

Research suggests fitness reduces inflammation

Although a number of studies have suggested that regular exercise reduces inflammation – a condition that is predictive of cardiovascular and other diseases, such as diabetes – it is still not clear whether there is a definitive link. And if such a link exists, the nature of the relationship is by no means fully understood.

A recent study by kinesiology and community health researchers at the University of Illinois provides new evidence that may help explain some of the underlying biological mechanisms that take place as the result of regular exercise.

According to the researchers, that knowledge could potentially lead to a better understanding of the relationship between exercise and inflammation.

The objective of their research was to examine the independent effect of parasympathetic tone – in this case, determined by assessing heart-rate recovery after exercise – on circulating levels of C-reactive protein (CRP). Parasympathetic tone and its inverse function – sympathetic tone – are components of the autonomic nervous system. CRP, which is secreted by the liver, circulates in the bloodstream and is a biomarker for inflammation in the body.

“The sympathetic nervous system speeds things up, and the parasympathetic slows things down,” said Victoria J. Vieira, a predoctoral fellow in kinesiology and community health and in nutritional sciences, and the primary author and designer of the study, published in a recent issue of the Journal of the American Geriatrics Society. “So when you’re exercising, your sympathetic nervous system will be on, increasing your heart rate, your respiration, etc. Once you stop, your body always tries to get back to homeostasis. So the parasympathetic nervous system kicks in to get everything back down to baseline levels.”

Co-author and kinesiology and community health professor Jeffrey A. Woods said cardiologists are already routinely gauging CRP levels in much the same way they look at lipids panels to assess cholesterol levels.

“Certainly, that’s being done in the cardiovascular disease realm, but I think (it may be effectively used as a monitor) for other diseases, such as Alzheimer’s, diabetes and metabolic syndrome,” he said.

Woods said the main question motivating the current research was, “What factors are related to CRP in the elderly?”

“We’ve known that as people age, their CRP levels go up,” Vieira said. “That’s one of the reasons why older individuals are more prone to develop inflammation-related diseases such as diabetes and heart disease. So we just wanted to look at what’s predicting those levels of CRP in an average older population that is relatively healthy.”

Perhaps the most notable result of the study, according to the researchers, relates to heart-rate recovery following exercise.

“The quicker the individuals were able to get back to their resting heart rate after a strenuous exercise test was inversely related to their CRP,” Vieira said. “In other words, individuals who had better parasympathetic tone had lower levels of inflammation.

“And the reason we’re excited about this is that exercise is a great way to improve parasympathetic tone. When you exercise – that is the sympathetic/parasympathetic communication – your sympathetic goes up,

and when you stop exercising, your parasympathetic kicks in to bring you back to normal. An untrained person will take a while to get their heart rate back down to resting. A trained person's heart rate will come back down very quickly.”

The cross-sectional study focused on baseline test results from 132 sedentary, independently living individuals aged 60 to 83 (47 males; 85 females) who had been recruited to participate in the Immune Function Intervention Trial (ImFIT), a randomized longitudinal trial designed by Woods and funded by the National Institute on Aging to examine the relationship between exercise and immune function.

Participants included only individuals who did not take medications that included corticosteroids, which could interfere with immune measurements. Smokers and/or those with severe arthritis, a history of cancer or inflammatory disease, chronic obstructive pulmonary disorder, uncontrolled diabetes mellitus, congestive heart failure, recent illness or vaccination, or a positive stress test were excluded.

The physical fitness of subjects was assessed through a battery of tests that measured such variables as fatigue, blood pressure, oxygen intake and carbon dioxide elimination and heart-rate recovery in conjunction with exercise on a walking treadmill. Tests also were administered to determine the subjects' levels of physical activity, physical fitness, emotional stress and body composition (bone density and body fat). Blood samples also were drawn to measure CRP levels.

“The major criterion we were looking at was their fitness level,” Vieira said. “A strength of our study is that we have very good data on their fitness levels.”

And while other studies have explored the relationship between exercise and inflammation, another unique aspect of the U. of I. research, Vieira said, is that “no other studies have adjusted for fitness and body fat percentages simultaneously to really get at that question, ‘Is exercise independently reducing CRP levels, or is it modulated through a decrease in adiposity (body fat)’”

Because the study was cross-sectional – meaning the researchers essentially took a snapshot of the participants' reactions and measurements at a single, fixed point only – Vieira said it was important to note that “we can't say anything about cause and effect relationships.”

However, Woods said, “it gives you some idea of what factors are related, and then you test those in a more rigorous manner.”

Vieira said the research “certainly suggests that fitness may be associated with a decrease in inflammation even independent of body fat and several things, and the mechanism may involve a parasympathetic anti-inflammatory reflex.”

“We know inflammation is bad. We know it increases as we age, with stress and other things,” she said. “So if we can decrease that to protect ourselves somehow by just adopting a physically active lifestyle, that's definitely an advantage.”

And while the study confirms the conclusions of previous research by others indicating that high body fat is related to high inflammation and high fitness to low inflammation, “the unique part of this paper is that controlling for those, we also show that high parasympathetic tone is related to low inflammation,” Woods said.

“And it's even independent of their fitness level,” Vieira interjected.

“Fitness, fatness and parasympathetic tone appear to be important,” Woods said, summing up the findings. “And at least according to our results, parasympathetic tone might even be more important than those other factors.”

Source: University of Illinois at Urbana-Champaign

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