Orange juice beverage fortified with plant sterols lowers indicators of heart disease risk

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Plant cholesterols known as sterols -- recognized for their cholesterol-lowering power when added to margarines, salad dressings and other fats -- also have been found to be effective in reducing low-density lipoprotein, or "bad" cholesterol" levels, when added to orange juice. Now, UC Davis researchers have found that twice-daily servings of a reduced-calorie orange juice beverage fortified with plant sterols also reduces levels of C-reactive protein, a marker of inflammation and an accepted risk marker for heart disease.

"This is the first study to show that healthy people who drink a plant sterol-fortified orange juice beverage can reduce C-reactive protein levels," said Sridevi Devaraj, lead author of the study. Devaraj is an associate professor of pathology and an investigator in the UC Davis Laboratory for Atherosclerosis and Metabolic Research. "We already knew that adding plant sterols to a juice could lower 'bad' cholesterol levels. Now we see an added benefit of reducing inflammation, a process we know plays an important role in the development of heart disease," Devaraj said.

The current results, based on an eight-week study of 72 healthy volunteers, appear in the October issue of the *American Journal of Clinical Nutrition*.

Devaraj and Ishwarlal Jialal, UC Davis professor of medicine and pathology, first showed the cholesterol-reducing effects of adding plant sterols to a nonfat beverage in 2004. The current findings further support

the idea of using plant sterols to improve health.

"The best way to fight heart disease is through changes in diet and exercise. But, the reality is that people have trouble making those changes," explained Jialal, who is co-author on the current study. "Drinking a plant sterol-fortified orange juice beverage is a relatively simple thing to do and it may have important preventative effects."

To help individuals reduce their risk of heart disease, both the American Heart Association and the National Cholesterol Education Program recommend a diet low in saturated fat and cholesterol and high in soluble fiber and plant sterols. Sterols are present in small quantities in a variety of foods, including fruits, vegetables, nuts, seeds, cereals and legumes. Chemically similar to cholesterol, sterols are thought to lower LDL levels in the body by limiting absorption of cholesterol in the intestine.

In the current study, 72 healthy male volunteers ate their normal diet, but added a cup of the juice beverage to their breakfast and dinner. Half of the group drank a reduced-calorie, sterol-fortified orange juice beverage, while the other half drank a juice beverage without sterols. Both beverages were provided by The Coca-Cola Company's Beverage Institute for Health & Wellness.

Blood samples from fasting participants were taken before and after the trial to determine cholesterol levels. Researchers found that volunteers who drank the sterol-fortified orange juice beverage had an average 9-percent decrease in LDL cholesterol, and an average of 12-percent decrease in C-reactive protein levels. Researchers found no significant changes in LDL or C-reactive protein levels in those who drank the non-sterol fortified orange juice beverage.

Despite great strides in prevention and treatment, cardiovascular disease remains the leading cause of death throughout the Western world. Nearly

half of all cardiovascular disease events occur in people without elevated blood cholesterol or lipid levels. Therefore, the potential role of inflammation in the development of cardiovascular disease has come under intense study in recent years.

Initial reports suggested C-reactive protein levels merely reflected an underlying inflammatory process. However, accumulating evidence now suggests that C-reactive protein could also be a causative factor, and there is growing circumstantial evidence that reducing C-reactive protein levels might benefit some individuals. For example, C-reactive protein is present in atherosclerotic lesions, and some studies suggest it may actively contribute to the progression and/or instability of atherosclerotic plaques. The American Heart Association and Centers for Disease Control and Prevention now recommend that C-reactive protein levels be used to further evaluate cardiovascular disease risk.

According to Jialal, the simultaneous reduction of LDL cholesterol and C-reactive protein levels prevents more heart attacks than reducing either measure alone. Devaraj pointed out that, in addition to cardiovascular disease, elevated levels of C-reactive protein have been found in those at risk of developing metabolic syndrome and diabetes.

"We are facing an epidemic of these lifestyle diseases. We need new strategies to help people fight back," Devaraj said. "Sterol-fortified, especially reduced-calorie beverages, offer our patients an effective, easy way to lower their risk of developing these deadly diseases."

The U.S. Food and Drug Administration has concluded that foods containing at least 0.4 grams per serving of plant sterols, consumed twice a day with meals for a daily total intake of at least 0.8 grams, as part of a diet low in saturated fat and cholesterol, may reduce the risk of heart disease.

Source: University of California, Davis