Brain reward circuits respond differently to two kinds of sugar

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The brain responds differently to two kinds of sugar, according to a report today at the American College of Neuropsychopharmacology annual meeting in Phoenix Arizona. The study suggests that fructose heightens the response of brain reward circuits to food cues, promoting feeding behavior.

Currently, roughly two out of three U.S. adults are overweight and one out of three is obese. Changes in lifestyle and dietary intake during the past quarter century are thought to be the main culprits, with the increase in fructose consumption of particular concern. Fructose is the simple sugar found in fruit, but it is added to many foods as a "refined sugar" in the form of high-fructose corn syrup. By comparison, glucose, the primary energy source for the body, is usually produced through the breakdown of complex carbohydrates. Fructose ingestion produces

smaller increases in circulating satiety hormones than glucose ingestion. Further, administration of fructose directly into the brain provokes feeding in rodents, whereas glucose administered this way promotes satiety, or the feeling of being full. Preliminary studies in people have also shown that glucose reduces activity in the hypothalamus, an event that is associated with metabolic satiety, whereas fructose does not.

Using functional magnetic resonance imaging (fMRI), Kathleen Page at the Keck School of Medicine and her colleagues in the Department of Psychology at the University of Southern California extended this work. They examined brain responses and motivation to eat when research volunteers viewed images of food (like chocolate cake) after they drank a beverage containing either glucose or fructose. The participants were 24 young men and women, 16 to 25 years of age. They viewed images of food during fMRI scans of their brains and reported how much they wanted to eat. The food cues produced activation in the nucleus accumbens, a part of the brain's "reward circuit", and increased the desire for food. Activation in the nucleus accumbens was greater after consuming the fructose drink compared to the glucose drink. The fructose drink also resulted in greater ratings of hunger and motivation to eat compared to the glucose drink. These neural and behavioral responses to high-calorie food stimuli could promote eating, and more so after consuming fructose compared to glucose.

These studies have important public health implications in a society that is inundated with high-sugar foods and tantalizing food stimuli. They suggest that consumption of fructose may promote overeating.

Provided by American College of Neuropsychopharmacology