.fr.

Sugar consumption in early life alters intestinal bacteria - at least in rats

The human body is home to trillions of bacteria, primarily within the gastrointestinal (GI) tract. Although these bacteria were once thought to simply aid in digesting dietary fiber and provide small amounts of vitamins to the human "host," a growing literature suggests that they do much more. For instance, certain GI microbes are associated with obesity. Other findings suggest that microbial variation may predispose or protects us from type 2 diabetes, irritable bowel syndrome, chronic inflammation, and perhaps even autism. As such, understanding how and which microbes colonize the GI tract may help us understand disease risk and how to prevent acute and chronic illness. Variation in diet is likely the most robust environmental factor in this regard. For example, studies using laboratory rats and mice suggest that increasing dietary fat might lead to GI colonization by bacteria that promote weight gain and cognitive dysfunction. Despite current trends reporting high intakes in sugar consumption, particularly from sweetened beverages and especially among children, relatively little is known about how

dietary sugars affect the GI microbiome. Yet early life consumption of certain types of dietary sugar has been shown to impair cognitive function and may contribute to other forms of metabolic disease. Recently, a research group set out to investigate how dietary sugars impact the GI microbiome during the juvenile and adolescent periods, a time of susceptibility to diet-induced cognitive impairments. Their results are published in the January 2017 issue of The Journal of Nutrition.
The study, led by Drs. Emily Noble, Michael Goran, and Scott Kanoski (University of Southern California), utilized laboratory rats to investigate whether consumption of fructose and glucose (simple sugars commonly added to sweetened beverages) consumed during early life influences GI microbial communities and, if so, whether this is related to differences in calorie intake or adiposity. Three different sugar solutions were administered, and the results were compared with a control group given water alone instead of a sugar solution. Fecal samples were collected and analyzed for their complex microbial makeup.
Compared to animals offered unsweetened water, those consuming the sweetened versions had substantially different fecal bacterial communities, with over a quarter of all bacterial families significantly altered. For instance, sugar consumption increased relative abundances of species within the phyla Bacilli, Actinobacteria, and Proteobacteria. These and other apparent differences were not related to differences in calorie intake or body fat of the rats, and the various sugar mixtures had similar effects. Whether these results would be seen in children and if they have implications on health will require further studies, but these data provide intriguing evidence that early life sugar consumption may have important effects on the bacteria that share our bodies.
Reference Noble EE, Hsu TM, Jones RB, Fodor AA, Goran MI, Kanoski SE. Early-life sugar consumption affects the rat microbiome independently of obesity. *Journal of Nutrition* 2017;147:20-28.
For More Information To contact the corresponding author, Dr. Scott Kanoski, please send an e-mail to kanoski@usc.edu.

The Journal of Nutrition: Editor's Picks

Diet diversity and quality among subsistence farmers in Africa is positively impacted by crop diversity
Accurate estimations of intake are a critical element of conducting population-based studies that attempt to determine the relationship between diet and health. Portion size estimation remains problematic with current tools used to estimate intake. The automated self-administered 24-hour dietary recall system (ASA24) is a web-based tool that uses digital images to help responders estimate portion sizes. However, it is not known if this tool results in more accurate estimates than the automated multiple-pass method (AMPM) approach that relies on interviewer-assisted recalls. Work by Kirkpatrick and colleagues reported in the December 2016 issue of *The Journal of Nutrition* makes a direct comparison of the accuracy of portion size estimation between these two approaches.
Participants (n=81, 20-70 years old) for this study were identified from the Washington, DC area. The subjects were randomly assigned to complete either an ASA24 or AMPM recall the day after true intakes were measured for 3 meals. The two groups were matched by sex and age range. Results generated by the two reporting procedures were compared to the known portion sizes.
Differences between the true portion sizes and the ASA24 procedure were smaller than were obtained when the AMPM procedure was used. Approximately 92-100% of the estimates fell within the accepted limits for agreement, with the category of food or drink as well as the recall procedure used, impacting the result. The AMPM procedure tended to overestimate portion sizes for most foods, with amorphous or soft foods, as well as those consumed in small quantities causing the greatest problems. In contrast, the ASA24 tended to underestimate portion sizes of some foods. The authors concluded that digital images used in these

recall protocols should be tailored to the types and formats of foods if accurate estimates of portion sizes are to be obtained.

Reference

Jones AD. On-farm crop species richness is associated with household diet diversity and quality in subsistence- and market-oriented farming households in Malawi. *Journal of Nutrition* 2017;147:86-96.

To contact the corresponding author, Andrew D. Jones, please send an email to jonesand@umich.edu.

Fanzo JC. Decisive decisions on production versus market strategies to improve diets in rural Africa. *Journal of Nutrition* 2017;147:1-2.

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Human and bovine milk-derived exosomes may impact health

Exosomes are one class of extracellular vesicles found in blood, urine and milk, and they contain lipids, proteins, mRNAs and noncoding RNAs. The chemical nature of exosomes helps protect their contents from enzymatic and nonenzymatic degradation. As a result, it is theoretically possible for those molecules to be taken up by other cells, and thus have an effect of the functioning of those cells. Because exosomes in milk have been found to contain microRNA with sequences that could alter gene expression in humans, it is possible for milk-derived exosomes to impact infant health. Zempleni and colleagues review the existing knowledge in this area and suggest the potential for altered human health in a paper published in the January issue of the Journal of Nutrition.

Data presented in the review document the transport of exosomes and their contents into intestinal epithelial cells and eventually being taken up by peripheral tissues. Although the quantity of molecules in exosomes is relatively minor when compared to those produced endogenously, the data indicate microRNA in exosomes may influence gene expression through noncanonical pathways (alternative pathways). Interestingly, the pattern of molecules contained in exosomes is distinct from the pattern contained in the cells that produce them. This evidence suggests that packaging and release of exosomes occurs to achieve specific cell to cell signaling purposes.

The importance of exosome molecule-mediated signaling or regulation of gene expression is still unknown. However, the authors provide evidence to suggest that exosomes in human breast milk may affect immunity, cell cycle regulation and differentiation. Therefore, the authors conclude that much more work is needed to explore the importance of these observations, and define the potential for exosomes in human and bovine milk to influence physiological systems.

Reference Zempleni J, Auilar-Lozano A, Sadri M, Sukreet S, Manca S, Wu D, Zhou F, Mutai E. Biological activities of extracellular vesicles and their cargos from bovine and human milk in humans and implications for infants. *Journal of Nutrition* 2017;147:3-10.

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