

# LONG LONG LIFE – GLOSSARY ON LONGEVITY AND AGING

Long Long Life is a free scientific, educational and information website where you can learn more about the fight against aging and the improvement of human longevity. It is written by scientists who aim to allow everybody to be aware of the last discoveries in anti-aging research.

We are confident that with the right information, anyone can make wise choices concerning treatments that might have an impact on human longevity. For the information to be available to everyone, we created a glossary to clarify specialized terms.

This glossary is not intended to be used as a scientific resource but as a tool to facilitate the understanding of our articles, for you to take control of your lifespan.

**Amino Acid:** Amino acids are the “building blocks” of proteins. They are composed of a carboxyl (- COOH) and an amino-acid (-NH<sub>2</sub>).<sup>1</sup>

**Amniotic fluid:** The amniotic fluid is a sterile, clear, watery liquid bathing the embryo and then the fetus throughout pregnancy in mammals.<sup>2</sup>

**Antagonistic pleiotropy hypothesis:** George C. Williams's theory which suggests that aging is due to genes that have pleiotropic effects: Genes that are beneficial because they promote growth and reproduction but are harmful afterwards because they are a part of the aging process.<sup>3</sup>

**Apoptosis:** The apoptosis is a genetically directed process of cell self-destruction that is marked by the fragmentation of nuclear DNA, activated either by the presence of stimulus, and is a normal physiological process which eliminates DNA-damaged, or unwanted cells, and when halted (for instance, by genetic mutation) it may result in uncontrolled cell growth and tumor formation also called cell suicide, and programmed cell death. Apoptosis, unlike necrosis, does not induce any inflammatory process<sup>4</sup>.

**Atherosclerosis:** The atherosclerosis is the accumulation of lesions resulting from the deposition of cholesterol on the arterial walls, favored by circulating oxidized LDL cholesterol.<sup>5</sup>

**Adenosine Triphosphate (ATP):** The adenosine triphosphate is a molecule produced by mitochondria and composed of a nucleotide, adenosine triphosphate, which occurs in all cells where it stores energy in the form of high-energy phosphate bonds.<sup>6</sup>

**Carbonic anhydrase:** Carbonic anhydrase is a zinc-containing enzyme that helps carbon dioxide transport from tissues and helps release it from the blood in the lungs by catalyzing the reversible hydration of carbon dioxide into carbonic acid.<sup>7</sup>

**Cellular Senescence:** Cellular senescence is an irreversible state of the G1 cell cycle arrest in which cells are refractory to growth factor stimulation.<sup>8</sup>

**Chaperones proteins:** They are proteins that assist others to fold properly after synthesis and refold after partial denaturation.<sup>9</sup>

**Chromatin:** Chromatin is a substance composed of DNA and proteins that are used in the DNA compaction. It is usually dispersed in the interphase nucleus, then condensed into chromosomes in mitosis and meiosis.<sup>10</sup>

**Curcumine:** It is a yellow pigment, extracted from the rhizome of Curcuma longa (turmeric), and its main active ingredient. It is an antioxidant and has anti-inflammatory properties.<sup>11</sup>

**Cystic fibrosis:** Cystic fibrosis is a progressive genetic disease that causes persistent lung infections and limits the ability to breathe over time, slowly leading to the early death of the patient if they cannot receive a lung transplant on time.<sup>12</sup>

**Cytokine:** It is a peptide mediator which plays an active role in the immune and inflammatory signaling.<sup>13</sup>

**Deacetylation:** This a chemical process that removes acetyl on a molecule.<sup>14</sup>

**Disposable soma:** Theory for the evolution of senescence, which suggests that senescence arises from an optimal balance of resources between reproduction and somatic repair. This choice favored the sustainability of species over reproduction of humans who are doomed to die.  
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**Dyskeratosis congenita (Zinsser-Engman-Cole Syndrom):** The dyskeratosis congenita is a rare ectodermal dysplasia that often presents with the classic triad of nail dysplasia, skin pigmentary changes, and oral leukoplakia associated with a high risk of bone marrow failure (BMF) and cancer.<sup>16</sup>

**Enzyme:** An enzyme is natural protein produced by all living organisms (bacteria, plants and animals). They are biochemical catalysts which accelerate chemical reactions in cells and convert molecules into other ones.<sup>17</sup>

**FISSEQ (fluorescent in situ sequencing):** Method to pinpoint the precise location of specific RNA molecules in tissue.<sup>18</sup>

**Friedreich ataxia:** Friedreich ataxia is an autosomal recessive neurodegenerative disorder characterized by progressive gait and limb ataxia with associated weakness of the limb muscles, absent lower limb reflexes, extensor plantar responses, dysarthria, decreased vibratory sense and proprioception and can lead to death.<sup>19</sup>

**Gendicine:** Gene therapy medical product that fights against cancer by injecting an adenovirus which carries the p53 gene into the tumor in order to prevent cancer cells proliferation.<sup>20</sup>

**Gene:** A gene is a basic physical and functional unit of heredity information.<sup>21</sup>

**Genome:** The complete set of genetic material of an organism, including all of its genes in DNA.<sup>22</sup>

**HDL cholesterol (high density lipoproteins):** It consists of lipoprotein with a relatively high concentration of protein and low concentration of lipids that incorporates cholesterol and transports it to the liver.<sup>23</sup>

**Hematopoietic stem cells:** A hematopoietic stem cell is an immature cell from bone marrow which can develop into all types of blood cells, including white blood cells, red blood cells and platelets.<sup>24</sup>

**Heterochromatin:** Heterochromatin is a condensed form of chromatin (different from euchromatin which is the non-condensed form) in higher eukaryotic cell that was originally identified by light microscopy.<sup>25</sup>

**Histone:** Histones are proteins which contribute to DNA compaction. Their sequence rich in alkali amino acids, positively charged at a physiological PH, allows them to interact greatly with negatively charged phosphate groups.<sup>26</sup>

**Homeostasis:** Self-regulating process by which biological systems tend to maintain stability while adjusting to conditions that are optimal for survival.<sup>27</sup>

**Huntington's disease:** Huntington's disease is a progressive brain disorder that causes uncontrolled movements, emotional problems, and loss of thinking ability (cognition).<sup>28</sup>

**Hypermethylation:** Methylation is a chemical process that adds a methyl group on a molecule, and the hypermethylation is the overall increase in DNA methylation.<sup>29</sup>

**In vivo:** Performance of a given procedure in a controlled environment inside a living organism is referred to as "in vivo".<sup>30</sup>

**LDL cholesterol (low density lipoproteins):** Lipoprotein of blood plasma that is composed of a moderate proportion of protein with a small amount of triglyceride including a high proportion of cholesterol. A high LDL concentration is associated with an increased probability of developing atherosclerosis.<sup>31</sup>

**Lipogenesis:** Process that converts non-fat food materials into body fat.<sup>32</sup>

**Lipoprotein:** Any of a group of soluble proteins that transport triglycerides in the blood plasma.<sup>33</sup>

**Locus:** Location of a gene (or of a significant sequence) on a chromosome or on a linkage map.

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**Lymphoma:** A usually malignant tumor of lymphoid tissue.<sup>35</sup>

**Lysosome:** Subcellular organelle that is found in nearly all types of eukaryotic cells (cells with a clearly defined nucleus). It is responsible for the digestion of macromolecules, old cell parts, and microorganisms.<sup>36</sup>

**Macular degeneration:** Group of diseases associated with a loss of central vision and damage to the macula.<sup>37</sup>

**Metalloenzyme:** A metalloenzyme is a protein in which are related one or several metal ions that contribute to its three-dimensional structure maintenance and/or its catalytic activity.<sup>38</sup>

**Metformin:** An oral antidiabetic agent that decreases the production of glucose in the liver and lowers plasma glucose levels.<sup>39</sup>

**DNA Methylation:** Process that adds a methyl group (-CH<sub>3</sub>) to any other molecule.<sup>40</sup>

**Microbiome:** Community of microorganisms (such as bacteria, fungi, and viruses) that live in or on the human body.<sup>41</sup>

**Mitochondria:** Organelle within eukaryotic cells essential for breathing that produces adenosine triphosphate (ATP) which is the main energy molecule used by the cell.<sup>42</sup>

**Mitogen:** A mitogen is a substance that triggers the process of cell division.<sup>43</sup>

**mRNA:** Form of RNA, transcribed from a single strand of DNA. It carries the required genetic information for the protein synthesis from DNA to the ribosomes.<sup>44</sup>

**MRI:** A non-invasive imaging technology that produces three-dimensional detailed anatomical images without the use of damaging radiation.<sup>45</sup>

**mtDNA:** DNA that is contained in the mitochondria of eukaryotic cells and is inherited maternally.  
<sup>46</sup>

**NAD (Nicotinamide adenine dinucleotide):** A coenzyme involved in many cell redox reactions, including ATP synthesis.<sup>47</sup>

**Neurogenesis:** Process which generates functional neurons from adult neural precursors, and occurs throughout life in restricted brain regions in mammals.<sup>48</sup>

**Nootropics:** Nootropics are smart drugs or cognitive enhancers, supplements, or other substances that improve cognitive function, particularly executive functions, memory, creativity, or motivation, in healthy individuals.<sup>49</sup>

**Nucleotide:** A group of molecules that, when linked together, form the building blocks of DNA or RNA.<sup>50</sup>

**Oncogene:** An oncogene is a genetic material that can promote tumor proliferation.<sup>51</sup>

**Osteogenesis imperfecta:** A hereditary disease caused by a defective or a deficient collagen production and marked by an extreme brittleness of the long bones and a bluish color of the whites of the eyes.<sup>52</sup>

**Osteoporosis:** A disease characterized by a low bone mass and a deterioration of bone tissue.<sup>53</sup>

**Organelle:** An organelle is a component of the cell that carries out a specialized metabolic function inside a cell.<sup>54</sup>

**Oxidative Stress:** Oxidative stress is a strain on cellular function induced by ROS, which derives from the oxygen metabolism.<sup>55</sup>

**Oxidative phosphorylation:** Process in which ATP is formed as a result of the transfer of electrons through the respiratory chain from the energy released by mitochondrial oxidation.<sup>56</sup>

**P53:** P53 is a tumor suppressor gene located on the short arm of chromosome 17 that encodes a nucleophosphoprotein, binds DNA and negatively regulates cell division; frequently measured as a marker of malignant diseases.<sup>57</sup>

**PARP (Poly [ADP-ribose] polymerase):** Family of proteins involved in a number of cellular processes such as DNA repair, genomic stability, and programmed cell death.<sup>58</sup>

**Phagocytosis:** A process by which cells such as immune cells can internalize and destroy foreign particles.<sup>59</sup>

**Phosphorylation:** A process in which a phosphate group is added to a molecule, such as a sugar or a protein.<sup>60</sup>

**Peroxisome:** A peroxisome is a dynamic ubiquitous cellular organelle involved in the metabolism of hydrogen peroxide (generation and elimination) and lipids (fatty acids α- and β-oxidation).<sup>61</sup>

**Policosanol:** This is a well-defined mixture of higher primary aliphatic alcohols isolated from sugar cane wax with cholesterol-lowering effects proven for a dose range from 5–20 mg/day in patients with type II hypercholesterolemia and dyslipidemia associated with non-insulin-dependent diabetes mellitus.<sup>62</sup>

**Polyuria:** Polyuria is pathological symptom characterized by a high urine volume.<sup>63</sup>

**Proteome:** Set of proteins expressed in a cell at any time<sup>64</sup>

**Rapamycin:** Bacterial macrolide with antibiotic and immunosuppressive activity and structural similarity to FK506.<sup>65</sup>

**Reactive oxygen species (ROS):** A type of unstable molecule that contains oxygen and that easily

reacts with other molecules in a cell.<sup>66</sup>

**Resveratrol:** The resveratrol is a trihydroxy stilbene derivative that is found in some plants, fruits, seeds, and grape-derived products (such as red wine) and has been linked to a reduced risk of coronary disease and cancer.<sup>67</sup>

**Rheumatoid arthritis:** Inflammatory illness that affects the joints and other parts of the body.<sup>68</sup>

**Sarcopenia:** Sarcopenia is a progressive withdrawal of anabolism and increased catabolism, along with a reduced muscle regeneration capacity.<sup>69</sup>

**Shelterin:** Protein complex with DNA remodeling activity that acts together with several associated DNA repair factors to cover the structure of the telomeric DNA, thereby protecting chromosome ends.<sup>70</sup>

**Sirtuin:** Any of a family of enzymes that occur in all living organisms and are thought to regulate cellular aging, apoptosis, and resistance to stress in more complex eukaryotic organisms.<sup>71</sup>

**Stem cells:** A stem cell is an undifferentiated cell of a multicellular organism which is capable of giving rise to indefinitely more cells of the same type, and from which certain other kinds of cell arise by differentiation.<sup>72</sup>

**T lymphocyte:** Type of lymphocyte that is produced or processed by the thymus gland and actively participating in the immune response.<sup>73</sup>

**Telomerase:** DNA polymerase that is a ribonucleoprotein inducing the elongation of chromosomal telomeres in eukaryotic cell division and is particularly active in cancer cells.<sup>74</sup>

**Telomere:** A telomere is a repetitive nucleotide sequence at each end of a chromatid, which protects the end of the chromosome from deterioration or from fusion with neighboring chromosomes.<sup>75</sup>

**Ulcerative colitis:** Disease that is characterized by inflammation and micro-ulcers in the superficial layers of the large intestine. The inflammation usually occurs in the rectum and lower part of the colon, but it may affect the entire large intestine (pancolitis).<sup>76</sup>

**Tomography:** Method of producing a three-dimensional image of the internal structures of a solid object (such as the human body or the Earth) by the observation and recording of the differences in the effects on the passage of waves of energy impinging on those structures.<sup>77</sup>

**Tumorigenicity:** The property of cells that describes their potential for forming tumors, or abnormal growth of cells.<sup>78</sup>

**Tumor necrosis factor:** A tumor necrosis factor is an inflammatory cytokine produced by macrophages/monocytes during acute inflammation and is responsible for a diverse range of

signaling events within cells, leading to necrosis or apoptosis.<sup>79</sup>

**Ureagenesis**: Set of enzymatic reactions leading to the formation of urea components.<sup>80</sup>

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