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The Unsuspected Capacity of Human Being to Dissociate the Water Molecule. Implications in the Context of Anatomy and Physiology

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Abstract

The development of morphological sciences, dates from centuries. An early case in point might be, for instance, the French surgeon Guillaume Desnoues (1650-1735), whose models circulated through Italy, France, Germany, Denmark and England at the very beginning of the eighteenth century. Later, papier-mâché models reveal the complex status of anatomical models which, as exemplified by Desnoues's and Curtius's models a century before, had been exhibited alongside freaks and automata whose mechanisms represented the marvels of human (and animal) physiology, reflecting the contemporary research into and exploration of human being anatomy.

But one thing is the modelling of a human body, and another very different is to understand its functioning or principles of operation, as demonstrated by the collective error that began in the XVIII century, about our body takes the oxygen that he needs, from the surrounding air, through the lungs, and it is a very rooted dogma that persists to date, being a basic component of textbooks and even worse of medical practice. This wrong dogma will have to be corrected to the benefit of students, physicians and sick people.

Based on our clinical finding, conducted during an observational study that lasted 12 years (1990-2002) and included 6000 patients, about the morphology of the optic nerve blood vessels in humans and their interaction with the surrounding tissues, we could finally identify some molecules, normally present in human eukaryotic cells, capable of dissociating the molecule of water, as in plants. This ground-breaking observation, means that textbooks of Anatomy, physiology and biochemistry, must be rewrite.

Keywords: Air; Alveoli; Anatomy; Bronchiole; Hydrogen; Glucose; Dissociation; Oxygen; Waterg

Introduction

Morphology can be considered among the most visible aspects of a phenotype, reflecting the complex relationship between structure and biological function in organs and systems. The specific functions of organs are largely determined by their anatomical and histological structure [1]. But, in relation to lung function, we were and continue wrong, because the lung and oxygen have nothing to do with each other. Our body does not take the oxygen of the air that surrounds it, but of the water contained inside the cells that make us, as in the plants [2].

So, the lung function is essentially to expel CO_2 that is continually formed inside our body, tissues, and cells. And the efficiency of pulmonary alveoli to expel the CO_2 that the bloodstream collects after the entire organism, is extraordinary, given the limited solubility of the gases in the plasma, and for which, nature develops the carbonic anhydrase enzyme which significantly increases the speed of the reaction, which allows the usual concentration of CO_2 of the atmospheric air, which is 0.04%, rises 100 times, to 4.0% within the multiple alveolar spaces of the lung [3].

The atmospheric air that we introduce during inspiration, is only with the objective to serves as a vehicle for the transport of the relatively small amount of CO_2 that we expel to the atmosphere with each inspiration and expiration, but physiologically cannot be greater volume than it is, because the CO_2 in the alveolar space, would tend to reabsorb and therefore harm our acid/basic balance between other important things. In fact, it is likely that the activity of the carbonic anhydrase enzyme, rises significantly when the lung is filled with air, to dilute the toxic CO_2 that we expel all the time, day and night. When the alveolar space has little or no air, the activity of the carbonic anhydrase is significatively reduced to a minimum, so that toxic levels of CO_2 are not achieved within the alveolar spaces of the lung [4].

The atmosphere contains relatively little oxygen, between 18 to 21 % at sea level. But within our body, oxygen levels are almost five times more, and therefore, they cannot come from the atmosphere, since lung tissues lack mechanisms that allow it to separate oxygen (21%) from the nitrogen (78%) of the air that surrounds us, and then concentrate it 5 times and finally introduce it to the bloodstream [5].

No living being has such capacity. But, on the other hand, the molecular and anatomic-physiological mechanisms through which the lungs expel the CO_2 from the interior of the body to the atmosphere, are very similar in all living beings, including the omnipresence of the carbonic anhydrase enzyme, since it is a molecule widely disseminated in nature, given the importance of its physiological and biochemical role [6]. If the gaseous exchange that supposedly occurs in the lungs in each inspiration/expiration movement, is so fast, that the processes inherent for it, in relation to oxygen and CO_2, would hinder among themselves, significantly reducing the lung efficiency of expel the CO_2 to atmosphere [7].

The mechanisms governing pulmonary gas exchange were heavily debated at the start of the 20th century when Christian Bohr provided measurements of lung and blood gases as well as rational arguments in favor of oxygen being secreted actively from the lung cells, and this gas goes to the blood within vertebrate lungs [8]. Although in light of our work, we would add that all the body's cells have the appropriate and necessary molecules to dissociate water and obtain oxygen (and hydrogen), and not only the lung cells, in an astonishing accurate form, so the metabolism of the eukaryotic cell requires for its correct metabolism [9].

Christian Bohr

History has been kind to Christian Bohr (1855-1911). His name is attached eponymously to three different areas of respiratory physiology. The first is the Bohr dead space, which refers to the portion of the tidal volume that does not undergo gas exchange. The second is the increase in oxygen affinity of haemoglobin caused by the addition of carbon dioxide to the blood. This is known as the Bohr effect and is a very important feature of gas exchange, both in the lung and in peripheral tissues. Both contributions by Bohr are familiar to most students. Bohr's third contribution refers to the calculation of the changes in the PO_2 of blood as oxygen is loaded in the pulmonary capillary, the so-called Bohr integration [10].

The analysis is challenging because the very nonlinear shape of the oxygen dissociation curve from haemoglobin (not from melanin), means that the PO_2 difference between the alveolar gas and the capillary blood, which is the driving pressure for diffusion, changes in a complicated way. Indeed, because alveolar oxygen gas, is completely independent of the PO_2 of capillary blood.

Thereby, cannot be explained, and much less contrast experimentally, since the mathematical models implemented since the beginning of the 20th century, are so tangled and complex, that it is not possible to do so, and on the other hand, the new technologies used to deepen in the knowledge of the Gaseous exchange, they have yielded contradictory results to the prevalent theories in this regard [11].

Mathematical models simulate different parts of the pathway of oxygen molecules from the red blood cell, through the plasma, the endothelial cell, other elements of the vascular wall, and the extra- and intracellular space. Are focused on the theory of oxygen transport from atmosphere - lung - bloodstream to tissues and cells and presents, supposedly, the state of the art in mathematical modeling of transport phenomena, but no mathematical model can supplant reality or at least explain something that is not possible to exist or happen. Thereby, the results obtained with the classic Krogh tissue-cylinder model and recent advances in mathematical modeling of haemoglobin-oxygen kinetics, the role of haemoglobin and myoglobin in facilitating oxygen diffusion, and the role of morphologic and hemodynamic heterogeneities in oxygen transport in the microcirculation they have aroused more discussion than agreements [12], much less represent an advance in the knowledge of the area.

Oxygen must come from inside out, and not from atmosphere

Thereby, the classic paragraph in textbooks:

Oxygen is known to play a key role in cellular energetics. Both oxidation and other forms of energy production depend on a continuous supply of oxygen to the cells. In mammals, oxygen is extracted from the atmospheric air in the lungs and carried by the bloodstream through the circulation to the tissue, where it is utilized mainly within the mitochondria [13].

It must substantially modify underlining that each cell of our body has different molecules capable of dissociating the water molecule, allowing each cell to generate its own oxygen (and hydrogen), which they use for themselves, in their entirety, since oxygen molecules they are generated, they do not reach beyond the cell membrane of the cell itself that produces them. Correcting a deep-rooted dogma dating from the 18th century, will allow us to answer questions such as the following, which had not yet been able to resolve.

Behind this simple picture (above paragraph) lie many questions concerning physical mechanisms of transport in different parts of the pathway.

a) Is oxygen transported in blood mainly by pure convection, and what are the roles of diffusion and chemical kinetics? **Answer:** Blood does not transport atmospheric oxygen, because this element does not cross the lung tissues given its high-water content in each cell (> 70 %). Oxygen is repelled by water. The gas that mainly transports the bloodstream is CO_2, from the cells, tissues, organs, and systems, towards the lungs, for its

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consequent expulsion to the atmosphere. Oxygen and lung have nothing to do with each other.

b) How important are the resistances to transport provided by various membranes (red blood cell, endothelial cell, parenchymal cell) along the pathway? **Answer:** It is important, very important, even decisive, because the same barriers that prevent the oxygen from the atmosphere can penetrate into our body, its tissues and cells, also prevent the oxygen that is constantly generated inside the cells can come out outside them, which makes it necessary for the cell, to eliminate the excess of molecular oxygen (those that is not used), is attached a carbon atom forming CO_2. Hence, CO_2 is formed almost as fast as oxygen is generated. ($O_2 + C \rightarrow O{=}C{=}O$).

c) Does oxygen cross these membranes by pure diffusion, or is the diffusion facilitated by a carrier? **Answer:** neither one nor the other. Oxygen simply cannot cross a drop of water since the water repels it, and inside the cells, the water content is enormous, since they not only use it as a universal solvent, but as a main or unique source of oxygen, hydrogen, and high energy electrons (e^-). The last occurs when hydrogen and oxygen from water dissociation, for example, inside melanin itself, are re-bond $H_{2(gas)}$ and $O_{2(gas)}$ forming liquid water again and generating 4 high-energy electrons for every two molecules of water that is re-formed. Apparently, this only happens in the cell parts called fibrous organelles, as electrons, due to the speed with which they travel (almost 300,000 per second) are quite difficult to control, so they are rapidly absorbed, mainly by these fibrous organelles, such as the rough endoplasmic reticulum, since it is surrounding the space that wrapped completely the cell nucleus, the so-called the perinuclear space, being this zone the main location of melanosomes.

d) What are the mechanisms of transport inside the cells? **Answer:** oxygen transport is inverse to how until now it was believed, since the oxygen that the cell requires for its functioning and maintenance of the form, does not come from the atmosphere but from the interior of the cells, and it takes advantage of it integrally, undoing the rest in the form of CO_2. The oxygen moves to the interior of the cell mainly by simple diffusion, that is: from the area of greater concentration to the area of lower concentration. Thus, the area where oxygen (and hydrogen) is usually generated is around the cell nucleus, where the melanosomes are located, this is: at perinuclear space. From here, the molecule of oxygen is slowly displaced to the cell periphery. But it is a relatively slow movement that allows the chemical reactions that take advantage of it can have the constantly along the path. And the equation is completed if we add that the activation energy that any chemical reaction requires, is provided by the molecular hydrogen that is generated simultaneously when the water molecule dissociates. Then, the energy that is released when the molecule of the water is broken, is captured, at least in part, by the hydrogen molecule, which fulfills the great energy carrier role and not only inside the cell but in the entire universe. The perinuclear location of melanin, rarely is cited in most textbooks, probably derived from another ancient dogma: melanin is a simple solar filter that tends to disappear as civilizations advance.

e) Does active transport play any role in oxygen delivery? **Answer:** Probably none.

f) What is the main site of oxygen exchange between the blood and tissue: arterioles, capillaries, or venules? **Answer:** None, all oxygen management is at the intracellular level, since there is generated and used mostly and in many ways. The oxygen surplus is eliminated from the interior of the cell in the form of CO_2, once the cell mechanisms add a carbon atom (probably or mainly from food metabolism) since it is about 25 times more soluble in water than oxygen. And if we add the very active and crucial role of the carbonic anhydrase enzyme, the transport rate of CO_2 from inside the cells to the interstitial space, and then to the blood plasma, where it travels in the form of a bicarbonate, and when it reaches the lung It is converted to CO_2 again by the same enzyme, aforementioned, complete a quite fast and precise cycle developed by nature over millions of years and that is remarkably similar in all living beings, since CO_2 began to form at the same as the Universe. Even, in the early days, the atmosphere of the Earth was composed of CO_2. Therefore, CO_2 is an old known for the mechanisms that gave rise to life, and this from the beginning of life, so they handle it well, very well.

g) Are these sites different for different physiological conditions and for different tissues? **Answer:** It could be, but in general terms the order is maintained: oxygen must come from the interior of the cell, this is to be generated thanks to the dissociation of the water molecule. Therefore, our body does not take the oxygen from the air that surrounds us, but from the water inside the cells. A palpable test is that when patients with acute respiratory failure arrive at the hospital and health personnel try to introduce oxygen through the lungs, in a forced way, mortality is unacceptably high, becoming 90% in some countries or regions.

h) Currently, we do not have definitive and complete answers to these important above questions. **Answer:** We have good news. Oxygen must come from inside-out, and not outside-inside.

i) A clear understanding of the physical mechanisms of oxygen transport throughout the pathway is a prerequisite to understanding the regulation of blood flow. **Answer:** We already have it, we already achieve it, what follows is to spread it and apply it.

Conclusion

The usual introduction into textbooks that mammals take the oxygen from the air through the lungs, and then introduce it to the

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bloodstream so that it is distributed by all the cells of the body, and the mitochondria use said oxygen to combine it with glucose and in a unique way (graduated combustion) to get energy, it's a wrong concept that must be completely eliminated from both the curricula of the careers of biology, medicine and related sciences, as well as textbooks and especially people's minds.

The above is a formidable challenge since it is a dogma dating from the 18th century, and therefore is depth rooted into practically all areas of human activity. Breaking it completely is a formidable but necessary challenge in favor of human health and the planet.

In the anatomy, physiology and biochemistry aspect, concepts should be re-placed in its entirety since oxygen is generated in each cell arising from the dissociation of the water molecule, a process that was glimpsed in plants during the 18th century, but in humans it had not been detected. We circumstantially detect it during an observational, descriptive investigation, which began in 1990 and ended in 2002, and in which digitized ophthalmological studies of 6000 patients were included.

Our work hypothesis was characterized by the fine morphology of the blood vessels that enter and leave the optic nerve and try to find some correlation between this morphology and the pathophysiology of the three main causes of blindness prevalent worldwide since the half of the past century, that is: Age related macular degeneration, diabetic retinopathy, and glaucoma.

Our surprising results were received at the beginning with skepticism, but as the barriers beat, our concepts began to gain ground. In the area of anatomy, physiology, and biochemistry, in the close future, we are awaited with arduous work to reorganize our wrong precepts with respect to blood circulation, lung function, mitochondrial function, etc., but at the same time that the path to go craving long, no It is tedious because new horizons open that will allow us to advance in the knowledge of the deep mysteries of life, its origins and its functioning.

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