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The Link between Electrical Properties of COVID-19 and Electromagnetic Radiation

Awaad K. Al Sarkhi

Abstract

The ability of a new vaccine design based on control the intracellular physiological consequences of both the electrical properties and the electromagnetic radiation interactions between a virus and a host cell, which is a method to strengthen immune system develop protection against COVID-19 and new strains. The capacity of COVID-19 to bind to angiotensin-converting enzyme 2 (ACE2) and immune evasion mechanisms are only one of the properties required to stimulate a preventative immune response. In this chapter, a multidimensional new strategy is used to exemplify the empowerment function intracellular and extracellular level information can play in the support of immunogen against COVID-19 pathogens. Besides during this chapter, the nature of electromagnetic radiation is described as a vibrating string based on a string-theory and unification of electromagnetic radiation and gravitational waves by supporting with multiple cites strong evidence. Overall, we demonstrate a new approach to understand the important role of the physiological consequences of the interplay between the immune system and COVID-19 and designing vaccine strategy immunogens that take advantage of that information against COVID-19 and new strains.

Keywords: COVID-19, Electrophysiology, Electrostatic Discharge (ESD), Electromagnetic Radiation (EMR), Voltage-Viral Channels, Zinc Homeostasis

1. Introduction

Vaccine design is either a method, or style, or programming to activate the immune system to help the immune system develop protection against infectious disease. Vaccination includes various strategies of immunogen designs [1–3]. In this chapter, we describe a new strategy based on events for the COVID-19 's journey to and interaction with the host cells, it seems to have the ability to induce a protective response against COVID-19 pathogens.

As known COVID-19 is adept at evasion host immune responses [4] and interfere with several receptor signaling pathways such as chemokine receptors to produce an active inflammatory response [5, 6]. Our previous work has shown the electrical properties of COVID-19 [7]. On another hand, many studies have shown a stronger electrotactic attraction over chemical gradients for human T cells led to migration [8]. This provides insight into the stronger electrotactic attraction for COVID-19 over chemical gradients for human T cell migration, and this reason virus interfered with several receptors signaling to prevent activation of

the host innate immune system to allow for COVID-19 replication. This means the COVID-19 have electrical properties to evade interferon signaling and induction to avoid the antiviral agents of the host immune system. Evasion of the host antiviral immune response is critical for COVID-19 replication or spread. That is why some humans get very sick and may lead to death while some do not severely sick or even have no symptoms, and the reasons some humans have long-term impacts throughout their body, maybe get very sick and may lead to death.

In many types of the viral envelope, it has the viral ion channel in the small envelope membrane proteins like viroporins [9–12]. From a role and function in the viroporin life cycle standpoint, it has viral protein with viral ion channel proteins have been shown to play a significant role to help in multiple processes of the journey for viral to and interaction with the host cells, such as CoV (SARS-CoV), influenza A, Human immunodeficiency virus (HIV)-1 [13, 14].

2. COVID-19's journey to and interaction with the host cells

The electrical and electromagnetic radiation events are one of the first indications that virus is undergoing activation steps during infection to replicate the viral genome. There are four steps to and interaction with the host cells leads to having symptoms and long-term impacts throughout the body, maybe get very sick and may lead to death.

Step I. COVID-19 Migration: Virus is attracted by either chemical or electrical factors and which are released via the target cells. The behavioral response of a virus is the pattern of movement during an external stimulus such as electrotaxis and chemotaxis that leads the migration of the virus towards target cells. Several electrotaxis studies have shown that electrotaxis in the body in many cells plays an important role in physiological processes that can direct the migration of various cell types such as inflammation, cancer cells, and immune cells [15, 16]. Mutual electrotaxis and chemotaxis of the virus-host cell is a critical element of these events; electrical signals from the host cell investments induce spectacular changes in form and function of the virus, and the virus triggers the quiescent host cell into protease activation, cleavage and activation allow the virus to enter the host cell.

Step II. Binding and interaction of virus-host cell: After virus migration to the target cells to bind. Many studies have shown that a Spike protein on the virus can bind to angiotensin-converting enzyme 2 (ACE2) receptors on the host cells [5]. The angiotensin-converting enzyme 2 (ACE2) is a zinc-containing metalloenzyme [17]. An angiotensin-converting enzyme 2 (ACE2) does play an essential role in maintaining the physiological and homeostasis in the body [17]. The membrane proteins for COVID-19 sense electrical energy by electrotaxis according to the important role of zinc in angiotensin-converting enzyme 2 (ACE2) is converting chemical energy into electrical energy leads to binding to (ACE2) receptors that are found on the surface of many human cells. Angiotensin-converting enzyme 2 (ACE2) is located on the surface of cells such as (lung, arterial and venous endothelial, enterocytes of the small intestine, and other) cells [18, 19].

Step III Electrical events link with an emitted electromagnetic radiation: In the biological cell, contains ions (the potassium K^+ and chloride anion Cl^-) are inside the cell, and ions (sodium Na^+ , calcium Ca^{2+} cations, and chloride anion Cl^- (at higher concentration) are outside the cell [20]. After the virus enters a host cell leads it to changes the electrical steady state of the virus because the different distribution of electrical charges inside and outside the virus leads to an electrical gradient (voltage) across the membrane. This electrical gradient is a difference across the viral membrane that generates a store of potential energy in the form

of an electrochemical gradient [21], which helps create the electric field or an electrical potential by the movement of ions across the two sides of the membrane [22, 23]. The viral membrane marks the border between the internal and external of the COVID-19 particle, which means, here the difference in electric potential between the inside and outside the COVID-19 particle. Thus, the viral membrane is responsible for the establishment of the electrical potential and serves as an insulator, all this indicates that there are lost or gained an electron, so there are lost or gained electrical charges. In another word, the viral membrane functions as an insulator and a diffusion channel to the movement of electrical charges, we will call it “Voltage-Viral Channels”. The voltage-viral channels are formed by the movement of electrical charges that are activated by changes in the viral membrane potential close and open the viral channels. The viral membrane potential changes the modification of viral channels by complex mechanisms are regulating either closing or opening, and voltage-viral channels directionally diffuse the electrical signals. Virus enters host cells after binding via charges conductivity, the voltage-viral charges channels embedded in a COVID-19’s envelope can actively collaborate in a COVID-19 entry through an endocytic process, whereas the customary view considered a spike protein is a part that appears to play a key role in entry to the host cell [4].

Moreover, the movement of ions generates an electric current by membrane depolarization (the influx of positive charge), in repeated motifs are regular by opening and closing of the channels because of a high potential difference. This electrical potential (high voltage) of the fluid surrounding a spike (S) protein is being electrically charged leads to generate corona discharge as results being a charged spike (S) protein have a sharp point, in adding to the protein–protein interactions (PPIs) leads to generate electrostatic force [24–26]. One of the side effects from an electrostatic discharge (ESD) is an induced to generate a corona discharge method, according to our previous work [7]. The corona discharge is a series reaction are creating a free electron that ionizes atoms surrounding it to create a positive ion and a free electron [24]. A corona discharge is classified into two general categories based on the type of attraction if all the electrons are attracted inward and the ions are repelled outwards, called a positive corona, else all the ions are attracted inward and all the electrons are repelled outwards, called a negative corona [24]. When the electrons from an inner orbit are released, the vacancy will be filled by the electrons from an outer orbit led to the excess energy from this shift is emitted as electromagnetic radiation, thus serve to ionize other atoms [27]. The emitted ionized radiation via the corona discharge method ionizes different cellular compartments inside the host cell. This emitted ionizing radiation can be damaged deoxyribonucleic acid (DNA) for host cell or many sorts of mutagens, thus cause host cell death via apoptosis [28].

Step IV. Fusion of virus–host cell: In the corona discharge method, occurs through a difference of electrical potential of the space surrounding a spike (S) protein, it in the COVID-19’s envelope, that is electrically charged by voltage-viral channels. In adding to the protein–protein interactions (PPI) that occur between COVID-19 proteins (spike (S), envelope (E), membrane (M), and nucleocapsid (N), are disassembled under this high voltage condition, resulting in that form viral fusion, according to the phenomenon by Zimmermann [29, 30]. The fusion virus–host cell fusion finally triggers the fusion of the COVID-19 and endosomal membranes, leading to the release of virus RNA genome in the host cell cytoplasm, thus, the loss of ion homeostasis or fluctuation in the level of the ion triggered by COVID-19 activity excites the activation of the host defensive programmed cell death pathways, from stress responses to apoptosis [28]. Finally, COVID-19 is replication and secreted from the host cell through exocytosis [31].

Step V. Activation and the disorganized immune response: Besides modifying cellular processes to support COVID-19 propagation, the stress responses to apoptosis triggered by an electrical and an electromagnetic radiation events activity may have deleterious consequences for the host cell leads to inflammatory in response to virus such as the cytokines, chemokines in plasma, and chemokine-receptor, and interfere with several receptors signaling pathway [6]. Because the COVID-19 seems is an electrically excitable virus has a structure that permits virus to pass chemical signal or an electrical signal to another virus or to the host cell that actively responds to effects some change brings it about and a stimulus such as B cell, T cells, Cytokine, chemokine, chemokine receptor, cytokines, and mast cell that (involved in the development of asthma or allergic rhinitis). These cells and their receptors produce an incongruous signal cause by the disorganized immune responses. Sometimes the properties electrical for COVID-19 permit to pass an electrical signal without the need for angiotensin-converting enzyme 2 (ACE2) receptors to recognize chemical messengers, as known in neurons cells the electrical signal transmission is faster than that which occurs across the chemical signal. The COVID-19 factories will be able to direct the synthesis of viral proteins by they possess both fusion functions and encode their genetic information using an RNA genome by forcing them to rapidly-produce thousands of similar copies of COVID-19 in the human cell. In changes to membrane potential for host cell during the second step and third step, because the electric field is the gradient of the voltage distribution, in general, electrical signals within biological cells are driven by ions [29, 30]. This means that there is a change in membrane potential and property host cell excitability if it is considered to have an excitable membrane (e.g., taste receptors, beta cells, alpha cells, delta cells, enteroendocrine cells, and immune cells) [32]. Cell excitability. Such COVID-19 pump takes in virus from one side of the membrane (decreasing its concentration there) and releases them on the other side (increasing its concentration there) such as processes concentration gradients across the membrane [29, 30].

Finally, novel viruses are produced from infected cells by transport, thus that can infect other cells. While both a protease and a zinc metalloenzyme inside the (ACE2) uses electrical charges or electrical signal to push a non-spontaneous redox reaction such as process electrolysis. As known protease is often used to catalyzes the breakdown of proteins, with supplementary helping mechanisms from viruses [33]. Because the COVID-19 has an electric potential as discussed under Step III when COVID-19 migration to the (ACE2) this means occurs electrolysis.

3. Mechanisms of zinc metalloenzyme

In several studies have shown either the metal zinc, or ions zinc, or zinc transporters, or zinc signals, it has acted in different cellular functions and function of immune cells for both innate immune responses and adaptive immune responses [34–37]. This chapter explains the mechanisms of zinc metalloenzyme being necessary for regulating zinc homeostasis in the body. The angiotensin-converting enzyme 2 (ACE2), contains a zinc metalloenzyme [17], in addition to the angiotensin-converting enzyme 2 (ACE2) protein contains protease and amino acid [17], which means that both a protease and a zinc metalloenzyme in the angiotensin-converting enzyme 2 (ACE2) are often used to generate an electric current from spontaneous redox reactions like as electrical battery, has two different metalloenzymes connected by a salt bridge (amino acid) externally completing an angiotensin-converting enzyme 2 (ACE2). An angiotensin-converting enzyme 2 (ACE2) is using this electric current seemingly as signals.

To understand an (ACE2) is extensions of spontaneous redox reactions, in this redox reaction, zinc metalloenzyme or metal is oxidized to ions (Zn^{2+}) and ions other electrode is reduced to metalloenzyme or metal such as two electrodes (a cathode and an anode). When electrons are transferred directly from Zn to ions another electrode, is allowing the chemical energy interconversion to electrical energy. In the zinc metalloenzyme such as (half-cell), which is inside the (ACE2), the zinc dissolves via oxidation into the oxidation ions (Zn^{2+}), other words releasing electrons. Results the zinc ion concentration increased to recompense via amino acid, which is inside the (ACE2), the zinc ions leave, and anions enter the zinc. In the other electrode such as (another half-cell), the ions onto this electrode reduce, taking up electrons that are leaving the zinc.

4. Vaccine strategy

To optimize vaccine design, it seems relevant to investigate the relationship between the electrophysiology properties for COVID-19, which can include the COVID-19 's journey to and electrochemical interactions with the host cells, and the regulate zinc homeostasis on an intracellular level which includes (the mechanisms of zinc metalloenzyme inside the angiotensin-converting enzyme 2 (ACE2), zinc transporters, and zinc signals) through the physical processes. In several studies have shown the zinc is an essential supplement that serves to regulate different physiological mechanisms, it has antiviral properties [34–37]. It is well known that zinc homeostasis or the zinc metalloenzyme homeostasis is crucial for a single cell or even inside cell level, protects the cell against oxidative damages, and supports on functions of the immune system [34].

Consequently, by investigating from this relationship, the findings that are the regulated zinc homeostasis on the intracellular level is targeted to inhibit or prevent COVID-19 before infection or even infection has already occurred. Zinc-regulation plays a critical and essential role in maintaining immune cell numbers and activities. The surprising efficiency of the influence on influenza virus, HCV, SARS-CoV-2, treatment of COVID-19, suggest a novel strategy for the vaccine design of COVID-19. Continuous monitor every period of the zinc homeostasis in the body, and correct zinc homeostasis if there is a defect in zinc homeostasis. This strategy can enhance antiviral immunity and innate immunity functions, it holds promise as an effective vaccine design strategy that should be further explored.

5. The nature of electromagnetic radiation (EM radiation)

To exploitation of biophysics, electrochemical, and physical processes for combat infectious diseases by blocking or disrupting their electrostatic discharge (ESD) properties link with electromagnetic radiation (EM) interactions something in a skillful manner. Here, electromagnetic radiation is imagined as a flow of tones produce via the vibrating strings with free ends, whereas tones produce via the vibrating strings with fixed ends in the darkness. In nature the electromagnetic radiation, more studies have suggested that the electromagnetic radiation has behaved either a wave or a particle, and some of the studies have suggested, it behaves as a wave and a particle at the same time. In this chapter, we will raise the conjecture (the purport of which will hereafter be called the “Principle of Diplopia and String”), to the status of a postulate, and introduce another postulate, which is only apparently irreconcilable with the former, namely, that the introduction of a “gravitational wave” will prove to be necessary since the view here to be developed

will require a unification of electromagnetic radiation and gravitational waves. Those two postulates suffice for the attainment of a simple and consistent theory of electromagnetic radiation. Thus, those two principles contribute as key to solve the mystery of the wave-particle duality for objects, the darkness, the dark energy.

5.1 Vibrating strings with free ends

To describe the electromagnetic radiation based on the principle of diplopia and string. We must imagine the electron, which that is a closed vibrating string loop or an opened vibrating string. To render our presentation more precise and to distinguish this electron verbally from others which will be introduced hereafter, we call it the “electronString” and the free electronString. Thus, that is an electronString, which is the quotient of a combination between energy, and its mass (-9.11×10^{-31} kg) [38].

If the electromagnetic radiation is imagined as a flow of tones, these tones we will call the “photonTone” with each photonTone carrying a separated packet of energy. To prove these tones means sound waves, and sound waves are part of the electromagnetic. First, according to several studies of electromagnetic radiation, which is a vibration of electric and magnetic fields at right angles. Accordingly, the tones or a sound wave are a disturbance that travels through a medium, this medium is a vibration of electric and magnetic fields, where here the tones, which is a vibration of electric and magnetic fields.

Let us apply the pair production [39, 40], based on the principle of diplopia and string when photonTone at extreme energy (gamma ray) can create two electronStrings. Here, the gamma ray or high photonTone, makes an electronString and its anti electronString, where the anti electronString is positively charged with the same mass as the electronString. By several studies have shown the sound waves carrying mass [41], and because the photonTone is a flow of tones carrying by a tones separated packet of energy, which means these photonTones carrying mass. Because we used a photonTone at extreme energy, this means the tones (sound wave) could carry much of mass to produces an electronString and its anti electronString. These two electronStrings can recombine with each other and create the photonTones. Thus, with the help of certain imaginary physical experiments we have settled what is to be understood by:

$$(es -) + es \rightarrow pht + pht \quad (1)$$

where,

(es-): an electronString = -9.11×10^{-31} kg + pht (its energy),
 es: a positronString = 9.11×10^{-31} kg + pht (its energy), and
 pht: an emitted photonString.

$$(-9.11 \times 10^{-31} \text{ kg}) + pht + 9.11 \times 10^{-31} \text{ kg} + pht \rightarrow pht + pht \quad (2)$$

Thus, when a number or amount (9.11×10^{-31} kg) is subtracted from itself, the results is zero.

$$pht + pht \rightarrow pht + pht \quad (3)$$

When applying the photoelectric effect as shown in **Figure 1** based on the principle of diplopia and string, when a photonTone incident on an atom transfers all its energy to this electronString, while the electronString containing the energy of the photonTone leaves the orbit of the atom.

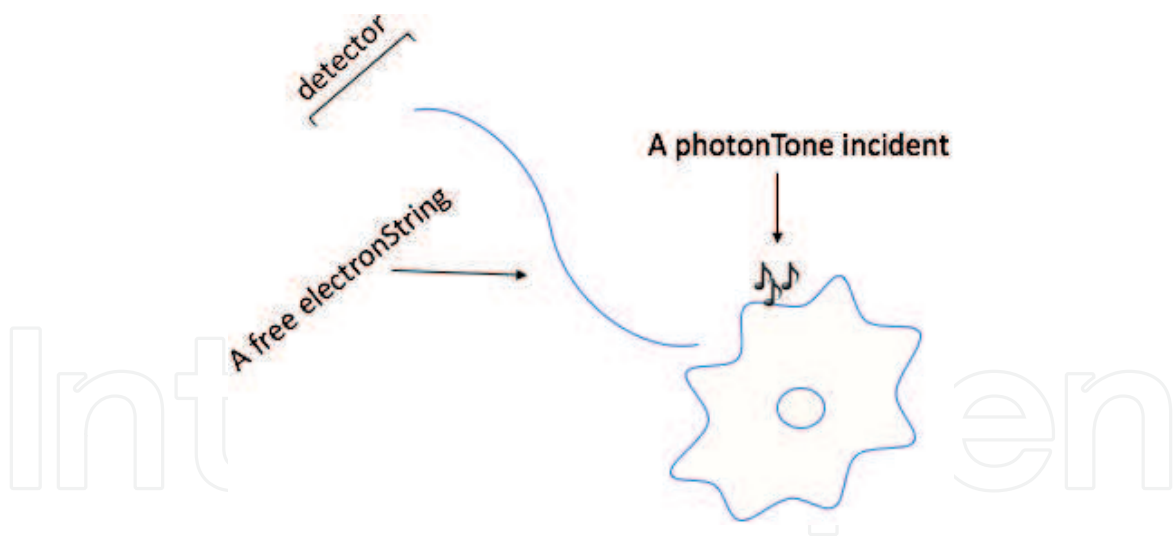


Figure 1.
Here, a photon incident on a hydrogen atom transfers its energy to an electronString, which leaves the orbit and is detected.

Each electronString has a certain amount of binding energy, which is the minimum energy that is required to remove an electronString from an atom, this electronString is held in place by the electrostatic pull of the positively charged nucleus. For example, when an electronString absorbs a photonTone incident, this electronString becomes the move to a higher energy shell or become a free electronString, when this electronString drops back down to a lower-energy shell. Thus, this electronString will release energy represent a photonTone. Now, the electromagnetic radiation can be pictured as a vibrating photonTone by oscillating electric and magnetic fields that move in a straight line at a constant velocity.

5.2 Vibrating strings with fixed ends

If darkness is imagined as a flow of tones, these tones are producing via the vibrating strings with fixed ends by the gravitational wave, thus can generate standing waves. Where the gravitational waves squeeze and stretch strings in their path as they pass by to vibrate the string produce their tones, these tones represent energy. The tones are standing wave modes that arise from the combination of reflection and interference such that the reflected waves interfere constructively with the incident waves.

In the musical instrument, the vibrating strings are squeeze and stretch the string in their path as they pass by to vibrate the string produce their tones [42], as in the darkness is created from two waves with equal frequency, amplitude, and wavelength traveling in opposite directions by applying superposition. Where occur the destructive or constructive interference of counter-propagating waves one form of energy decreases and the other increases such that the total energy remains constant, we will call this a pair of the superposition of standing waves “diplopia waves”.

6. Conclusion

Effectiveness of vaccine against several types of viruses such as COVID-19 is mainly realized through investigating the relationship between the electrophysiology properties for a virus, and the regulate zinc homeostasis on intracellular level through the physical processes such as viral binding, membrane fusion,

and infection. The regulated zinc homeostasis serves to stabilize the membrane potential which could play a role in preventing the virus of COVID-19 entry into the host cell. In additionally, the regulated zinc homeostasis serves to inhibit viral replication by protecting the deoxyribonucleic acid (DNA) from damage via an emitted ionizing radiation or mutagens as discussed under step III, protect the cells from exposure to oxidizing agents because the Zn^{2+} concentrations are directly belonging to the intracellular redox state. Interestingly, all this evidence used in this chapter supports the essential role for regulating zinc homeostasis to inhibit the physiological consequences as discussed under step III by this new vaccine strategy. This vaccine strategy is based on the properties of COVID-19, the voltage-viral charges channel activity required to inhibit the physiological consequences via dampening specific electrochemical functions associated with COVID-19's journey to and interaction with the host cells and to strengthen immune system develop protection against COVID-19 and new strains.

Conflict of interest


The author declares no conflict of interest.

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'Biotechnology to Combat COVID-19' is a collaborative project
with Biotechnology Kiosk

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