A Princeton University research team has demonstrated that all sweeteners are not equal when it comes to weight gain: Rats with access to high-fructose corn syrup gained significantly more weight than those with access to table sugar, even when their overall caloric intake was the same.

In addition to causing significant weight gain in lab animals, long-term consumption of high-fructose corn syrup also led to abnormal increases in body fat, especially in the abdomen, and a rise in circulating blood fats called triglycerides. The researchers say the work sheds light on the factors contributing to obesity trends in the United States.

"Some people have claimed that high-fructose corn syrup is no different than other sweeteners when it comes to weight gain and obesity, but our results make it clear that this just isn’t true, at least under the conditions of our tests," said psychology professor Bart Hoebel, who specializes in the neuroscience of appetite, weight and sugar addiction. "When rats are drinking high-fructose corn syrup at levels well below those in soda pop, they're becoming obese -- every single one, across the board. Even when rats are fed a high-fat diet, you don’t see this; they don't all gain extra weight."

In results published online Feb. 26 by the journal Pharmacology, Biochemistry and Behavior, the researchers from the Department of Psychology and the Princeton Neuroscience Institute reported on two experiments investigating the link between the consumption of high-fructose corn syrup and obesity.

The first study showed that male rats given water sweetened with high-fructose corn syrup in addition to a standard diet of rat chow gained much more weight than male rats that received water sweetened with table sugar, or sucrose, in conjunction with the standard diet. The concentration of sugar in the sucrose solution was the same as is found in some commercial soft drinks, while the high-fructose corn syrup solution was half as concentrated as most sodas.

The second experiment -- the first long-term study of the effects of high-fructose corn syrup consumption on obesity in lab animals -- monitored weight gain, body fat and triglyceride levels in rats with access to high-fructose corn syrup over a period of six months. Compared to animals eating only rat chow, rats on a diet rich in high-fructose corn syrup showed characteristic signs of a dangerous condition known in humans as the metabolic syndrome, including abnormal weight gain, significant increases in circulating triglycerides and augmented fat deposition, especially visceral fat around the belly. Male rats in particular ballooned in size: Animals with access to high-fructose corn syrup gained 48 percent more weight than those eating a normal diet.
When male rats were given water sweetened with high-fructose corn syrup in addition to a standard diet of rat chow, the animals gained much more weight than male rats that received water sweetened with table sugar, or sucrose, along with the standard diet. The concentration of sugar in the sucrose solution was the same as is found in some commercial soft drinks, while the high-fructose corn syrup solution was half as concentrated as most sodas, including the orange soft drink shown here. (Photo: Denise Applewhite)