# ELECTRICAL PHYSIOLOGY

OR

# ELECTRO-CHEMIC ENERGY vs. OXYGENATION OF THE HUMAN BLOOD.

**A Lecture delivered before the National Eclectic Medical Association at Indianapolis, Ind., June 11, 1903.**

BY


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VS.

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MR. PRESIDENT AND FELLOW MEMBERS:

After much study and careful experiment, I have concluded that the process of revitalization of the blood in the capillaries of the lungs is due to the action of electro-chemic energy, and that oxygen does not pass into the blood by osmosis.

In the following paper I submit to you an account of my experiments, and a brief history of the course of reasoning that has led me to this important conclusion, so widely differing from the present accepted theories.

Although the theory of osmosis has been generally received, it has not been proven. Thoughtful physiologists have admitted this; for instance, Dalton, in his "Human Physiology" says, page 537, "When we endeavor to learn the place and manner of oxidation in the living body, the attempt fails. There is no evidence of such direct action taking place in the circulating fluid, nor in any of the organs or tissues." Again, on page 257, he says: "The blood collects or disseminates substances which have already been prepared in other parts, and, as a general rule, conveys them unchanged to their destinations. Even a substance like pyrogallic acid, so readily oxidizable in an alkaline solution that it is employed for the quantitative determination of oxygen in the air, when introduced into the animal system passes through it unchanged and reappears in the urine. There is no evidence that the blood exerts anywhere a direct oxidizing action."

Further, in reference to this subject, "Howell's American Text Book of

Physiology," page 537, says: "Most of the studies have been made solely by determinations of the quantities of carbon-dioxide given off in respiration, the results being taken as standards for the relative volumes of oxygen absorbed; but such deductions are of very uncertain value, and may be entirely misleading."

With such authorities leading the way to doubt, it is not presumptuous to turn to new lines of reasoning to find rational explanation for the vital phenomena taking place in the human system. Consequently I offer the following analysis of the existing conditions, with a feeling that it will bear the most exacting tests.

In the human lungs two great circulations meet—that of the blood, and that of the atmosphere. These circulations moving in opposite directions, bring together elements which have mutual attraction. Under the influence of heat these elements unite—generating electro-chemic energy, which purifies the blood, and thus sustains the life of the organism.

That oxygen and carbon are found in the chemical constituents of the blood can not be denied; but that these elements reach it by a process of osmosis is indeed very questionable. Neither can it be shown in a single instance that these elements unite in any form while they are circulating in the blood. In the course of analysis, it will be shown that the supply of oxygen and of carbon found in the blood and tissues reach the system through the route of digestion.

A strong argument against the theory of osmosis, or diffusion of gases lies in the fact of the greater resistance offered by living membranes, and by the pressure of the blood exerted against that of the atmosphere. The proof of greater pressure is shown by the hemorrhage which results if the smallest opening is made in the air-sac of the lung. Notice how carefully Nature guards the possibility of hemorrhage in tubercular lungs, by infiltrating large areas about the point of infection. Another instance is seen in the provision of an artery for the passage of venous blood from the heart to the lungs—the only place in the human system where an artery is used for the conveyance of venous blood.

In regard to filtration or osmosis, Howell says, in "The American Text Book of Physiology," page 156: "It has been shown that living membranes offer considerable resistance of filtration, even when liquid pressure on one side is much greater than on the other. Tigerstedt and Santessen, for instance, found that a lung taken from a frog just killed gave no filtrate when its cavity was extended by liquid, under a pressure of 18 to 20 centimetres—provided the liquid used was one that did not injure the tissues. If, however, the lung tissue was killed by heat or otherwise, filtration occurred readily under the same pressure."

In my own experiment on fresh lungs from the sheep, I have repeatedly

demonstrated that the lungs can be inflated with pure oxygen gas and they will keep so for forty-eight hours, without loss of oxygen. In these experiments the heart was always removed, and all blood-vessels leading away from the lungs were cleared of clots and left open. The lungs were kept in a normal salt solution, at a temperature of 98° F. At the end of the time mentioned the lung tissue showed signs of decomposition, owing to the action of the gas and water; consequently there was then a loss of oxygen.

Moreover, I have performed tracheotomy on the living animal, killing it as soon as the lungs could be inflated with oxygen gas and the trachea tied. In every instance, upon opening the thoracic cavity, the lungs were found to be inflated to their fullest capacity, remaining so for an indefinite period without loss of oxygen.

Furthermore, the living membrane of the lungs is protected from the diffusion of gaseous matter, by the mucous secretion from its secretory cells, and still more so by the extreme swiftness with which the current of life-force passes through it.

Living membranes absorb and secrete elements through organs which Nature has prepared for that purpose. These organs of secretion and absorption may be stimulated or sedated by various influences, and they mark the difference in Nature's methods of transfering elements in simple and in complex forms of organic life. My experiments prove that oxygen may be sealed in a pair of fresh lungs, and these can be carried about as though they were an oxygen bag.

It is the office of venous blood to collect waste products from the tissues, and carry them to the organs of exit. It has been mentioned, and it is a fact that all excretions of waste material take place through glands and ducts of organs, as in the skin and kidneys, and it would be unreasonable to consider the lungs an exception to this general rule of organic life.

It is estimated that about five hundred grammes of carboniferous, decaying animal matter are excreted from the lungs every twenty-four hours. It is claimed by some physiologists that all this mass of decaying matter passes out of the blood by exmosis during the time of expiration. Venous blood is exposed to the influence of atmosphere about one and one-half seconds; during this time it is supposed to give up carbon-dioxide, and to receive sufficient oxygen to furnish energy for the entire system.

There is no evidence that carbon-di-oxide is formed in the blood. Dalton, in "Human Physiology," page 257, says: "In the blood, the plasma consists mainly of organic substances in solution, and oxygen is abundant in the globules in a state of loose combination. But the union of carbon and oxygen does not take place in the blood."

The chemical analysis of venous blood shows more carbon in its compositiou than does that of arterial blood. When compared with inspired air

expired air shows a gain in carbon in union with oxygen in the form of carbon-dioxide. It has been shown that the union of carbon and oxygen does not take place within the blood stream, hence it is obvious that the lungs excrete carbon, and that the union between carbon and oxygen of expired air must take place in the lungs, outside of the blood stream. It is evident that the larger portion of the oxygen of inspired air unites with carbon at this point, and therefore could *not pass into the blood by* osmosis.

The excretions of the lungs represent elements of decomposition, material from the tissues undergoing retrograde metamorphosis. In the "American Text Book of Physiology," page 944, the author says: "Through putrefaction hydrogen is liberated." Further, on the same page, he continues: "In putrefaction in the presence of oxygen, the hydrogen formed immediately unites with the oxygen, producing water; hence, notwithstanding the enormous amount of putrefaction in the world there is no accumulation of hydrogen in the atmosphere." The liberation of hydrogen from the decaying excretions of the lungs explains the presence of watery vapor in expired air. It is well known that there are but slight traces of hydrogen in pure atmosphere; it is equally well known that there is a considerable quantity of watery vapor in expired air. Therefore, it is evident that hydrogen thus liberated would, under the influence of electro-chemic energy, unite with oxygen of atmosphere, forming water, which becomes vaporized by the heated condition of the lungs. In this union between hydrogen and oxygen of air, together with the before-mentioned union of excreted carbon and oxygen of the air, will be found every molecule of atmospheric oxygen which is supposed to pass into the blood by osmosis.

Oxygen of air is a cooling, para-magnetic element; its molecules move in pairs. Under the influence of heat these molecules expand, thus becoming more gaseous; this disturbs their magnetic polarity and breaks their chemical bonds. When the bonds of chemical affinity between the molecules of any substance are broken by heat, expansion, electrolysis or other means, electro-chemic energy is generated. This energy is positive or negative in character according to the nature of the elements from which it originates.

Oxygen is found chemically combined with arterial blood. Before oxygen of air could unite with blood, circulating as it does in a closed system of tubes, it must be reduced to a fluid state. According to physics there are but two methods of reducing gases to fluids—these are by pressure, or by cooling agencies, neither of which conditions exist in the lungs.

The temperature of air averages from 60° to 70° F., while the temperature of the human lungs is nearly 100° F.; consequently, in the human lungs we have a cool current of air meeting the resistance of heated surfaces, a condition which forbids the reduction of gases to fluids but which favors electro-chemic action.

The temperature of venous blood is higher than that of arterial blood, and its energy is of a negative character, consequently, by law of opposite attraetions, its energy and heat are drawn toward the new field of action caused by the molecular rearrangement of elements taking place in the lungs outside the blood stream. It must be kept in mind that heat is a form of electro-chemic energy, and the cooling, watery vapors of the lungs are a good conductor for it.

Draper, in "Medical Physics," page 234, says: "Chemical affinity, heat, motion, magnetism, electricity and light are convertible one into another." Massey, in his "Conservative Gynecology and Electro-Therapeutics," in a foot-note on page 39, says: "Chemic affinity is now understood to be identical with electric affinity."

The negative oxygen elements of inspired air meet the positive carbon elements which are excreted by the lungs from venous blood. Through the influence of heat molecular rearrangement ensues, and by the nature of the elements rearranged positive electro-chemic energy results.

It is a fundamental law of chemistry that molecular rearrangement, with chemical union, always produces electro-chemic energy. By the action of opposite attractions, and by the conductivity of oxygen elements the positive energy of the new field is drawn to the negative blood.

"Venous blood is distributed to the lungs by the pulmonary artery, whose terminal branches form a plexus of capilliary vessels surrounding the air-cells. The air and blood are thus brought into intimate relationship being separated only by the delicate wall of the capillary. A capillary frequently passes through an aperture in the cell wall but never becomes altogether free from it, and no blood escapes into the air-sac during its passage."—Gray's Anatomy.

In the extremity of the bronchiac we also find non-insulation in the air-sac, showing that Nature has prepared the way for the transmission of electro-chemic energy.

In Gray's Anatomy," it is said: "The mucous membrane of the trachea and bronchial tubes is pierced by many excretory glands; it is also covered with columnar epithelium." This epithelium acts as a complete insulation to the escape of any electric energy produced within the tubes; but the terminal bronchial tubes lose their epithelium and muscular coat at about one-eighth of an inch from the most distant air-cells to which they may lead, and are thus reduced to a single basement membrane. Thus it also becomes non-insulated to facilitate the transmission of energy to the blood.

Residual air of the lungs, with the saline, watery elements, plays an important part in the conduction of electro-chemic energy to and from the blood. Residual air being heavier than tidal air, is drawn back and forth to and from the air-sac, transmitting the energy to and from the blood with perfect, rythmic action, similar to the action of a to and fro current. Residual air of the

lungs always remains about the same in quantity; its quality is maintained by constant motion of its molecules, the supply of which is renewed by continual interchange with tidal air.

Venous blood is cooled slightly by evaporation in the lungs, and by loss of carbon and hydrogen.

The liberation of hydrogen from the watery elements of the blood, by electrolytic action leaves free oxygen in the blood stream, which accounts for the excess of free oxygen in arterial blood, as will be fully elucidated in the course of analysis.

The blood, as a whole, is dia-magnetic, that is, it has a tendency to throw out force from, and at right angles to its center. This being a fact, it would be impossible to form an attractive magnetic field in the blood current, if Nature had not placed para-magnetic iron with the 55 per cent of carbon in the hemoglobin.

The carbon attracted by the iron forms a magnet which, when charged with electro-chemic energy, creates a current in the center of the blood stream, causing this part to move more rapidly than the surrounding parts of the fluid.

Oxygen of venous blood, made free by the loss of hydrogen, is attracted to the positive carbon, and arranges itself in a loose manner at right angles to the carbon of hemoglobin. None of these elements unite on account of the inflow of electro-chemic energy from the atmosphere at this point. It is a law of electrolytic action that the movement of a current through a fluid decomposes its elements and prevents union which would otherwise take place. This action explains why carbon di-oxide is not formed in the blood; it also shows why there is no coagulation in circulating blood.

In experimenting on venous blood, I have submitted the coagulated blood to the action of currents of galvanic electricity with the following results: coagulated blood was made fluid, also its color was changed and rechanged, according to the application of the electrodes.

When venous blood is subjected to the action of an electric current the molecular arrangement is disturbed and altered. The instant a current enters the blood there is great activity among its elements—they begin to circulate freely, and each moves toward the point of electrical attraction. Carbon, hydrogen and all other positive elements are torn from their union with other elements of the blood, and collect at the negative pole of the circuit, while oxygen and all negative elements collect at the positive pole.

The carboniferous elements at the negative pole give to the blood its dark, venous hue, while those of free oxygen and other negative elements at the positive pole give the characteristic scarlet hue to arterial blood, showing clearly that electro-chemic action is the cause of change of color in the blood.

We have shown that energy results from the chemical changes which take

place in the lungs outside the blood stream. This energy conducted by the elements of residual air, and confined by the insulation of the bronchial tubes passes on to the non-insulated air-sacs and capillaries, where it enters the negative venous blood. The instant this energy reaches the blood it causes it to glow with a new life; its color changes by the vitalizing effect of the charge, and consequent rearrangement of its molecules.

*Here is the beginning of the circulation of life.* Here is the power which transforms venous into arterial blood and starts it upon its mission of maintaining life in the human organism.

In applying electro-chemic principles to the human organism it becomes necessary to use familiar terms common to electrical nomenclature, but it must be borne in mind that while the energy in the organism works upon the same plan as electrical energy everywhere, yet here we have a higher order, and a more complex arrangement of action. In the living organism we have something better than a machine, something that is self-adjusting, self-repairing, growing, constantly changing condition, therefore the comparisons are necessarily crude; nevertheless, they help us to mentally grasp certain principles which will lead us to a better understanding of phenoma which has hitherto baffled analysis.

There are two great sources from which the human system gains its supply of electro-chemic energy; one is from the atmosphere, the other is from the reduction of food elements. One is organic, the other is largely inorganic. The intermingling of energy from these two sources maintains organic life of the highest order.

It is now accepted by leading scientists that all matter is energy condensed into different forms. It is my opinion that energy is a form of matter in rapid vibratory motion.

All fluids and food structures used in the economy of the human system represents a certain refined, or stored energy, which under proper conditions may be liberated to perform functions in higher organic life. These elements have passed through many evolutionary processes of refinement. In the energy which maintains human life we find the blending of forces which are respectively the highest product of the organic and inorganic kingdoms of Nature.

In reference to the chemistry of the animal body, Howell's "Text Book of Physiology," page 962, says: "The chlorophyll-containing leaf of the plant, through the medium of the energy of the sun's rays, brings the molecules of water and carbonic oxide derived from the air in such a position with regard to each other that they unite to form sugar with the elimination of oxygen; this process is called synthesis—the construction of a more complicated body from simple ones.

The active, or "kinetic" energy from the sun required to build up the com-

pound is stored, becoming "potential" energy in that compound, and is liberated again in exactly the same quantity on the resolution of the substance into its original constituents.

So the amount of energy liberated in decomposition of a food in the body is exactly equal to the energy needed to build it up from its excreted constitnents; and this liberated energy appears in the body as heat, work and electric currents."

The electro-chemic energy which is liberated from the reduction of food structures in the human system is negative, or lower in potential to that which is produced in the lungs from the atmosphere. The exchange between these two electro-chemic energies keeps in action that vast system of forces which we know as human life.

Physiologists must recognize that no chemical changes can take place in the human system without the liberation of electro-chemic energy from the elements undergoing transformation. The blood is the physical conductor of electro-chemic energy to tissues, organs and nerves of the human system. It is composed of many elements and structures, all of which have an especial purpose in the economy of nature.

Digestion prepares food structures to enter the circulation for further reduction. Chyle does not represent the final step in the reduction of food structures, as these must be reduced to energy before they are fitted to become a sustaining part of the vital organism.

The ultimate step in the reduction of structures transpires in the blood; at each circuit of blood some of the compounds are torn apart by electrolytic action; each time a compound is broken a certain amount of stored energy is released from the elements of that compound, and thus becomes a part of the sustaining energy of the system. When structures are completely reduced they are not destroyed, but having parted with their portion of energy they are no longer useful to the system, and consequently pass away from it as waste, or retrograde products, or elements.

Every particle of food that is used by the system must be converted into energy before it plays its part in the functions of the organism. Here is the secret of vitality; here we gain the force that keeps our bodies alive. These products of digestion act similarly to the zincs and carbons of a battery; they are slowly converted into force by numerous rounds of circulation in the system. At each circuit they are acted upon by various organs, each one of which has its own peculiar function. It is thus that the products of digestion finally reach that most refined condition known as vital force.

When the products of digestion are poured into venous blood they consist of a fluid which is composed of many structures. Water forms a large percentage of this compound; from the source of digestion, also, comes the supply of oxygen, carbon and other elements, which must be subjected to

electrolytic action in the blood, in order to render them useful in the organism. When the watery elements of digestion undergo electrolytic action in the blood stream the bonds of union between hydrogen and oxygen are broken; this frees a sufficient supply of each of these elements for all uses of the system. By this method, and from this source the system is supplied with needful elements.

The two great circulations, of air and of blood, move in opposite directions, rotating with as absolute a precision as the planets of the solar system.

In an electrical sense, the capillaries of the lungs and the capillaries of the systemic circulation represent a positive and negative relation toward each other; yet, taking the blood as a whole, the positive and negative poles of the atmospheric electro-chemic circuit are in the lungs; that is, the arterial blood, which is positively charged, starts out from the lungs to perform its office to the system, and represents the outgoing current of energy. Venous blood, which has become negative through loss of a portion of its atmospheric energy, returns to the lungs for revitalization, and represents the return current of negative energy.

Arterial blood is the distributor to the system, while venous blood is the collector from the system. The latter is loaded with carbon and hydrogen—positive elements which have been decomposed during their rounds of circulation. According to electric laws, the positive elements decomposed in the atmospheric circuit would naturally collect at the negative pole for excretion.

The arteries leading from the heart are strong, cylindrical tubes, insulated throughout their length for the purpose of confining the blood and its energy, thus conducting the energy to its proper point of distribution, the capillaries. If it were not for this insulation of the blood vessels the dia-magnetic action of the blood would cause the energy to be distributed too soon. The arteries rapidly diminish in size, until in the capillaries they become microscopic, and loose their insulation, thus permitting free electrical exchange in the tissues.

In the capillaries, the minuteness of the channels causes resistance to the passing electro-chemic energy in the blood. This resistance produces electro-chemic heat, with consequent molecular rearrangement and change of color. The heat produced in this manner helps to maintain an even temperature in the body. Oxygen is set free at this point to enter the lymph spaces, and carbon is collected from the tissues. Here, also, the nerves terminate in such a manner as to be in direct communication with the stream of life, and thus become the finer conductors of vital energy to all parts of the human system.

Scudder, in "Principles of Medicine," page 47, quotes Prof. Youmans as follows: "As it is now admitted that no chemical change can occur without electrical excitement, and as the human body is a mass of rapidly changing chemical materials, it must be the theater of extensive electrical movements;

though to demonstrate this has been one of the most difficult and delicate problems of science. The blood is an alkaline fluid, while the juice of the flesh is acid, and the two liquids are only separated by the thin walls of the vessels. By the action of these fluids there must be in every mass of muscle myriads of electric currents. Matteucci has proved that currents of electricity are circulating in the frames of all animals. The smallest shreds of muscular tissue have been proved by Dubois Raymond to manifest currents, the longitudinal section being always positive to the transverse section.

Every cell in the human body is an organ which, under proper stimulus of electro-chemic energy, absorbs, secretes or excretes elements suitable to the function it performs in the living economy.

When the blood passes from the capillaries into the veins it is in a negative condition, having parted with the greater portion of atmospheric energy. It travels slowly in consequence of loss of energy, but the increase in number and the constantly widening channels of the veins offer little resistance to its passage, and thus facilitate its return.

In traversing the circuit of circulation there are many changes in the molecnlar arrangements of the elements composing the blood. This causes seeming losses and apparent gains, but if we examine these from an electro-chemic standpoint, and with due consideration of the digestive supply, we shall find that they consist in rearrangement, and wherever an element is given up to the tissues its loss to the blood stream is supplied from some other organ, before the circuit is completed.

Thus we can account for all of the elements made use of in the maintenance of the system, and know the source from whence they come.

When venous blood leaves the heart to enter the lungs for revitalization, it has in its composition all the elements of arterial blood, except the energy which the latter had received from the atmosphere, and to regain which venous blood returns to the lungs. For without this energy which passes from the atmosphere to the blood there could be no reduction of food elements in the blood stream, they would remain unchanged—their stored energy could not be released because their bonds of chemical union would remain unbroken.

The human organism, as a whole, is a vast electro-chemic laboratory, wherein are generated electro-chemic forces whose action sustains the life of the body, keeping its fluids in circulation.

These forces remain vital through constant interchange with those of the atmosphere; the point of this interchange is the lungs. The electro-chemic forces of the body are liberated through reduction of food elements.

The atmospheric electro-chemic energy is generated in the lungs by molecular rearrangement and chemical change of atmospheric gases. The energy in the human body is negative to that of the atmosphere, hence there is mutual attraction and circulation of energy between them; this constitutes the

circulation of life, bringing together, as it does, the highest product of all Nature's Kingdoms.

We have shown how the blood receives positive electro-chemic energy in the lungs—how this energy acts upon the various food elements in the blood in such a manner as to release their contained or stored energy, which is negative to that of the atmospheric energy. We have noted the insulated blood vessels, and have seen how this insulation is removed within the capillaries so that energy may be taken up by the nervous system to be used in the economy of the organism.

We have seen how this return flow of energy through venous blood collects the waste or retrograde products at its negative pole, for exit through excretion. These waste products, positive in their nature, are now descending in the scale toward lower forms of life, where Nature, in her wonderful conservation of energy, utilizes them.

Attention has been called to the fact that carbon and hydrogen decomposed by electrolysis in the blood stream collects at the lungs for excretion, and when excreted these elements leave in the venous blood free oxygen for molecular rearrangement in arterial blood.

It has been shown how liberated hydrogen, in the presence of oxygen, unites with that element to form the watery vapors of expired air, and how carbon unites with oxygen, forming carbon-dioxide, producing the positive energy which purifies and renews the life of the blood. These elements have now performed their office in the human system, and are expelled from the lungs as dead, or devitalized air.

The effete gases thrown off from the lungs are fifty times heavier than atmosphere, consequently they are naturally attracted toward the earth's carboniferous plant life. Botanists tell us that under the influence of sunlight, plants absorb carbon from the air, and excrete oxygen; hence it is readily seen that the vegetable kingdom has a great influence on the purification of the atmosphere.

Nature's methods are perfect. In her economy she uses the retrograding elements to generate or liberate energy which is ascending. The disintegrating elements from one kingdom become the food supply for another, and all kingdoms are united by that subtle force, electro-chemic energy. Nothing is lost. Matter is reduced to energy, and energy is condensed into matter—neither can be absolutely destroyed. The changes which we witness are those of reduction, change of form. By a close study of the laws of resistance to passing energy we shall ultimately learn the secret of how cells are formed from condensing energy.

Solar energy mingling with gaseous elements imparts some of its electric life to them, causing motion and circulation.

Too much stress can not be placed upon the fact that it is the life-giving

influence of the electrical sunlight, which imparts to growing vegetation its stored electric energy, and to the atmosphere the qualities which make its elements play so important a part in the maintenance of life.

Chas. Dennison, A.M., M.D., of Colorado, in his valuable paper on "Devitalized Air Toxæmia, a Prime Cause of Tuberculosis," says: "The life of the air consists, to a greater extent than has been heretofore recognized, in the molecular mobility of its atoms caused by the sun's influence. The diffusibility of the air, its easy and ceaseless motion, due to changes of temperature in different strata, are forces of molecular activity which, under the influence of some electrical or other force yet to be fully understood, probably impart the life-giving principle to the atmosphere. The restraint of this molecular motion, and consequent limitation of vitality, are in direct proportion to the deficiency of ventilation. Herein, I conceive, lies the great mistake of our civilization, i. e., in relation to our mode of living. Here is to be seen the need of education, that this cause of disease may be realized."

Further he says: "There may be a new principle or ingredient yet to be discovered in the air, which governs the arrangement either of its atoms or molecules, and thus make it respirable. Indeed, we seem to be confronted with the most important inquiry, the answer to which would be of the most inestimable value, namely, what is the relation of atmospheric electricity to the respirability of air? In other words, how does the breathing of air through its oxygen be only partially consumed, make it unfit for again sustaining life till it is re-electrified or re-vitalized? Or again what, if any, is the inhibitive state of oxygen in the air, especially in once-used air, which renders it non-absorbable or its use nugatory in sustaining life."

I think it is not presumptuous to say that the preceding analysis to a great extent answers these questions. I repeat with Dr. Dennison, that the lack of proper ventilation and open-air life is the bane of civilization. If the human lungs had plenty of moving air, without draught, and the human race had sufficient good food, with less worry and waste of energy in gaining the necessities of life, there would be such a decrease in the death-rate from consumption or tuberculosis, that within a period of a few years the disease would scarcely be known.

We must remember the great amount of carboniferous, decaying matter thrown off from the lungs every twenty-four hours. If, for any reason, the lungs are not cleared of this vitiated animal matter, what is the result? They become clogged, and proper electrification of the blood cannot take place. The mass becomes a hot-bed for the generation of tubercular bacilli which appear by the million, as a result, and not as a cause of this scourge of the human race.

Too much stress can not be laid on the subject of ventilation. In this age all buildings are so constructed as to nearly exclude air; as a consequence

we are fast developing into a race of consumptive and nervous wrecks Every infant born must fight its way in life against the fearful odds of vitiated and non-electrified air; under those conditions thousands of them perish before they even taste the first fruits of happy childhood with its open-air life.

Go into the crowded theaters and churches, you will find them a hot-bed of disease and corruption, all on account of a lack of air. People crowd together, breathing over and over again the devitalized air—and then they wonder why they feel so stupid, why they take cold so easily. If the doctors and ministers of the world would only teach the people the value of fresh air, they would indeed be teaching the laws of life.

Everywhere we can see the great necessity of proper electrification of the blood, and its influence upon the health and harmony of the individual. It is obvious that the system will not receive its proper supply of energy, and the whole organism will suffer in consequence, if the atmosphere is poor or devitalized.

For example, let us take a case of carbon-monoxide poisoning. Here we have carbon instead of oxygen passing into the lungs, and what action should we expect? The carbon of the gas meets the carbon and hydrogen excreted by the lungs; now these molecules are repellant, or dia-magnetic to each other, consequently molecular rearrangement can not occur and no electro-chemic energy results. Gradually the carbon ceases to be excreted by the lungs, venous blood remains unchanged and passes into the arteries, making a few circuits, and is found as such when the post-mortem is made by the coroner. In his mistaken diagnosis, he believes that the carbon has passed from the carbon mon-oxide gas by osmosis and has formed a union with hemoglobin, but the real action which takes place is the union between unexcreted carbon of venous blood and hemoglobin. The reason for this union is because the blood fails to gain its supply of electric energy from the atmosphere; the moment this supply ceases there is nothing to prevent the elements having attraction for each other within the blood stream from uniting.

The lungs are the all-important center of physical life; their motion is synchronous with that of the brain. "Man does not live by bread alone," he may exist for weeks without food, for a less time without fluid, but if he is deprived of air and of that necessary energy which he gains from breathing it, he dies within a very few moments.

Notice the horse, as he draws a heavy load, his dilated nostrils show his struggle for breath. Give him a few moments to catch his wind, and he lifts the load to the brow of the hill. Observe the athlete, when performing feats of strength, see how he pauses to renew his vital energy by deep-drawn breaths; watch his chest rise and fall, as the air rushes to and from the

heated surface of the lungs. Why does he do this? His weight is nearly the same, his stomach may be well supplied with food, yet something is needed to enable him to continue his activity—it is electro-chemic energy that he gains from breathing atmosphere, which creates the breath of life.

At all times and under all conditions, there is a manifest necessity for the revitalization of the blood. Every cell with its nerve connection, every organ with its cylindrical, insulated tubes, indicates to the thinking mind that this great work of renewal is that of an electro-chemic process. What the sun is to the earth in the renewal of atmospheric life, the lungs are to the blood in the renewal of its life.

The organs that propel the blood stream never sleep. Night and day the lungs, heart and nervous system labor in perfect accord to keep the vital energy at a proper "potential" or standard which we know as health. Even in sleep this work goes on. Other organs may rest, but these maintain an incessant activity. While the brain reposes the system has time to accumulate energy whose supply is continually drawn upon during activity. If our rest be perfect we awaken with bouyant spirits and with nerves tingling with a charge of new life; but if our sleep be broken, if we toss to and fro, the energy does not accumulate and we arise exhausted; we are using our forces faster than the great batteries can supply them. We can not digest our food for lack of energy; we have no resistance to the opposing forces about us, and are thus in a condition for the ravages of disease.

In this age we are still taught that disease is an entity—a microbe, a devil; something that must be driven out by some powerful antiseptic, or killed by poisonous serum.

All this is contrary to nature. It can bring nothing but disappointment to the physician and sorrow to the suffering millions of earth. In the name of progress I must emphasize the fact that the primary cause of all disease is a lack of life, a lowering potentiality of the normal electro-chemic forces of the human system.

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## OLIVE-OIL IN THE TREATMENT OF HEMATOMATA.

Dr. Camescasse *(Rev. de Therap.)* advises the application of olive-oil in all cases of contusion and hematomata. No rubbing in is necessary—it is indeed painful and therefore to be avoided—but the oil is simply sprinkled on or applied on lint. If the skin is broken, a previous cleansing with some antiseptic is advisable. The mode of action of the remedy is not clear, but the rapidity and effectiveness of its operation are said be remarkable. A black eye thus treated disappeared so quickly and completely that the victim was inclined to complain on the ground that he had no visible injury to show to the police.—*Mass. Med. Journal.*.