Exercise discovery could save lives of sickest patients

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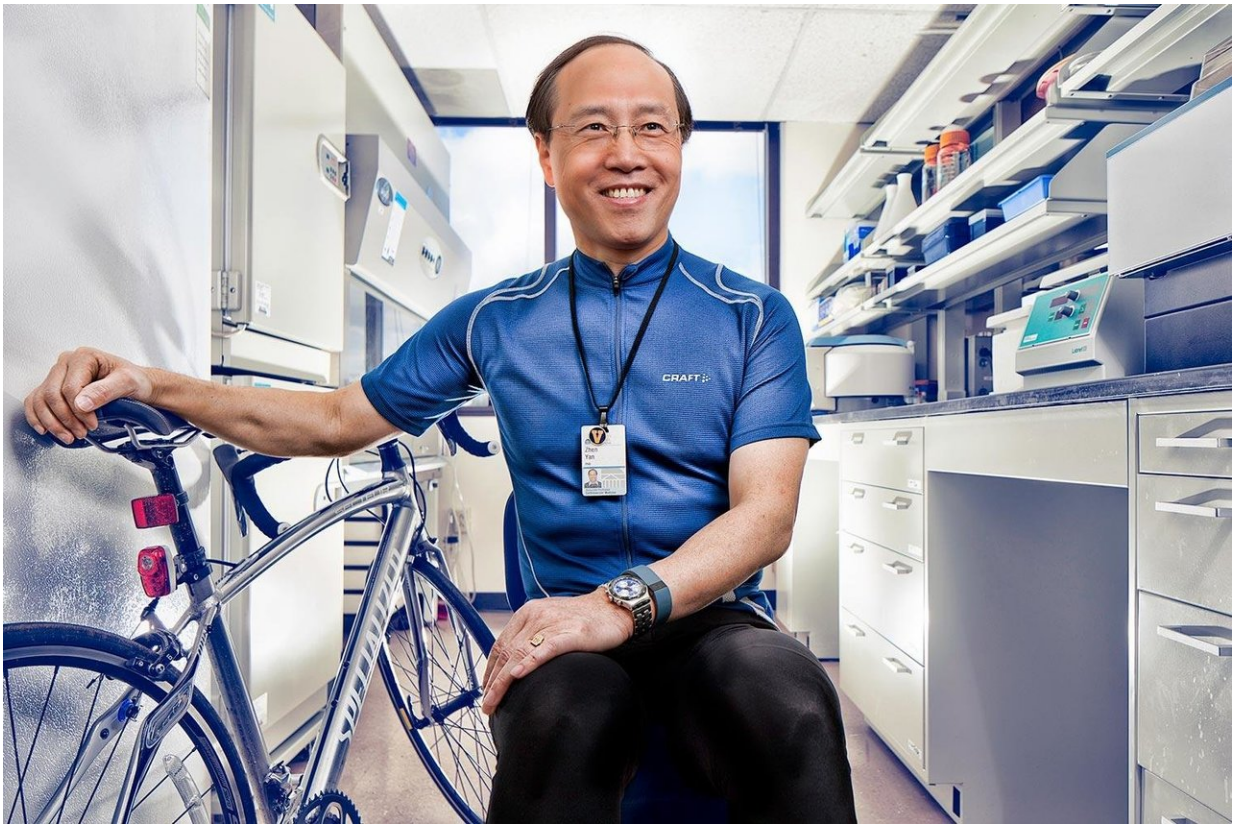

UVA researcher Zhen Yan found that an antioxidant produced by skeletal muscles during exercise may be able to halve deaths from a condition that causes 80 percent of deaths in clinical ICUs. Credit: UVA Health System photo

A new discovery about how exercise helps protect us from disease could

one day dramatically reduce the death rate among the sickest and most gravely injured.

People suffering from severe trauma or the full-body infection known as sepsis often develop multiple organ dysfunction syndrome, or MODS. It's as though the immune system turns against the patient, attacking the vital organs instead of the infection. MODS is a primary cause of death in intensive care units, killing up to 80 percent of patients who develop it.

Frustratingly, doctors know little about why it occurs, and nothing can be done to stop it. But the new discovery from the University of Virginia School of Medicine could change that.

"This data suggests if everything is true, if this can indeed provide protection against sepsis and multi-organ dysfunction, that would imply that 80 percent of deaths in the clinical ICU could be cut in half," UVA researcher Zhen Yan said.

Exercise for Disease Prevention

Yan's research suggests that our skeletal muscles naturally make an antioxidant that helps get rid of excessive free radicals. The antioxidant, known as EcSOD, is one of the mechanisms by which exercise protects the body from disease, his findings show.

"This data really provides direct evidence that a humoral factor – a factor carried in the blood circulation produced by [the muscles], the largest organ of the body – 'knows' intelligently where to go and really provides protection where there is crisis," said Yan, of UVA's Department of Medicine and UVA's Robert M. Berne Cardiovascular Research Center.

The antioxidant helps prevent MODS by protecting the first line of defense, the vessel wall, and preventing inflammatory cells from accumulating inside the vital organs. "In the condition of sepsis and severe trauma, our defense system becomes exaggerated to the point that [the body's immune defenses] misunderstand the signal, so that they begin to attack the organs," Yan said. "Our body is mistakenly thinking there is a danger signal coming from the organs themselves."

The new insight into the role of this elegant antioxidant that is produced by our body may let doctors rein in the excessive and damaging immune response. "If we understand the mechanism, we may be able to strategically and intelligently design better pharmacological interventions and genetic interventions," Yan said.

"Clinically, this has huge implications, indicating the importance of regular exercise in keeping us more resistant to many disease conditions," he noted. "Even under the condition of serious disease, like sepsis, you have a better chance to survive."

Benefits for Patients, Troops

Yan, a top expert in the study of the benefits of exercise, said his findings may offer a way to head off MODS and sepsis if those conditions are caught early. It's unclear if a treatment based on the finding would help those with severe multi-organ dysfunction, he said. But he can foresee another benefit as well: "It could have tremendous implications for personnel deployed to the battlefield who may get injured," he said. "If we train them regularly with the appropriate exercise regimen which will produce more [of the antioxidant] from the muscle, or we can design ways to provide biologically active EcSOD to subjects who are either vulnerable or who have already started to have severe disease conditions, this may lead to a huge impact on their survival."

The researchers have published their findings online in the scientific journal *Free Radical Biology & Medicine*.

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