A cherry on top: Tart cherries may alter heart/diabetes factors

30 April 2007

Tart cherries may be good for more than just making pie, according to new data from an animal study conducted by University of Michigan Health System researchers and presented today at a major scientific meeting.

In a study involving rats, the researchers report that animals that received powdered tart cherries in their diet had lower total cholesterol, lower blood sugar, less fat storage in the liver, lower oxidative stress and increased production of a molecule that helps the body handle fat and sugar, compared with rats that didn't receive cherries as part of an otherwise similar diet. All of the rats had a predisposition toward high cholesterol and pre-diabetes, but not obesity.

All the measures on which the two groups of animals differed are linked to metabolic syndrome, a collection of risk factors linked to high rates of heart disease and Type 2 diabetes. Tens of millions of Americans have metabolic syndrome; most don't know it.

The researchers say the correlation between cherry intake and significant changes in metabolic measurements suggest a positive effect from the high concentrations of antioxidant compounds called anthocyanins that are found in tart cherries. The new results were given today in an oral presentation at the Experimental Biology 2007 meeting in Washington, D.C.

It's not yet known if cherry-rich diets might have a similar impact in humans, but a
U-M team will soon launch a small clinical trial to start to find out. Meanwhile, additional research is being carried out in animals prone to both obesity and diabetes.

The study's lead author is E. Mitchell Seymour, M.S., a U-M research associate and supervisor of the U-M Cardioprotection Research Laboratory, which studies the potential preventive benefits of antioxidant-rich foods. Support for the new study comes from an unrestricted grant from the Cherry Marketing Institute, a trade association for the cherry industry. CMI has no influence on the design, conduct or analysis of any U-M research it funds.

Seymour and the laboratory's director, U-M cardiac surgeon Steven Bolling, M.D., caution that their results cannot be directly translated into humans. But they are encouraged by the positive signs seen in the new data.

"Rats fed tart cherries as 1 percent of their total diet had reduced markers of metabolic syndrome," says Seymour. "Previous research by other groups studied pure anthocyanin compounds rather than anthocyanin-containing whole foods, and they used concentrations of anthocyanins that would be very difficult if not impossible to obtain in the diet."

He continues, "We are interested in a whole-foods approach, using amounts of fruit that are relevant to human diets. We are enthusiastic about the findings that tart cherries conferred these beneficial effects at such a modest daily intake."

The potential for protective effects from antioxidant-rich foods and food extracts is a promising area of research, says Bolling, who is the Gayle Halperin Kahn Professor of Integrative Medicine, a professor of cardiac surgery, co-director of U-M Integrative Medicine and member of the U-M Cardiovascular Center.

"These data from whole tart cherries join other findings that suggest a correlation between anthocyanin intake and reductions in cardiovascular and metabolic risk factors," he says. "But there is still a long way to go before we can advocate any course of action for humans. Still, the growing body of knowledge is encouraging."

Bolling and Seymour performed the study using 48

male Dahl Salt-Sensitive rats, which are bred for their susceptibility to salt-linked high blood pressure, high cholesterol and impaired glucose tolerance.

For 90 days beginning in their sixth week of life, the rats were fed either a carbohydrate-enriched diet or a diet that, by weight, included 1 percent cherries or 10 percent cherries. The higher cherry dose was used to look for any toxic effects; none were seen.

The cherries were Montmorency tart cherries grown in northern Michigan, frozen, and powdered. Michigan is the nation's largest producer of tart cherries, which are used in pies and jams as well as juice. They are different from the sweet Bing cherries that are often eaten raw, and have higher concentrations of antioxidant anthocyanins than sweet cherries.

By the end of the study, the rats that received the 1-percent cherry diet had total cholesterol, triglyceride, glucose and insulin levels that were significantly lower than those of the rats that did not receive cherries. The same was true for those on the 10-percent cherry diet, compared with rats that received a diet with an equivalently high level of carbohydrates not from cherries.

The researchers also measured plasma TEAC, a measure of antioxidant capacity in the blood on which a higher reading means better ability to neutralize damaging free radical molecules produced in the body during metabolism. The rats that received cherries had higher antioxidant capacity, indicating lower oxidative stress in their bodies, than those that did not.

In addition to blood measures, the researchers measured the level of fat in the livers of the rats, and the genetic expression of PPAR (peroxisome proliferator-activating receptor) in the liver.

The "fatty liver" measure is important because the storage of excess energy as fat in the liver is a common effect in metabolic syndrome – and because it feeds the vicious cycle of increased cholesterol and decreased response to insulin that can lead to cardiovascular disease and Type 2 diabetes.

Meanwhile, the measure of PPAR messenger RNA in the liver reflects the readiness of the liver tissue to express functional PPAR. PPAR is important to the process by which the body burns fat instead of storing it, and it is important in the formation of blood lipids like LDL, typically known as the "bad cholesterol". Drugs in the classes known as thiazolidinediones and glitazars activate PPAR and are often used to manage high cholesterol and risk for Type 2 diabetes.

In the current study, the rats that received cherries had both a lower level of fat in their livers, and a higher expression of the PPAR gene, than those that did not – and the correlation between the two was dose-dependent.

Now, the Cardioprotection Laboratory team has embarked on a new study in rats that have Type 2 diabetes, both with and without obesity and in the presence of low-fat and high-fat diets. They will look at whether tart cherries have an impact on the storage of fat in fat tissue and in muscle, and on the production of specific blood lipids like LDL and HDL. In addition, they will characterize cherries chemically, to assess the levels of phytochemicals in whole cherries, cherry juice and dry cherries.

Meanwhile, U-M Integrative Medicine co-director Sara Warber. M.D., an assistant professor of family medicine at the U-M Medical School, will lead a pilot clinical trial of whole tart cherries in humans. The study will enroll healthy individuals who will spend a night at the U-M General Clinical Research Center, and have their blood tested multiple times to look for the breakdown products of cherries.

Source: University of Michigan