

# FUNDAMENTALS OF MEDICINAL BIOMAGNETISM

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**Abstract:** Medicinal Biomagnetism (MB) is a therapy for the prevention, diagnosis, and treatment of diseases using static magnetic fields. It is based on physical-chemical and physiopathological principles. To understand the technique, it is necessary to present the concepts of magnetism, potential of hydrogen, magnetic resonance, entropy, symbiosis, homeostasis, and the rheology of fluids. Understanding the fundamentals of MB is

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the first step towards the construction of a scientific language, as well as for the understanding and clinical interpretation of its results. This study is a narrative review of the literature that aims to present the fundamentals of MB within the principles of physics, chemistry, biology, physiology, and biochemistry to serve as a basis for technique application and for new scientific research projects in the area. Most of the studies that have applied the technique could not be considered for analysis due to a lack of the necessary methodological rigor, while others were derived from end-of-course papers and are not yet published. Regarding the investigated fundamentals, a vast body of literature was found, and its relationship with MB can be explored. It is concluded that there is coherence between the theoretical bases already

substantiated in science and the principles of MB.

**Keywords:** Medicinal biomagnetism; biomagnetic pair; magnetism; static magnetic Fields.

## INTRODUCTION

Medicinal Biomagnetism (BM), previously known as Medical Biomagnetism, is a therapeutic system created and developed since 1988 by the Mexican doctor, physiotherapist, and acupuncturist Dr. Isaac Goiz Durán, after the discovery of the first Biomagnetic Pair (BMP). It is presented as a tool of prevention, diagnosis, and organic energetic re-equilibrium that contributes to the treatment of infirmities, through the depolarization of BMPs that support such imbalances.



BMP is understood as a biochemical structure formed by two elements with opposite charges, one acid and one alkaline, which are maintained polarized in magnetic resonance between one another, being separated by the body's own metabolism, and thus supporting pathologies. In other words, BMP can be understood as a set of two charges related to a determined pathology, which are formed through the bioelectric alteration and the pH of the tissues and organs that support them within a living organism (Durán, 2008; Mondelo, 2017; Frank, 2017).

Durán's theory (Durán, 2008) proposes that if the charges of the chemical elements could somehow be united, breaking the dielectric, the body would have the conditions to naturally re-establish homeostasis, reducing entropy and favoring the action of

the immunological system in the combat of antigens.

With the aim of proving the theory that applying pairs of magnets to the BMPs would balance the charges and break the dielectric of the body to re-establish health and prevent diseases, Durán developed a well-defined therapeutic system, protocolled and structured for diagnosis and organic re-balancing with impact on the treatment and prevention of pathologies. This system is therefore based on the re-balancing of the biomagnetic and bioenergetic dysfunctions identified in the screening of the organism.

For this purpose, for a period of five years and with over 22 thousand patients, the creator of the theory used Static Magnetic Fields (SMF) composed of small magnets with a magnetic flux density above 1,000 Gauss, to depolarize BMPs. Identifica-



tion of the BMPs occurs through a physical examination, known as biomagnetic and bioenergetic screening. The results of BMP depolarization demonstrated consistency as aids in the treatment of various pathologies. In this case, depolarization means breaking and eliminating the magnetic resonance formed between the poles that make up the BMP (Durán, 2008; Mondelo, 2017; Frank, 2017).

The fundamentals of MB consist of various aspects of biology, physiology, and physics, which provide support for the Biomagnetic Pair theory of Dr. Isaac Goiz Durán. The theory is based on the principles of magnetism, potential of hydrogen, magnetic resonance, entropy, symbiosis, homeostasis, and the rheology of fluids. However, until now, no studies have been identified that present a concise

and integrated summary of the concepts associated with MB.

Various therapists known as biomagnetists apply MB; however, not all biomagnetists have sufficient knowledge and understanding of the theoretical foundation of the therapy. Thus, it is essential that all biomagnetists have adequate training so that the technique is only applied with its theoretical and practical bases. In addition, so that the therapeutic system developed by Durán can serve as a complementary integrative therapy in various areas of health, as advocated by the World Health Organization (WHO), it is necessary to prove the scientific evidence, which, over time, has been observed in practice.

Considering the aspects presented above, the main aim of this study is to clearly and objectively present the fundamentals



of MB to provide a basis for both technique application and for new scientific research projects in the area.

## **MATERIAL AND METHODS**

The present study is a narrative review of the literature. Narrative reviews have an open theme that is generally not part of a specific, well-defined question. The search for the sources used is neither pre-determined nor specific, making it less comprehensive. This type of narrative literature review on the proposed theme plays an essential role in continuing education as it enables the reader to acquire and update knowledge on the subject in a short space of time (Cordeiro et al., 2007).

In general, the search for articles was carried out over the years 2020, 2021, and 2022,

using the electronic databases Scientific Electronic Library Online (SCIELO), PubMed, and Portal de Revistas Científicas em Ciências da Saúde (The Portal for Scientific Periodicals in Health Sciences). Included in the study were full articles in English, Spanish, and Portuguese, prioritizing those with a DOI - Digital Object Identifier. The DOI is a pattern of letters and numbers with the purpose of identifying publications exclusive to the virtual environment, conferring greater credibility to the publications that contain said register. The priority was to also search for articles dealing with the topic of the fundamentals in question and of biomagnetism.

Given that the literary databases on MB are scarce and there are practically no scientific publications on the subject, the literature review basically con-



sisted of the analysis of books published by universities in Ecuador and Mexico, written by Dr. Isaac Goiz Durán, and other European doctors that have studied his theory, such as Dr. Salvador Gutiérrez, Dr. Raymond Hilu, and Dr. Enrique Castejón.

Regarding the basic concepts in the field of physics, chemistry, biology, physiopathology, physiology, and biochemistry, there is a vast body of literature addressing these subjects. The themes researched on the databases were entropy, symbiosis, magnetism, potential of hydrogen, electromagnetic resonance, medicinal biomagnetism, homeostasis, magnetic therapies, and rheology of fluids.

Certain authors cited the MB technique application in their studies; however, they did not demonstrate the results or even the methodology used.

Certain dissertations on biomagnetism were located, but the data were not published.

Of the 110 references obtained, those that were related to the theme and provided a contribution were listed, with a total of 43 publications being used.

## RESULTS AND DISCUSSION

A synthesis of this narrative review demonstrates that MB is an extremely young form of therapy, created and developed in 1988. Despite thousands of patients having benefitted from its practice both through the intervention of the theory's creator, Dr. Isaac Goiz Durán, and through the numerous biomagnetists that use the therapy on a daily basis (Fernández et al., 2018), the scientific research and specific publications on the theme remain scarce (Frank, 2017).



Frank (Frank, 2017) was the first author to describe the theory of Biomagnetic Pairs in a scientific article, as per Durán's description (Durán 2005a). The author demonstrates that when the north pole of a magnet is placed over the alkaline region and the south pole over the acid region of the organism, this then breaks the resonance of the BMP. The breakage promotes homeostasis of the organism through equilibrium of the pH. Positive results were obtained with this technique in the treatment of typhoid fever in most of the sample.

No article refers to the scientific foundation of MB from the perspective of its theoretical principles. Those that report its application and clinical results after employing the technique (Fernandez et al., 2018; Damyanov 2019a; Damyanov 2019b), did so without the adequate me-

thodological rigor and could not therefore be considered in this review.

Dr. Isaac Goiz Durán has written various books on MB (Durán 2008, 2014, 2003, 2007; Durán et al., 2010; Durán et al., 2005a, 2005b) and based his therapeutic system on various areas of knowledge, such as physics, chemistry, biology, physiopathology, anatomy, physiology, and biochemistry. Regarding this foundation, the evaluated literature presents well-established concepts on the subject (Marques, 2013; Ribeiro, 2016; Guyton, 2011; Mas Diego, 2005; Sosa et al., 2002; Carneiro et al., 2000); Cal, 2004; Bossa, 2021; Im et al., 2017; Almeida & Filho, 2018; Null, 1998; Broeringmeyer, 1991; Levin & Buck, 2015; Nitu et al., 2011; Castejón, 2012; Goldstein & McEwen, 2002; Hage & Iwasaki, 2009; Gardelli, 2018;



Andreola, 2018; Blundell, 2012; Cavalcanti et al., 2018; Simonini & Romagnoli, 2019; Chatelard & Cerqueira, 2015; Oliveira et al., 2021; Filho et al., 2020; Ferreira et al., 2005; Weish et al., 2006; Joyner et al., 2020; Rodgers et al., 2009; Ashta et al., 2020).

Thus, the relationship between the fundamentals of MB and the scientific concepts for magnetism, potential of hydrogen, magnetic resonance, entropy, symbiosis, homeostasis, and rheology of fluids will be addressed in the format of topics for better understanding.

### **Magnetism**

All material consists of atoms. Atoms contain particles with an electric charge, so our body and everything that surrounds us, is also somewhat magnetic (Marques, 2013). The tissues

and organs of the human body have specific magnetic pulses, a phenomenon known as biomagnetic fields. Imbalances in the biomagnetic fields can lead to diseases, so their study is therefore important for the maintenance of health and the treatment of pathologies (Ribeiro, 2016).

The flow of ions in cells is controlled by the permeability of the plasmatic membrane and the potential for action. It is the membrane that allows the cell to leave its state of equilibrium. When there is an imbalance of charges, that is, an imbalance of cellular bioelectricity, there is depolarization of the membrane, opening of the ionic channels, and all the cell machinery will be activated to re-establish equilibrium (Guyton & Hall, 2011). The movement of ions through the membrane generates magnetism, signaling and attracting





ions to the extracellular environment of the depolarized region. Ionic exchanges occur, with or without spending energy, and if the cell is unable to re-establish equilibrium, it will enter a process of apoptosis. It is important to transfer this concept of potential for cell action to the organs and then to the systems. It is thus possible to associate cellular physiology to MB, in the functioning of the organism and its equilibrium (Durán, 2014 and Guyton & Hall, 2011).

When a magnetic field is applied to microorganisms, this can influence cell membrane permeability and the flow of ions through the membrane, interfering in enzymatic processes, the reactions of free radicals, and the reproduction of microorganisms (Mas Diego, 2005). Ashta et al. (2020) describe that the association of static magnetic fields,

frequency magnetic fields, and anti-carcinogenic drugs may increase cytotoxicity, the production of free radicals, and p53 protein expression, followed by p53 protein expression in the cell line of human glioblastoma.

The extent to which a material may be magnetized under the action of a static magnetic field is defined as magnetic susceptibility. Living beings are composed of various materials that have a high degree of magnetic susceptibility, especially iron. Iron can be found in organs, the central nervous system, blood, ferritin, the lungs, and even tumors (Marques, 2013).

Given the magnitude of the scope of magnetism, it has been divided into several branches of science such as magnetobiology and biomagnetism (Sosa et al., 2002). Magnetobiology is an area of research that studies



the effects that magnetic fields can produce in living beings and their relationship with health/disease. Biomagnetism is occupied with studying the magnetic fields generated by living organisms themselves or by the magnetic markers present in living organisms (Marques, 2013; Carneiro et al., 2000).

The first studies on the effects of magnetic fields on both animals and plants appeared in the second half of the 20th century, giving rise to biomagnetism as an area of scientific teaching (De la Cal, 2004).

Durán (Durán, 2008) and Mondelo (Mondelo, 2017) considered magnetic material to be that which has the capacity to be magnetically polarized, be it at an atomic, microscopic, or macroscopic level. The human body is a machine that generates an electric current and commu-

nication at cell, tissue, organ, and system level occurs through electric impulses. Through the commands of the electric impulses, there is movement of electrolytes in the body and a variable magnetic field is generated, the intensity of which oscillates according to the direction and speed of charge displacement. A variation in the electrolyte can generate an imbalance in the magnetic field of the organ and cause a biological anomaly, an alteration in pH, and the formation of a BMP. The use of magnets with opposite poles on the corresponding poles of the BMP can restore the natural balance of the magnetic field (Durán, 2008; Mondelo, 2017).

The figure below describes the formation of the BMP in the human body and the breakage of its resonance through magnets.



## BIOMAGNETIC PAIR

THYMUS GLAND X RECTUM

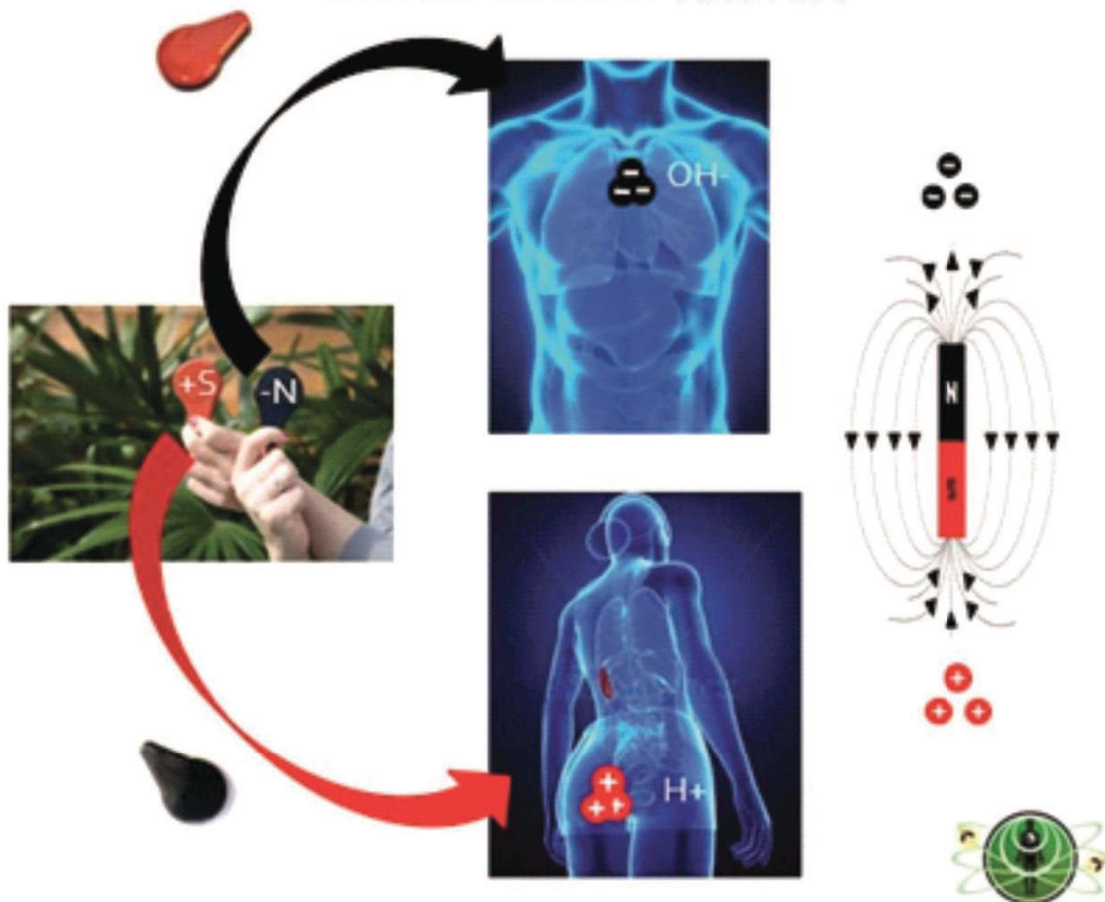


Figure 1. Biomagnetic Pair. In the center of the figure, where a cluster of  $\text{OH}^-$  ions can be observed, is a representation of an accumulation of free radicals in the region of the THYMUS, where there is dysfunction to greater alkalinity (north pole of the Biomagnetic Pair). The image where there is  $\text{H}^+$  represents an accumulation of the hydrogen ion in the region of the RECTUM, where there is a dysfunction to greater acidity (south pole of the Biomagnetic Pair). These two points, when in magnetic resonance between each other, are called a Biomagnetic Pair, in this case, the "Thymus/Rectum Pair". The name of the BMP is described first with its alkaline point and then with its acid point. On the left-hand side of the figure, the north pole of the magnet can be observed being applied to the north pole of the BMP and the south pole of the magnet to the south pole of the BMP. Source (Bossá, 2021).

Physiopathologically, metabolism produces an imbalance when the organism suffers a bone fracture, for example, the body's fracture, which, according to MB



theory, leads to the formation of a BMP. Repair cells are attracted by the magnetism of the injured area. Through electric impulses, the central nervous system is communicated to initiate the tissue repair response. The repair of the bone tissues occurs through the opening of the calcium channels of the cell membranes, that is, the biomagnetism will determine the migration of calcium to the injured site. Therefore, biomagnetism would be considered the key to the onset of the electric impulse (De La Cal, 2004).

The magnetic field is the cause and bioelectricity is the effect. The metabolism locally unbalances the pH, and this transforms us into a living battery. The discharge of the battery through bioelectric currents is called life. This is how biomagnetism should be

understood, as an essential tool that acts on the fundamentals of life. (De La CAL, 2004 p. 34).

Biomagnetism should be treated as an interdisciplinary science to understand, measure, observe, and even repair human organs and tissues that suffer the action of internal or external magnetic fields. In recent years, biomagnetism has seen rapid growth in its applications in therapeutic and diagnostic techniques (De La Cal, 2004) and it is possible to prove and measure the presence of magnetic fields in the cardiac system, the nervous system (Im et al., 2017), and all other systems (Marques, 2013; Carneiro et al., 2000).

### **Potential of Hydrogen**

When a magnetic field



acts on the body, it is acting on a group of substances, among which water has an absolute majority (Cal, 2004). Water consists of molecules of hydrogen and oxygen that are in constant association and dissociation. The ratio between the number of dissociated molecules and unaffected molecules is defined as potential of hydrogen (pH) and determines the level of acidity or basicity of a system (De La Cal, 2004; Almeida & Filho, 2018).

According to the studies by Null (1998), the inflammatory process occurs in an organism when there is an imbalance in acidity and alkalinity, or a variation in pH. The acidic state promotes low electrical conductivity and cellular hypoxia (insufficient level of oxygen). Acidemia (excess acidity in the environment) promotes the opening of calcium channels in the cells and its relea-

se into the extracellular environment, installing the inflammatory process (Durán, 2014; De La Cal, 2004; Broeringmeyer, 1991).

The acid-base equilibrium is essential for life. Macromolecules on which living organisms depend, especially enzymes, are sensitive to changes in pH. Physiological systems use the equilibrium between bicarbonate, carbon dioxide, and protons to buffer pH, involving organs like lungs and kidneys (Levin & Buck, 2015; Nitu et al., 2011).

The inflammatory process is directly related to the formation of BMP. When a region of an organism is with excess hydroxyl ions (OH<sup>-</sup>), the north pole of the BMP is established, and another region will be with an excess of hydrogen ions (H<sup>+</sup>), where the south pole of the BMP is established, and these regions will be in magnetic resonance



with each other. These zones, which are separated by tissues in the body, are the BMPs that become biological territory for microorganisms with affinities for the generated acidic or alkaline environments, thus beginning the physiopathological process of disease (Durán, 2008; Mondello, 2017; Frank, 2017; Castejón, 2012).

These BMPs are detected through BM screening, and the application or impaction of magnets with the same polarity as the BMP of the region or organ will break this resonance and neutralize the ions. The formation of water and the re-balancing of the pH will then occur, enabling the organism to return to homeostasis. Consequently, the immunological system will act on the biological territory that was essential for the survival of the antigens (Frank, 2017).

## Homeostasis

Homeostasis is another fundamental of MB and an essential principle of integrative physiology. It can be understood as the result of all the physiological processes coordinated to maintain a state of stability in the organism (Goldstein & Mcewen, 2002). It is in this state of equilibrium, known as the Normal Energy Level (NEL), that Durán defines the state of health and disease in his theory (Durán, 2008).

In the human body, everything from a cell to a system works integrally to maintain stable conditions within favorable physiological parameters for the maintenance of life, that is, all the organs and tissues of the human body execute functions to maintain homeostasis. For example, the lungs supply oxygen to



the extracellular liquid to replace the same in the cells, while the kidneys maintain the constant concentration of ions, and the gastrointestinal system supplies nutrients (Guyton & Hall, 2011).

In the biology of systems, homeostasis seems to be almost invisible, but is the fundamental objective that drives all bodily processes to maintain a state of equilibrium and health (Goldstein & McEwen, 2002).

MB can also be considered a system that aims for the maintenance of homeostasis of the organism. Through the application of magnets over biomagnetic pairs and in the intention to neutralize them, NEL will be re-established (Durán, 2008). Upon re-establishing NEL, the entropy of the systems will be reduced and, in association with the other bodily systems for the maintenance of homeostasis, such as the

lungs, kidneys, skin, glands, and the immunological system, these can all act with greater efficiency in the performance of their functions.

### **Magnetic resonance**

The first studies relating electricity and magnetism appeared in the 18th century. It was Ampère who proved that all magnetic phenomena have an origin in the movement of electric charges, including the magnetism of magnets (Hage & Iwasaki, 2009; Gardelli, 2018). Authors currently recognize the work of Ampère but have also proved that magnetism generates the movement of charges and the formation of electric impulse through magnetic induction (De La Cal, 2004).

Magnetic resonance, which is a form of imaging exa-



mination used throughout the world, has its origin in electromagnetism. It also provided a basis for cordless telephones and the transmission of sound and images between a generator and a receiver, which are in vibratory resonance and allow the reproduction of electromagnetic phenomena (Hage & Iwasaki, 2009).

Electromagnetic resonance makes it possible to identify BMPs in an organism in the MB technique through the identification of points that are not at their NEL (Durán 2008; Mondelo, 2017). Each microorganism, be it a virus, fungus, parasite, or bacteria, or even a glandular dysfunction, establishes a vibratory and energetic resonance that should be identified and measured in future experiments (Durán, 2008; Castejón, 2012).

By transferring the concepts of physics to MB, it can be

understood that magnetic resonance happens when the energy of a given material is transferred to a physical body. Resonance happens when the natural vibration frequency of the first is reached. When the material begins vibrating intensely, the amplitude tends to increase, giving rise to magnetic coupling. As cited by Faraday, magnetic coupling occurs when two objects exchange energy through a varying magnetic field, the stimulus being emitted by the primary coil, which is the principle of cordless phones and BMP for MB (Durán 2008; Mondelo, 2017; Andreola, 2018; Blundell, 2012).

Resonant coupling occurs in an organism when the natural frequencies of two bodies are very close. Microorganisms present magnetic resonance between each other, an energetic and vibrational relationship





known as symbiosis. In the BMP, bacteria are in resonance with viruses and fungi are in resonance with parasites. When the BMP is depolarized through magnetic fields generated by magnets, the resonance between the microorganisms is broken. Consequently, pH equilibrium and homeostasis of the organism can be re-established by the patient's immunological system (Durán, 2008; Durán, 2003; Castejón, 2012).

### **Entropy**

Entropy is understood to be a thermodynamic concept of significant importance that is linked to the direction of transformations, that is, the natural order with which events take place (Cavalcanti et al., 2018). The authors also emphasize that the origin of explanations on the concept of entropy were designed based on

the work of the French engineer Sadi Carnot in *Réflexions Sur la Puissance Motrice du Feu Et Sur Les Machines Propres à Développer Cette Puissance* (Reflections on the Motive Power of Fire and on Machines Fitted to Develop that Power), which was originally published in 1824. In this study, a hypothesis is presented in which a thermal machine functioning cyclically should absorb energy in the form of heat from a given source and then release energy to a cold reservoir, spending energy in the process (Cavalcanti et al., 2018).

When transferring the thermodynamic concept to the body, entropy is understood as being the amount of heat that a body gains or loses in its absolute temperature. The high-speed movement of molecules generates increased entropy and the release of energy in the form of heat.



Entropy refers to the quantity of heat loss or gain needed for thermal equilibrium. Equilibrium is translated by the interruption of heat exchanges. Taking into consideration the first law of thermodynamics, which states that the heat/energy of the universe is constant, according to the authors, the second law of thermodynamics establishing entropy, supports the dispersal of heat in a determined closed system. With time heat will tend towards its maximum level, that is, it will reach thermal equilibrium (Simonini & Romagnoli, 2019). Therefore, the more energy exchanges occur, the greater the entropy, which is possible from the moment that the energy is more widely distributed, leading to the interpretation of entropy as being the natural tendency to a greater dispersal of energy, or a greater variety in the distribution of

energy as spontaneous transformation occurs. Entropy is therefore understood as a measure of energy dispersal. [...] In addition, the calculation of the variation of entropy for some processes, such as the expansion of a gas in a vacuum and the solid-liquid and liquid-vapor phase transitions, helped students and teachers understand the variation in entropy as an increase in disorder. (CAVALCANTI et al., 2018, p. 2).

For Durán (Durán, 2008), the greater the disorder in a system, the greater its entropy and the greater the release of heat. The energy can be released, but there is no way of re-establishing the initial entropy of the system; the energy will be dissipated or lost in the universe. Entropy is defined in the state of neutrality of a system and its variation can be calculated. The entropy of a system can only be altered by the



action of an external factor, as the natural tendency of matter is to remain in equilibrium. Upon transferring the thermal energy of one system to another, or from one body to another, its entropy can be reduced.

Transferring the concept of entropy from thermodynamics to MB, it is observed that the temperature alterations in an organism are responsible for the variation of pH and, consequently, the formation of BMPs. The depolarization of the BMPs and the rupture of the resonance between the pathogens generates an increase in entropy, since the immunological system will be activated to combat the agents promoting the pathology. The momentary elevation of entropy with MB will provide conditions for the immunological system to play its role effectively. The negative entropic effect, secondary

to MB, will come together with homeostasis (Durán, 2008; Mondelo, 2017 and Castejón, 2012).

When MB is applied to patients with high entropy, adverse effects can be observed, caused by the action of homeostasis systems. Signs such as fever, insomnia, drowsiness, headaches, diarrhea, and polyuria can be observed (Durán, 2008; Mondelo, 2017). Thus, the depolarization of BMPs should not be carried out in hemodynamically unstable individuals, so as not to promote increased entropy (Durán, 2008; Mondelo, 2017; Castejón, 2012).

### **Symbiosis**

As defined in Biology, symbiosis is a direct, harmonic, productive functional relationship between two organisms of different species, in which both have mutual benefits (Cha-



telard & Cerqueira, 2015).

The human gastrointestinal tract (GI tract), for example, is host to trillions of microorganisms, which cover more than 200 m<sup>2</sup> of mucosa. Their number is 10 times greater than the number of cells in our body, in addition to them having 150 times more genes than the human genome. The ecological relationship of these microorganisms with the human organism is an example of symbiosis (Oliveira et al., 2021).

In the symbiotic relationship that occurs in the GI tract, the microbiota help in the preservation of immunological functions, the adequate absorption and digestion of nutrients, and the habitual metabolic functions. The GI tract, in turn, provides the biological territory for the survival of the microbiota (Oliveira et al., 2021).

In NEL, the symbio-

tic relationship is balanced, and the organism is healthy (Durán, 2003). When external factors break the relationship of symbiotic balance, be it through temperature alterations, pH, nutritional deficit, use of antibiotics, stress, or several other factors, the disease state is activated (Oliveira et al., 2021).

For Durán (Durán, 2003) viruses, bacteria, fungi, and parasites do not live individually. He considers the symbiosis relationship as a “harmonic concert” of coexistence, use of space, and resources for the natural metabolism of pathogens. In BMPs, bacteria and parasites have affinity for the north pole while viruses and fungi have affinity for the south pole. In his theory, Durán considers the existence of two symbiotic relationships. One is of a vibrational and energetic nature, which occurs among



bacteria and viruses, the other is metabolic, occurring between the BMPs, and involves viruses and fungi and parasites and bacteria (Durán, 2003, 2008, 2014).

Viruses are microorganisms that require a cell for their reproduction and transport. In the BMP, pathogenic viruses make resonance and symbiosis with non-pathogenic bacteria, such as the bacteria of the GI tract, using their machinery for the manufacture of their capsid and subsequent transport and proliferation (Durán, 2003, 2008).

Pathogenic bacteria use RNA viruses structurally in order to survive. When the viral capsid couples to a cell, its genetic material enters the cytoplasm, and the capsid remains adhered to the membrane of the host cell. It is in this sequence of proteins that the pathogenic bacteria adhere and produce toxins

to begin pathogenicity (Mondelo, 2017; Durán, 2003, 2014).

Fungi mainly require four factors for their development and reproduction, these being organic material, humidity, low luminosity, and acidic pH. Acidic pH arises from certain factors such as diet, exposure to hyperthermia or ionizing radiation, and especially through the presence of pathogenic viruses. Therefore, when a pathogenic fungus is identified in MB screening, we should presume the existence of a pathogenic virus, which provides conditions of hyperacidity of the environment for the development and pathogenicity of the fungus. In this relationship, the virus determines the site for the manifestation and expression of the fungus (Durán, 2003, 2014).

Parasites are natural bacteria reservoirs, which can be pathogenic or otherwise. These



microorganisms live in symbiosis, since the bacteria first promote the alkalinity of the pH of an anatomical micro region so that the parasite is installed, and subsequently use it as a reservoir. These beings may also use the mucoproteins, sugars, and the bacteria themselves for their metabolism (Durán, 2003, 2014).

For Durán (Durán 2003, 2008, 2014) and Mondelo (Mondelo, 2017), when analyzing the physiopathology of a microorganism in isolation, the patient's signs and symptoms can be wrongly interpreted, leading to imprecise diagnosis and treatment of diseases.

BMPs appeared to throw light on the physiopathology produced by the symbiosis between the microorganisms in the human being and for the treatment of pathologies at their energetic, vibrational, and meta-

bolic origin (Durán, 2003).

### **Rheology of fluids**

Rheology can be conceived as the branch of science that aims to study the flow and deformation of matter, taking into account the relationship between tension and shear, in addition to the deformation that occurs over time (Filho et al., 2020). The main objective of rheology consists of the study of the deformation and flow of matter, which can involve elasticity, plasticity, and viscosity (Ferreira et al., 2005).

The intracellular environment is far from being an homogeneous mixture. In addition to the nucleus, it is composed of an heterogenous solution with various organelles dispersed within. The cellular environment is delimited by a flexible plasmatic membrane and organized into lo-



cally distinct collections of molecules and structures, within a dynamic, filamentous cytoskeletal framework (Weihs, 2006).

The precise control of the chemical and mechanical properties of the membrane is essential to conducting a specific biological response, given the metabolic cellular processes and the action of medication, for example (Joyner et al., 2020). To understand the cellular dynamic and its adaptive responses, an integrated model of cellular physiology that incorporates this complexity is required, due to the dynamics and mechanics impacting all the traffic and communication processes that coordinate functional responses. This approach is taken in bio-microrheology (BMR) and is related to endoplasmic reticulum flow (Weihs, 2006; Joyner et al., 2020).

Rheological measures

quantify the volume or the mean physical responses of liquids and flexible macromolecules to deformation or mechanical force.

Rheological properties can vary as a result of time, temperature, concentration, and applied stress. For example, a basic rheological property is a fluid's viscosity, or resistance to flow (Weihs, 2006; Joyner et al., 2020).

Based on cellular rheology, the rheology of bodily fluids can be understood as the flow of solid substances, liquids, and gases, and is thus one of the fundamentals of MB. For Durán (Durán, 2003), the movement of a fluid, or its flow through a conduit in a determined period, is understood as rheology.

In the rib cage, air, blood, lymphatic, and humoral flow should be in harmony and integrated within the expansion and retraction limits of the same.



Ventilation, distribution, diffusion, perfusion, and rheology should be executed concurrently, in addition to the phenomena of nutrition and elimination of gases inspired by the lungs that are in the intrathoracic tissues. The synchronicity of these processes with less energy spend for the organism in relation to time determine the energetic states for health or disease (Durán 2003).

Air flow depends on the anatomical and functional integrity of the muscular groups responsible for ventilation, in addition to those that constitute the rib cage. Blood flow, in turn, depends on the muscular strength of the heart and vascular compliance. Lymphatic flow, on the other hand, will depend on the phenomena of capillary action and muscular contractility, especially of the diaphragm. In addition, humoral flow crosses

the pleural cavity and enables the generated negative pressure to maintain the natural and forced expansion of the lungs, among other things. Under normal conditions, the four flows have constant rheology that increases in proportion to the physical effort of the organism, that is, the effort of its metabolism (Durán, 2003).

In the organism:

The alteration of intrathoracic rheology of one of the fluids in question will have repercussions for the other fluids. All these kinetic considerations are even more evident due to the presence of other fluids, which under normal conditions are not important, but are pathologically able to sustain the alteration: bronchial sputum and potential spaces in the thorax, pericardium, and pleura. Normally,





the organism expels H<sup>+</sup> ions that the organism's buffering systems are incapable of balancing in the extracellular environment. However, if the proportion of H<sup>+</sup> increases, phenomena such as bronchial hypersecretion occur, which first tends to inundate the alveolar tissue and then obstructs the airways as it becomes thicker and more abundant. When this phenomenon occurs, resistance to air flow is added to the phenomena of distribution and diffusion in the presence of pathological conditions of the mucus and even more so when the natural drainage systems fail, or when sputum viscosity increases, be it through dehydration or infection. In these cases, sputum rheology be-

comes important insofar as it affects the rheology of air flow, blood flow, or intrapulmonary lymphatic flow (DURÁN, 2003 p. 91).

## CONCLUSION

When analyzing all the concepts presented above and discussed from the perspective of Medicinal Biomagnetism, coherence can be observed between the theoretical bases already grounded in science and the principles of MB.

However, this study has important limitations to be cited, but which do not diminish its relevance within the proposed context. One of the limitations would be the scarcity of articles related to the use of the MB technique as proposed by Durán. Furthermore, most of the articles found with



this approach have methodological limitations, which made it impossible to compare the analysis and evaluation of their results.

Therefore, a narrative review of the subject was chosen, which, according to Rodgers et al. 2009, allows for theoretical-reflexive discussion of previously published studies on a given subject, enabling access to and the processing of knowledge and new ideas in relation to the studied theme.

#### **FUTURE PERSPECTIVES**

It is expected that by relating what has been grounded in scientific literature to the theoretical bases of MB proposed in this review, further studies will be carried out with the aim of enabling evaluation of the efficacy of this therapy as another complementary integrative thera-

peutic technique.

When there is consistent research in relation to the technique, all the scientific community and patients will be able to understand the results of this therapy.

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