Algae as a surprising meat alternative and source of environmentally friendly protein

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With more of us looking for alternatives to eating animals, new research has found a surprising environmentally friendly source of protein—algae.

The University of Exeter study is the first of its kind to demonstrate that the ingestion of two of the most commercially available algal species are rich in protein which supports muscle remodeling in young healthy adults. Their findings suggest that algae may be an interesting and sustainable alternative to animal-derived protein with respect to maintaining and building muscle.

The paper is entitled "Algae Ingestion Increases Resting and Exercised Myofibrillar Protein Synthesis Rates to a Similar Extent as Mycoprotein in Young Adults" and is published in *The Journal of Nutrition*.

Researcher Ino Van Der Heijden from the University of Exeter said, "Our work has shown algae could become part of a secure and sustainable food future. With more and more people trying to eat less meat because of ethical and environmental reasons, there is growing interest in non-animal-derived and sustainably produced protein. We believe it's important and necessary to start looking into these alternatives and we've identified algae as a promising novel protein source."

Foods rich in protein and essential amino acids have the capacity to stimulate muscle protein synthesis, which can be measured in the laboratory by determining the incorporation of labeled amino acids into muscle tissue proteins and translated to a rate over time. Animal-derived protein sources robustly stimulate resting and post-exercise muscle protein synthesis.

However, because animal-based protein production is associated with increasing ethical and environmental concerns, it's now been discovered that an intriguing environmentally friendly alternative to animal-derived protein is algae. Cultivated under controlled conditions, spirulina and chlorella are the two most commercially available algae that contain high doses of micronutrients and are rich in protein. However, the capacity of

spirulina and chlorella to stimulate myofibrillar protein synthesis in humans remains unknown.

To bridge the knowledge gap, University of Exeter researchers assessed the impact of ingesting spirulina and chlorella, compared with an established high-quality nonanimal-derived dietary protein source (fungal-derived mycoprotein) on blood amino acid concentrations, as well as resting and post-exercise myofibrillar protein synthesis rates.

Thirty-six healthy young adults participated in a randomized, double-blind trial. Following a bout of one-legged resistance leg exercise, participants ingested a drink containing 25 grams of protein from fungal-derived mycoprotein, spirulina or chlorella.

Blood and skeletal muscle samples were collected at baseline and during a four-hour post-feeding and post-exercise period. Blood amino acid concentrations and myofibrillar protein synthesis rates in rested and exercised tissue were assessed.

Protein ingestion increased blood amino acid concentrations, but most rapidly and with higher peak responses following consumption of spirulina compared with mycoprotein and chlorella. Protein ingestion increased myofibrillar protein synthesis rates in both rested and exercised tissue, with no differences between groups, but with higher rates in exercised compared with rested muscle.

This study is the first of its kind to demonstrate that ingestion of spirulina or chlorella robustly stimulates myofibrillar protein synthesis in resting and exercised muscle tissue, and to an equivalent extent as a high-quality nonanimal derived counterpart (mycoprotein).

In a companion commentary, Lucy Rogers and Professor Leigh Breen from the University of Birmingham highlight the strengths and utility of

these novel findings, while identifying paths forward for future research that focuses on diverse populations such as older adults.

More information: Ino van der Heijden et al, Algae Ingestion Increases Resting and Exercised Myofibrillar Protein Synthesis Rates to a Similar Extent as Mycoprotein in Young Adults, *The Journal of Nutrition* (2023). DOI: 10.1016/j.tjnut.2023.08.035

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