

New research adds spice to curcumin's health-promoting benefits

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The health benefits of over-the-counter curcumin supplements might not get past your gut, but new research shows that a modified formulation of the spice releases its anti-inflammatory goodness throughout the body.

Curcumin is a naturally occurring compound found in the spice turmeric that has been used for centuries as an Ayurvedic medicine treatment for such ailments as allergies, diabetes and ulcers.

Anecdotal and scientific evidence suggests [curcumin](#) promotes health because it lowers inflammation, but it is not absorbed well by the body. Most curcumin in food or supplements stays in the gastrointestinal tract, and any portion that's absorbed is metabolized quickly.

Many research groups are testing the compound's effects on disorders ranging from colon cancer to osteoarthritis. Others, like these Ohio State University scientists, are investigating whether enabling widespread availability of curcumin's biological effects to the entire body could make it useful both therapeutically and as a daily supplement to combat disease.

"There's a reason why this compound has been used for hundreds of years in Eastern medicine. And this study suggests that we have identified a better and more effective way to deliver curcumin and know what diseases to use it for so that we can take advantage of its anti-inflammatory power," said Nicholas Young, a postdoctoral researcher in rheumatology and immunology at Ohio State and lead author of the

study.

The research is published in the Nov. 4, 2014, issue of the journal *PLOS ONE*.

Curcumin powder was mixed with castor oil and polyethylene glycol in a process called nano-emulsion (think vinaigrette salad dressing), creating fluid teeming with microvesicles that contain curcumin. This process allows the compound to dissolve and be more easily absorbed by the gut to enter the bloodstream and tissues.

Feeding mice this curcumin-based drug shut down an acute inflammatory reaction by blocking activation of a key protein that triggers the immune response. The researchers were also the first to show that curcumin stops recruitment of specific immune cells that, when overactive, are linked to such problems as heart disease and obesity.

Young and his colleagues, including co-senior authors Lai-Chu Wu and Wael Jarjour of the Division of Rheumatology and Immunology at Ohio State's Wexner Medical Center, now want to know if curcumin in this form can counter the [chronic inflammation](#) that is linked to sickness and age-related frailty. They have started with animal studies testing nano-emulsified curcumin's ability to prevent or control inflammation in a lupus model.

"We envision that this nutraceutical could be used one day both as a daily supplement to help prevent certain diseases and as a therapeutic drug to help combat the bad inflammation observed in many diseases," Young said. "The distinction will then be in the amount given - perhaps a low dose for daily prevention and higher doses for disease suppression."

The term nutraceutical refers to foods or nutrients that provide medical

or [health benefits](#).

The curcumin delivery system was created in Ohio State's College of Pharmacy, and these researchers previously showed that concentrations of the emulsified curcumin in blood were more than 10 times higher than of curcumin powder suspended in water. From there, the researchers launched experiments in mice and cell cultures, generating artificial inflammation and comparing the effects of the nano-emulsified curcumin with the effects of curcumin powder in water or no treatment at all.

The researchers injected mice with lipopolysaccharide, a bacteria cell wall extract that stimulates an immune reaction in animals. Curcumin can target many molecules, but the research team zeroed in on NF-kB, a protein that is known to play an important role in the immune response.

In a specialized imaging machine, mice receiving plain curcumin lit up with bioluminescent signals indicating that NF-kB was actively triggering an [immune response](#), while mice receiving nano-emulsified curcumin showed minimal signs – a 22-fold reduction – that the protein had been activated at all.

Knowing that curcumin delivered in this way could shut down NF-kB activation throughout the animals' bodies, researchers looked for further details about the compound's effects on inflammation. They found that nano-emulsified curcumin halted the recruitment of immune cells called macrophages that "eat" invading pathogens but also contribute to inflammation by secreting pro-inflammatory chemicals. And in cells isolated from human blood samples, macrophages were stopped in their tracks.

"This macrophage-specific effect of curcumin had not been described before," Young said. "Because of that finding, we propose nano-

emulsified curcumin has the best potential against macrophage-associated [inflammation](#)."

Inflammation triggered by overactive macrophages has been linked to cardiovascular disease, disorders that accompany obesity, Crohn's disease, rheumatoid arthritis, inflammatory bowel disease, diabetes and lupus-related nephritis.

Provided by The Ohio State University

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