

Evolutionary link to modern-day obesity, other problems

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(PhysOrg.com) -- That irresistible craving for a cheeseburger has its roots in the dramatic growth of the human brain and body that resulted from environmental changes some 2 million years ago.

Higher quality, nutritionally dense diets became necessary to fuel the high-energy demands of humans' exceptionally large brains and for developing the first rudimentary hunting and gathering economy.

But the transition from a subsistence to a modern, sedentary lifestyle has created energy imbalances that have increased rapidly -- evolutionarily speaking -- in recent years and now play a major role in obesity.

Activity patterns must get every bit as much attention as consumption of unhealthy foods in any attempt to reverse the modern-day permeations of an evolutionary trend that now contributes to obesity worldwide, according to William Leonard.

Leonard, chair and professor of anthropology at Northwestern University, will discuss his work during the 2009 American Association for the Advancement of Science (AAAS) meeting in Chicago.

Two million years ago shifts in foraging behavior and dietary quality helped to provide the energy and nutrition to support the rapid evolutionary increases in both the brain and body sizes of our ancestors.

Today modern humans use nearly a quarter of their resting energy needs

to feed our brains, considerably more than other primates (about 8 to 10 percent) or other mammals (3 to 5 percent). To support the high-energy costs of our large brains, humans consume diets that are much richer in calories and nutrients than those of other primates.

"While our large-bodied ape relatives -- chimps, gorillas and orangutans -- can subsist on leaves and fruit, we needed to consume meat and other energy-rich foods to support our metabolic demands," Leonard said.

Staple foods for all human societies are much more nutritionally dense than those of other large-bodied primates. "To obtain these higher-quality diets, our foraging ancestors would have had to have moved over larger areas than our ape relatives, requiring large activity budgets," he said.

But substantial reductions of intense physical activities for adults living a modern lifestyle in the industrialized world have dramatically lowered the metabolic costs of survival.

The differences between energy in and energy out widen as we increase the nutritional density of our diets while reducing the time and energy associated with obtaining food. "Think about our ancestors," Leonard said. "Human hunter-gatherers typically move 8 miles per day in the search for food. In contrast, we can simply pick up the phone to get a meal delivered to our door."

That decline in daily energy expenditures contributes not only to obesity, but also to other chronic diseases of the modern world, such as diabetes and cardiovascular disease. "In a sense, those modern diseases represent where we started early in our evolutionary history," Leonard said.

The data clearly suggest the obesity epidemic cannot be understood solely by looking at consumption, he stressed. "Throughout most of our

evolutionary history, the acquisition of our high-quality diets required substantial expenditure of energy and movement over much larger areas than for other primates."

The imbalance between energy intake and energy expenditure today, Leonard concludes, is the root cause of obesity in the industrialized world.

Source: Northwestern University

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