



Body Fat Distribution Differs between White and African Americans

Background Adipose tissue is found in many locations in the body, such as underneath the skin (subcutaneous adipose tissue, SAT) and around internal organs in the abdominal cavity (visceral adipose tissue, VAT). Although having excess overall body fat is clearly detrimental to health, risk of cardiovascular disease tends to be especially sensitive to increased levels of VAT. There are many factors related to body fat and its distribution, including race. For instance, the prevalences of obesity among white and African Americans are 30.6% and 45%, respectively, but African American men tend to have lower amounts of VAT than do white American men. To provide additional information concerning this important issue, researchers at the Pennington Biomedical Research Center measured body fat distribution in a large, multiracial group of American men and women. Their findings, along with a discussion by Demerath, are available in the January 2010 issue of *The American Journal of Clinical Nutrition*.

Study Design Subjects (790 white women, 435 African American women, 606 white men, and 136 African American men) were participants in the ongoing Pennington Center Longitudinal Study. During their initial examination for this study, all subjects underwent basic anthropometric measurement testing to determine weight, height, and body mass index (BMI; kg/m²); overall body composition and adipose tissue distribution were estimated by using dual-energy X-ray absorptiometry (DXA) and computed tomography (CT scans), respectively.

Results After control for a number of related variables (eg, age and smoking status), data indicated that abdominal VAT was significantly higher in white than in African American men and women. Conversely, after similar mathematical adjustments were made, SAT was found to be lower among white men and women than in their African American counterparts. These differences were most pronounced in individuals with higher amounts of total body fat.

Conclusions The authors admit that “the finding that African Americans have lower amounts of VAT yet higher mortality rates from diabetes, cardiovascular disease, and cancer than white Americans is a paradox.” Demerath extends the conundrum further by asking whether these data suggest that different (lower) BMI and waist circumference cutoffs might be necessary to help decrease risk of chronic disease in African Americans. Genetic determinants responsible for racial diversity in visceral adiposity, possibly shaped by different ancestral environments and the selection of different evolutionary “strategies” against endemic infectious diseases, are put forth, as is the potential for race-dependent epigenetic modifications of those genetic determinants. Elucidating the magnitude of and mechanisms by which each of these factors influences racial differences in body fat distribution will potentially lead to important insights on how and why visceral fat contributes to chronic disease risk.



Katzmarzyk PT, Bray GA, Greenway FL, et al. Racial differences in abdominal depot-specific adiposity in white and African American adults. *American Journal of Clinical Nutrition* 2010;91:7–15.

Demerath EW. Causes and consequences of human variation in visceral adiposity. *American Journal of Clinical Nutrition* 2010;91:1–2.

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National Folic Acid Fortification—Did It Hit the Target?

Background Folate is an essential vitamin found naturally in many foods including leafy vegetables, legumes, and fruit. “Folic acid” is a synthetic form of folate used in fortified foods and supplements, and its mandatory inclusion in “enriched” cereal grain products was prompted by strong evidence that folate adequacy in the earliest days of pregnancy decreases the occurrence of neural tube defects. Since initiation of folic acid fortification, however, there has been concern that excessive consumption of folic acid–fortified foods might increase risk of some forms of cancer and cognitive disorders. As such, rigorous documentation of trends in folic acid intake and additional studies of potential negative effects of excessive consumption are needed. Two epidemiologic studies have now provided important information concerning folic acid consumption trends in the United States; their results can be found in the January 2010 issue of *The American Journal of Clinical Nutrition*. Accompanying them is a related editorial by Rosenberg as well as results from a clinical trial investigating potential effects of folic acid supplementation on molecular events associated with colorectal cancer.

Study Designs Both epidemiologic studies utilized data collected in the National Health and Nutrition Examination Survey (NHANES) between 2003 and 2006, a nationally representative, cross-sectional survey that documents nutrient intake from foods, beverages, and dietary supplements. In one study, intakes of both naturally occurring folate and synthetic folic acid were documented. In the other, only folic acid consumed in enriched cereal grain products, ready-to-eat cereals, and supplements was evaluated. Both of these investigations also carefully estimated the proportion of individuals consuming folic acid at levels above what is recommended. In the clinical trial, subjects with a previous colorectal adenoma were assigned randomly to consume either a placebo or folic acid (1 mg/d) for 3–6 y. In a subgroup analysis involving 94 men and women, markers of folate status (plasma folate and homocysteine) and faulty synthesis of DNA in rectal tissue and blood white cells (misincorporation of uracil) were measured.

Results Folic acid consumption was estimated to be ~100–700 µg/d in both of the epidemiologic studies, with dietary supplements being an important contributor of overall folic acid intake. Consumption was generally highest in non-Hispanic whites, whereas non-Hispanic blacks consumed the least. In both men and women, intake increased with advancing age. Somewhat contrary to current concern, these studies found that only 2.7–5% of the population consumed amounts higher than the Institute of Medicine’s Tolerable Upper Intake Level (UL),

and many of these individuals were supplement users. The results of the clinical trial suggested no effect of folic acid supplementation on misincorporation of uracil in rectal tissue.

Conclusions These studies show that the vast majority of Americans do not consume excessive folic acid, but some individuals taking supplements of folic acid (>400 µg/d) may be at risk of consuming more than the safe upper level. Conversely, there are still some groups such as non-Hispanic black women, who may still be consuming too little. In addition, although some studies have provided evidence that folic acid supplementation increases risk of colorectal adenomas, the clinical trial also published in the current issue suggests that this does not occur through misincorporation of uracil. In his accompanying editorial, Rosenberg lauds the US Food and Drug Administration's ability to accurately predict the effect of fortification on at-risk populations prior to the initiation of a national folic acid fortification program—being able to minimize risks and maximize benefits. He also urges continued modification of public health programs and recommendations concerning optimal folate nutrition.



References

- Yang Q, Cogswell ME, Hamner HC, et al. Folic acid source, usual intake, and folate and vitamin B-12 status in US adults: National Health and Nutrition Examination Survey (NHANES) 2003–2006. *American Journal of Clinical Nutrition* 2010;91:64–72.
- Bailey RL, Dodd KW, Gahche JJ, et al. Total folate and folic acid intake from foods and dietary supplements in the United States: 2003–2006. *American Journal of Clinical Nutrition* 2010;91:231–7.
- Hazra A, Selhub J, Chao W-H, Ueland PM, Hunter DJ, Baron JA. Uracil misincorporation into DNA and folic acid supplementation. *American Journal of Clinical Nutrition* 2010;91:160–5.
- Rosenberg I. Getting folic acid nutrition right. *American Journal of Clinical Nutrition* 2010;91:3–4.

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Genetic Study Helps Scientists Understand Complex Architecture of Obesity

Background Burgeoning rates of obesity have been linked with myriad social and physical habits and patterns that coordinately increase caloric intake and decrease energy expenditure. Nonetheless, although we all live in an obesogenic environment, some individuals are more prone than others to becoming obese, and scientists have long contested that some of this is due to genetic differences. Previous studies of twins and families suggest that between 40% and 85% of obesity risk lies in our genes. Until recently, however, pinpointing which genes are involved was not possible. Over the past few years, technology has allowed scientists to begin identifying genetic variants (single nucleotide polymorphisms or SNPs) associated with increased risk of

obesity. In the most comprehensive study to date, researchers at the University of Cambridge studied the independent and interactive relations between all known obesity-related SNPs and indicators of adiposity. Their results, and an accompanying editorial by Bouchard, are published in the January 2010 issue of *The American Journal of Clinical Nutrition*.

Study Design This investigation was part of the European Prospective Investigation into Cancer and Nutrition (EPIC), and subjects ($n = 20,431$) were recruited from the Norfolk, United Kingdom area. Body measurements such as waist circumference, weight, and height were made, and body mass index (BMI; in kg/m^2) was calculated. The presence of 12 SNPs was determined, and relations between genetic markers and measures of adiposity and obesity were evaluated.

Results Between 20% and 85% of subjects were found to have at least one SNP of interest, and having any one of these genetic variants was related to a 3–14% increased risk of obesity. “Genetic predisposition scores” were determined as the number of obesity-related genetic variants each individual had, and this value was found to be positively associated with BMI and waist circumference. In other words, the effects were cumulative; with each additional genetic risk variant, body weight increased by 444 g, BMI increased by 0.149, and risk of obesity increased by 10.8%. Nonetheless, taken together, these genetic variations still only accounted for ~1% of the variance in BMI and provided limited predictive value for obesity risk, a value far less than the >40% genetic risk found in classical studies of heritability.

Conclusions In summary, the authors concluded that common genetic variants have small but cumulative effects on obesity. In his companion editorial, Bouchard suggests that there might be important, albeit rare, obesity-related SNPs that have yet to be identified. There may also be interactions with diet and other behaviors (such as physical activity) that influence whether and to what extent a particular SNP is obesogenic. He also proposes the possibility that the importance of genetic factors has been overestimated by twin studies. Even so, he lauds the authors of this paper for using state-of-the-art methods to study an undeniably important health epidemic and encourages further work in this area.



References

Li S, Zhao JH, Luan J, et al. Cumulative effects and predictive value of common obesity-susceptibility variants identified by genome-wide association studies. *American Journal of Clinical Nutrition* 2010;91:184–90.

Bouchard C. Defining the genetic architecture of the predisposition to obesity: a challenging but not insurmountable task. *American Journal of Clinical Nutrition*. 2010;91:5–6.

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Diet, Oxidative Stress, and Inflammation—Dairy and Whole Grains Win Out Once Again

Background Experts agree that, in large part, “you are what you eat.” In other words, the body’s structural integrity and strength depend on the quality and quantity of the diet. However, dietary choices can influence health and well-being in myriad other ways as well. For example, consumption of specific nutrients can influence the body’s overall oxidative and inflammatory states; this is thought to modulate the risk of many serious conditions such as cancer and cardiovascular disease. As such, scientists are trying to understand these complex relations to help prevent many common illnesses. Of considerable interest is whether it makes a difference if someone consumes soy compared with dairy milk, because although soy is thought to benefit bone health in postmenopausal women, dairy might be especially important in reducing inflammation. Additionally, whole-grain foods are thought to be antiinflammatory. In 3 independent studies reported in the January 2010 issue of *The American Journal of Clinical Nutrition*, researchers investigated the complex relation between these types of foods and risks of chronic disease in healthy and overweight men and women.

Study Designs In the first, Zemel and colleagues conducted a controlled, clinical, 28-d trial in 20 subjects to determine differential responses when subjects consumed “smoothies” made from dairy or soy on different occasions. Oxidative stress and inflammation were measured at the beginning and end of each test drink. In a more long-term (3-y) intervention, a research team headed by Lee Alekel at Iowa State University determined the effect of 2 doses of soy isoflavones consumed in table form on bone mineral density in 224 healthy postmenopausal women. Finally, scientists from the Netherlands and Scotland studied whether whole-grain barley (compared to white bread) consumed as part of an evening meal can modulate glucose metabolism and inflammation the next day.

Results Data from the first study show consistent and positive effects of dairy (but not soy) consumption on reducing markers of oxidative stress and inflammation. For instance, plasma malondialdehyde was reduced by 22%, tumor necrosis factor- α (TNF- α) by 15%, and interleukin-6 (IL-6) by 13% while subjects consumed the dairy-rich smoothies. Similarly, results from the international study suggested rather impressive benefits of barley on both glucose metabolism and markers of inflammation, such as TNF- α and IL-6. On the other hand, Alekel’s study did not provide compelling evidence that tablets containing soy isoflavones, even over a 3-y period, decreased bone loss, except for a modest effect of the high dose on the femoral neck.

Conclusions Collectively, these studies support positive effects of dairy foods and whole-grain barley products on several risk factors for chronic disease; both reduced markers of inflammation, and barley also helped regulate glucose metabolism. Further studies are needed to determine whether these physiologic outcomes translate into lower risk of disease and if there are combined effects of these types of food over time.



References

- Zemel MB, Sun X, Sobhani T, Wilson B. Effects of dairy compared with soy on oxidative and inflammatory stress in overweight and obese subjects. *American Journal of Clinical Nutrition* 2010;91:16–22.
- Priebe MG Wang H, Weening D, Schepers M, Preston T, Vonk RJ. Factors related to colonic fermentation of nondigestible carbohydrates of a previous evening meal increase tissue glucose

uptake and moderate glucose-associated inflammation. *American Journal of Clinical Nutrition* 2010;91:90–7.

Alekel DL, Van Loan MD, Koehler KJ, et al. The Soy Isoflavones for Reducing Bone Loss (SIRBL) Study: a 3-y randomized controlled trial in postmenopausal women. *American Journal of Clinical Nutrition* 2010;91:218–30.

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