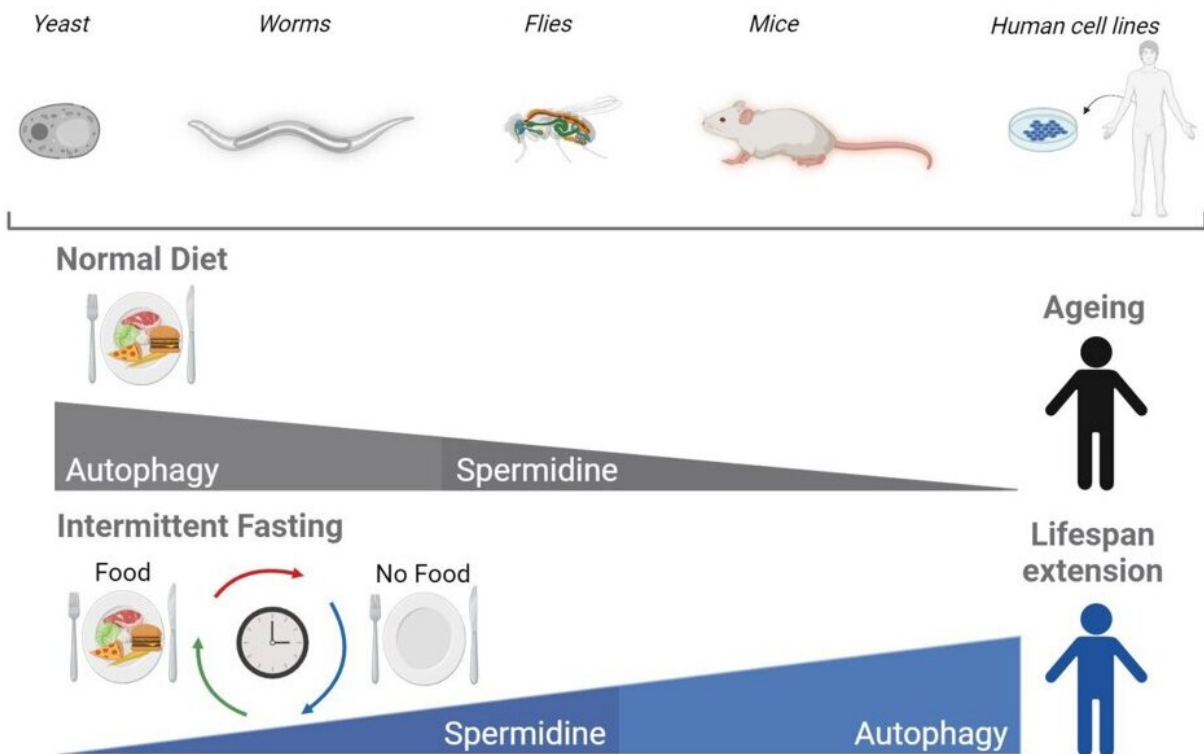


# Study reveals how intermittent fasting regulates aging through autophagy

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Credit: Foundation for Research and Technology - Hellas

Recent research at the Institute of Molecular Biology and Biotechnology (IMBB) of the Foundation for Research and Technology-Hellas (FORTH), at the Paris Cité University, and at the University of Graz,

[published](#) today in *Nature Cell Biology*, sheds light on the mechanism through which spermidine regulates autophagy, a process that ensures the recycling of components within the cell, to promote the anti-aging effects of intermittent fasting.

IMBB Researchers, Dr. Ioanna Daskalaki and Dr. Ilias Gkikas, led by Dr. Nektarios Tavernarakis (Professor at the Medical School of the University of Crete, and Chairman of the Board of Directors at FORTH, Greece), in collaboration with the research groups of Dr. Guido Kroemer (Professor at Paris Cité University, France) and Dr. Frank Madeo (Professor at the University of Graz, Austria), demonstrated that intermittent fasting increases the levels of [spermidine](#), a chemical compound (natural polyamine), that enhances the resilience and survival of cells and organisms, through the activation of [autophagy](#).

Autophagy is a process of cellular recycling, the destruction of non-functional/unnecessary components and organelles of the cell.

Autophagy defects have been linked to aging, as well as, with the emergence of age-related disorders, such as diabetes, cardiovascular diseases, cancer and neurodegenerative diseases.

Dietary habits, such as low or [high-fat diet](#), over-nutrition, or fasting can influence the development of these chronic diseases, the prevalence of which is expected to increase considerably in the coming years. Dietary interventions, such as caloric restriction and intermittent fasting, can slow down aging and promote longevity.

A key element of these interventions is the maintenance of cellular homeostasis through the induction of autophagy. Direct administration of spermidine is an alternative strategy for inducing autophagy and extending lifespan. However, the role of spermidine in the regulation of autophagy and aging upon intermittent fasting remains unclear.

Using a range of experimental models, ranging from the nematode (*Caenorhabditis elegans*), yeast (*Saccharomyces cerevisiae*), fruit fly (*Drosophila melanogaster*), mouse (*Mus musculus*), and human cell lines, the research teams of Prof. Tavernarakis, Prof. Kroemer, and Prof. Madeo have shown that intermittent fasting increases the cellular levels of spermidine, which in turn induces autophagy, resulting in the prolongation of lifespan in these organisms.

Conversely, inhibition of spermidine synthesis, using appropriate inhibitors, counteracts the benefits of autophagy on lifespan through intermittent fasting.

The results of the research highlight the critical role of spermidine in regulating autophagy under intermittent fasting, thereby improving lifespan expectancy across all model organisms studied. The fact that the regulation of autophagy through spermidine and intermittent [fasting](#) is an evolutionarily conserved process, underscores its central role in monitoring and maintaining cellular homeostasis across different organisms.

The study carried out by IMBB researchers and their colleagues, provides crucial insights into the mechanisms through which dietary habits can influence aging in humans, and suggests new strategies for addressing age-related diseases, aiming to improve both life expectancy and quality of life for the elderly.

**More information:** Sebastian J. Hofer et al, Spermidine is essential for fasting-mediated autophagy and longevity, *Nature Cell Biology* (2024). [DOI: 10.1038/s41556-024-01468-x](https://doi.org/10.1038/s41556-024-01468-x)

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