

Cocoa May Enhance Skeletal Muscle Function

March 02, 2012 |

Improvements seen in patients with heart failure and type 2 diabetes in initial study

A small clinical trial led by researchers at UC San Diego School of Medicine and VA San Diego Healthcare System (VASDHS) found that patients with advanced heart failure and type 2 diabetes showed improved mitochondrial structure after three months of treatment with epicatechin-enriched cocoa. Epicatechin is a flavonoid found in dark chocolate.

The results of this initial study has led to the implementation of larger, placebo-controlled clinical trial at UC San Diego School of Medicine and VASDHS to assess if patients with heart failure and diabetes show improvement in their exercise capacity when treated with epicatechin-rich cocoa.

The study published this week by the journal *Clinical and Translational Science* looked at five profoundly ill patients with major damage to skeletal muscle mitochondria. Mitochondria are structures responsible for most of the energy produced in cells. These “fuel cells” are dysfunctional as a result of both type 2 diabetes and heart failure, leading to abnormalities in skeletal muscle. In patients with heart failure and diabetes abnormalities in both the heart and skeletal muscle result in impaired functional capacity. These patients often complain of shortness of breath, lack of energy and have difficulty walking even short distances.

The trial participants consumed dark chocolate bars and a beverage with a total epicatechin content of approximately 100 mg per day for three months. Biopsies of skeletal muscle were conducted before and after treatment. After the three-month treatment, the researchers looked at changes in mitochondria volume and the abundance of cristae, which are internal compartments of mitochondria that are necessary for efficient function of the mitochondria, and measurable by electron microscopy.

“The cristae had been severely damaged and decreased in quantity in these patients,” said one of the senior investigators, Francisco J. Villarreal, MD, PhD of UC San Diego’s Department of Medicine’s Division of Cardiology. “After three months, we saw recovery – cristae numbers back toward normal levels, and increases in several molecular indicators involved in new mitochondria production.”

The results, which mimicked earlier studies showing improvement in skeletal and heart muscle function in animal models after treatment with epicatechin, were promising enough to prompt the larger study.

The principal investigator of this trial was Pam R. Taub, MD, assistant professor of medicine at UC San Diego and the VA San Diego Healthcare System. Taub will be leading the new clinical trial at UC San Diego that will enroll normal sedentary subjects as well as patients with heart failure/diabetes who will be treated with placebo, or epicatechin-rich chocolate.

Patients who would like more information about the clinical trial can call 858-552-8585, extension 3866.

Additional contributors to the published study include Israel Ramirez-Sanchez, PhD, Theodore P. Ciaraldi, PhD, Alan S. Maisel, MD, and Robert R. Henry, MD, UC San Diego School of Medicine and VA San Diego Health System; Guy Perkins, PhD, Anne N. Murphy, PhD, Robert Naviaux, MD, PhD and Michael Hogan, PhD, UC San Diego School of Medicine; and Guillermo Ceballos, MD, PhD, Escuela Superior de Medicina del Instituto Politécnico Nacional, Mexico City.

The study was supported in part by grants from the National Institutes of Health, American College of Cardiology and The Hershey Company.

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