

Citrus fruits could help prevent obesity-related heart disease, liver disease, diabetes

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Oranges and other citrus fruits are good for you—they contain plenty of vitamins and substances, such as antioxidants, that can help keep you healthy. Now a group of researchers reports that these fruits also help prevent harmful effects of obesity in mice fed a Western-style, high-fat diet.

The researchers are presenting their work today at the 252nd National Meeting & Exposition of the American Chemical Society (ACS). ACS, the world's largest scientific society, is holding the meeting here through Thursday. It features more than 9,000 presentations on a wide range of science topics.

"Our results indicate that in the future we can use [citrus](#) flavanones, a class of [antioxidants](#), to prevent or delay chronic diseases caused by obesity in humans," says Paula S. Ferreira, a graduate student with the research team.

More than one-third of all adults in the U.S. are obese, according to the U.S. Centers for Disease Control and Prevention. Being obese increases the risk of developing heart disease, liver disease and diabetes, most likely because of oxidative stress and inflammation, Ferreira says. When humans consume a high-fat diet, they accumulate fat in their bodies. Fat cells produce excessive reactive oxygen species, which can damage cells in a process called oxidative stress. The body can usually fight off the molecules with antioxidants. But obese patients have very enlarged fat cells, which can lead to even higher levels of reactive oxygen species that overwhelm the body's ability to counteract them.

Citrus fruits contain large amounts of antioxidants, a class of which are called flavanones. Previous studies linked citrus flavanones to lowering oxidative stress in vitro and in animal models. These researchers wanted to observe the effects of citrus flavanones for the first time on mice with

no genetic modifications and that were fed a high-fat diet.

The team, at Universidade Estadual Paulista (UNESP) in Brazil, conducted an experiment with 50 mice, treating them with flavanones found in [oranges](#), limes and lemons. The flavanones they focused on were hesperidin, eriocitrin and eriodictyol. For one month, researchers gave groups either a standard diet, a high-fat diet, a high-fat diet plus hesperidin, a high-fat diet plus eriocitrin or a high-fat diet plus eriodictyol.

The high-fat diet without the flavanones increased the levels of cell-damage markers called thiobarbituric acid reactive substances (TBARS) by 80 percent in the blood and 57 percent in the liver compared to mice on a standard diet. But hesperidin, eriocitrin and eriodictyol decreased the TBARS levels in the liver by 50 percent, 57 percent and 64 percent, respectively, compared with mice fed a [high-fat diet](#) but not given flavanones. Eriocitrin and eriodictyol also reduced TBARS levels in the blood by 48 percent and 47 percent, respectively, in these mice. In addition, mice treated with hesperidin and eriodictyol had reduced fat accumulation and damage in the liver.

"Our studies did not show any weight loss due to the citrus flavanones," says Thais B. Cesar, Ph.D., who leads the team. "However, even without helping the [mice](#) lose weight, they made them healthier with lower oxidative stress, less liver damage, lower blood lipids and lower blood glucose."

Ferreira adds, "This study also suggests that consuming [citrus fruits](#) probably could have beneficial effects for people who are not obese, but have diets rich in fats, putting them at risk of developing cardiovascular disease, insulin resistance and abdominal obesity."

Next, the team will explore how best to administer

these flavanones, whether in citrus juice, by consuming the fruit or developing a pill with these antioxidants. In addition, the team plans to conduct studies involving humans, Cesar says.

Provided by American Chemical Society

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