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The importance of interplay of repulsive and attractive forces in aging

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Abstract

The role of repulsive and attractive forces at the molecular level in the aging process is a constant, omnipresent part that occurs over time, in all chemical processes, not just biochemical ones. The same thing happens in concrete, because as time goes by, it tends to become more and more compact, which is a result of the repulsive forces being minimized and the attractive ones being optimized.

And since it is a process that happens in all or almost all molecules, our body is no exception. So, the molecules that make up us tend to compact because the molecules that make up us tend to compact over time. That is: Repulsions are minimized, and attractions are optimized. This is why people tend to be smaller as they age.

Life is based on the interaction between attractive and repulsive forces and is a dynamic process that is strictly regulated by millions of years of evolution. We can say that it is an amazingly accurate process, which is surprising because, the attractive and repulsive forces start from the atoms, which have positive and negative charges.

And even more so because it is not understood how these charges are generated, without referring to electrons or protons, but what is it that gives charge to said subatomic particles; it is much less understood why different charges attract, and like charges repel.

So, projecting the interaction of charges from the subatomic, atomic, and molecular level, until reaching the complex organic molecules, made up of very complex as well as very large molecules, then we understand why it is so difficult to understand the interaction of repulsive forces and attractive in relation to life, because in fact, this dynamic interaction, carefully regulated by millions of years of evolution, hatches until we reach what we call life.

And from there we move on to another equally complex question: where do the elements and energy necessary for the cell to carry out these interactions come from? These not only have to do with cellular functions, but even with maintaining the necessary dynamic or even normal cell's shape.

Keywords: Aging; Charges; Hydrogen; Magnets; Molecules; Oxygen; Water.

Introduction

The recent formulation of the hallmarks of aging means a generalized failure. These hallmarks (genomic instability, telomere attrition, epigenetic alterations, loss of proteostasis, deregulated nutrient sensing, mitochondrial dysfunction, cellular senescence, stem cell exhaustion, and altered intercellular communication, and frequent idiopathic pulmonary fibrosis) were elaborated trying to understand why aging occurs, and its mechanisms or how it occurs [ ].

It is not known whether lifespan of humans can be extended by pharmacological or regenerative therapies [ ]. And the answer to this question is yes, but first we must understand how the normal human body works. Well, the answer to the complex questions about aging cannot be implemented from false premises.

For example, we must banish as soon as possible the ancient dogma that our body takes the oxygen it contains from the air that surrounds it. Let's start because since 1750, when the oxygen in the atmosphere was characterized, it was also found that the percentage of oxygen it contains is relatively small, at most 21% at sea level. 100 years later, when the biochemistry of the human body was further studied, it was found that our body contains almost five times more oxygen than the atmosphere. And since then, there has been heated controversy about where so much oxygen comes from [ ].

And even worse, when the prevailing dogma maintains that atmospheric oxygen passively passes through the lung tissues,

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reaching the bloodstream. But simple diffusion is very far from explaining the marked difference between the oxygen in the atmosphere and the tissues of our body, not to mention the physicochemical properties of both, which tend more to repel each other than to attract each other [ ].

And the much-vaunted "conclusive evidence" that Marie and August Krogh provided in favor of simple diffusion as a mechanism of gas-interchange between the atmosphere and the lung, in relation to oxygen, is reduced to a very convoluted mathematical model, which cannot be tested. at the laboratory [ ].

But who would have thought that the answer to the heated debate would be found in an observational, descriptive study about the vessels of the optic nerve and its possible correlation with the three main causes of blindness [ ]. And after 12 years (1990-2002) and six thousand patients, the conclusion was surprising: our body has several molecules capable of taking oxygen from the water contained inside the cells, like plants.

So, first we must break the dogma that our body takes oxygen from the air around us, but rather it takes it from the water contained inside the cells, as in plants. Breathing has nothing to do with oxygen, but only with CO2, since the primary function of the lungs, both day and night, is to expel the CO2 that is constantly formed inside our body.

The above implies that we must rewrite the biology and medicine books, since the story in them begins with the supposed introduction of atmospheric oxygen into the human body, through the lungs. Now the physiology of the human body will have to be because the lung only expels CO2, and each cell extracts oxygen from the water it contains, like plants [ ]; and once these collective errors are corrected, then we will be able to advance in the mysteries of aging.

Idiopathic pulmonary fibrosis, cardiovascular disease, neurodegenerative disease, cancer, osteoporosis, and diabetes are likely to share common pathophysiologic mechanisms with the aging process itself [ ]. Furthermore, there is an overlapping of genomic instability, telomere attrition, epigenetic alterations, loss of proteostasis, deregulated nutrient sensing, mitochondrial dysfunction, cellular senescence, stem cell exhaustions, and altered intercellular communication [ ], and all these are compatible data with a generalized failure, and this kind of failure are characteristic of energy dysfunction, in any system.

So, to understand deterioration at the end of life, we must first understand how it originates.

What is the first reaction in the sequence of reactions that make up what we call life?

The first spark of life, as its name describes it, is the energy or everything that causes a change. And the dissociation of water that we observe in living beings meets the requirements in this regard. To begin with, it happens both inside the cell and outside it, therefore it would be the long-sought abiotic part of the origin of life.

We can imagine life as a process that originated slowly and gradually, that is: from the abiotic or inanimate part, over time the animate was created, formed, or evolved. But the thousands of years that the evolution of the first forms of life probably required, unicellular at first and then multicellular, required that the abiotic part be constantly contributing its part, that is energy, so that the biotic or animated part was replicating itself repeatedly again, until the appearance of genetic memory allowed the process to be accelerated significantly. That is, the entire evolutionary history did not have to be repeated, but the appearance of biological memory, in the form of genes or other biological molecules, substantially accelerated evolution, but at the same time allowed the appearance of increasingly complex forms of life. However, the abiotic part of the origin of life must still be present even today, just as it was at the beginning of time.

Living beings are made up of the same molecules that we observe in nature, in our environment. Their physicochemical characteristics are very similar. This is: Atomic number, atomic mass, oxidation levels, etc. And the above characterizes its behavior in relation to being attracted or repelled by other molecules or atoms.

So, what is it those that orders the physical and chemical characteristics of the atoms or molecules that make us up?

And the answer is the first spark of energy, which is constant from then and now, since it is present and acting all the time inside our cells, providing the energy that the order and sequence of life requires to manifest, to hatch, to evolve. And it is a unique type of energy, amazingly exact, and repeating all the time both day and night. But with the difference that the abiotic molecule that provided energy at the beginning of time is the same one that provides it today, but both prokaryotic and eukaryotic cells learned or implemented the cellular, enzymatic machinery that allowed them and in fact currently It does so that the cell can synthesize these primitive molecules. That is: living entities gradually became independent of the abiotic, inanimate, or external part, and over time they included it inside the cells, synthesizing it (Figure 1, 2).

For instance, this abiotic precursor is present very early during the embryogenesis. Dopaminergic (DA) neurons of the substantia nigra were detected through TH immunoreactivity from week 12. At week 16, the substantia nigra was clearly delineated as a compact group of intermingled neurons and fibers [ ].

Melanin, the common ancestor

The physicochemical characteristics that a molecule requires to be considered the abiotic part of the origin of life are like the requirements requested for dark matter, for example: extraordinary stability. The chemical energy produced by melanin from the dissociation of water, a highly endergonic chemical reaction driven on planet Earth by sunlight; can be considered as the very first spark of life that Darwin mentioned; but the chemical reactions driven by this very exact energy that were

Figure 1: *Photograph of a ruffled lemur.*

Figure 2: *Brazilian wandering banana spider. Note the presence of the abiotic molecule par excellence: Melanin.*

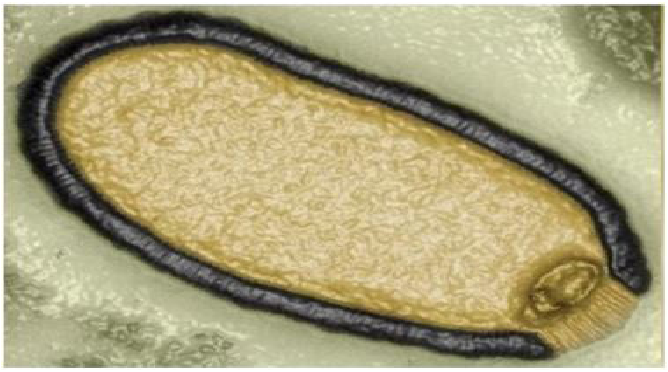

Figure 3: *Any form of life requires its "transducer" to transform light energy into chemical energy, through the dissociation of water, like plants. In the photo, a zombie virus, unearthed in the arctic recently.*

added gradually to the biochemical logic of life were not added overnight (Figure 3). It took eons of years for the biological processes inherent to life to be perfected, and this required a constant injection of this amazingly precise water dissociation process. And melanin is the most stable substance known: 160 million years proven [ ].

Neuromelanin pigment (Figure 4), at the substantia nigra is scarce at the extremes of life, that is: At birth and after the 60s. Marked loss of pigment at the substantia nigra is a hallmark of aging and neurodegenerative diseases, such as Parkinson's disease, Alzheimer's disease, Lewis Body Disorders, Creutzfeldt Jakob Disease, Chronic Traumatic encephalopathy, Progressive Supranuclear Palsy, Corticobasal Degeneration,

Figure 4: *In Magnetic Resonance studies it is possible to detect the substantia nigra, in the midbrain (yellow arrow).*

Figure 5: *Melanin meets the requirements to be the long-sought dark matter. Absorption of any wavelength, both visible and invisible spectrum, extraordinary stability, and massive nature.*

Figure 6: *Black dust brought back by NASA from the asteroid Bennu, rich in carbon (4.7 % W), minerals and water. Is it Melanin? It is very difficult to study melanin in the laboratory, starting because it is even difficult to identify it.*

Pick´s Disease, Synucleinopathies, Multiple System Atrophy, FTLD-TDP, and others [ ].

Melanin always has water, not less of 40 % w, even in quite dry conditions (like space). (Figure 5 and 6) Melanin has the characteristics to be the long-sought dark matter, which makes up 85% of the matter in the universe. But we have not been able to observe it because it absorbs any wavelength, both in the visible and invisible spectrum. Its presence would explain the functioning of the universe, for example the slow movement of the planets [ ].

The unsuspected intrinsic property of melanin to dissociate the water molecule.

Melanin is a ubiquitous biological pigment found in bacteria, fungi, plants, animals, and interstellar space (Figure 7). It has a diverse range of ecological and biochemical described functions, including display, evasion, photo-protection, detoxification, and metal scavenging. Melanin is found in fossils including, where is the best-preserved compound. Its function within both eukaryotic and prokaryotic cells has been primarily relegated to the role of a simple built-in sunscreen.

Melanin has a wide range of unique chemical signatures that can be used to identify and characterize its different forms in nature [ ]. The single unique modern assay commonly used to identify melanin's is alkaline hydrogen peroxide oxidation.

Photo-dissociation takes place when the photon absorbed by the molecule has a sufficient energy to dissociate the molecule. The photon energy is distributed on all vibrational degrees of freedom of the molecule. Large molecules have more degrees of freedom available to store the excess energy brought by photons, which modify the photo-dissociation rate.

In Central Nervous System, neuro-melanin (Dopamine-quinone) is synthesized by oxidation of the catechol ring of dopamine. If this occurs within the neuronal cytosol, the quinone may react with cytosolic components, particularly with cysteine residues. In contrast, if quinone is produced within neuronal lysosomes it may provide the fundamental building block for neuro-melanin [ ].

So, the discreet but incessant, constant chemical reaction that happens inside melanin, through which light energy is transformed into chemical energy, capable of being used by the eukaryotic cell and which turns out to be the fundamental reaction of life, was detected during an observational, descriptive study about the vessels of the optic nerve and its possible relationship with the three main causes of blindness in the world: macular degeneration, diabetic retinopathy, and glaucoma. This study lasted 12 years (1990-2002) and included ophthalmological studies of 6000 patients (Figure 8 and 9).

And thanks to this study, we were able to understand that the most important reaction in eukaryotic cells is when the oxygen that the intracellular water contains is extracted by the various pigments [ ] that the human organism and other living beings contains, being the most efficient melanin pigment. And it is the fundamental chemical reaction of life because it appeared before any other process or molecule during evolution. Therefore, all the other biochemical changes that make up what we call life appeared later and thanks to the dissociation of water, since this is an essential requirement for these processes to occur with the intensity, frequency, and location that the intricate and complex processes that make up the biochemical logic of the body happen properly.

Water dissociation, the very first step of life.

So if we consider the transformation of light energy into chemical energy as Darwin's first spark of life, we can decipher how the molecules that make up us, and that in most cases exist in the environment, fit together in an orderly manner, according to its loads mainly, promoting a very precise and constant order, which in the end constitutes the difference between the living and the inanimate. And this order, so perfect, so dynamic, so constant, so homogeneous, is determined and driven by

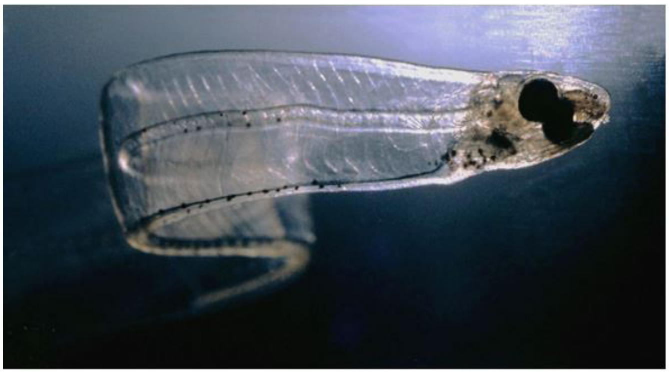

Figure 7: *Larva transparent at the beginning of life, however, melanin is present.*

photosynthesis, which we now know exists in all living beings, and not only in plants.

Therefore, the dissociation of water, which is the fundamental basis of photosynthesis, is an amazingly exact chemical reaction, and in nature, it occurs at room temperature. And such intrinsic accuracy of the first reaction of life is what determines and directs the sequence and location of subsequent chemical processes. Therefore, when the very first reaction of life, that is: the dissociation of water, occurs properly, all the consequent processes will happen in the appropriate way, (Figure 10) but when the dissociation of water is altered or unbalanced by contamination of the water, the air, and food, then the biochemical reactions that make us up will reflect this imbalance in the form of diseases.

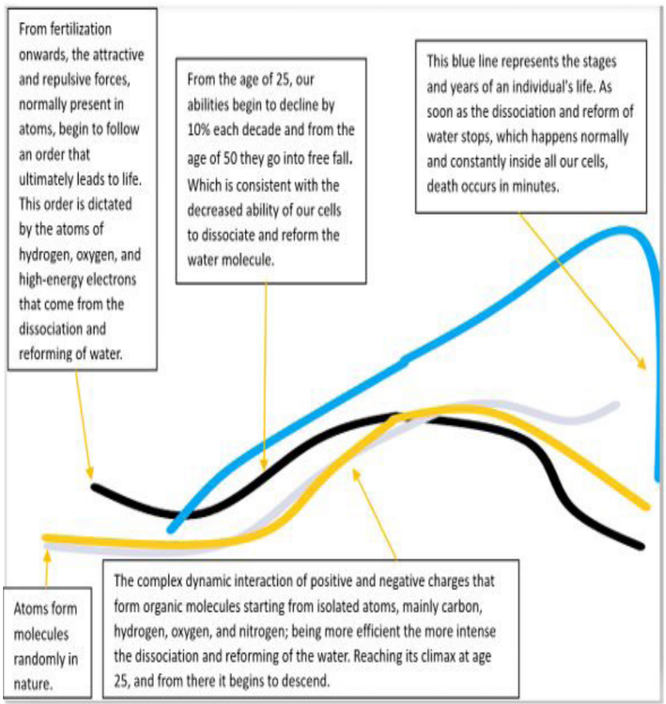

Figure 10: *The black line means the activity level of the various mechanisms of our body that dissociate the water molecule, this is: Transforming the light power into chemical energy, like plants. This capacity is higher during fetus formation, diminishing during labor, to increase again during body´s development. Apparently, the maximum peak of water dissociation activity is at age 25, and after that age it begins to decline by approximately 10% every decade, entering free fall after age 50.*

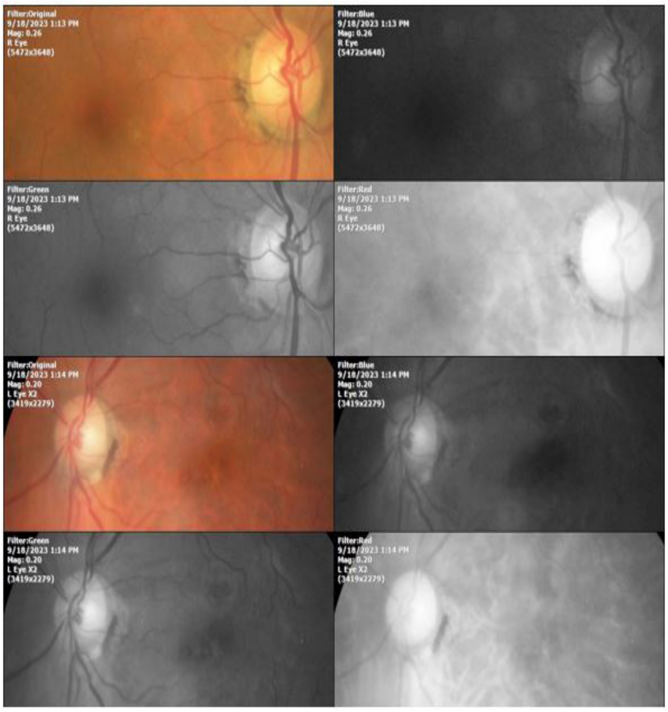

Figure 8 & 9: *Photographs of the fundus of the eye, where the omnipresence of melanin can be seen on the edges of the optic nerve.*

And any disease begins at this level, because if the dissociation of water occurs with its amazing accuracy, the health of the individual will be intact, since the human body is very well made. Therefore, we can infer that both diseases and aging occur when the very first reaction of life loses its unique qualities. This is consistent with the fact that when water dissociation is disturbed, the body becomes disorganized, causing generalized failures to appear, such as those described in common illnesses at the end of life.

The blue line represents the life expectancy of the individual, beginning at birth and ending at death. The gray and yellow lines represent attractive and repulsive forces, respectively. These forces have a very complex dynamic relationship that allows the emergence of life, and those forces that determine their interaction come from the dissociation of water. When the dissociation of water begins to decrease, the repulsive forces, at the molecular level, tend to be minimized every day, and on the contrary, the attractive forces tend to be optimized.

Conclusion

The difference between the living and the inanimate is the order between the attractive and repulsive forces that characterize the molecules that make up living entities. Well, even though we are made up of the same substances, what differentiates us is the precise order in which the attractive and repulsive forces of the molecules are arranged in living beings. In inanimate objects, the arrangement of these forces, which function like magnets, happens entirely by chance, but in living beings, thanks to photosynthesis, the role of chance is reduced to its minimum expression, allowing the appearance of life.

And it is the tendency to disorder of matter that ultimately undermines the effectiveness of photosynthesis, disorganizing the human body, and favoring the appearance of various diseases. It can be said that the force that opposes entropy is photosynthesis, and whose fundamental reaction is the dissociation of water, so what we can do to care for and promote this very first reaction of life will benefit an organism with a higher level of health and therefore a better quality of life.

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