ClinicSearch

Clinical Trials and Case Studies

Yuri Pivovarenko *

Open Access

Review Article

Biological oxidation as a means of reproducing the conditions for the genesis of cellular life and as a means of disease prevention

Yuri Pivovarenko

Research and Training Center 'Physical and Chemical Materials Science' Under Kyiv Taras Shevchenko University and NAS of Ukraine, Kiev, Ukraine.

***Correspondence Author:** Yuri Pivovarenko, Research and Training Center 'Physical and Chemical Materials Science' Under Kyiv Taras Shevchenko University and NAS of Ukraine, Kiev, Ukraine.

Received Date: February 16, 2024 | Accepted Date: March 11, 2024| Published Date: April 15, 2024

Citation: Yuri Pivovarenko (2024), Biological oxidation as a means of reproducing the conditions for the genesis of cellular life and as a means of disease prevention, *Clinical Trials and Case Studies*, 3(2); **DOI:**10.31579/2835-835X/056

Abstract:

Currently, it is believed that the atmosphere of the ancient Earth was rich in gaseous hydrogen and carbon dioxide, but did not contain gaseous oxygen at all. This, in turn, suggests that the conditions under which cellular life arose and developed have disappeared over time. At the same time, the fact that cellular life has survived to this day indicates that ancient cells found means that allowed them to resist the specified changes in the gaseous composition of the Earth's atmosphere. Perhaps the most radical of these means was invented by the intestinal microflora, which constantly releases gases, the composition of which largely reproduces the atmosphere of the ancient Earth; thus, intestinal gas should be seen as an evolutionary solution, not as a kind of "exhaust gas". All this allows assuming that biological oxidation, which essentially consists in the extraction of hydrogen atoms and carbon dioxide molecules from various substrates, arose, first of all, as a means of protection. Moreover, all this explains the success of both hydrogen therapy and carboxytherapy, which actually reproduce in the patient's body the conditions under which cellular life arose and developed; equally, all this allows to explain the importance of the microflora present in the human intestine for human immunity. Naturally, all this gives grounds for the conclusion that it is the oxygen in modern air, which is a source of reactive oxygen species (ROS), which cause many modern diseases.

Keywords: evolution; biooxidation; hydrogen therapy; carboxytherapy; intestinal microflora; intestinal gas; ROS

Introduction

It is now well known that reactive oxygen species (ROS) cause many diseases [1 – 3], while hydrogen therapy and carboxytherapy successfully treat most of them [4 – 10]. All this, in the end, caused the need to consider the biological consequences of those changes in the composition of the Earth's atmosphere, which occurred from the moment of the appearance of cellular life forms to the present day.

So, it is now believed that the atmosphere of the ancient Earth was rich in gaseous hydrogen and carbon dioxide, but did not contain gaseous oxygen at all [11 – 13]. All this, in turn, allows concluding that the ancient waters, in which cellular life actually originated, did not contain oxygen, but were rich in gaseous hydrogen and carbon dioxide. In addition, all this suggests that the replacement of hydrogen gas with oxygen gas in the earth's atmosphere led to the disappearance of conditions that were suitable both for the emergence of the first cells and for their life activity. At the same time, the fact that cellular life has survived to this day indicates that ancient cells found means that allowed them to resist the specifiedchanges in the gas composition of both the Earth's atmosphere and waterbodies.

Undoubtedly, these means are worth discussing.

Discussion

Because the mitochondrial Krebs cycle is the primary source of cellular atomic hydrogen and carbon dioxide (Figure 1), which were common in the ancient atmosphere [11 – 13], it is primarily worth considering as such a means; this, in turn, allows perceiving mitochondria, in fact, their absorption by ancient cells, as an evolutionary achievement that reduced the sensitivity of cells to changes in the gas composition of both the Earth's atmosphere and Earth's water bodies, mainly to the appearance of gaseous oxygen in them.

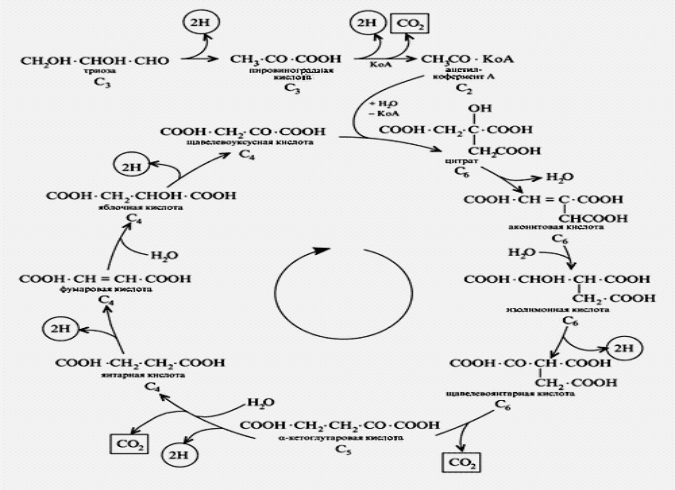

Figure 1. This is a Russian-language diagram of the Krebs cycle, which turned out to be most suitable for this article.

Pairs of hydrogen atoms released in the reactions of the Krebs cycle are enclosed in circles; it is now believed that these hydrogen atoms are targeted to reduce FAD and NAD [14 – 16].

Carbon dioxide molecules, also released in the reactions of the Krebs cycle, are enclosed in squares; these molecules are now commonly identified with exhaust gases.

Therefore, it is very likely that the association with mitochondria was the very solution that allowed the first cells to survive.Probably, other types of biooxidation should also be perceived primarily as means that allowed the first cells to survive, despite changes in the composition of the Earth's atmosphere, which, accordingly, changed the gas content of Earth's water bodies. With this in mind, both glycolysis and fat oxidation should primarily be considered as the means that allowed the first cells to withstand the above atmospheric changes, given, of course, that both of these types of bio oxidation are sources of hydrogen atoms [14, 15].

Perhaps it is worth mentioning here the ability of atomic hydrogen to convert pyruvic acid into lactic acid:

CH_3•CO•COOH → CH_3•HCOH•COOH (1) [14, 15],

thus blocking the Krebs cycle (Figure 1). In particular, this ability proves that the need for the Krebs cycle arises when there is a lack of cellular hydrogen atoms and disappears when there are enough of them. Accordingly, this same ability of hydrogen atoms allows us to perceive them as regulators of cellular metabolism. In view of this, hydrogen gas, which is part of human intestinal gases, can also be perceived as a regulatory factor of human cellular metabolism, of course, taking into account the variation of its content in the human intestine [17] and its high penetrating ability (Figure 2).

At the same time, this very high penetrating ability of gaseous hydrogen (Figure 2) determined the need of cells for such substances as ubiquinone, FAD and NAD [14, 15], which are able to retain hydrogen atoms removed during biological oxidation, in particular during the Krebs cycle (Figure1), in particular, before they neutralize oxygen, thereby neutralizing it. This, in turn, allows supposing that bioenergetics, which is largely based on biooxidation [14, 15, 19 – 21], arose as a supplement to ancient processes initially aimed at preventing the contact of cells with oxygen that appeared in the Earth's atmosphere, and therefore, in the waters of the Earth [13].

Arguably, carbon dioxide, which is also formed in the Krebs cycle (Figure 1), deserves a separate discussion, since it is usually seen as a by-product, and not as a significant component of the atmosphere of the ancient Earth [11 – 13] and its water bodies. To change this view of carbon dioxide, it is enough to take into account even the fact that the buffer system of human blood is based on equilibrium:

$CO_2 + H_2O \leftrightarrow H_2CO_3 \leftrightarrow H^+ + HCO_3^-$ (2) [14, 15], which undoubtedly also took place in the reservoirs of the ancient Earth.

Figure 2. This is a demonstration of the high penetrating ability of gaseous hydrogen: this is what a PET bottle with gaseous hydrogen looks like 4 weeks after its filling [16, 18]. with this in mind, the carbon dioxide produced in the Krebs cycle should be seen as the primary source of the buffer system that allows humans to survive in today's Earth's atmosphere, not as a kind of "exhaust gas". At the same time, the fact that the buffer system of human blood is based precisely on equilibrium (2) can be interpreted as the original desire of cells to preserve the conditions in which they arose. Apparently, the fact that plants absorb carbon dioxide for most of the day and at the same time get rid of oxygen should be considered in the same aspect.

In view of all this, carboxyanhydrases, which catalyze the conversion of carbon dioxide to carbonic acid [14, 15], should be considered as part of a system that allows cells to survive, rather than as part of a carbon dioxide removal system.A further comparison of the properties of the ancient and modern Earth's atmospheres also forces us to take into account the fact that gaseous hydrogen electrifies the water environment negatively (Figure 3, left), while modern air electrifies positively (Figure 3, right).

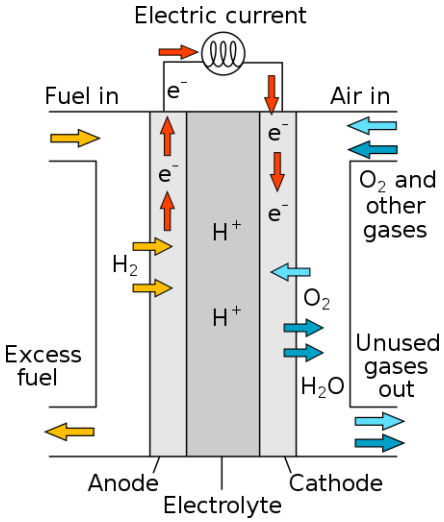

Figure 3. This is a diagram of an air-hydrogen electrochemical cell. The red arrows indicate the movement of electrons from a compartment containing an aqueous solution bubbled with hydrogen gas to a compartment containing an aqueous solution bubbled with air.

This diagram shows that bubbling with hydrogen gas is accompanied by negative electrization of water, and bubbling with air or gaseous oxygen is accompanied by positive electrization of water [16].

This difference in the electrifying power of hydrogen gas and modern air (Figure 3) should be considered in conjunction with the fact that negatively charged water does not dissolve lipids at all (Figure 4), while positively charged water dissolves them easily (Figure 5).

All this together (Figures 3 – 5), respectively, indicates that the ancient atmosphere of the Earth contributed to the formation of cell membranes, while the modern atmosphere of the Earth does not contribute to this formation. Considering this, the appearance of cellular processes aimed at removing protons from cells should also be considered as a protective response of cells to the appearance of atmospheric oxygen.

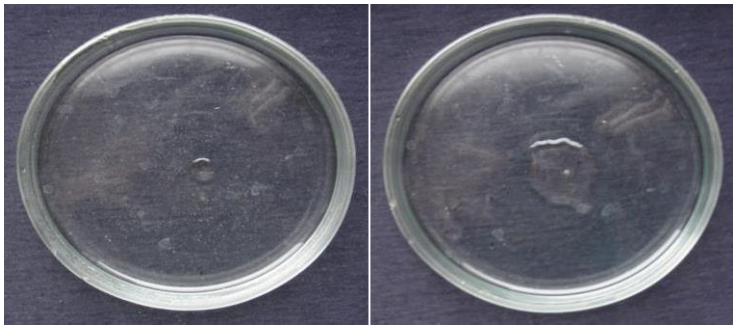

Figure 4. Left: a small oil drop on the surface of water with a potential of –500 mV looks like this. Right: a large oil spot on the surface of water with a potential of –500 mV looks like this.

The constant shape of both of these stains indicates that there is no interaction between the oils and the sufficiently negatively charged water [22, 23].

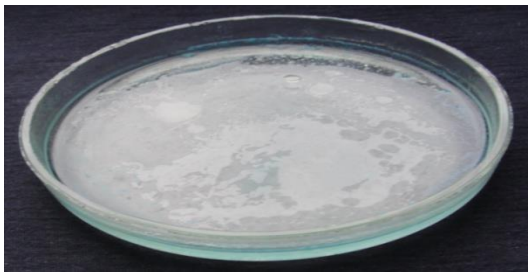

Figure 5. This is what a film formed from an oil drop on the surface of water with a potential of +500 mV looks like [22, 23].

Therefore, it is quite likely that all these processes (Figure 6) were initially means of counteracting the positive electrization of the internal environment of ancient cells, which undoubtedly occurred as a result of the replacement of the ancient atmosphere with modern air (Figure 3, right).

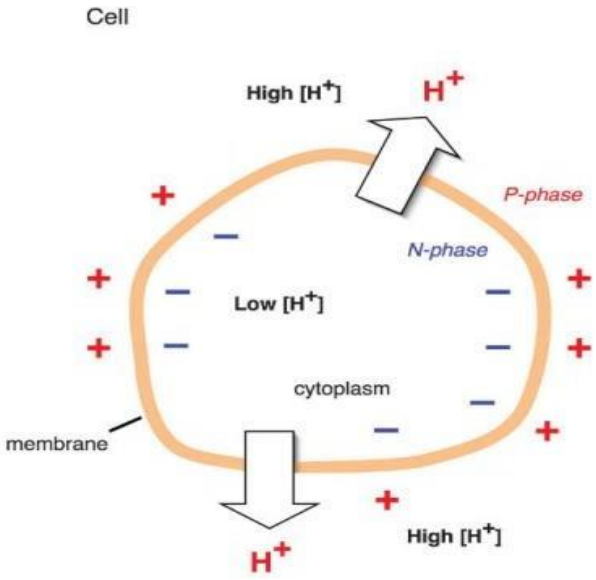

Figure 6. This diagram reflects the current understanding of the distribution of protons between the intracellular and extracellular environments of ancient cells [24].

Probably, here it is worth paying attention to the ability of mitochondria to actively release protons [19 – 21]; this, of course, further increased the ancient cells' need for a means of getting rid of protons. Given this, it is quite likely that cellular bioenergetics, which is largely based on membrane proton gradients [19 – 21], arose as a supplement to ancient processes originally aimed at ridding cells of protons [24, 25]. At the same time, one should also take into account the fact that only solutions of biopolymers in positively charged water form hydrogels with adhesive capabilities [26]. Therefore, the same means (Figure 6) prevented the gelatinization of the cytoplasms of ancient cells and, accordingly, the slowing down of their cellular metabolism. At the same time, it is quite likely that these same released protons (Figure 6) contributed to the gelatinization of the extracellular environment, thus contributing to the formation of the primary matrix that caused cell adhesion and, ultimately, contributed to the formation of multicellular organisms. It is no less likely that it is this proton-stimulated gelatinization of the extracellular environment that underlies thrombosis, which may initially have been a means of preventing cell contact with air oxygen; probably, it is precisely this evolutionary point of view on thrombosis that can make its appearance less mysterious than it is now [27, 28].Anyhow, the value of membrane proton gradients for cells should not be considered exclusively from the point of view of bioenergetics, as is currently accepted [14, 15, 19 – 25].

It also seems reasonable to consider chlorides as an evolutionary tool that allowed cells to bind atomic oxygen. All this, in turn, allows us to rethink the initial role of myeloperoxidase, which catalyzes the very attachment of oxygen atoms to chloride anions, turning the latter into hypochlorite anions [16]. This, in turn, indicates that the spread of chlorides in cells [16, 17], including human cells [29], was initially determined by their ability to reduce the level of atomic oxygen in the intracellular environment; at the same time, it suggests that myeloperoxidase was originally used by cells as a catalyst for this reduction, which increased cell viability. Therefore, it is quite likely that the protective function of myeloperoxidase of leukocytes [30] arose as a supplement to ancient processes originally aimed at ridding cells of oxygen atoms. (Perhaps, all this should be taken into account by therapists trying to use myeloperoxidase as a medicine [31, 32]).

Conclusion

It appears that the point of view presented here on the evolution of the earth's atmosphere as a driver of the evolution of living matter is sufficiently justified and consistent. In any case, this point of view allows explaining the success of both hydrogen therapy and carboxytherapy [5 – 10], since both of them are aimed at reproducing in the human body the conditions under which cellular life originated.

In addition, the same point of view allows explaining the contribution of the human intestinal microflora to its immunity [18, 33 – 35] due to its ability to increase the content of hydrogen gas in the gas filling the human intestine up to 50% [17]. So, it seems that it is this microflora that reproduces the ancient earth's atmosphere in its own environment, simultaneously contributing to the saturation of the human body with gaseous hydrogen, which exhibits healing properties; of course, the high penetrating power of hydrogen gas (Figure 2) is also important for this.At the same time, the success of carboxytherapy forces us to change our views on the human attraction to smoking and such carbonated drinks as beer, mineral water, cola, etc., considering that this attraction is also evolutionarily determined. At the extreme, all these sources of carbon dioxide can be considered as specific means of carboxytherapy, considering that they are able to increase the buffer capacity of human blood and, thus, make a person more resistant to adverse environmental factors and diseases.In addition, the same point of view clearly explains the pathogenicity of ROS [1 – 3], which obviously could arise, in particular in the human body, only when gaseous oxygen appeared in the Earth's atmosphere. Apparently, all this together gives enough grounds for the unexpected conclusion that it is the modern earth's atmosphere that is the root cause of many modern diseases, including viral ones [36]. In support of this conclusion, it is worth citing the results of T. Ozawa, who showed that the oxidation of mitochondrial DNA is the primary cause of death in patients who had different ages and diagnoses [1]. In fact, T. Ozawa proved the impossibility of human life in the absence of gases that are formed in the Krebs cycle (Figure 1) and that reproduce the atmosphere of the ancient Earth, which is in good agreement with all of the above.

Obviously, this same point of view provides grounds for revising traditional ideas about the importance of plants for non-vegetable life forms. In any case, it seems that by absorbing carbon dioxide and getting rid of gaseous oxygen, plants solve only their own “life problems”; however, it turned out that it is plants that create significant life problems for non-plant life forms by enriching the air with oxygen, a precursor to ROS. At the same time, the fact that plants are sources of starch, and therefore of glucose, during the oxidation of which cells receive both

atomic hydrogen and carbon dioxide, forces us to take them leniently.Be that as it may, it seems that the proposed point of view should be taken into account by those scientists who try to explain from materialistic positions both the origin of earthly life, primarily cellular, and the direction of the evolution of living matter [24, 25, 37 – 39].

References:

1. T. Ozawa (1997). Oxidative damage and fragmentation of mitochondrial DNA in cellular apoptosis. *Bioscience Reports*. 17(3), 237-250.
2. Alfadda A.A. and Sallam R.M. (2012). Reactive oxygen species in health and disease. *BioMed Research International.*
3. Yang S. and Lian G. (2020). ROS and diseases: role in metabolism and energy supply. *Molecular and Cellular Biochemistry*. 467(1), 1-12.
4. Ohta S. (2011). Recent progress toward hydrogen medicine: potential of molecular hydrogen for preventive and therapeutic applications. *Current Pharmaceutical Design*. 17(22), 2241-2252.
5. Fu Z. and Zhang J. (2022). Molecular hydrogen is a promising therapeutic agent for pulmonary disease. *Journal of Zhejiang University-Science* B. 23(2), 102-122.
6. Chen J.B., Kong X.F., Lv J.J. et al. (2019). "Real world survey" of hydrogen-controlled cancer: a follow-up report of 82 advanced cancer patients. *Medical Gas Research*. 9(3), 115-121.
7. Brandi C., D'Aniello C., Grimaldi L. et al. (2001). Carbon dioxide therapy in the treatment of localized adiposities: clinical study and histopathological correlations. *Aesthetic Plastic Surgery*. 25(3), 170-174.
8. Doghaim N.N., El-Tatawy R.A., Neinaa Y.M. and Abd El-Samd M.M. (2018). Study of the efficacy of carboxytherapy in alopecia. *Journal of Cosmetic Dermatology*. 17 (6), 1275-1285.
9. Elmorsy E.H., Elgarem Y.F., Sallam E.S., Taha A.A. (2021). Fractional carbon dioxide laser versus carboxytherapy in treatment of striae distensae. *Lasers in Surgery and Medicine*. 53(9), 1173-1179.
10. Kroumpouzos G., Arora G., Kassir M. et al. (2022). Carboxytherapy in dermatology. *Clinics in Dermatology*. 40 (3), 305-309.
11. Kasting J.F. and Howard M.T. (2006). Atmospheric composition and climate on the early Earth. Philosophical Transactions of the Royal Society B: Biological Sciences. 361(1474), 1733-1742.
12. Zahnle K.J., Schaefer L. and Fegley B. (2010). Earth's Earliest Atmospheres. Cold Spring Harbor Perspectives in Biology, 2(10)
13. Section "Evolution of the atmosphere" in Encyclopedia Britannica.
14. Chatterjea M.N., Shindle R. and Venkatesh T. (2011). Textbook of medical biochemistry, 8th Edition. *Jaypee Brothers Medical Publishers*.
15. Nelson D.L. and Cox M.M. (2013). Lehninger: Principles of Biochemistry, 6th Ed. NY: W.H. Freeman and Company.
16. Pivovarenko Y. (2019). Biochemical and physiological basis for treating hydrogen gas as a medicine. *European Journal of Preventive Medicine*. 7(6), 100-107.
17. Section "Intestinal gases" in the Encyclopedia Britannica.
18. Pivovarenko Y. (2022). Intestinal hydrogen gas as co-creator of both human immunity and aura. *Journal of Clinical Case Reports and Studies.* 3(10).
19. Mitchell P. (1961). Coupling of phosphorylation to electron and hydrogen transfer by a chemi-osmotic type of mechanism. *Nature.* 191(4784), 144-148.
20. Green D.E. and Zande H.D. (1981). Universal energy principle of biological systems and the unity of bioenergetics. Proceedings of the National Academy of Sciences of the United States of America. 78(9), 5344-5347.
21. Nicholls D.G. and Ferguson S.J. (1992). Bioenergetics, 2, 2nd Ed. San Diego: Academic Press.
22. Pivovarenko Y. (2023). Positively charged water as a tumor growth stimulator. *Biomedical Sciences*, 9(3), 64-72.
23. Pivovarenko Y. (2023) Catalytic properties of positively charged water promoting tumor growth. *Journal of Cancer Research and Cellular Therapeutics*. 7(5);
24. Lane N., Allen J.F. and Martin W. (2019). How did LUCA make a living? Chemiosmosis in the origin of life. Problems and Paradigms. 32(4), 271-280.
25. Lane N. (2017). Proton gradients at the origin of life. *Review Bioessays*. 39(6).
26. Pivovarenko Y. (2018). ±Water: demonstration of water properties, depending on its electrical potential. *World Journal of Applied Physics*. 3 (1), 13-18.
27. Gutmann C. Siow R., Gwozdz A.M. et al. (1918). Reactive oxygen species in venous thrombosis. *International Journal of Molecular Sciences.* 21(6).
28. Li P., Ma X. and Huang G. (2924). Understanding thrombosis: the critical role of oxidative stress. *Hematology*. 29(1).
29. Deane N., Ziff M. and Smith H.W. (1952). The distribution of total body chloride in man. *Journal of Clinical Investigation*. 31(2), 200-203.
30. Klebanoff S.J. (2005). Myeloperoxidase: friend and foe. *Journal of Leukocyte Biology*. 77(5), 598-625.
31. Malle E., Furtmüller P.G., Sattler W. and Obinger C. (2007). Myeloperoxidase: a target for new drug development? *British Journal of Pharmacology*. 152(6), 838-854.
32. Mika D. and Guruvayoorappan C. (2011). Myeloperoxidase: the yin and yang in tumor progression. *Journal of Experimental Therapeutics and Oncology*. 9(2), 93-100.
33. Wu H.-J. and Wu E. (2012). The role of gut microbiota in immune homeostasis and autoimmunity. *Gut Microbes*, 3(1), 4-14.
34. Belkaid Y. and Hand T. (2014). Role of the microbiota in immunity and inflammation. *Cell*. 157(1), 121-141.
35. Zheng D., Liwinski T. and Elinav E. (2020). Interaction between microbiota and immunity in health and disease. *Cell Research*. 30, 492-506.
36. Pivovarenko Y. (2022). Negative electrization of air as a means of counteracting airborne viral infections. *European Journal of Preventive Medicine*. 10(1), 34-39.
37. Section "The origin of life" in Encyclopedia Britannica.
38. Walker S.I., Packard N. and Cody G.D. (2017). Re-conceptualizing the origins of life. Philosophical Transactions A: Mathematical, Physics and Engineering Sciences. 375(21090).
39. Joseph A. (2023). Beginnings of life on Earth, Chapter 3 in: Water Worlds in the Solar System. *Elsevier*.