

Intensive care patients' muscles unable to use fats for energy

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The muscles of people in intensive care are less able to use fats for energy, contributing to extensive loss of muscle mass, finds a new study co-led by UCL, King's College London and Guy's and St Thomas' NHS Foundation Trust.

Intensive care patients can lose 20% of their muscle mass in just 10 days, which can contribute to long-term disability. Nutrition and exercise programmes designed to prevent this [muscle loss](#) have largely been unsuccessful, and this new finding, published in *Thorax*, helps explain why.

"We already knew that our patients have difficulty using glucose to generate energy. Our new data suggests they also find it hard to use fats in the feed we give them to generate energy," said lead author Dr. Zudin Puthuchearu (UCL Medicine, Institute of Sport, Exercise and Health, and Royal Free London NHS Foundation Trust).

The findings suggest the inability to generate energy is likely a result of the widespread [muscle inflammation](#) experienced by patients in the early days of intensive care.

The research team took leg muscle biopsies and blood samples from 62 patients on their first and seventh days in intensive care, and tested them for key proteins that are involved in energy conversion. They found that the quantity of fat in a patient's tube feed was unrelated to the amount of energy in the muscle and to changes in quantity of muscle, instead

finding a close and direct relationship between impaired energy conversion and loss of muscle quantity.

They also found a build-up of fats in the muscle, suggesting it wasn't being effectively used for energy.

"Fats typically make up close to half of the energy content of tube feeds for critically ill patients. Previous studies into increasing nutrition for [intensive care patients](#) have shown conflicting results; our findings help clarify why our patients aren't benefiting from higher-calorie feeds as fats are an ineffective source of energy in the first few days of intensive care," said senior co-author Professor Nicholas Hart (Guy's and St Thomas' NHS Foundation Trust).

The researchers are now investigating whether different types of nutrition that use alternative energy sources, such as ketones, could be more effective, and perhaps treating muscle inflammation before exercise interventions could help maintain or restore muscles.

"Muscle wasting is associated with increased length of intensive care unit stay and with mortality, so it's vital that we find better ways to ensure that nutrition and rehabilitation programmes are effective at preventing [muscle wasting](#)," said senior co-author Professor Stephen Harridge (King's College London).

"By clarifying the complex relationship between inflammation, metabolic processes and signalling, and resulting loss of [muscle mass](#), we have identified where researchers should focus their efforts on finding better ways to keep [intensive care](#) patients as healthy as possible," said senior co-author Professor Hugh Montgomery (UCL Medicine and Institute of Sport, Exercise and Health).

Dr. Puthuchearu added: "Exercise and rehabilitation in this group is

going to be difficult if our patients' muscles lack [energy](#) to work and grow. Our [patients](#) may need a coordinated nutrition and exercise regime to recover just like athletes do—not just one or the other. This needs to be put in place once the [muscle](#) inflammation has subsided."

More information: Zudin A Puthuchearry et al, Metabolic phenotype of skeletal muscle in early critical illness, *Thorax* (2018). [DOI: 10.1136/thoraxjnl-2017-211073](#)

Provided by University College London

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