

# Energy Medicine: Current Status and Future Perspectives

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## Abstract

Current practices in allopathic medicine measure different types of energy in the human body by using quantum field dynamics involved in nuclear medicine, radiology, and imaging diagnostics. Once diagnosed, current treatments revert to biochemistry instead of using biophysics therapies to treat the disturbances in subtle energies detected and used for diagnostics. Quantum physics teaches us there is no difference between energy and matter. All systems in the human being, from the atomic to the molecular level, are constantly in motion-creating resonance. This resonance is important to understanding how subtle energy directs and maintains health and wellness in the human being. Energy medicine (EM), whether human touch or device-based, is the use of known subtle energy fields to therapeutically assess and treat energetic imbalances, bringing the body's systems back to homeostasis (balance). The future of EM depends on the ability of allopathic medicine to merge physics with biochemistry. Biophoton emissions as well as signal transduction and cell signaling communication systems are widely accepted in today's medicine. This technology needs to be expanded to include the existence of the human biofield (or human energy field) to better understand that disturbances in the coherence of energy patterns are indications of disease and aging. Future perspectives include understanding cellular voltage potentials and how they relate to health and wellness, understanding the overlap between the endocrine and chakra systems, and understanding how EM therapeutically enhances psychoneuroimmunology (mind–body) medicine.

## Keywords

energy medicine, psychoneuroimmunology, device-based, human touch, endocrine/chakra systems, voltage potentials

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## Introduction

Energy medicine (EM) has been defined as a branch of integrative medicine that studies the science of therapeutic applications of subtle energies. For centuries, allopathic or Western medicine has investigated the body's internal systems—from organs, tissues, and cells to the current understanding of hormones and peptides. While modern medicine focuses primarily on physiology, the human organism has many aspects that are not physical—aspects that generate and absorb massive amounts of information. Physiology interacts with its environment via ambient fields such as light, sound, electricity, magnetism, and with all other living organisms to generate massive amounts of information in the form of energy fields. Voltage potentials (VPs) across cell membranes direct ion flux, modulating cell function. VPs are involved in the therapeutic effects of pulsed electromagnetic field (PEMF) on immune function and tissue

regeneration, on organ-associated frequencies instrumental in the endocrine/chakra systems, and on the regulatory mechanisms of neurotransmitter conversion of external fields into chemical or electrical energy involved in mind–body function known as psychoneuroimmunology (PNI). The subtle energies involved in these systems exhibit the internal and external aspects of the human being described as the human biofield or *human energy field* (HEF). To both understand and treat the entire human being, current practices in Western medicine must expand concepts of healing to incorporate physics

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of the HEF into modern medical practice. Knowledge of the existence of and effects on the HEF will determine the future of medicine by opening new medical paradigms, integrating Western medicine with Eastern medical practices that have been time tested for thousands of years.

## Current Status

Current practices in Western medicine measure different types of energy in diagnostic procedures. These include sonograms, X-rays, magnetic resonance imaging, electrocardiogram, electroencephalogram, computed tomography, and positron emission tomography scans involved in nuclear medicine, radiology, and molecular imaging diagnostics. These devices use an energy source, such as radiopharmaceuticals (which emit radiation), introduced into specific tissues or organs that alter or absorb external electromagnetic fields (EMFs) or ultrasound to diagnose cell and organ function. Biophotonics is being used in medical diagnostics for tagging single intracellular protein molecules, allowing scientists to track molecular function in real time with a high degree of accuracy.<sup>1</sup> Biophoton emissions were first discovered by Fritz-Albert Popp using a type of photomultiplier to count light, photon by photon. This device is highly sensitive to extremely weak photon emission. Biophotonics addresses the way in which light interacts with biological systems including molecules, cells, tissues, and whole organisms.<sup>2</sup> Quantum processes include resonant frequencies such as in nuclear magnetic resonance, a physical phenomenon in which nuclei in a strong magnetic field are perturbed by a weak oscillating magnetic fields (in the near field, therefore not involved in electromagnetic waves) that respond by producing an electromagnetic signal with a frequency characteristic of the magnetic field at the nucleus.<sup>3</sup> All atomic nuclei consist of protons and neutrons, with a net positive charge. Certain atomic nuclei, such as the hydrogen nucleus, or the phosphorus nucleus, possess a property known as "spin," dependent on the number of protons. This can be conceived as the nucleus spinning around its own axis, although this is a mathematical analogy. While the nucleus itself does not spin in the classical meaning, but through its constituent parts induces a magnetic moment, generating a local magnetic field with north and south poles. The quantum mechanical description of this dipolar magnet is analogous to classical mechanics of spinning objects, where the dipole is a bar magnetic with magnetic poles aligned along its axis of rotation.<sup>3</sup> Nuclei that possess spin can be excited with magnetic fields in short pulses, whereby the absorption of energy via the nucleus causes a transition from higher to lower energy levels and vice versa on relaxation, returning the system to thermal equilibrium. Energy

absorbed (and subsequently emitted) by the nucleus induces a voltage that can be detected by a suitably tuned wire coil, amplified, and displayed as "free-induction decay," causing each nucleus to resonate at a characteristic frequency when placed in the same magnetic field.<sup>4</sup> These diagnostic procedures provide tremendous amounts of information relating to the health of the patient.

Once the diagnosis using quantum mechanics is completed, current treatments revert to biochemistry instead of using treatments involving the subtle energies that made the original diagnosis. Quantum physics teaches us there is no difference between energy and matter. All systems in an organism, from the atomic to the molecular level, are constantly in motion-creating resonance. This resonance is important to understanding how electromagnetism (radiation/light) can have different effects on the body. While all matter resonates, there are signature resonant frequencies, emitting unique characteristic signals from the nuclei of their respective atoms.<sup>5,6</sup> Most biomedical researchers agree that EMFs surround and flow through the body in the form of electricity, with the heart registering the highest electrical activity, emitting 2.5 W, producing 40 to 60 times more electricity than the brain.<sup>7</sup> The electrical activity of the heart and nervous systems interacts and affects one another, with the heart being correlated with the highest magnetic activity.<sup>8</sup>

Classic body systems include the nervous/enteric system, the circulatory system, the immune/lymphatic system, the digestive system, skeletal system, respiratory system, integumentary, endocrine, urinary/renal, and reproductive systems. Each of these systems is a channel for energy communication. Wisneski and Anderson suggest that these energy communication channels effect emotions as well as our sense of self.<sup>9</sup> For example, the nervous system transmits information to the proper part of the brain to be assimilated and sent back to a part of the body it intends to influence. Cerebral spinal fluid carries information that affects the endocrine, immune, and the central nervous system (CNS), sympathetic nervous system (SNS), and parasympathetic nervous system (PNS). PNI, the relationship between the psyche (thoughts), neuroscience (CNS, SNS, and PNS), and immunology, incorporates psychology with neurology, immunology, physiology, endocrinology, and rheumatology.<sup>10</sup> Research suggests that the mind and body communicate in a bidirectional flow of hormones, neuropeptides, and cytokines.<sup>11,12</sup> In the immune system, protein molecules known as cytokines are the principal mediators of communication between the immune and neuroendocrine system, which results in immune system modulation, particularly regarding inflammation and infection.<sup>13</sup> Activated immune cells can permeate the blood-brain barrier and secrete cytokine mediators.<sup>14-16</sup>

Cytokines play an enormously important role in system homeostasis during immune challenges.<sup>17</sup> Both immune and neuroendocrine systems share signaling molecules, primarily neuropeptides, and cytokines, which promote communication with and between the systems of the body. These are examples of how the body has the capacity to function in a similar manner, with separate, yet fully interactive parts, maintaining homeostasis.

There is a substantial body of evidence to suggest that perceptions of one's environment can be profoundly immune enhancing or immune suppressive.<sup>11</sup> Stress decreases the body's lymphocytes—the white blood cells that help fight off infection. Lower lymphocyte levels increase the risk of viral infection and common cold.<sup>18</sup> Leukocytes not only modulate neuroendocrine peptide production via the CNS but are capable of producing stress-associated peptides and hormones previously thought to reside exclusively in the CNS.<sup>19</sup> High-stress levels can also cause anxiety and depression, leading to higher levels of inflammation.<sup>20</sup> Current medical science uses this biochemical model of molecules, cells, tissues, organs, and systems to focus on an organized structure–function relationship of health and disease. This model needs to be expanded to deeper levels that include electromagnetic and quantum processes that play a major role in how nature organizes itself.

### Energy Medicine (EM) Defined

EM is the use of known subtle energy fields to therapeutically assess and treat energetic imbalances, bringing the body's systems (neurological, cardiovascular, respiratory, skeletal, endocrinal, emotional/psychological, etc) back to homeostasis. Knowledge of the existence of the HEF is the first step to understanding integral physiology, which unites body, mind, and spirit to treat the entire human being—not just the physiology.<sup>21</sup> The HEF has been described as a complex dynamic of EMFs that include individual oscillating electrically charged moving particles such as ions, biophotons, and molecules, which create standing waves.<sup>22</sup> Disturbances in the coherence of energy patterns of the HEF are indications of disease and aging.<sup>23</sup> When these energy particles are exposed to EM in the form of coherent energy patterns (eg, PEMF, vibrational medicine, Polarity Therapy, acupuncture, Healing Touch, etc), the disturbed resonant patterns return to their original, coherent, harmonic, and vibrational state (homeostasis). If Western medicine applied the principles of modern physics, it would understand human beings are composed of information (energy) interacting with other energy (environment) to profoundly impact our physical and emotional health. The HEF has been investigated in scientific laboratories where photon emissions were detected using photometers and color filter.<sup>24–27</sup>

Human energy vibrations were recorded at 1000 times higher in frequency than the electrical signals of nerve and muscle, with continuous dynamic modulation unlike the pulsing signals of the nervous system.<sup>23</sup> Energy in the HEF is typically referred to as subtle energy,<sup>28</sup> which is electromagnetic in nature. It is a system of wave-particle matter, transmitting and receiving vibrational information governing the physical matter of the body. Healing is achieved by directing coherent, harmonic energy into distortions caused by stressors and disease.

For many years, Western medicine rejected the possibility that an EMF could affect biochemical mechanisms with such weak electrical fields. Biochemistry, however, is based on an understanding of the flow of energy that drives chemical reactions.<sup>29</sup> Physical properties of molecules can be combined to express internal energy and thermodynamic potentials, which are necessary for equilibrium and homeostasis in spontaneous processes.<sup>9</sup> New models of biophysics emphasize cooperative electrical activity of highly ordered elements at all levels of physiology: cells, tissues, organs, organ systems, as well as the entire body. Laboratory research with in vivo (animal) and in vitro (cell and tissue cultures) has shown important effects caused by low-frequency or weak EMF therapies, causing changes in cell proliferation; alterations in membrane structure and function; changes in nucleic acids, protein phosphorylation, and adenosine triphosphate (ATP synthesis); as well as entrainment of brain rhythms and conditioned brain response.<sup>30–32</sup> Parameters of these fields include frequency, amplitude (field strength), waveform, and time of exposure. Recognition of physiological sensitivities to *exogenous* EMF came from the observation of internal *endogenous* electrical processes.<sup>9</sup> An example of this is the piezoelectric properties of bone that use electromechanical control to determine which cells become osteoblasts or osteoclasts. By modulating cellular processes with PEMF,<sup>33</sup> windows of opportunity for therapeutic application have been discovered for improving the regeneration of osteoblasts to bone before becoming osteoclasts.<sup>34</sup> All cells produce EMFs because the human body produces complex electrical activity in all the body's 210 different cell types. Neurons, endocrine cells, and muscle cells are all referred to as “excitable cells.” These cells produce current (via electron transfer); magnetic field (via moving charges); a pulsed frequency; as well as pH, oxygen, carbon dioxide, and light (via biophotons).<sup>35</sup>

Detailed clinical research in biophysical stimulation has identified specific cellular processes responding to electromagnetic forces. Selective pathways at the cell plasma membrane are activated depending on the PEMF applied. These include voltage-gated calcium channels activated by capacitive coupling,<sup>32</sup> intracellular calcium flux modulated with inductive coupling,<sup>36</sup> and

inositol phosphate by mechanical stimulation.<sup>37</sup> Basic research on cells, animals, along with clinical studies have reported therapeutic dosimetries for frequency, amplitude (field strength), waveform, orientation, and time of exposure needed to activate specific processes in specific cells.<sup>30</sup> Processes activated by PEMF signals have been reported in the plasma membrane's cell surface receptors through the cytoplasm into the nucleus and genes, where transcription factors affect translation of cell function.<sup>38,39</sup> Externally applied EMF can affect orientation, migration, and proliferation of cells, playing key roles in healing.<sup>36</sup>

## Modalities of EM

There are several modalities of EM that interact with the subtle energy of the body. These include, but are not limited to, PEMF therapy, Polarity Therapy, acupuncture, Healing Touch, Therapeutic Touch, Reiki, homeopathy, Qi Gong, and applied Kinesiology. New medical paradigms can bridge the gap between conventional/allopathic and EM. For instance, PEMF and acupuncture have plausible electromagnet modes of action.

### Device-Based Treatment

Research shows PEMF at extra low frequencies (ELFs) is beneficial to immune system modulation<sup>40</sup> as well as tissue regeneration.<sup>32</sup> PEMF can pass through the skin into the body's conductive tissue, resulting in reduced pain and edema, and stimulation of wound healing after trauma.<sup>36</sup> Electromagnetic therapies can affect cell signaling systems through the modulation of cytokine function,<sup>40</sup> second messengers such as cyclic adenosine monophosphate,<sup>41</sup> transcription factor nuclear factor kappa B,<sup>40</sup> and tissue regeneration,<sup>34</sup> without cytotoxic or genotoxic effects.<sup>42</sup> EMFs oscillate at various frequencies, however, ELFs (<100 Hz) are most commonly used for therapeutic purposes. Currently, there are several types of EMF therapies used in Western medicine. They include Laser surgery to resect hepatomas, metastatic tumors, and colorectal liver metastases;<sup>43</sup> transcutaneous electrical nerve stimulation to relieve acute and chronic pain;<sup>44</sup> cranial electrical stimulation for the treatment of neuroendocrine imbalance and chronic stress-associated diseases;<sup>45</sup> and PEMF therapy, which has been approved by the U.S. Food and Drug Association for the treatment of nonunion fractures, muscle reeducation, and relations of muscle spasm.<sup>46</sup> PEMF has also been used to treat osteoarthritis,<sup>47</sup> peripheral nerve pain,<sup>44</sup> wound healing,<sup>36</sup> spinal cord injury,<sup>48</sup> and cartilage repair.<sup>32</sup> Targeted pulsed magnetic fields are being used to treat depression in the form of transcranial magnetic stimulation (TMS).<sup>49</sup> This therapy targets key areas of the brain that are

underactive in people with depression.<sup>50</sup> Inefficient production of brain neurotransmitters (chemical messengers that send signals between brain cells) are brought back to homeostasis,<sup>51</sup> without the adverse effects of antidepressants.<sup>52</sup>

PEMF medical devices are available to purchase, but expertise is needed to assure the patient is using the optimal frequency, field strength, and time of exposure for the tissue type being treated. These devices can be applied in 2 different ways—either by capacitive or by inductive coupling. In capacitive coupling, there is no contact with the body, whereas direct coupling requires the placement of opposing electrodes in direct contact with the surface of the targeted tissue. With inductive coupling (nondirect capacitive coupling), electrodes do not have to be in direct contact with the tissue because the electric field produces a magnetic field that, in turn, produces a current in the conductive tissues of the body.<sup>46,53,54</sup> PEMF therapy is based on Faraday's law, a basic law of electromagnetism that predicts how a magnetic field will interact with an electric circuit to produce an electromotive force known as electromagnetic induction. EMF has been stigmatized as a cancer causing agent; however, it is the ionizing EMF that emits high enough energy states to dislodge electrons from atoms.<sup>55</sup> It is the *nonionizing* EMF that is used for therapeutic purposes.

### Acupuncture

Acupuncture can be considered an electromagnetic phenomenon due to the ionic charge between 2 acupuncture points. This has been demonstrated by Mussat and others.<sup>56–58</sup> Acupuncture needles with 1 metal (copper, silver, bronze, or an alloy) for the shaft and another metal for the handle, form tiny batteries.<sup>9</sup> Some acupuncture therapies use additional electrical stimulation (2–4 Hz) applied to the needles. From this electrical perspective, each organ in the body is like a battery housed in a sac of electrolytes, with a positive potential on the surface of the sac that is the aggregate result of electrical processes in the tissues of the organs.<sup>9</sup> The positive potential at the needle tip attracts negatively charged ions from the interstitial medium until a saturation equilibrium is achieved.<sup>59–61</sup> The normal functions of an organ tend to generate stronger and more harmonic ionic effects than organs with trauma or disease.<sup>62</sup> Acupuncture is considered a wiring system in the body, as is the analog perineural nervous system,<sup>63</sup> and ion transfer within blood plasma.<sup>64</sup> It is difficult to use a voltmeter to measure the voltage in organs because voltages pulse in the body. It is common to use an ohm meter to measure the voltage and convert ohms to volts using Ohm's law (voltage = ohms × amps). Table 1 shows frequencies that correspond to

**Table 1.** Frequencies Associated With Normal Organ Function.

Organ	Frequency (MHz)
Brain	70–78
Thyroid	62–68
Lungs	58–65
Thymus	65–68
Heart	67–70
Spleen	60–80
Liver	55–60
Stomach	58–65
Colon	70–78

organ function. Assuming amperage is constant, then ohms = voltage.<sup>65</sup>

### Human Touch Therapies

Touch therapies work using touch, interaction, and certain protocols to modulate energy imbalances in the HEF. Polarity Therapy, Healing Touch, Reiki, Cranial-Sacral Therapy, Trager, Bowen, and Brennan Healing Science all use similar techniques for bringing the HEF back to homeostasis. The subtle energy of the HEF is easily modulated by the therapist's hands. The client and practitioner work together using breathing techniques to move stagnant or blocked energy from the cells, across the tissues and through the organs. Human touch therapies are patient–practitioner oriented, where both the giver and receiver of the energy treatment must work in tandem for beneficial results to occur. The practitioner grounds and centers himself/herself, meaning all thoughts, emotions, and physical sensations are neutralized. During optimal healing states, our bodies resonate at certain frequencies (0.3–100 Hz), which correlate with delta, theta, alpha, and beta brain waves<sup>66</sup> (see Table 2).

Touch therapies bring distorted frequencies of brain waves, organ resonance, and endocrine/chakra systems back into balance by modulating the subtle energies of the HEF. Practitioners detect and manipulate the subtle energy and provide a resonating template for the patient's biofield to follow. In this state, body–mind–spirit is optimal for bringing the patient/client back to homeostasis energetically. Practitioners of touch therapies are a valuable resource in guiding both the practice and science of biofield therapies and could, with collaborative support of researchers, prepare meaningful case reports and best-case series for patients.<sup>67</sup>

### Future Perspectives

The future of EM depends on the ability of Western medicine to merge physics with biochemistry. As mentioned earlier, Western medicine uses physics to diagnose

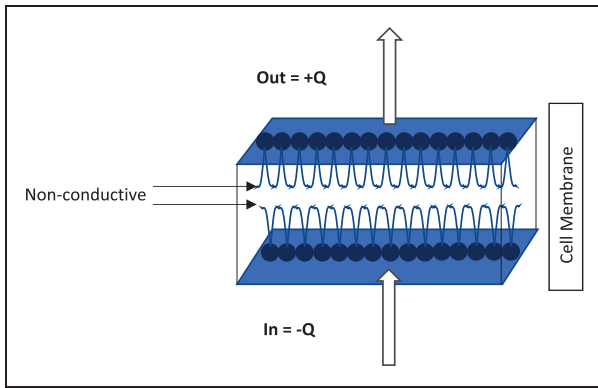
**Table 2.** Brain Wave States and Their Correlated Frequency and Physiology.

Brain Wave	Frequency (Hz)	Physiology
Gamma	30–100	Peak performance
Beta	12–30	Awake—normal alert consciousness
Alpha	8–12	Relaxed, calm, lucid, not thinking
Theta	4–7	Deep relaxation and meditation, mental imagery
Delta	0.3–4	Deep dreamless sleep

and then immediately reverts to a biochemical model to treat. It is widely accepted that quantum physics drives the energy behind diagnostic equipment.<sup>68,69</sup> Biophoton emissions as well as signal transduction and cell signaling communication systems in the body are also widely accepted in today's medicine.<sup>70</sup> However, the idea of a cellular and molecular global communication system involving energy fields is beyond the central dogma of Western medicine. Future perspectives include bridging the gap between allopathic and EM, which would include the crossover between the following: (a) understanding cellular VPs and how they relate to health and wellness, (b) understanding the overlap between the endocrine and chakra systems, and (c) understanding how EM therapeutically enhances PNI (mind–body medicine).

### Cellular Voltage Potentials (VPs)

The human body is controlled primarily by physics that drives the chemistry and biology.<sup>65</sup> Therefore, to understand how the body works, it is important to understand physics and electronic applications of cellular structure. Endogenous VPs control cell behavior and instruct pattern regulation in vivo.<sup>71</sup> Cells are designed to operate with a pH between 7.35 and 7.45. This equates to a voltage of between  $-20$  and  $+125$  mV.<sup>65</sup> The minus (–) sign denotes electrons are being donated (alkaline), and the plus (+) sign denotes electrons are being taken (acidic). A slightly alkaline environment is more beneficial. For example, a free radical is a molecule with missing electrons, and an antioxidant is a molecule donating electrons. Health is maintained with vital immune function and cell regeneration. A voltage of  $-50$  mV is required for regenerating cells.<sup>65</sup> Jerry Tennant, MD, reports that a  $-50$  mV energy state is necessary for maintaining good health, and  $-70$  mV is optimal. Without this balanced VP, aging and chronic disease occurs.<sup>65</sup> This baseline can be achieved through healthy diet and keeping the body's subtle energy balanced. Cells contain a process for turning fatty acids into glucose. They are processed through a series of chemical reactions known as the Krebs cycle. The Krebs cycle



**Figure 1.** A healthy cell has a membrane potential of approximately 70 mV, meaning that the potential inside the cell is 70 mV less than the potential outside due to a layer of negative charge on the inner surface of the cell wall and a layer of positive charge on the outer surface. This effectively makes the cell wall a charged capacitor.<sup>32</sup>

converts ATP to adenosine diphosphate (ADP). As ATP provides electrons to keep the cell functioning, it becomes a discharged/rechargeable battery called ADP. If voltage drops, the VPs go from electron-donor to electron-stealing status. This will cause a change in polarity. When voltage drops to +30 mV, disease sets in Tennant.<sup>65</sup>

To produce voltage, cell membranes are made up of opposing layers of fats called phospholipids. They are composed of phospholipid heads, which are round, and phospholipid tails, which look like legs (Figure 1).

Anytime 2 conductors are separated by an insulator, they create a capacitor, and this can be observed in the cell's plasma (outer) membrane.<sup>72</sup> Capacitors are designed to store electric charge (electrons), allowing cells not only to store energy but also to transfer it. The plasma membrane allows EMF to permeate into the cell to affect cellular mechanisms such as cytokines and second messengers (transcription factors) to carry information from the plasma membrane through the cytoplasm into the nuclear membrane to affect genetic function. The plasma membrane contains voltage-gated ion channels that open and close depending on the voltage supplied.<sup>32</sup> If they become hyperpolarized, then ions such as calcium ( $\text{Ca}^{2+}$ ), potassium ( $\text{K}^+$ ), and sodium ( $\text{Na}^+$ ) cannot flow freely in and out of the cell. This causes increases in the pain-related neurotransmitters and inflammatory/immune functions of cells.<sup>13</sup> In his book, *The Body Electric*, Robert O Becker, MD, discusses the direct current (DC) system of glial cells involved in regenerating electrical feedback loops that influence the production and transmission of these voltage-gated action potentials in nerves.<sup>73</sup> For example, glial cells are nonneuronal cells that maintain homeostasis, form myelin, and provide support and protection for

neurons in the brain and for neurons in other parts of the nervous system (such as the autonomic nervous system).<sup>74</sup> Nerve cells are constantly releasing neurotransmitters into the synaptic gaps between themselves and the neurons they contact. The DC carried over these cells energetically effects the nerves they surround by influencing the presynaptic sites. Thus, the plasma membrane VP determines the responsiveness of each neuron in releasing neurotransmitters on cue. These signals can be modulated by exogenous fields such as electromagnetism.<sup>32,36</sup>

## Endocrine and Chakra Systems

The pathway from the physical body through the hormones to the psychological and emotional body is through the endocrine system, which is closely associated with the chakra system. The major glands of the endocrine system are the hypothalamus, pituitary, thyroid, parathyroid, adrenal, pineal, and reproductive organs (generatives). The pituitary cells are neuronlike—they express numerous voltage-gated sodium ( $\text{Na}^+$ ), calcium ( $\text{Ca}^{2+}$ ), potassium ( $\text{K}^+$ ), and chloride ( $\text{Cl}^-$ ) channels, and fire action potentials spontaneously, accompanied by a rise in intracellular  $\text{Ca}^{2+}$ . In some cells, spontaneous electrical activity is sufficient to drive the intracellular  $\text{Ca}^{2+}$  concentration above the threshold for stimulus-secretion and stimulus-transcription coupling. In other cells, the function of these action potentials is to maintain the cells in a responsive state with cytosolic  $\text{Ca}^{2+}$  near, but below, the threshold level. Some pituitary cells also express gap junction channels, which could be used for intercellular  $\text{Ca}^{2+}$  signaling in these cells. Endocrine cells also express extracellular ligand-gated ion channels, and their activation by hypothalamic and intrapituitary hormones leads to amplification of the pace-making activity and facilitation of  $\text{Ca}^{2+}$  influx and hormone release. These cells also express numerous G protein-coupled receptors, which can stimulate or silence electrical activity and action potential-dependent  $\text{Ca}^{2+}$  influx and hormone release.<sup>75</sup> Other members of this receptor family can activate  $\text{Ca}^{2+}$  channels in the endoplasmic reticulum, leading to a cell type-specific modulation of electrical activity.<sup>75</sup> These same physics phenomena are seen in the other glands of the endocrine system.<sup>76</sup>

Overlapping the endocrine system is the chakra system, which contains seven vital energy centers that run from the base of the spine to the top of the head, centered on the spinal column. They include the following: (1) root chakra—associated with the adrenals, (2) the sacral chakra—associated with the generatives (ovaries for women and testes for men), (3) the solar plexus chakra—associated with the pancreas, (4) the heart chakra—associated with the thymus, (5) the throat

**Table 3.** Chakra Location and Correlated Frequency.

Chakra Location	Frequency (Hz)
Crown	216
Third eye	144
Throat	192
Heart	128
Solar plexus	182
Sacral	303
Root	228

chakra—associated with the thyroid, (6) the third eye (located between the eyebrows)—associated with the pituitary gland, and (7) the crown chakra—associated with the pineal gland. Table 3 shows the correlation between the chakra location and its associated frequency.<sup>77</sup>

Chakras produce energy vortices, which, when healthy, provide the energetic information by which all the systems of the body create a global information system. More empirical data are needed to determine whether EM therapies can heal endocrine diseases/distortions through the subtle energy in and around these glands. Endocrine disorders include glucose homeostasis disorders, thyroid disorders, calcium homeostasis disorders, metabolic bone disease, pituitary gland disorders, sex hormone disorders, and tumors of the endocrine glands, to name a few. These conditions affect the quality of life of millions of people around the world. When the exchange of information between hormones, peptides, neurotransmitters, cells, tissues, organs, and regulatory systems in the body break down, the most efficient way to bring this exchange of information back to health is through energy in the form of electromagnetic information. The directives of subtle energy treatments realign the HEF back to homeostasis or default mode. The HEF information system is similar to the interconnection of all global computers that form the Internet, with each cell representing an individual personal computer constantly uploading and downloading information to the World Wide Web. Once there is an understanding of the human being as a global information system of cell communication, signaling transduction, and energetic instruction sets, medicine will begin to treat the entire human, body–mind–spirit, with physics as the lowest common denominator, instead of biochemistry.

### Mind–Body Medicine (PNI)

Many aspects of the human endocrine system are associated with mind–body medicine, also known as PNI. PNI explains the connection between the mind/thought and the immune and nervous systems. Life experiences such as stressors and depression induce immunological

activation, associated with cytokines and the hypothalamic-pituitary-adrenal (HPA) axis, which is the central stress response system.<sup>78</sup> Accessory cells, such as macrophages, which are essential for the modulation of immune response, mitigate both acute and chronic stress states having calcium-dependent biochemical mechanisms affecting T-cell proliferation and signal transduction pathways.<sup>79</sup> PNI studies exact mechanisms through which specific brain immunity effects are achieved. Evidence for nervous system/immune system interactions exists on several biological levels. The immune system and the brain communicate with each other through signaling systems of the body linking the HPA axis and the SNS. The activation of SNS during an immune response is triggered to localize the inflammatory response.<sup>80,81</sup> The HPA axis responds to physical and mental challenges to maintain stability in part by controlling the body's cortisol level. Imbalances in the HPA axis are the cause of many stress-related illnesses.<sup>82</sup> HPA-axis activity is linked by inflammatory cytokines that stimulate adrenocorticotropic hormone and cortisol secretion, while glucocorticoids suppress pro-inflammatory cytokines. Cytokine regulation of hypothalamic function is an active area of research for the treatment of anxiety-related disorders.<sup>83</sup> Complex interactions between cytokines, inflammation, and adaptive immune responses maintain homeostasis in the body to protect against disease. As discussed earlier, PEMF has been reported to significantly downregulate key cytokines involved in neuroinflammatory diseases<sup>84</sup> and provide critical results in treating dysfunction of neurotransmitters in severe stress and depression using TMS devices. Volumes of evidence have been published supporting the integration of mind–body medicine (PNI) with endocrine/chakra systems and EM for the benefit of Western medicine.<sup>9,11</sup>

### Coherence/Decoherence and Quantum Resonance

One underlying mechanism that would bring biochemistry and nuclear diagnostic applications together would be the understanding of how resonance applies to biological systems. After discovering biophotons in the body, Popp et al., revealed the source of biophoton emissions is deoxyribonucleic acid (DNA). Here, he discovered DNA sends out a large range of frequencies, where certain frequencies were linked to certain functions.<sup>85</sup> Popp reported that biophoton emissions are low intensity because they are involved in cell coordination and communication that could only occur at quantum levels.<sup>86</sup> Once energy reaches a certain threshold, molecules begin to vibrate (resonate) in unison until they reach a level of coherence. The moment molecules

reach this state of coherence, they take on certain qualities of quantum mechanics, including nonlocality, where they operate in tandem.<sup>87</sup> This occurs in ion flux where the selectivity filter of ion channels exhibits quantum coherence, which is relevant for the process of ion selectivity and conduction;<sup>88</sup> endocrine hormone secretion, where highly organized timing of circadian rhythms and daily control of hormone secretion achieves optimal biological functioning in health;<sup>89</sup> PNI (the mind–body connection);<sup>90,91</sup> and decoherence, which is associated with disease.<sup>92,93</sup>

## Conclusion

Without crossover applications of human touch and device-based EM treatments well integrated and easily accepted in Western medicine, today's medicine will continue to lack the missing piece of science so desperately needed to complete the human cycle of existence. Physics must be blended with biochemistry to effectively treat the human being without adverse effects. It is clear that science and technology have resulted in vastly improved understanding, diagnosis, and treatment of disease, but the emphasis on biochemical treatment over quantum/energy-based technology is creating adverse events in today's health care.<sup>21</sup> The healing of a patient must include more than the biology and chemistry of their physical body; by necessity, it must include the mental, emotional, and spiritual (energetic) aspects. EM is on the forefront of accepting this challenge.

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