Longevity and human health may be linked to a muscle cell enzyme

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Exercise and fasting do not change the location of a key enzyme involved in energy production, a study in *Experimental Physiology* found.

SIRT3 is an important enzyme involved in fat metabolism and energy production. Located within the mitochondria of human skeletal muscle, it acts by targeting certain proteins and altering their activity. Nearly every cell in the body contains mitochondria as they are responsible for producing the energy cells need to function properly. Learning more about the enzymes located in the mitochondria, their movements, and purpose in relation to the entire cell is essential for fully appreciating how cellular functions can influence the entire body's well-being.

To determine if SIRT3's location within muscle cells changes, healthy young men were split into two groups with one being subjected to endurance exercise for an hour and the other fasting for 48 hours. The researchers then took skeletal muscle biopsies at various time points post exercise and fasting and isolated the mitochondria. They found that, although the level of SIRT3 mRNA in cells decreases, its location does not change, suggesting that its activity is not regulated by changes in its abundance within mitochondria in human skeletal muscle.

Dr Brendon Gurd, Associate Professor of Muscle Physiology at Queen's University, Ontario Canada and lead investigator of the study explained, 'Skeletal muscle cells respond to stimuli by activating many mitochondrial proteins in an attempt to meet the energy demands of the cell. Proteins can be regulated by controlling their access to certain areas

of the cell, so we hypothesized that SIRT3 might travel to the mitochondria in response to exercise and fasting'.

He added, 'The family of sirtuins that SIRT3 belongs to are proposed to regulate longevity and metabolic health; however, most of the data to support this comes from research in cells and animals. Whether these proteins play a role in aging and health in humans needs to be confirmed, and more research is necessary to understand how sirtuins themselves are regulated in humans. Our study is one of the first to investigate how SIRT3 is regulated in humans, and understanding the mechanisms that might control SIRT3 activity is not only important at the basic science level, but may be crucial for future studies that try and target the activity of this protein in an attempt to combat various metabolic diseases in humans'.

In future, it will be interesting to note which proteins SIRT3 targets specifically in humans, and the mechanisms used to regulate this activity.

More information: Brittany A. Edgett et al, SIRT3 gene expression but not subcellular localization is altered in response to fasting and exercise in human skeletal muscle, *Experimental Physiology* (2016). DOI: 10.1113/EP085744

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