

Stone-age genes, space-age times Studies tie increasing weight among girls to earlier puberty, possible cancer risk

Fifteen thousand years ago, humans were hunter-gatherers who consumed little if anything when food was scarce, but ate heartily and stored energy as body fat when they had a chance. Their genetic makeup was well-suited to that up-and-down lifestyle. "Our genes haven't changed. We still have the stone-age genes, but we live in space-age times. If we want to gather an extra 5,000 calories, all we have to do is go down and order a couple of super-sized meals," said Frank Biro, M.D., Cincinnati Children's Hospital Medical Center. "At no time in human existence have people been able to purchase so many calories for so little relative money."

This comparatively high standard of living is having several unfavorable consequences, including an increase in the weight of children and teens, said Dr. Biro, who presented a session called "Influence of Obesity on Timing of Puberty" at the 2005 conference on Emerging Topics in Breast Cancer and the Environment Research. He pointed out numerous studies that have linked increased weight in girls with earlier onset of puberty and menstruation, and possibly with a higher future risk for breast cancer.

For example, research has documented a dramatic hike in the overall size of Americans, as measured by the body mass index (weight in kilograms divided by height in meters squared). A person with a body mass index, or BMI, of 25 is considered overweight, and a BMI of 30 falls into the obese category. "There has been an increase of about 50 percent in those exceeding a BMI of 25 over the span of 1980-1997, and almost a tripling of those with a BMI greater than 30," Dr. Biro said. "Among girls who are in early puberty, the rate of an elevated BMI, which is a risk for overweight, has gone from a little more than 3 percent to almost 15 percent over these years." He added, "We now see a fair number of 250-pound, 13- and 14-year-old girls, and that's something we really hadn't seen when I started practicing in Cincinnati 22 years ago."

The reason for larger-sized children is the combination of more calories and less exercise, he said. A 2001 study comparing diet of 6-11 year olds over a 30-year period showed that they were eating 150-200 calories more per day, and that snacks were making up a greater portion —18-24 percent more — of their daily diets, he recounted.

In 2004, another study found that teens ate fast foods on 30 percent of days. Biro remarked, "They are eating more fast food and fewer meals at home. The things they consume at fast-food restaurants are typically very calorically dense and contain a greater percentage of saturated fat, and they are much more likely to be consuming soft drinks instead of milk."

At the same time that girls are eating calorie-rich diets, they are exercising less, he said. Researchers in a 2002 study tracked exercise levels in females from the time they were 9-10 years old to their 18th or 19th years. "Regular, organized physical activity decreased by 100 percent in African-American girls, and by about 55 percent in white girls," he said.

The resulting increases in weight can lead to early pubertal development among girls, he said. "The heavier you are, the earlier you develop. The earlier you develop, the earlier you hit menarche," he said, noting that the 2001 comparison study found that girls currently have their first periods about six months earlier than was typical in 1971.

Scientists are now beginning to understand some of the reasons that obesity may hasten pubertal development. One is a chain of reactions centering on leptin, a hormone that is produced by and occurs in fat cells. Identified in 1994, leptin stimulates the secretion of gonadotrophic releasing hormone, which triggers the pituitary gland to make two other hormones, called luteinizing hormone and follicle-stimulating hormone. These two hormones rouse the gonads, which make the sex hormones and control puberty, he explained.

He said, "The first puberty occurs at the third trimester of pregnancy and lasts for the first three to six months of life, but the brain then shuts it down. Puberty gets turned on again around the ages of 5, 6, 7 or 8, and leptin is a necessary co-factor. It appears to serve as a necessary metabolic agent for puberty to progress at that time."

In addition, leptin may also play a part in the heightened risk for breast cancer through another rather complex chain reaction, he said. Leptin activates the adrenal gland, which makes a number of hormones that can serve as a substrate for estrogens, through the action on an enzyme known as aromatase. Research now indicates that aromatase activity in fat cells is linked to breast cancer risk, he said.

With research studies beginning to show a connection between obesity and earlier development, and between early puberty and heightened breast cancer risk, Biro suggested that humans' stone-age genes are making their presence known in these eat-more, exercise-less space-age times.

Summary of Dr. Biro's presentation at the November 2005 BCERC Scientific Symposium:
Influence of Obesity on Timing of Puberty.
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