

# Psychology Today

## FOR A HEALTHIER LIFE

### 9 Ways to Live Healthier and Longer

*What is autophagy and why do we need it?*

By Ilene S. Ruhoy M.D., Ph.D.

June 19, 2022

#### KEY POINTS

- Autophagy is the cellular process by which cells are cleaned out.
- Autophagy can dictate not only how well we live but perhaps how long we live.
- There are ways we can optimize autophagy in our bodies.

Autophagy is the process by which our cells are cleaned out. The organelles, proteins, and debris that are no longer efficient or effective are packaged and sent on their way, either by degradation or release. Autophagy can dictate not only how well we live but perhaps how long we live. It is a key physiological mechanism that has been conserved throughout evolution for the distinct purpose of allowing the human species to thrive.

When the autophagic mechanisms are overwhelmed or dysfunctional, the cells are unable to perform optimally, which can result in disease or more rapid aging. Autophagy encompasses mitophagy, the removal of damaged mitochondria, lipophagy, the breakdown of lipids by lysosomal organelles, and aggrephagy, the clearance of other cellular proteins and debris, and more.

It is notable that most neurodegenerative disorders, such as Alzheimer's disease or Parkinson's disease, are associated with the accumulation of misfolded proteins or pathologic proteins. Impaired autophagy causes disease, but the exact mechanism by which it does so is not completely understood, as there are multiple transcription

factors, signaling molecules, and chaperone proteins that have been implicated. Regardless, we do know the regulation of autophagy can be affected by our lifestyle, our environment, our nutrient status, and external and internal stressors.

### Here are ways you can optimize autophagy:

1. **Caloric restriction:** Restriction of calories with intermittent fasting upregulates autophagy. Studies demonstrate caloric restriction is associated with an upregulation of autophagy in the liver, fat, brain, and muscle as well as longer, healthier lifespans. This is thought to be due to an increased availability of substrates and precursors for other essential biochemical reactions.
2. **Nutrition:** Intracellular enzymatic reactions require not only substrates but also co-factors for proper functioning. Co-factors are often vitamins that can be obtained from a wide array of plant-based foods. Excess protein and saturated fats impair autophagy as they require too much cellular energy to digest, with a consequent increase in reactive oxygen species. Plant-based foods have a vast amount of antioxidants to reduce oxidative stress, which can disrupt autophagy.
3. **Antioxidants:** Foods to include in your plant-based diet are berries, such as barberries, a source of berberine; broccoli seed sprouts, a source of sulforaphane; and green tea, a source of polyphenols. Juice turmeric and ginger roots and drink them often.
4. **Avoid oils, saturated fat, dairy, sugar, and processed foods:** These items are pro-inflammatory and can burden the mitochondria, impairing their function and role in autophagy.
5. **Exercise and oxygenate:** Regular aerobic exercise improves the delivery of oxygen and nutrients to your cells by increasing blood flow to your vital organs. It also improves the transport of packaged and degraded inflammatory metabolites and waste by-products. **Improving oxygenation has positive effects on autophagy and can also be accomplished by hyperbaric oxygen therapy (HBOT). HBOT helps wounds heal in part due to its regulation of autophagy. HBOT has also been shown to improve neurogenesis and decrease inflammation.**
6. **Restorative sleep:** The glymphatic system and autophagy are highly active during sleep. They work synergistically to improve the health and functioning of your brain. We should all work hard to respect the circadian nature of our brains and our bodies, as this will help improve the quality of our sleep. It can be simple but requires motivation and dedication. Go to bed at the same time each night and wake up at the same time each morning. Get outside in the morning to take in the light. Eat at regular meal times and exercise at similar times each day. The use of melatonin 30 minutes prior to bedtime can be helpful as well. Recent research on melatonin supports its neuroprotective role.

7. **Protect your genes:** Chromatin and epigenetic changes via histone modifications can have a significant impact on autophagy. While we don't have much control over many exposures, we should strive to reduce exposure to electromagnetic radiation, chemicals, pollutants, and toxins, all of which have post-translational effects on our genomes.
8. **Amplify the AMPK pathway:** The adenosine monophosphate-activated protein kinase (AMPK) is an enzyme that is critical for cellular bioenergetics. During nutrient-depleted states, AMPK is activated to upregulate autophagy to maintain homeostatic demands. Impairment of the AMPK pathway has been associated with aging, cancer, neurodegenerative disease, and endocrine dysfunction. Cold temperatures have been shown to upregulate AMPK (the basis behind cryotherapy) but could also be accomplished by cold showers, cold baths, cold swims, and the use of cold packs. There are also some medications, such as aspirin or metformin, and natural medicines, such as cordyceps, that can regular AMPK. Intermittent fasting, as well as a diet low in saturated fats, can be helpful as well.
9. **Get outdoors and interact with nature:** Exposure to nature has been repeatedly demonstrated to decrease inflammatory mediators, such as prostaglandins and interleukins, as well as upregulate inducers of autophagy.