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Biophoton Radiation Affecting DNA

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Abstract

The important component of the bio-photonic radiation is the bio-photonic solitons. Due to their existence, the bio-photonic radiation is different from ordinary electromagnetic radiation and has a very clear self-induced transparency. On the other hand, there are also various bio-solitons in DNA and proteins, which are manifested as various structural solitons such as kinks, or transmission solitons that use kinks as envelope waves and carry exponential and other wave functions. It is in DNA that there are two types of solitons with different properties, namely, wave envelope solitons have the function of transmitting biological binding energy and biological information, and Kink solitons only have the function of expanding or contracting double helix structures or opening and closing double helices. Their mutual cooperation enables the function of DNA to be completed. This paper proposes that the bio-photonic solitons in the bio-photonic radiation resonate with various solitons in the receptor DNA or protein as a whole (or locally), thereby transmitting biological information or genetic information, which is one of the important mechanisms for the bio-photonic radiation to transmit donors or change the genetic traits of receptors. It can be simply referred to as the soliton resonance mechanism. Furthermore, through the research and development of various instruments for collecting or amplifying plant photonic radiation signals, human cells can safely receive plant signals. This can be a process of resonance between plant photonic solitons and various biological solitons in human cells, which can play a role in regulating diseases. These experimental results and applications also provide an excellent interpretation of the soliton resonance mechanism.

Keywords

Bio-Photonic Radiation, Bio-Photonic Solitons, Resonance, Bio-Information, DNA

1. Introduction

Ultra-weak light radiation is prevalent in biological systems, covering a wide range, including animals and their organs, tissues, cells, and even biological macromolecules; plants and their roots, stems, leaves, flowers, and fruits; various microorganisms, bacteria, etc. This ultra-weak light radiation is called the bio-photonic radiation, and its intensity of the photonic radiation is defined as the number of photons emitted per square centimeter per second by the measured sample surface, ranging from a few to thousands of photons [1]. The usual spectral response is 0.2 - 0.8 microns, but high-frequency bio-photonic radiation may also exist.

The research on the bio-photonic radiation can be traced back to the 1920s. In 1923, the former Soviet biologist Gurwritsch first discovered through the famous onion experiment [1]-[4] that the weak ultraviolet light of bio-radiation stimulated the cells in the roots of onions, which served as detectors, causing them to divide rapidly, thus discovering the non-contact biophysical effects of bio-photonic radiation. Over the next 100 years, many experts and scholars, such as the physics team headed by Italian scientist Colli, have indeed observed the ultra-weak luminescence phenomenon of some plant seedlings (such as wheat, millet, beans, lentils, etc.) using photomultiplier tube detectors [5]. Another example is that in the 1960s, many Soviet scientists, under limited scientific and technological conditions, persisted in conducting a comprehensive exploration of bio-photonic radiation and achieved many historically significant research results. They found that under certain conditions, the bio-photonic radiation can be used to transmit energy and information between organisms, thereby affecting or changing biological genetic traits [6]-[8]. It is worth mentioning that Jiang Kanzheng, a Chinese scientist in the former Soviet Union, used physical shielding technology to complete many experiments, verifying the phenomenon of biological microwave communication, and achieved many incredible experimental results in the transfer of genetic traits in animals and plants and human rehabilitation [9] [10]. In the past 20 years, Xinzhou Yuan and his team in China invented the bio-information energy compensation technology, namely CBE (Compensating Bio-information Energy), bio-information breeding machines and other instruments and equipment. They further used plant signal transduction methods to complete a number of experiments on the directional transfer of genetic traits in plants of the same or cross-family, discovered the transfer phenomenon of genetic information in life, and called it DNA communication. Their experimental results show that the application of CBE technology can achieve non-contact, cross-space, and directional transfer of plant genetic traits, allowing plants to change from random mutations to controllable directional mutations, opening up a new asexual, molecular transfer-free, fast, and low-cost breeding method for plants, and providing new evidence that there can be information energy wave connections between plant DNA [11].

Not only that, based on the experimental results that plants and humans can achieve information transfer through physical signal transmission, reverse human cell aging, and improve human cell function, they let many patients with chronic diseases and difficult diseases serve as recipients and randomly participate in a new conditioning experiment: edible and medicinal plant combinations are selected as donors of biological signals; after adjusting the patient's biofield, CBE high-tech is used to transfer the plant radiation signal and transmit it to the patient's body in a targeted manner; through this health care method of physical therapy, the main function and cell function, cell biochemistry and body temperature of each patient before and after the experiment are tested, the same body control and data statistical analysis are performed, and the comprehensive integration method is used to evaluate the effect. As a result, they found that after 1 - 4 courses of treatment (7 - 28 d × 2 h), the patient was free of disease and related indicators improved rapidly, the risk of critical illness was significantly reduced, and cell function and symptoms improved simultaneously. The effective rate reached 90%, and the significant effective rate was as high as 57%, which once again showed that plants and human cells can achieve biophysical signal communication; it can alleviate or reverse human cell aging, restore human cell function, and allow chronic diseases and difficult diseases to heal themselves. They called it the cell information therapy [12].

However, a serious problem is increasingly facing people. What is the scientific basis or mechanism of the plant energy information changing genetic traits or "cell information therapy" in conditioning people? Since the biophotonics involved is still a new discipline, the microscopic measurement of plant photonic radiation cannot reach a certain level of accuracy, and many microscopic processes of biophotonic radiation are still unclear, so it is extremely difficult to explore the mechanism of how this bio-information energy acts on or changes the DNA traits of the target object.

Starting from the theoretical basis of biophotonics, this paper strictly analyzes the characteristics of the Maxwell-Bloch equations that describe the system composed of collective two-level atoms and single-mode radiation fields of bio-photonic radiation, and finds that bio-photonic solitons are the main contributors to the self-induced transparency of bio-photonic radiation; on the other hand, we further analyze the characteristics of kinks in the dynamic process of biological DNA, and find that in the rich and complex DNA dynamic process (including transcription, replication, etc.), there are many types of solitons of Kinks, and in a certain state, these Kinks can be transformed into solitons similar to the morphology of bio-photonic solitons, very similarly, like the self-induced transparency of bio-photonic radiation, satisfying similar standard Sine-Gordon equations. Therefore, we judge that the two systems have similar soliton solutions, which lays the foundation for the similar resonance between the both. It is this kind of similar resonance that provides a way or a mechanism for the bio-photonic radiation as a donor to affect or change the characteristics of recipient DNA.

The following text is divided into 5 sections. Section 2 analyzes and discusses how the bio-photonic radiation produces the bio-photonic solitons and its relationship with self-induced transparency; Section 3 analyzes and discusses from another perspective how to produce various Kinks in the DNA macromolecular structure and obtain the dynamic process similar to biological solitons; Section 4 proposes a donor and acceptor soliton resonance principle, that is, further discussing and pointing out that the biological donor can affect or change the genetic traits of the donor by transmitting its genetic traits through the resonance of the solitons in the bio-photonic radiation and the Kinks in DNA, and it is explained by experiments on plant and human adjustment. Section 5 discusses the experimental results of using this type of soliton or excitation resonance principle to adjust or treat human diseases. The last section is a summary and outlook of the whole text.

2. Self-Induced Transparency of Bio-Photonic Radiation

In many experiments on the bio-photonic radiation, it can be found that the bio-photonic radiation has a property called self-induced transparency, that is, bio-photons are very similar to light signals working in the soliton state, and can propagate almost losslessly in biological media, showing extremely high transparency. In order to explain the mechanism of this transparency, we first start from the Maxwell-Bloch equations that describe the system composed of collective two-level atoms and single-mode electromagnetic radiation fields, and consider the lateral effect of the radiation field [13], then we can get:

$$\dot{R}_2 = \frac{\mu}{\hbar} E R_3 \tag{1}$$

$$\dot{R}_3 = -\frac{\mu}{\hbar} E R_2 \tag{2}$$

$$c\frac{\partial E}{\partial z} + \frac{\partial E}{\partial t} = \frac{\mu \Omega}{2\varepsilon} R_2 \tag{3}$$

where R_2 and R_3 are related to the distribution matrix of the two-level atoms, that is, let $|a\rangle$ and $|b\rangle$ represent the upper and lower energy states of the two-level atomic system, Ω, k and $\phi(z,t)$ represent the amplitude, frequency, wave number and phase of the field mode, respectively; ρ_{ab}, ρ_{aa} and ρ_{bb} represent the diagonal and non-diagonal elements of the atomic distribution matrix, respectively; while ε is the dielectric constant of the material, c is the speed of light in the medium, σ is the conductivity of the medium, E is the amplitude of the light field, μ is the dipole moment of the atom, and $\hbar$ is Planck's constant divided by 2π, then

$$R_2 = i\rho_{ab} \exp\left\{ i\left[\Omega t - kz + \phi(z,t) \right] \right\} + c.c. \tag{4}$$

$$R_3 = \rho_{aa} - \rho_{bb} \tag{5}$$

Obviously, R_3 reflects the inversion density of atoms between energy levels $|a\rangle$ and $|b\rangle$, while R_2 is related to the macroscopic electric polarization intensity. From Equations (1) and (2), we can find:

$$R_2 = -n \sin\theta \tag{6}$$

$$R_3 = -n \cos\theta \tag{7}$$

$$\dot{\theta} = \frac{\mu}{\hbar} E \tag{8}$$

where n is the maximum possible value of the atomic inversion density R_3, which is actually the atomic density of the system, and θ is called the Bloch angle, which is a function of time. Substituting Equations (6)-(8) into Equation (3), we can get:

$$c\frac{\partial^2 \theta}{\partial z \partial t} + \frac{\partial^2 \theta}{\partial t^2} = -\omega_n^2 \sin\theta \tag{9}$$

where ω_n is:

$$\omega_n = \sqrt{\frac{n\mu^2 \Omega}{2\hbar\varepsilon}} \tag{10}$$

Introduce a dimensionless variable ξ and τ, that is:

$$\xi = \omega_n t - \frac{2\omega_n}{c} z \tag{11}$$

$$\tau = \omega_n t \tag{12}$$

Then, Equation (9) can be rewritten as:

$$\frac{\partial^2 \theta}{\partial \xi^2} - \frac{\partial^2 \theta}{\partial \tau^2} = \sin\theta \tag{13}$$

Equation (13) is a standard form of the Sine-Gordon equation, and its solution is:

$$\theta = 4\arctan\left[\exp\left(\xi\sqrt{1+\alpha^2} - \alpha\tau\right)\right] \tag{14}$$

where α is a time-independent constant related to the initial conditions of the system. Combining Equation (14) with Equation (8) yields an optical soliton solution (see **Figure 1** for a special case), whose waveform is:

$$E(z,t) = E_0 \operatorname{sech}\left(\frac{t - \frac{z}{U}}{t_D}\right) \tag{15}$$

where,

$$E_0 = E(0,0) = 2\frac{\hbar}{\mu}\omega_n\left(\sqrt{1+\alpha^2} - \alpha\right) \tag{16}$$

is the amplitude of the pulse, U and T_D are the speed and width of the pulse respectively, which are related to E_0 and can be expressed as:

$$U = \frac{c}{1 + 2\frac{\hbar\omega_n}{\mu E_0}} \tag{17}$$

$$t_D = 2\frac{\hbar}{\mu E_0} \tag{18}$$

Obviously, $E_0 \uparrow$ will cause $U \uparrow$ and $t_D \downarrow$. The time integral of the soliton pulse induces the pulse area, which gives its energy at any position z in space.

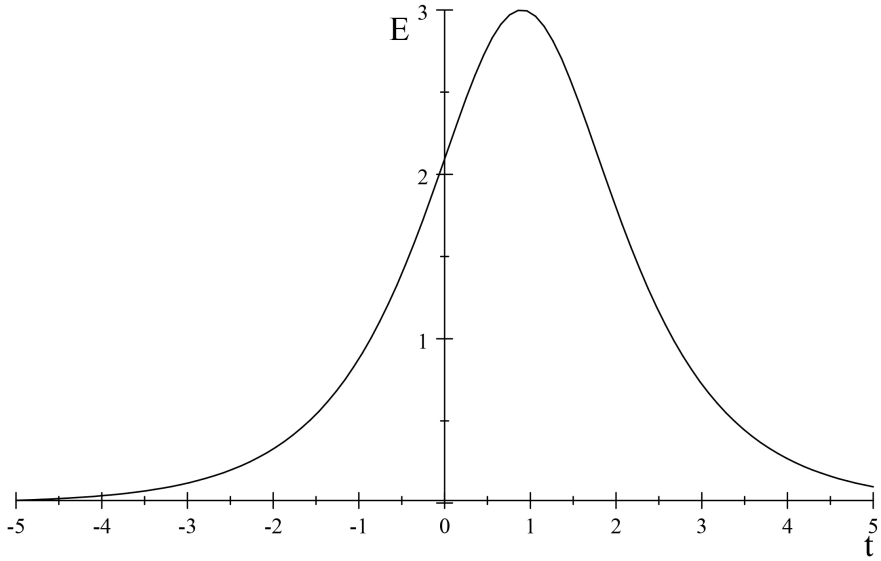

Figure 1. A bio-photonic soliton, when $E = 3\,\text{sech}(t - 0.9)$, $E_0 = 3$, $z/U = 0.9$, $t_D = 1$.

$$\theta = \frac{\hbar}{\mu}\int_{-\infty}^{\infty} E(z,t)\,\mathrm{d}t = \frac{\hbar}{\mu}\int_{-\infty}^{\infty} E_0\,\text{sech}\left(\frac{t-\dfrac{z}{U}}{t_D}\right)\mathrm{d}t$$
$$= \frac{\hbar}{\mu}E_0 t_D\left[\arctan\left(\sinh\xi\right)\right]_{-\infty}^{\infty} = 2\pi \tag{19}$$

The above formula is equal to the constant 2π, which means that the energy of soliton propagation is actually independent of the position z and is constant. The mechanism is that when the soliton passes through the medium, it continuously transfers energy to the medium to excite its atoms to a higher energy level. When the soliton leaves the medium, the high-energy-level atoms transfer the energy back to the soliton in equal amounts. Therefore, in theory, there is no consumption when the soliton propagates in the medium. This is determined by the waveform of the hyperbolic secant function, *i.e.* sech, which is called the self-induced transparency of the soliton pulse.

It is very surprising that in the bio-photonic radiation system, the self-transparency phenomenon of bio-photonic radiation can indeed be found [14] [15]. For example, the results of measuring the extinction coefficient of sand and soybean cells of various thicknesses to artificial light show that: for the same light, living matter has better transparency; and for different media, that is, in the case of sand and cells, the biophotons have better transparency when passing through; further, living matter has better transparency to the propagation of biophotons [16]. For example, the series of data on the measurement of plant bio-photonic radiation by Xinzhou Yuan's team in the past all show that biophotons have extremely high transparency to the recipient plants or human bodies. In these biological media, the penetration of bio-photonic radiation is much higher than that of ordinary electromagnetic waves [11] [12] [17] [18]. So, we can say that the important component of plant photonic radiation is the bio-photonic solitons, and the biophotons have the propagation characteristics of optical solitons.

3. The Solitons in DNA

On the other hand, local fluctuations and structural distortions of the DNA double helix structure can induce various forms of solitons in DNA. According to the Yomosa theory modified by Xiaofeng Pang [19] [20], the Hamiltonian of a DNA system can be expressed as:

$$H = H^B + U + u + u_{int} \tag{20}$$

Here, H^B is defined as:

$$H^B = \sum_n \left\{ \left(\frac{I_n}{2}\right)\dot{\varphi}_n^2 + \left(\frac{I'_n}{2}\right)\dot{\varphi}_n'^2 \right\} \tag{21}$$

Among them, I_n is the constant dispersion energy, $\varphi_n \equiv \angle P'_n P_n B_n$, $\varphi'_n \equiv \angle P_n P'_n B_n$ are respectively the angular displacement of two base rotors relative to the equilibrium position. U is defined as the energy of hydrogen bonding interactions between bases caused by changes in the spacing between base pairs,

$$U = h_n\left(1-\cos\varphi_n\right) + h'_n\left(1-\cos\varphi'_n\right) - \lambda_n\left[1-\cos\left(\varphi_n - \varphi'_n\right)\right] \tag{22}$$

where h_n, h'_n and λ_n represent the interaction constants of the local field and hydrogen bond energy of the *n*th base pair, respectively. u is defined as the interaction between the *n*th base and the adjacent bases in the S and S' chains caused by the state change of DNA or by conformational distortion and local deformation, that is,

$$\begin{aligned} u = {} & J_n\left[1-\cos\left(\varphi_{n+1} - \varphi_n - \varphi_0\right)\right] + J'_n\left[1-\cos\left(\varphi_n - \varphi_{n-1} - \varphi_0\right)\right] \\ & + J_n\left[1-\cos\left(\varphi'_{n+1} - \varphi'_n - \varphi_0\right)\right] + J'_n\left[1-\cos\left(\varphi'_n - \varphi_{n-1} - \varphi_0\right)\right] + J'_n \end{aligned} \tag{23}$$

Among them, J_n and J'_n are the interaction constants related to the *n*th base in the S and S' chains, and are related to the correlation strength between adjacent bases. u_{int} is defined as the interaction energy between the dipole moments μ_A, μ_T, μ_G, and μ_C of adenine, thymine, guanine, and cytosine, namely:

$$\begin{aligned} u_{int} = {} & \frac{-\boldsymbol{\mu}_{n\cdot}(\boldsymbol{v})\cdot\boldsymbol{\mu}_n(\boldsymbol{v}) - \beta\left(\boldsymbol{\mu}_{n\cdot}(\boldsymbol{v})\cdot\boldsymbol{R}_n\right)\left(\frac{\boldsymbol{\mu}_{n\cdot}(\boldsymbol{v})\cdot\boldsymbol{R}_n}{R_n^2}\right)}{R_n^3} \\ & - \frac{\alpha\boldsymbol{\mu}_{n\cdot}(\boldsymbol{v})\cdot\boldsymbol{R}_n}{R_n^4} - \frac{\alpha'\boldsymbol{\mu}'_{n\cdot}(\boldsymbol{v})\cdot\boldsymbol{R}'_n}{R_n^4} + I \end{aligned} \tag{24}$$

where, $\boldsymbol{\mu}_{n\cdot}(\boldsymbol{v})$, $\boldsymbol{\mu}'_{n\cdot}(\boldsymbol{v})$ represent the dipole moments of bases G and C and A and T respectively related to the vibration frequency, and $\boldsymbol{R}_n$ is the distance between them, which is taken as a constant here for the sake of calculation simplification, so the above formula can be simplified to:

$$u_{\text{int}} = \sum_n \left\{ \chi_n\left[-\cos\left(\varphi_n - \varphi'_n\right)\right] - 3\chi_n\cos\varphi_n\cos\varphi'_n + \alpha_n\left(2-\cos\varphi_n - \cos\varphi'_n\right)\right\} + I \tag{25}$$

where, I is the constant dispersion energy, and χ_n and α_R are defined as:

$$\chi_n = \frac{\mu(v)\mu'(v)}{R^3} \tag{26}$$

$$\alpha_R = \frac{\alpha'\mu_n}{R^3} = \frac{\alpha\mu'_n}{R^3} \tag{27}$$

Since a stable conformation of DNA corresponds to the minimum of the above Hamiltonian, hence by the Euler-Lagrange equation, *i.e.*

$$\frac{\mathrm{d}}{\mathrm{d}t}\frac{\partial L}{\partial \dot{\varphi}_n} - \frac{\partial L}{\partial \varphi_n} = 0 \tag{28}$$

where

$$L = p_n\dot{\varphi}_n - H \tag{29}$$

$$p_n = \frac{\partial L}{\partial \dot{\varphi}_n} \tag{30}$$

The motion equation of the *n*th complementary base can be obtained as:

$$\begin{aligned} I_n\ddot{\varphi}_n = {} & J_n\left[\sin\left(\varphi_{n+1} - \varphi_n - \varphi_0\right)\right] - J'_n\left[\sin\left(\varphi_n - \varphi_{n-1} - \varphi_0\right)\right] + h_n \sin\varphi_n \\ & - \lambda_n \sin\left(\varphi_n - \varphi'_n\right) - \chi_n \sin\left(\varphi_n - \varphi'_n\right) + 3\chi_n \sin\varphi_n \sin\varphi'_n - \alpha_n \sin\varphi_n \end{aligned} \tag{31}$$

$$\begin{aligned} I'_n\ddot{\varphi}'_n = {} & J_n\left[\sin\left(\varphi'_{n+1} - \varphi'_n - \varphi_0\right)\right] - J'_n\left[\sin\left(\varphi'_n - \varphi'_{n-1} - \varphi_0\right)\right] + h_n \sin\varphi'_n \\ & - \lambda_n \sin\left(\varphi'_n - \varphi'_n\right) - \chi_n \sin\left(\varphi'_n - \varphi_n\right) + 3\chi_n \sin\varphi'_n \sin\varphi_n - \alpha_n \sin\varphi'_n \end{aligned} \tag{32}$$

The above equations can be further simplified. That is, based on the high symmetry of the double-stranded structure and dynamic characteristics of DNA, all bases are considered to be in the same situation. At this time, all parameters in the equations such as I, J, h, λ, χ, etc. are independent of n, and $I = I'$, $h = h'$, $J = J'$, so we can get:

$$\begin{cases} \left[\sin\left(\varphi_{n+1} - \varphi_n - \varphi_0\right)\right] - \left[\sin\left(\varphi_n - \varphi_{n-1} - \varphi_0\right)\right] \approx \varphi_{n+1} + \varphi_{n-1} - 2\varphi_n \\ \left[\sin\left(\varphi'_{n+1} - \varphi'_n - \varphi_0\right)\right] - \left[\sin\left(\varphi'_n - \varphi_{n-1} - \varphi_0\right)\right] \approx \varphi'_{n+1} + \varphi_{n-1} - 2\varphi_n \end{cases} \tag{33}$$

Considering that φ is a slowly varying function of n, we can adopt a continuous approximation, where $a \approx 6.4$ cm is taken as the base pair spacing, then we have:

$$\begin{cases} \varphi_{n\pm1} \approx \varphi_n \pm a\dfrac{\partial \varphi_n}{\partial z} + \dfrac{1}{2}a^2\dfrac{\partial^2 \varphi_n}{\partial z^2} + \cdots \\ \varphi_n(t) \to \varphi(z,t),\ \varphi'_n(t) \to \varphi'(z,t),\ \Sigma \to \dfrac{1}{a}\int \mathrm{d}z \end{cases} \tag{34}$$

then the motion equation of complementary bases can be changed to:

$$\begin{cases} I\dfrac{\partial^2 \varphi}{\partial t^2} - Ja^2\dfrac{\partial^2 \varphi}{\partial z^2} + (h+a)\sin\varphi - (\lambda+\chi)\sin(\varphi - \varphi') + 3\chi\cos\varphi'\sin\varphi = 0 \\ I\dfrac{\partial^2 \varphi'}{\partial t^2} - Ja^2\dfrac{\partial^2 \varphi'}{\partial z^2} + (h+a)\sin\varphi' - (\lambda+\chi)\sin(\varphi' - \varphi) + 3\chi\cos\varphi\sin\varphi' = 0 \end{cases} \tag{35}$$

If reintroduced:

$$\overline{v}_0^2 = \frac{Ja^2}{I}, \quad g^2 = \frac{Ja^2}{h+a}, \quad d = \frac{\lambda + \chi}{Ja^2}, \quad b = \frac{3\chi}{Ja^2} \tag{36}$$

then, Equation (35) can be transformed into a more complicated Sine-Gorden equation system:

$$\begin{cases} \dfrac{1}{\overline{v}_0^2}\dfrac{\partial^2 \varphi}{\partial t^2} - \dfrac{\partial^2 \varphi}{\partial z^2} + \dfrac{1}{g^2}\sin\varphi - d\sin(\varphi - \varphi') + b\sin\varphi\cos\varphi' = 0 \\ \dfrac{1}{\overline{v}_0^2}\dfrac{\partial^2 \varphi'}{\partial t^2} - \dfrac{\partial^2 \varphi'}{\partial z^2} + \dfrac{1}{g^2}\sin\varphi' - d\sin(\varphi' - \varphi) + b\sin\varphi'\cos\varphi = 0 \end{cases} \tag{37}$$

It is very difficult to find a strict solution to the Sine-Gorden equations above, but some special solutions can be found based on the symmetry and similarity of DNA. For example, it is reasonable to infer that there are two types of solutions for DNA: $\varphi = \pm\varphi'$. In these two cases, it can be assumed that:

$$\beta = \begin{cases} -\dfrac{1}{2}b, & \varphi = \varphi' \\ d + \dfrac{1}{2}b, & \varphi = -\varphi' \end{cases} \tag{38}$$

therefore, the above equations can be transformed into the following double Sine-Gorden equations:

$$\frac{1}{\overline{v}_0^2}\frac{\partial^2 \varphi}{\partial t^2} - \frac{\partial^2 \varphi}{\partial z^2} + \frac{1}{g^2}(\sin\varphi - \beta\sin 2\varphi) = 0 \tag{39}$$

The corresponding nonlinear potential $\overline{U}$ is given by:

$$\frac{\partial \overline{U}}{\partial(2\varphi)} = \frac{1}{g^2}(\sin\varphi - \beta\sin 2\varphi) \tag{40}$$

So, $\overline{U}$ can be found as function form:

$$\overline{U} = \frac{1}{g^2}\left[2(1-\cos\varphi) - \beta(1-\cos 2\varphi)\right] \tag{41}$$

which can be divided into the following three situations as 1), 2), and 3):

1) When $-\frac{1}{2} < \beta < \frac{1}{2}$, the shape of $\overline{U}$ is similar to that of a general sine function, with an absolute minimum at $\varphi = 0, 2\pi$ and an absolute maximum at $\varphi = \pi$. Therefore, the double Sine-Gorden equation has a 2π-kink soliton with an absolute minimum at $\varphi = 0, 2\pi$, that is,

$$\varphi = \varphi' = 2\tan^{-1}\left\{\pm(1-2\beta)^{\frac{1}{2}}\cosh(1-2\beta)^{\frac{1}{2}}\left[(z-z_0) - v(t-t_0)\right]\right\} \tag{42}$$

where the ± signs correspond to positive and anti-solitons respectively.

2) When $\beta < \frac{1}{2}$, the shape of $\overline{U}$ is like a double peak, with relative and absolute minima at $\varphi = \pi$ or 2π, and maxima at $\varphi = \cos^{-1}\left(\frac{1}{2\beta}\right)$ and $2\pi - \cos^{-1}\left(\frac{1}{2\beta}\right)$. At this time, the double Sine-Gorden equation has 2π-Kink

soliton solutions and bubble soliton solutions, that is,

$$\begin{cases} \varphi^{I} = \varphi'^{I} = 2\tan^{-1}\left\{\pm(1-2\beta)^{\frac{1}{2}}\cosh(1-2\beta)^{\frac{1}{2}}\left[(z-z_0)-v(t-t_0)\right]\right\} \\ \varphi^{II} = \varphi'^{II} = 2\tan^{-1}\left\{\pm(1-2\beta)^{\frac{1}{2}}\cosh(1-2\beta)^{\frac{1}{2}}\left[(z-z_0)-v(t-t_0)\right]\right\} \end{cases} \tag{43}$$

3) When $\beta > \frac{1}{2}$, the shape of $\bar{U}$ has relative minima at $\varphi = 0, 2\pi$, an absolute maximum at $\varphi = \pi$, and absolute minima at $\varphi = \cos^{-1}\left(\frac{1}{2\beta}\right)$ and $2\pi - \cos^{-1}\left(\frac{1}{2\beta}\right)$. The corresponding Kink soliton solution is:

$$\begin{cases} \varphi^{I} = \varphi'^{I} = 2\tan^{-1}\left\{\pm\left(\frac{2\beta-1}{2\beta+1}\right)^{\frac{1}{2}}\coth\left(\frac{2\beta^2-1}{8\beta}\right)^{\frac{1}{2}}\left[(z-z_0)-v(t-t_0)\right]\right\} \\ \varphi^{II} = \varphi'^{II} = 2\tan^{-1}\left\{\pm\left(\frac{2\beta-1}{2\beta+1}\right)^{\frac{1}{2}}\tanh\left(\frac{2\beta^2-1}{8\beta}\right)^{\frac{1}{2}}\left[(z-z_0)-v(t-t_0)\right]\right\} \end{cases} \tag{44}$$

The above two equations represent the solutions of large and small Kink solitons respectively, which are equivalent to the excited state of Kink, and are related to two degenerate relative minima $\varphi = \cos^{-1}\left(\frac{1}{2\beta}\right)$ and $2\pi - \cos^{-1}\left(\frac{1}{2\beta}\right)$. At this time, in several configurations of the DNA double helix structure (such as excited state A-DNA, left-handed Z-DNA, ground state B-DNA, etc.), the ground state is not at the original $\varphi = 0, 2\pi$, but at $\varphi = \cos^{-1}\left(\frac{1}{2\beta}\right)$ and $2\pi - \cos^{-1}\left(\frac{1}{2\beta}\right)$.

It is worth noting that in both cases 2) and 3), if the dipole-dipole interaction between the corresponding complementary bases is too small, that is, $\chi \to 0$, then the double Sine-Gorden Equation (39) can be obtained from Equation (38) when $\varphi = \varphi'$, *i.e.*

$$\frac{1}{2}b = 0 = -\frac{1}{2}b \to \varphi = \varphi' \to \beta = 0 \tag{45}$$

So, the double Sine-Gorden equation is transformed into the standard Sine-Gordon equation, that is:

$$\frac{1}{\bar{v}_0^2}\frac{\partial^2\varphi}{\partial t^2} - \frac{\partial^2\varphi}{\partial z^2} + \frac{1}{g^2}\sin\varphi = 0 \tag{46}$$

This of course has the same form of soliton solution as Equation (13) in the biophotonic radiation, namely:

$$\varphi = \varphi' = 4\tan^{-1}\exp\left\{\pm\frac{1}{g\gamma}\left[(z-z_0)-v(t-t_0)\right]\right\} \tag{47}$$

where $\gamma = \left(1-\frac{v^2}{\bar{v}_0^2}\right)^{\frac{1}{2}}$, ± represents positive and negative Kink solitons, corresponding to the positive and reverse open states in the DNA structure respectively. Since the factor γ in the above formula is related to the Lorentz transformation, it means that the movement of this soliton also obeys the law of Lorentz transformation.

4. Bio-Photonic Radiation Changes the Genetic Traits of DNA

So, we discovered a very interesting secret, namely the resonance of biological solitons; that is, if we compare the soliton (14) of bio-photonic propagation with the special solution (47) of the dynamic process in DNA above, namely:

$$\frac{\partial^2\theta}{\partial\xi^2}-\frac{\partial^2\theta}{\partial\tau^2}=\sin\theta\,,\quad \theta=4\arctan\left[\exp\left(\xi\sqrt{1+\alpha^2}-\alpha\tau\right)\right]$$

$$\frac{1}{\overline{v}_0^2}\frac{\partial^2\varphi}{\partial t^2}-\frac{\partial^2\varphi}{\partial z^2}+\frac{1}{g^2}\sin\varphi=0\,,\quad \varphi=4\tan^{-1}\exp\left\{\pm\frac{1}{g\gamma}\left[\left(z-z_0\right)-v\left(t-t_0\right)\right]\right\}$$

We can find their similarities, which is natural because they all belong to the solution of a certain standard Sine-Gordon equation. This is a surprising mathematical and physical similarity phenomenon in the bio-photonic radiation, which shows that the bio-photonic radiation has a mechanistic basis for affecting the genetic shape of the target DNA. In fact, it is very obvious to compare the two solutions that in biophysics, as long as the biophotons are transmitted to the target DNA, so that there is a similar resonance between the two solutions, then the bio-photonic radiation can transmit the biological information carried by the bio-photonic radiation through this resonance, such as complex waveforms with different vibration frequencies, to the dynamic Kinks of DNS to affect or change the waveform and frequency of the Kink solitons, and then affect or change the genetic characteristics of DNA. This is entirely possible. In other words, in essence, the bio-photonic radiation can form resonance with the dynamic solitons Kinks of the target DNA through one of its excitations, that is, the propagation of bio-photonic solitons, to affect or change its genetic characteristics. This should be one of the mechanisms that we have been looking for plant photonic radiation to affect the genetic shape of DNA and so on.

Furthermore, research has found that in addition to kinks (called structural solitons) in DNA, there are also wave packet type solitons that have the function of transferring biological binding energy and biological information, which can be called transmission solitons [19] [20], such as Davydov solitons produced by protein hydrolysis. Many of the envelope waves of these transmission solitons are described by the hyperbolic secant (sech) functions, which are similar to the function expression of optical solitons. Therefore, the bio-photonic solitons also have the possibility of resonating with them and thus affecting or changing their envelope waveforms and frequencies. Furthermore, it is also possible to use a combination of various plant seedlings to form a combination of various bio-photonic radiations [9], forming a combination of multiple types of bio-photonic solitons and multiple types of structural Kinks or transmission solitons in the DNA dynamics process to locally resonate or resonate with certain envelope waves in order to affect or change certain genetic shapes of DNA.

The resonance between solitons in bio-photonic radiation and kinks in DNA and related proteins can also help repair the damage of DNA and related protein biomacromolecules. In fact, due to environmental influences, it is possible that DNA and related protein macromolecules suffer from various random damages (such as viruses, bacteria, etc.), so that some solitons in the dynamic process are also affected by distortion, which is one of the sources of various diseases. If the solitons in healthy bio-photonic radiation resonate with the damaged kinks or envelope waves in DNA and related proteins, it is possible to restore the damage of kinks (such as waveform distortion) through the exchange of energy and information through this resonance. This is the principle that resonance can adjust or restore related cell functions, which is still based on the resonance of solitons of the two. Further, the three-chain vibration of protein molecules can form Davydov solitons, which are important units of information and energy transmission in the life process in a certain sense [19] [20]. The resonance (even resonance absorption) of healthy bio-photonic solitons and Davydov solitons can repair the distortion of Davydov solitons or improve their functions, so that the function of biological receptors can be restored at the cellular level and diseases can be treated. Therefore, this resonance mechanism can be used to adjust the health condition of the subject or cure the disease.

In summary, the "soliton resonance mechanism" proposed above can indeed be used to explain some of the experimental results we have conducted, manifested in two aspects: plant genetic trait transfer [11]; regulation and treatment of various diseases in the human body [12].

In the first aspect, Xinzhou Yuan's team has completed a number of experimental results on transferring genetic traits through bioinformatics breeding machines. Among them, after transferring the information of black peanuts to water radish, its fruit appearance (after harvest), leaf shape and root system have all changed significantly. For example, in September 2010, the first generation of its son (HS) was tested by the Testing Center of the Institute of Ecology, Chinese Academy of Sciences, and found significant changes in various amino acids and proteins. Compared with the control group, the information processing group had 18 items with a change rate ≥ 15%; 16 items with a change rate ≥ 40%; and 3 items with a change rate ≥ 100%, of which ammonia increased by 177.78% and potassium increased by 26.56%. The total amount of protein and amino acids in the treatment group increased by 84.3% compared to the control group, etc. In 2012, experimental seeds were provided by the Liaoning Academy of Agricultural Sciences, and the above-mentioned experiment of transferring black peanut information to water radish was repeated. After testing by the Shenyang Institute of Ecology, Chinese Academy of Sciences, the test center found that the changes in the 1st generation treatment group (HS) were still very significant. The center tested a total of 21 items, 8 items with a change rate ≥ 15%; 4 items with a change rate ≥ 40%; 2

items with a change rate ≥ 100%; among which protein increased by 468.42%; selenium increased by 42.8%; cystine increased by 42.8%; acid increased by 133%. In 2015, Xinzhou Yuan's team used the same method as mentioned above to complete the experiment of transferring muskmelon information to dry cucumber. The treatment group and the control group were planted in the experimental fields respectively. After they matured, the first generation of their sons (HS) were sent to Shenyang Agricultural University for testing, it was found that the soluble sugar content in the treatment group increased by 44.9% compared with the control group; the soluble protein content increased by 45%. In 2016, they also cooperated with experts from Shenyang Agricultural University to transfer the genetic traits of multiple soluble sugars in Northeastern jujube (wild kiwi fruit) to the original potato species through a bioinformatics breeding machine. The soluble sugar content of the 4 treatment groups was higher than that of the control group. There has been a significant increase, at least more than 3 times, and at most more than 6 times. In 2017, they cooperated with experts from the School of Life Sciences of Beijing University of Chinese Medicine. They provided biological information transfer experimental equipment. The students independently completed the experiment of transferring soybean sprout information to corn sprouts. Genetic testing found that the experimental group had soy isoflavones. The isogene has obvious expression in multiple treatment groups [9] [11].

The above multiple repeatable experimental results show that different recipient plants will produce different biological effects after receiving signals radiated by different donor plant seedlings after being processed by the bioinformation breeding machine. This is of course related to the waveform, frequency, and amplitude of the solitons in the bio-photonic radiation and the solitons in the target DNA, which vary from plant to plant. Whether it is a plant of the same family or a plant of a different family, after the recipient plant seedlings receive the signal of the budding donor through the bioinformation breeding machine for 50 to 100 hours, it can promote the germination potential of the first generation of the recipient (HS); the leaf shape, leaf veins, plant type, root stem and fruit shape of the first generation of the child (HS) have all changed significantly. After testing, it was also found that the genetic traits of the first generation of the recipient (HS) have all shifted in the direction of the prominent genetic traits of the donor. After the plant receptor receives the signal radiated by the donor plant in the bioinformation breeding machine, after resonance between certain solitons, the genetic traits are transferred in a directional manner. The change of genetic traits is not randomly oriented and distributed, that is, the information transferred to the receptor expresses the selected and prominent genetic traits of the donor plant, which to a considerable extent indicates that this is a directional transfer of genetic information. That is, the stronger the soliton signal, the more complete the resonance, and the more thorough the genetic information transfer. The experimental results also show that the genetic information transferred through the biological breeding machine is less distorted, and the real genetic information of the donor has undergone some transfer. Therefore, the "soliton resonance mechanism" has been explained to a certain extent in the experiment [11] [21].

On the other hand, in terms of using the "soliton resonance mechanism" to adjust or treat human diseases, Xinzhou Yuan's team has actually found that different plants radiate different signals and have different improvement effects on different cells of the human body. It seems that the DNA in different cells may radiate different life signals and can receive life signals that are compatible with it, so different life signal effects will be produced. These phenomena are obviously related to the "soliton resonance mechanism". Therefore, for patients who randomly participate in the experiment, they will select different combinations of living plants according to the different conditions of each patient, including a combination of grains, vegetables, and bean sprouts; a combination of Chinese medicinal plants; and a combination of grains, vegetables and Chinese medicinal plants, which they call "formulas". During the patient's recovery process, the plant "formula" should be adjusted according to their physical recovery conditions and needs.

The experimental results show that the correct formula will accelerate the recovery of patients' functions, which is similar to the method of conditioning and curing diseases with Chinese medicine formulas [12]. In practice, they used the TJQQ-ZDJTEQAM quantum resonance detector to determine the efficacy of plant information, and screened out several groups of grains, vegetables, bean sprouts and live Chinese medicinal plants that have high efficacy and are beneficial and harmless to patients' functions. The plants placed on the wooden rack are the combination plants that have been selected and are waiting to be put into the equipment. Then, the biological signal radiation power detector they developed was used to detect the radiation power of each selected plant. When it reaches a certain value, different varieties and different quantities of the above plants are selected according to the different symptoms of the experimenters as information donors and placed on the special wooden rack in the equipment. The patients participating in the experiment received plant signals for 40 minutes each time in the rehabilitation cabin to achieve overall conditioning of the whole body and mind. They can also let the equipment transmit to different parts of the patient's body in a directional manner. For example, the experimenters of vision rehabilitation received the selected plant information for 30 minutes on the biological information vision self-healing rehabilitation machine. Generally, a course of treatment for patients is 7 days, and the cell recovery time is about 14 hours (7 days × 2 hours). For patients with a long course of disease, older age and multiple difficult diseases, the treatment time is extended to 3 - 4 courses (21 - 28 days × 2 hours). Young people or patients with a short course of disease and less medication have faster functional improvement; those who are older and have a long course of disease need to extend the treatment time. It was found that: 1) Function and symptom improvement. There were 450 people who participated in the experiment randomly. After 1 - 4 courses (7 - 28 days × 2 hours) of cell information therapy, 405 of them had improved function and symptoms, accounting for 90% of the total number of people; 256 of them had significant improvement, accounting for 57% of the total number of people. There were still 10% who did not improve because no bioinformation donor plants for the patient's disease were found. 2) Reduce the risk of serious diseases. Patients with chronic diseases and difficult diseases are at risk of cerebral infarction and myocardial infarction. Cell information therapy can quickly reduce the risk of these two common serious diseases. They completed experiments on more than 10,000 chronic disease and critically ill patients without any medical accidents, and helped critically ill patients prolong their lives. 3) The "three highs" indicators dropped significantly. The chronic disease patients who participated in the experiment generally suffered from hypertension, high blood sugar, high blood lipids, low immunity and other diseases. For many years, these patients have been taking various drugs and undergoing various treatments, but the results are not ideal. Their body functions are low and they can't even take care of themselves. After 3 - 4 courses of cell information therapy (21 - 28 d × 2 h), the patients' higher indicators have dropped significantly. For example: when the patient's blood pressure drops to about 120/90 mmHg, the patient starts to stop or reduce the medication, and the blood pressure and other indicators have different repetitions. After continuing the course of treatment, it is found that the indicators gradually drop to a safe range. 4) Body temperature increased significantly and heart function improved. In some adjustments, patients were monitored for body temperature before and after health care treatment every day. They found that the body temperature of patients was low before health care, and it increased significantly after health care. After cell information treatment, the body temperature of patients with low body temperature increased by more than 90%, indicating that the immunity of patients was improved and the improvement was obvious. 5) Reverse cell aging and self-healing and recovery of human functions. In 2019, Xinzhou Yuan's team cooperated with Guangzhou Jinsaier Hospital and used their technology and equipment to conduct clinical experiments on restoring male function in patients with chronic diseases. Before treatment, the chronic patients participating in the experiment almost lost their male function. After 1 - 3 courses of cell information therapy, sexual function was restored to varying degrees, with an apparent efficiency of 60% and no adverse reactions. In some conditioning processes, more than 90% of patients had improved appetite, increased grip strength, increased physical fitness, improved vision, and improved sexual function; the skin became moist and shiny, the wrinkles on the face decreased, and the beard and hair grew faster than before. Even some elderly people in their 80s had significantly darker hair. This indicates that cell function has improved. In the experiment, we used the Scio biofeedback instrument (China Food and Drug Administration Certification Drug (Import) No. 2012 2213148) to perform cell function testing, which can determine the improvement of cell function. We found that the signals transferred to human cells through CBE technology do have self-sensing transparency and can directly pass through different cells in the human body without obstacles. It can be further inferred that cells can choose to absorb the information they need and perform solitary resonance to adjust or correct the distortion in the cells, thereby restoring function to a certain extent. This is reflected in the improvement or significant improvement of the comparison data of cell biochemical tests before and after cell treatment in patients, and various cell diseases have been gradually restored or even cured [12] [22].

5. Conclusions and Prospect

1) The important component of the bio-photonic radiation is the bio-photonic solitons. Due to their existence, the bio-photonic radiation is different from ordinary electromagnetic radiation and has a very clear self-induced transparency.

2) There are also many kinds of biological solitons in DNA and proteins, which are manifested as various types of structural solitons such as kinks or transmission solitons such as transmission solitons with kinks as envelope waves and carrying exponential wave functions. It is precisely in DNA that there are two types of solitons with different properties, namely, wave packet solitons have the function of transmitting biological binding energy and biological information, and Kink solitons only have the function of expanding or contracting double helix structures or opening and closing double helices. Their mutual cooperation enables the function of DNA to be completed and perfected.

3) The solitons in the bio-photonic radiation resonate with the various solitons in the receptor DNA or protein as a whole (or locally), thereby transmitting biological information or genetic information, which is one of the important mechanisms for the bio-photonic radiation to transmit donors or change the genetic traits of receptors. It can be referred to as the soliton resonance mechanism.

4) The results of many experiments show that plants can achieve the transmission of DNA genetic traits through the bio-photonic radiation, realize the transmission of biophysical signals and the directional transfer of plant-specific information. Not only that, the cell information therapy can achieve the transmission of selectable, directional, and increased physical signal transmission information through CBE technology. The patient's function improves in a relatively short period of time. At the same time, the results of cell biochemistry and other tests are also good, and there are follow-up effects. This shows that the patient has achieved self-healing recovery at both macro and micro levels, that is, cell information therapy has achieved both symptomatic and root cause treatment.

5) Looking forward to the future, through the development of various instruments that collect or amplify plant photonic radiation signals, human cells can safely receive plant signals. This can be a process of resonance between plant solitons and various biological solitons in human cells, which can play a role in regulating diseases and also provide an excellent interpretation of the soliton resonance mechanism.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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