

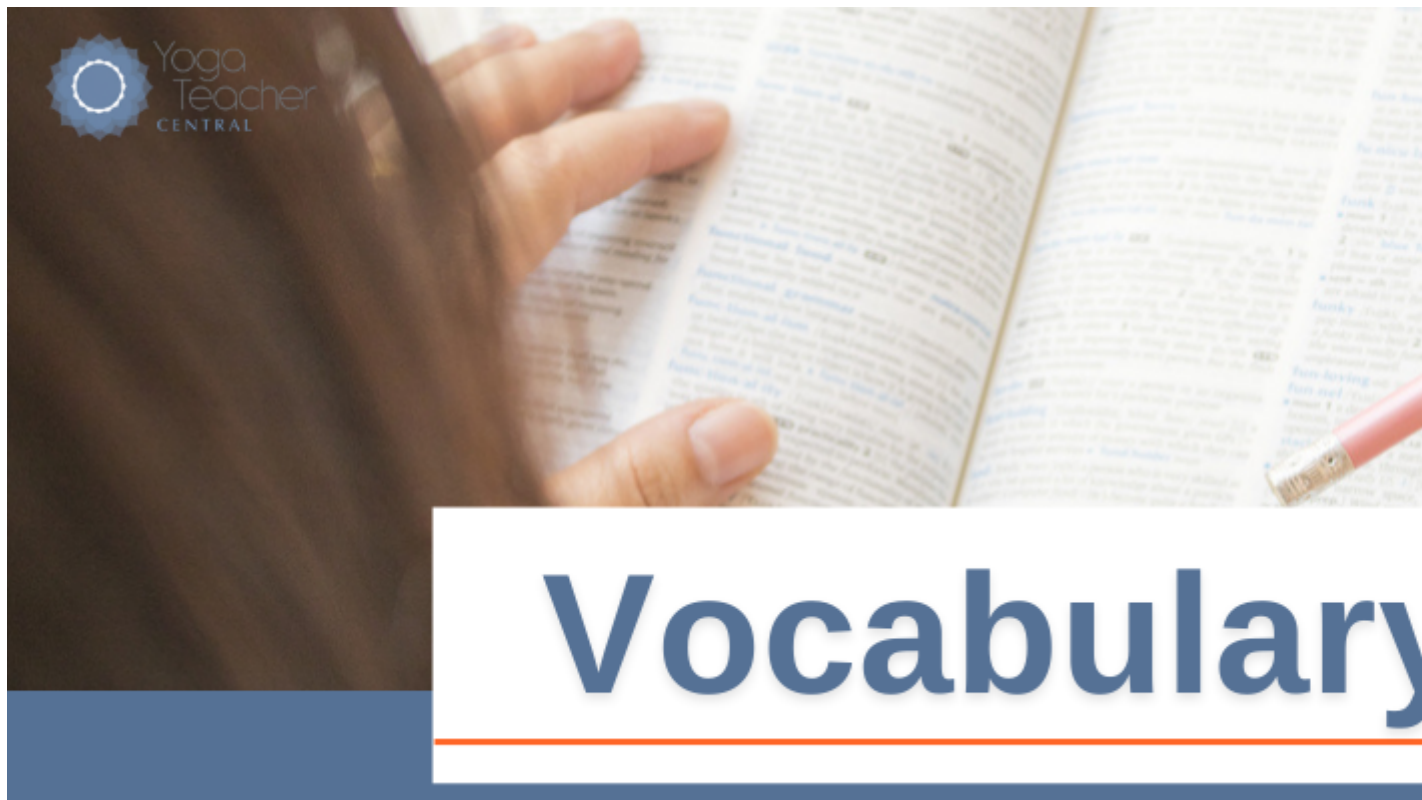


Cells & Cellular Biology

Description

Vocabulary

apoptosis, ATP, autophagy, biology, cell biology, cells, metabolism, mitochondria, molecular biology, nucleus, organelles, stem cells



1. **APOPTOSIS** ??? Programmed cell death, a part of healthy cellular functioning
2. **ATP** ??? The primary energy source of animals and plants, produced by cells

3. **AUTOPHAGY** â?? Meaning â??self-eating,â?• refers to the bodyâ??s process of recycling non-beneficial cells or parts of cells
4. **BIOLOGY** â?? The study of life
5. **CELL BIOLOGY** â?? The study of how cells behave
6. **CELLS** â?? The smallest â??partâ?• in our body that has all the characteristics of life, according to scientists; more than 30 trillion in the human body
7. **METABOLISM** â?? The process of converting one form of energy into another
8. **MITOCHONDRIA** â?? The site of energy production in cells; called the â??powerhouse or batteryâ?• of the cell
9. **MOLECULAR BIOLOGY** â?? The study of molecules within cells, specifically how DNA, RNA and proteins behave
10. **NUCLEUS** â?? Known as the control center of the cell, holds DNA, determines which genes will be expressed and which will be suppressed ([source](#))
11. **ORGANELLES** â?? Membrane-bound structures with complex functions that live outside the nucleus within the cytoplasm
12. **STEM CELLS** â?? Cells that do not yet have a specific role and can become almost any cell that is required; have been found in the embryo, placenta, bone marrow, lungs, liver, muscle, cartilage, spleen and fat tissue ([source](#))

Cells: Small Packets of Life

What is a Cell?

A cell is the smallest â??partâ?• in our body that has all the characteristics of life, as defined by scientists.

Cells are the fundamental biological â??unitâ?• of living tissues.

In essence, cells are â??small packets of life.â?• ([source](#))

The human body is made up of more than 30 trillion cells.

How Do Scientists Define Life?

Scientists define life as exhibiting the following characteristics:

1. 1. Responds to its environment
2. Grows and develops
3. Produces offspring
4. Converts one form of energy into another (metabolism)
5. Keeps its internal environment the same regardless of outside changes (homeostasis)

What Do Cells Do?

Cells create and maintain our body and its health. They do this by:

- - Multiplying

- Differentiating into hundreds of different cell types that make up our bodies • [\(National Academy of Sciences\)](#)
- Organizing themselves into tissues and organs (and thus, the body itself)
- Dying and regenerating

Such momentous life-giving activities utilize immense amounts of energy and complexity:

100,000 Biochemical Operations, Amazing Feats of Energy & Material Manifestation

Each second, each human cell undergoes approximately 100,000 biochemical operations! Jack Kruse, MD explains how the bioenergetics of the cell take advantage of a literal lightning bolt of energy contained within the magnetic field strength of the mitochondria within our bodies, and which make possible amazing feats of [energy and material manifestation](#), proving the cells have at their disposal, abilities which classical physics and biology consider impossible. Sayer Ji, GreenMedInfo, Leonardo da Vinci & The New Biology [link](#)

Power, Proficiency, Elegance, Intelligence

The power, proficiency, elegance and intelligence displayed at the cellular level gives us a view into the wisdom inherent in the body.

The Inherent Capability & Intelligence of Cells

The type of cells found in animals and humans (eukaryotic cells) are different from the cells of bacteria, for example, because they have:

1. **A Nucleus** (membrane-bound) Known as the control center of the cell, holds DNA, determines which genes will be expressed and which will be suppressed [\(source\)](#)
2. **Organelles** Membrane-bound structures with complex functions that live outside the nucleus within the cytoplasm
3. **Considerable Refinement & Capability** Eukaryotic cells have at least a dozen different types of chemically specific membranes that create separate intracellular compartments with different microenvironments required by various processes, such as respiration, photosynthesis, protein synthesis, and intracellular digestion. Additionally, comparable activities are differently distributed. • [\(National Academy of Sciences\)](#)

That tech-speak means that the cells are incredibly powerful and proficient, doing extraordinary activities to give us the experience of bodily life and health.

This indicates a substantial capability and intelligence at the most basic physical level that is far beyond what many humans can, at this point, comprehend.

In the first 5 minutes of [this video](#), Sayer Ji makes a vital point in response to Dr. Eric Berg's question about how garlic works at a cellular level to prevent cancer cells from proliferating. Ji describes the research showing profoundly capable and intelligent cells carrying out vital activity that determines how well our body functions, and thus what we experience at the more macro level as illness or health.

Power & Flexibility

Additional terminology related to cells includes:

1. **Mitochondria** – The site of energy production in cells; called the “powerhouse or battery” of the cell
2. **ATP** – The name given to the primary energy source of animals and plants, produced by cells ([source](#))
3. **Stem Cells** – Cells that do not yet have a specific role and can become almost any cell that is required; have been found in the embryo, placenta, bone marrow, lungs, liver, muscle, cartilage, spleen and fat tissue ([source](#))

An Example of Cellular Intelligence

Some different cells have different amounts of mitochondria [presumably] because they need more energy. So for example, the muscle has a lot of mitochondria, the liver does too, the kidney as well, and to a certain extent, the brain, which lives off of the energy those mitochondria produce. – National Human Genome Research Institute, Mitochondria [link](#)

How Can We Best Support This Intelligent System?

We might view the body as the quintessential example of “the sum is greater than its parts.” The body is a living, ultra-intelligent system. [We do not inhabit a machine with parts.](#)

Our body is an intelligent, complex and harmonious arrangement of [interconnection and structure](#).

Because mainstream science relies on a [materialist and reductionist](#) approach, bodily intelligence is not studied in its holistic complexity. As such, Western medicine employs strong interventions such as pharmaceuticals that are not familiar to the body’s biological system without taking responsibility for causing a cascade of potentially harmful effects in the bodily system. This is exemplified in the following article where we get a sense for how pharmaceuticals called statins affect the cells that create energy.

Multiple Research Studies Show that Pharmaceuticals Harm Our Body’s Cells Which We Experience as Side Effects, Symptoms & Ill Health

Your mitochondria generate about 90 percent of cellular energy in your body in the form of ATP. It also plays a role in major metabolic functions. Mitochondria are found in varying concentrations in different tissues in your body and are specialized for the purpose of that tissue. Clearly, your mitochondrial health is critical for your overall function and well-being. Mitochondrial dysfunction can cause problems throughout your body! One of the main problems with statin drugs is that they may damage your mitochondrial function. A 2017 review published in the Journal of Clinical Medicine found that while statin drugs are highly effective, statin-associated muscle symptoms (SAMS) is one of the main reasons for discontinuation (3). Researchers speculate that the cause of SAMS may be mitochondrial dysfunction caused by statin drugs. A 2016 review published in Postepy Biochemii has also found that statin drugs may impair mitochondrial functions (4). They noted abnormal mitochondrial morphology, reduced mitochondrial membrane potential, lower mitochondrial activation, and reduced oxidative

phosphorylation capacity. â?? Dr. David Jockers, *Statin Drug Side Effects: Symptoms and Support Strategies* [link](#)

See [the article](#) for many more side effects and risks with these drugs.

Here, weâ??re highlighting mitochondrial research to exemplify how interference with the complex bodily system can be happening at the most foundational, cellular level.

In contrast, we can acknowledge the bodyâ??s wisdom and seek to employ strategies that support and optimize the bodyâ??s systemic intelligence. See much more on this in this series of lessons (particularly in [Epigenetics & Lifestyle Research](#)).

Essential for Health: Cell Death, Recycling & Regeneration

The healthy functioning of cells (and therefore our experience of health) involves a continuous process of cell death, recycling, and regeneration.

Apoptosis

Apoptosis is the name given to the natural and healthy process of programmed cell death. The bodyâ??s innate intelligence programs cell death to eliminate cells that, for example, are damaged or were only needed temporarily.

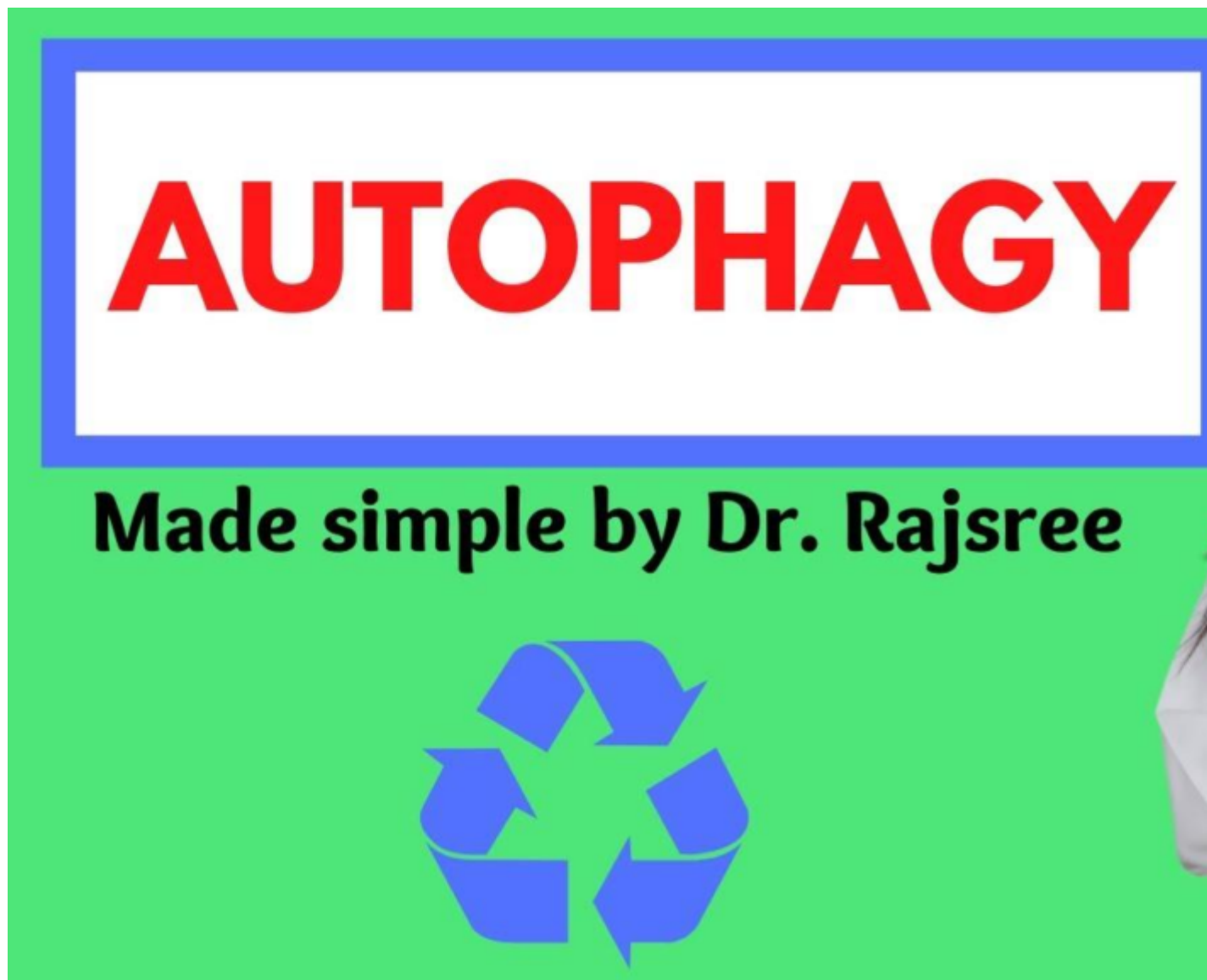
Autophagy

- Autophagy is a closely related concept to apoptosis. Meaning â??self-eating,â?• autophagy refers to the bodyâ??s process of recycling non-beneficial cells or parts of cells.
- Japanese cell biologist [Yoshinori Ohsumi won the Nobel Prize in Medicine](#) in 2016 for research on autophagy, showing that fasting activates autophagy, slowing down the aging process and having a positive impact on cell renewal.
- This PubMed [citation](#) speaks of autophagy as a subtype of apoptosis. The video below implies the two concepts are very similar and in some sources, the names seem to be used interchangeably, referring to cellular recycling in general. In cases where they are differentiated, it seems that apoptosis refers to total cell death, while autophagy refers to the recycling of damaged parts of a cell, as Dr. Berg explains [here](#).
- Multiple forms of cellular â??stressâ?• (meaning an environment that demands change) prompt this healthy cell activity. â??Autophagy happens when your body recycles and gets rid of old or excess cells (like fat) that donâ??t serve a purpose or benefit your health. The major drivers of autophagy are cellular stressors such as nutrient deprivation brought on from various mechanisms including fasting, exercise, and significant temperature change.â?• ([source](#))
- Autophagy is the term used when explaining the benefits of [intermittent fasting](#).

Our Cellular Activity is Aligned with Ancestral Norms & Optimized by Particular Types of Stress

It was very common for our ancestors to have stressful circumstances such as long periods of time without food, high intensity activity and excessive heat and cold. These demands stimulated a regular and healthy dose of autophagy within their cells. The process of autophagy is occurring within all mammals at some level but creating a lifestyle that optimizes autophagy can be extremely beneficial for

a number of reasons. Dr. David Jockers, *Autophagy: What is It and 8 Ways to Enhance It* [link](#)



In Healthy Functioning, Cells are Always Dying & Regenerating

Apoptosis, or programmed cell death, is a normal and controlled part of growth and development. While in the womb, it's apoptosis that causes the webbing between your fingers and toes to disappear, leaving you with 10 separate fingers and 10 separate toes. Though it may sound counterintuitive, by committing cellular suicide, apoptosis maintains homeostasis in your body, helping to eliminate cells with DNA damage, for instance, or remove cells that were only needed for a temporary task. Apoptosis exists to eliminate dysfunctional cells, but a hallmark of cancer is that the malignant cells are able to evade apoptosis. Without this crucial balance, cancerous cells continue to grow out of control and can ultimately bring down the whole organism. Senescent cells, which have stopped dividing and tend to accumulate with age, are another example. Cellular senescence is believed to occur in stressed cells as a tumor-suppressor mechanism, stopping cellular reproduction in order to protect against cancer. But these cells, even if they're non-cancerous, can become harmful as they accumulate. As such, elimination of senescent cells is believed to promote longevity and antiaging. There are at least 703 natural substances, such as curcumin, the active component in the spice



turmeric, and resveratrol, found in grape skins, that have apoptotic properties and serve as a balance to cellular regeneration. â?? GreenMedInfo, 15 Natural Strategies to Regenerate Your Body and Mind [link](#)

Cellular Regeneration

The human body replaces its own cells regularlyâ?|. About 330 billion cells are replaced daily, equivalent to about 1 percent of all our cells. In 80 to 100 days, 30 trillion will have replenishedâ??the equivalent of a new you. â?? Mark Fischetti & Jen Christiansen, Scientific American, Our Bodies Replace Billions of Cells Every Day [link](#)

Autophagy is Essential & Knowing How to Trigger It Helps Your BodyWhen your body is exposed to cellular stressors, such as nutrient deprivation from fasting, or high-intensity exercise, it needs fuel to produce the necessary energy for survival. To accomplish this, your body signals the break down of older and less efficient cells and cellular organelles, allowing room for the creation of new, healthier, and more efficient cells to produce more energy (2). As a result, autophagy helps your body to function better. With the help of new mitochondria and healthy cells, your body becomes stronger. It also becomes more resilient to chronic stress, inflammation, chronic pain, and disease (3). â?? Dr. David Jockers, 7 Herbs That enhance Autophagy and Cellular Healing [link](#)

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