Antioxidants aren't always good for you and can impair muscle function, study shows

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Antioxidants increasingly have been praised for their benefits against disease and aging, but recent studies at Kansas State University show that they also can cause harm.

Researchers in K-State's Cardiorespiratory Exercise Laboratory have been studying how to improve oxygen delivery to the skeletal muscle during physical activity by using antioxidants, which are nutrients in foods that can prevent or slow the oxidative damage to the body. Their findings show that sometimes antioxidants can impair muscle function.

"Antioxidant is one of those buzz words right now," said Steven Copp, a doctoral student in anatomy and physiology from Manhattan and a researcher in the lab. "Walking around grocery stores you see things advertised that are loaded with antioxidants. I think what a lot of people don't realize is that the antioxidant and pro-oxidant balance is really delicate. One of the things we've seen in our research is that you can't just give a larger dose of antioxidants and presume that there will be some sort of beneficial effect. In fact, you can actually make a problem worse."

David C. Poole and Timothy I. Musch, K-State professors from both the departments of kinesiology and anatomy and physiology, direct the Cardiorespiratory Exercise Laboratory, located in the College of Veterinary Medicine complex. Researchers in the lab study the physiology of physical activity in health and disease through animal models. Copp and Daniel Hirai, an anatomy and physiology doctoral

student from Manhattan working in the lab, have conducted various studies associated with how muscles control blood flow and the effects of different doses and types of antioxidants.

Abnormalities in the circulatory system, such as those that result from aging or a disease like chronic heart failure, can impair oxygen delivery to the skeletal muscle and increase fatigability during physical activity, Copp said. The researchers are studying the effects antioxidants could have in the process.

"If you have a person trying to recover from a heart attack and you put them in cardiac rehab, when they walk on
a treadmill they might say it's difficult," Poole said. "Their muscles get sore and stiff. We try to understand why the blood cells aren't flowing properly and why they can't get oxygen to the muscles, as happens in healthy individuals."

Copp said there is a potential for antioxidants to reverse or partially reverse some of those changes that result from aging or disease. However, K-State's studies have shown that some of the oxidants in our body, such as hydrogen peroxide, are helpful to increase blood flow.

"We're now learning that if antioxidant therapy takes away hydrogen peroxide - or other naturally occurring vasodilators, which are compounds that help open blood vessels - you impair the body's ability to deliver oxygen to the muscle so that it doesn't work properly," Poole said.

Poole said antioxidants are largely thought to produce better health, but their studies have shown that antioxidants can actually suppress key signaling mechanisms that are necessary for muscle to function effectively.

"It's really a cautionary note that before we start recommending people get more antioxidants, we need to understand more about how they function in physiological systems and circumstances like exercise," Poole said.

Hirai said the researchers will continue to explore antioxidants and the effects of exercise training. Their studies are looking at how these can help individuals combat the decreased mobility and muscle function that comes with advancing age and diseases like heart failure.

"The research we do here is very mechanistic in nature, and down the road our aim is to take our findings and make recommendations for diseased and aging populations," Copp said.

More information: The researchers have published their recent findings in several journals, including the *Journal of Applied Physiology*, *Respiratory Physiology and Neurobiology*, *Microvascular Research*, *The American Journal of Physiology and Experimental Physiology*.

Provided by Kansas State University