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**Epidemic Equations of COVID-19, Quantum  
Medicine and Three Principles of Self-cultivation  
and Health**

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*Department of Physics, Yunnan University, Kunming, 650091, China.***Abstract**

First, we research the preliminary epidemic equations of COVID-19 and their meaning. Second, we discuss the matrix mechanics of pharmacology, and corresponding quantum medicine. Third, based on the Chinese traditional culture, we propose three principles of self-cultivation and health: health must first nourish self-heart, life should be a combination of movement and peace, and the body-mind-spirit union.

**Introduction**

Based on the inseparability and correlativity of the biological systems, we proposed the nonlinear whole biology and its basic hypotheses [1]. This may unify reductionism and holism, structuralism and functionalism on biology, and is consistent with systems biology [2,3], which integrates multiple different levels in biological systems, from multiple molecules, cells, individuals, to populations, communities, ecosystems [4]. Further, based on the same character of human body, we proposed the nonlinear whole medicine and its three hypotheses and mathematics [5]. The propagation of COVID-19 is a typical nonlinear process with fractals and chaos. Based on human physiological indicators and the extensive quantum biology, we discussed the extensive quantum medicine [5]. It may quantitatively simulate the biological structure and physiological function from gene, cell to whole organ and system [6].

Journal of Clinical Case Reports Medical Images and Health Sciences is exclusively dedicated to publishing Case Series, Case Reports, Clinical Images, Letters to the Editor, Research and Review Articles which enhance understanding of disease processes, its diagnosis, management and clinicopathologic correlations. In this Journal Valentyn discussed that movement is life, proper movement is active longevity [7]. Prabakaran searched laser physics as an insight [8]. Chakrabarti, et al., studied the impact of COVID-19 pandemic on children: Evidence, underlying mechanisms and interventions [9]. Basa, et al., reported Covid-19 associated autoimmune encephalitis in Iraq [10].

In this paper, we propose the epidemic equations of COVID-19, the matrix mechanics of pharmacology and corresponding quantum medicine, and three principles of self-cultivation.

**Preliminary Epidemic Equations of COVID-19**

The propagation of COVID-19 is a typical nonlinear process with fractals and chaos. A key of controlling COVID-19 prevents propagation from reaching an irreversible chaos point. From corresponding nonlinear equations and their solutions, we may obtain three basic origins of disease, and corresponding therapeutic methods may be applied to COVID-19 [5]. This testifies that research on infectious diseases must apply the nonlinear whole medicine.

Liu, et al., developed two differential equations on COVID-19 epidemic model [11]. Beira, et al., discussed differential equations model-fitting analysis of COVID-19 epidemiological data to explain multi-wave dynamics [12]. Hall, et

al., researched a mathematical modelling of the COVID-19 epidemic in Northern Ireland in 2020 [13].

By similar infectious disease epidemic equations [14,15], let  $x(t)$  is the number of people exposed, and  $y(t)$  is the number of those potentially infected, we propose the preliminary epidemic equations of COVID-19:

$$\frac{dx}{dt} = \alpha xy - (\varepsilon + \delta)x - ky, \quad (1)$$

$$\frac{dy}{dt} = -\alpha xy + \delta x + ky. \quad (2)$$

Here  $\alpha$  is infection rate,  $\varepsilon$  is mortality rate,  $\delta$  is cure rate, and  $k$  is prevention rate. Their characteristic matrix is:

$$\begin{pmatrix} \alpha y - \varepsilon - \delta & \alpha x - k \\ -\alpha y + \delta & -\alpha x + k \end{pmatrix}. \quad (3)$$

$$\lambda^2 + [\alpha(x - y) - k + \varepsilon + \delta]\lambda + \varepsilon(\alpha x - k) = 0. \quad (4)$$

$$\frac{d(x + y)}{dt} = -\alpha x, \quad (5)$$

For Eq.(1) if  $k=0$ ,

$$x = C \exp[\alpha y - (\varepsilon + \delta)]. \quad (6)$$

As long as  $\alpha > 0$ , it will increase exponentially. If  $\alpha < 0$ ,  $dx/dt=0$ . Eq.(6) replaces into Eq.(2) with  $k=0$ , and derives

$$\frac{dy}{dt} = C^\alpha e^{\alpha y} (-\alpha y + \delta). \quad (7)$$

Integral of Eq.(7) is:

$$C_0 + \ln |y| - y + \frac{\alpha y^2}{2 \cdot 2!} - \frac{\alpha^2 y^3}{3 \cdot 3!} + \dots = -C^\alpha t. \quad (8)$$

Its first approximant is:

$$y = C^\alpha e^{-\alpha t}. \quad (9)$$

It will decrease exponentially.

For COVID-19 we edited the Special Issue in EC Neurology in January 2021. We believe that science will surely defeat the epidemic, and mankind will greet a bright future.

### Matrix Mechanics of Pharmacology and Quantum Medicine

Basic method of Chinese traditional medicine is treatment based on an overall analysis of the illness and the patient's condition. It is applied by the wholeness of the human body and the relevance of its parts.

In 1989 we proposed that the theory of Chinese traditional medicine is based on strict mathematical symmetry group, in which the Yin-Yang theory is the simplest binary symmetry group, and the Five-Elements theory (Fig. 1) is the five element rotation group [16], which is completely determined by the angle of rotation.

Here the solid lines represent promotion relations, and

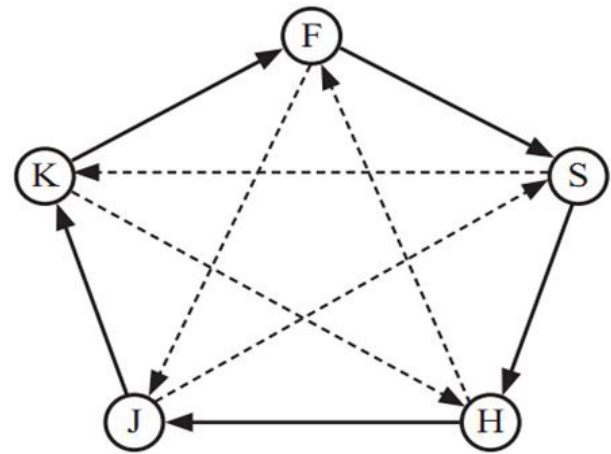


Figure 1: The Five-Elements Promotion-Restraint theory. the dotted lines represent restraint relations.

We discussed some mathematical and physical developments of biology and medicine, which include biofield and biological electromagnetics. We researched nonlinear biology and biotopology in which some knots may describe the protein folding, and symbolic dynamics of biology and the extensive quantum biology, and the biothermodynamics and entropy. In thermodynamics of pharmacology, the main effects of various drugs are to promote internal interactions in body, and entropy decrease. Further, we introduced the diagnostic space, treatment space and some medicinal vectors, and propose the matrix mechanics of pharmacology. We searched biology, medicine and pharmacology with time sequences. If we master the medication time, this will be able to get the minimum amount of medication, and the drugs can play the maximum treatment effect. If period is accurate, it can determine the time of play, negotiations, attack, etc. But, period of each individual should be change follow age, etc. This is a very valuable research [17].

Pharmacology studies interaction principles and mechanism between drugs and organism, which includes pharmacodynamics and pharmacokinetics. Drugs include chemical drugs and biological drugs in modern medicine, and natural drugs in traditional medicine.

The traditional Chinese medicine is related to the space of Five Elements and Eight Diagrams [18]. Yin-Yang, Five Elements and Eight Diagrams as the corresponding basic vectors in  $n$ -dimensional space form a diagnostic space. A person's state of illness as a vector is projected in this space. At the same time,  $i$  type of the drugs used constitute a set of agents, and the characteristics of each drug are also quantitatively projected in the diagnostic and treatment space. From this we obtain the equilibrium relations and a set of equations, and corresponding matrices. Such it can solve the amount of the drug used according to the vector value of this human.

More specifically, we list several equations corresponding to  $n$  dimensional diagnostic space, let  $(b_1, b_2, b_3, \dots, b_n)$  is the projection of a person's state of illness in  $n$  dimensional space, which forms a vector  $B$  with  $n$  row and 1 column on state of illness. Let  $(a_{1i}, a_{2i}, a_{3i}, \dots, a_{ni})$  is the projection of  $i$  type of drug in  $n$  dimensional space, so that the set of agents used forms a matrix  $A$  with  $n$  rows and  $i$  columns. So the equations can be simplified as matrix equations:

$$BX = \begin{pmatrix} b_1 \\ b_2 \\ \dots \\ b_n \end{pmatrix} X = \begin{pmatrix} a_{11} & a_{12} & \dots & a_{1i} \\ a_{21} & a_{22} & \dots & a_{2i} \\ \dots & \dots & \dots & \dots \\ a_{n1} & a_{n2} & \dots & a_{ni} \end{pmatrix} = A. \quad (10)$$

Its solution is:

$$X = B^{-1}A = (x_1, x_2, x_3, \dots, x_i). \quad (11)$$

It is a row vector with 1 row and  $i$  column, and its value is namely the amount of each  $i$  type drug used to treat this person. This is related to human health and diagnosis of diseases.

Further, the matrix mechanics of pharmacology may be related to the matrix form in quantum mechanics, and Heisenberg equation:

$$\frac{dF}{dt} = \frac{1}{i\hbar} [F, H]. \quad (12)$$

It may form the quantum medicine and its some characters. Different individuals have different matrices, which correspond to the dosage of the different agents. The change of the matrix is related to time and meridian flow (子午流注), and corresponds to the different effects of different treatment steps with visualization.

For equations the initial condition is age, and the boundary conditions are four seasons and environments. The dimension of diagnosis and treatment space is different, the number and elements of agents collection are also different, the corresponding equation can have multiple solutions, which corresponds to a variety of treatment can be used prescriptions. This set of linear equations may have multiple solutions, unique solutions, or even no solutions. The latter is namely that for this illness there was no cure in the circumstances. It can be related to different quantum paths with different probabilities and efficacy, or even theoretical treatments with multi-world. Different processes combined with nonlinear theory can correspond to cure if homing, or to chaos and death. This again corresponds to destiny.

In pharmacokinetics the processes of drug in the body, including absorption, distribution, biotransformation and transport, etc., are all internal interactions. In particular, in compartment model of pharmacokinetics the body acts as a system of multiple rooms must be an isolated system, in which the concentration change rate is described by the

nonlinear Michaelis-Menten equation.

Cell dynamics studies the changing rules of cell growth, reproduction, differentiation and death. The basic pharmacological action of antineoplastic agents affects mainly the biochemical process of biomacromolecules, and derives important genetic substances and protein metabolism disorders in cells, and prevents the division and reproduction of cell disorder. Gene therapy is a medical intervention based on modification of genetic material of living cells. It includes gene correction and gene replacement. Antisense drugs are a class of synthetic drugs carrying biological information, and are called as information drugs.

The same drugs, i.e., input the same energy and entropy, will produce different effects for various factors, which include age, sex, genetic factors, etc. Here emotional factors, pathological states, etc., all are some internal factors. In a word, we believe that the treatment is mainly based on internal interactions, including gene interactions, self-healing. Drugs enter the body, which form also an isolated system. Drug effect mainly depends on the reaction process between drug and the target site of organism.

In modern medicine selectivity and specificity of drugs are all the directional internal interactions. For the human body they must derive entropy decrease [19] (Chang 2013b), whether for the etiological treatment or the symptomatic treatment. This cannot consider that phenotype of drug effect, excitation and inhibition, central stimulants and sedative drugs, immunosuppressive agents and immunostimulants all are entropy increase. Only various adverse reactions are entropy increase. Therefore, except trauma and surgery, in the final analysis, almost all treatments are mainly based on the internal interaction in body as isolated system. Disease and death are entropy increase. Conversely, disease recovery and growth are entropy decrease, and are mainly internal interactions. Treatments are mainly internal conditioning.

The mechanism of drug actions, whether acting on the enzyme or receptor or carrier or gene, especially as the relations between the receptor and the ligand, the dynamics of drug and receptor reactions must be internal interactions.

It is known that matrix is the non-commutative, which corresponds to drugs applied must be considered in a sequential order. Matrix has addition, multiplication, and the inverse matrix, etc. Different operations correspond to different combinations of drugs. There have symmetric or anti-symmetric matrix. By chemical-biological methods drugs can often be turned into a diagonal matrix with a single index. Further, we should study various linear space,

linear transformation and linear algebra, etc., and their meaning in pharmacology. Linear equations may derive the discrimination theorem and structure of solutions.

In fact, this approach is universal method in any pharmacology, and can be extended to general medicine. The specific method is: first find out a number of indicators of the treatment of some diseases, such as the circulatory diseases are heart rhythm, blood pressure, blood lipid, heart tone and so on. They as a group of linear independent base vector constitute a space for diagnosis and treatment. Other diagnostics can be used as boundary and initial conditions for the equation. Secondly, the patient's conditions and the performances of each drug are quantitatively projected in this space. Third, list the equations and their solutions. If a drug  $k$  is not effective to treat the disease, it will be a zero vector in the diagnosis space, and its dose must be 0. This is the most basic approach of drug matrix mechanics. Various formulas and methods of linear algebra can be applied in medicine and pharmacology. Since the quantification of the diagnosis of modern medicine, this method is probably more suitable.

The foundation of quantum medicine is DNA, various cells and biological individuals are all quantized. It corresponds to the extensive quantum biology [20]. Further, it may develop to the quantum S-matrix of reaction theory, which may describe possible reactions with conservation laws. This may probably develop into the momentum representation, and derive the momentum spectra that may correspond to the sick ranks.

### Three Principles of Self-cultivation and Health

Chinese traditional medicine and culture have rich health care contents: such as martial arts, Taijiquan, Qigong, meditation, heart nourishing, etc. Based on these traditions, we propose three principles of self-cultivation and health:

The first principle: health must first nourish self-heart, to achieve body-life double repair.

A good attitude is not only beneficial to disease prevention, but also easy to heal when sick. Children are angels, and their bodies grow strong. But, we ordinary people, especially in the face of the changeable external world were a series of mind-body diseases. It disturbed the calm nature of mind, so lost the living order and life purpose and meaning. We use the Buddhism way, for example, and The Sutra of Hui Neng. Buddhism is the best and five-star psychology [1]. We can achieve the real understanding of the three different stages of life: the wind comes to move, the heart is empty. Then “our body is the Bodhi-tree, and our mind is a mirror bright, carefully we wipe them hour

by hour, and let no dust alight.” Finally tend to “there is not Bodhi-tree, nor stand of a mirror bright. Since all is void, where can dust alight.” In short, the heart wide disease less, more like less angry.

The second principle: life is not only about movement, it should be a combination of movement and peace.

The traditional concept that “life lies in movement” is a one-sided view. Big and strenuous movements are not good for health. This exercise is a heroic feat that pushes the limit, but it hurts the body. Only “life lies in the combination of movement and peace”, “life lies in the balance of Yin and Yang” is a comprehensive and conducive to health [21].

Breathing-meditation, proper exercise, timely exercise with different four seasons, different ages, different time sequence are necessary. Special meditation is the good way of the human body. Zen is the spiritual effect of the instruction heart to focus but not scattered. It the unity of the body and mind, and prevents the both scattered. At meditation you can adjust the physiological state, cultivation of body-mind, and free trouble. Zen is the basis of opening wisdom, and is a kind of heart and body synergy, spirit and flesh synergy. Now it has swept the world, former US President Bill Clinton also invited special guidance for meditation after retirement and illness. This kind of cultivation has a close relation with the Qigong of strengthening physical health. Mencius said, “I am good at cultivating my noble spirit”, which deeply reflects the interaction and relation among cultivating one's body, mind and morality.

The third principle: the body-mind-spirit union. It is based and combined on psychology and parapsychology, religions, etc.

Disease and health involve various causes, which include the three aspects: body, mind and spirit. We proposed three dimensional body-mind-spirit worlds on human society and parapsychology. Some observed results imply “ghosts” are probably the existences of some biological or non-biological objects that can not be detected usual methods, but can be detected by infrared light, etc. It will be a great contribution for world, and is the discovery of a new class of substances. Any observations and detections on mind and spirit worlds and on relations between both and matter are all valuable [22,23].

In a word, for the sake of the health of all mankind, we must abandon stereotypes, and combine the related traditional culture-medicine and modern medicine, parapsychology and religion, etc.

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