



Encyclopaedia of Epoch-Making of Traditional Chinese Medicine in the Treatment of Coronaviruses

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Abstract

As a traditional medical intervention in Asia and a complementary and alternative medicine in Western countries, traditional Chinese medicine (TCM) is capturing worldwide attention in life science field. Due to its worldwide use, potential impact on healthcare and opportunities for new drug development, traditional Chinese medicine is also of great international interest. Born in China, TCM has absorbed the essence of other civilizations, evolved, and gradually spread throughout the world. During its course of development spanning a couple of millennia, it has kept drawing and assimilating advanced elements of natural science and humanities.

TCM advocates "man should observe the law of the nature and seek for the unity of the heaven and humanity," full consideration of the environment, individual constitution, and climate and seasonal conditions when practicing syndrome differentiation and determining therapies, "yin and yang should be balanced to obtain the golden mean," practice of medicine should aim to help people, "reinforcing the fundamental and cultivating the vital energy, and strengthening tendons and bones," mastership of medicine lying in proficient medical skills and lofty medical ethics, "all the concepts that enrich Chinese culture and provide an enlightened base from which to study and transform the world.

A number of papers based on randomized controlled trials have suggested that TCM are effective in treating, preventing or helping alleviate symptoms to Severe Acute Respiratory Syndrome (SARS). Hence, based on the guiding principles of holism and syndrome differentiation and treatment, TCM has unique advantages in the treatment of SARS owing to the synergistic effect of multiple components and targets, which prevents drug resistance from arising. There are quite compelling evidences support the notion that TCM has beneficial effect in the treatment or prevention of coronaviruses. In this article, I shall guide you through the new landscape by providing information and tools you need to better manage disease outbreaks and health emergencies. Moreover, the prospects for developing TCM against coronaviruses is discussed to provide a reference for the research and development of innovative TCM with multiple components, multiple targets, low toxicity. Furthermore, the current progress in using TCM against coronaviruses is summarized according to modern biological theories.

Keywords: *Pandemics; Yin-Yang; Jing Luo; Zang-Fu; Meridian-Collateral System; Differentiation; Prescription; Syndrome; Formula; Traditional Chinese Medicine; Treatment Regimens.*

INTRODUCTION

The 21st century has witnessed changes --- travel and trade, urbanization, environmental degradation and other trends that increase the risk of disease outbreaks, their spread and amplification into epidemics and pandemics. At the same time, the science and knowledge around infectious hazards are constantly evolving.

Traditional Chinese medicine (TCM) is thousands of years old and has changed little over the centuries. It is an integral part of mainstream medicine in China. The health concept of TCM includes the holistic view of unison between man and universe, the harmonious unity of fusion of shape and soul, the people-oriented view of values and the balance of qi-blood-ying-yang in the human body.

Simply put, TCM is based on theories about qi, our body's vital energy, which is said to flow along channels in the body called meridians and help the body to maintain health. That means qi is what keeps our physical, mental, emotional and spiritual health in balance.

I agree with the concept that positive and health are synonyms (1). Human beings do not exist in a biological vacuum. We live in interdependent existence with the totality of the living world (2) and the interactions between physical, psychological, and social health (3). Many people like to consult TCM practitioners and use TCM to regulate the bodies as it has fewer side effects than those of modern medicine. Traditionally, Chinese doctors judge patients by observing the appearance of the patients, questioning them, feeling their pulse, and writing prescriptions based on experience

and ancient prescriptions. Most of the ingredients in these medicine are herbs. There is a lot of evidence indicating that TCM can modulate many imbalances in our human body, and TCM has been used for many chronic diseases (4). It is not only effective for chronic diseases, but also for acute and epidemic diseases. It not only treats the symptoms, but also cures the root cause. Hence, it has scientific integrity and is robust.

Acupuncture (5,6) is a non- pharmacological treatment option for multiple different diseases and symptoms.

In China, around the time “ Huangdi’s Neijing “ (Huangdi’s Classic of Internal Medicine) was published, though some experts suggest it could have been practiced earlier. Acupuncture is part of the ancient practiced TCM. This practice is based on how energy, or qi, flows through the body along a series of channels called meridians --- similar to the way nerves and vessels carry messages and blood throughout every system. It aims to assist people in achieving balance, or qi, and, as a result, provide relief for many ailments.

Our human body has more than 2,000 acupuncture points connected by pathways or meridians. These pathways create an energy flow (qi) through the body that is responsible for overall health. So, by applying acupuncture to certain points, it is thought to improve the flow of qi, thereby improving health.

With the development of Artificial Intelligence (AI), its implementation into acupuncture has achieved a series of significant breakthroughs (7~11) in many areas of acupuncture practice, such as acupoints selection and prescription, acupuncture manipulation identification, acupuncture efficacy prediction, and so on (12,13).

The National Institutes of Health (NIH) finds that acupuncture for pain relief tends to have the most evidence, especially for conditions that have become chronic like osteoarthritis and lower back pain, as well as tension headaches. According to one analysis published in February 2022 in the British Medical Journal (BMJ) that analyzed more than 2,000 scientific reviews of acupuncture therapies, the science is strongest behind acupuncture’s efficacy for post-stroke aphasia; neck, shoulder, and muscle pain; fibromyalgia pain; lactation issues after delivery; lower back pain; vascular dementia symptoms; and allergy symptoms. It has been recommended by the World Health Organization (WHO) in 1980 as an effective alternative therapy (14,15) for 43 different disorders . Its treatments include nausea, pain, allergies, hot flashes, breathing difficulty, mood disorders, dyspepsia, mood disorders, dyspepsia, and even tobacco use. It is most commonly used in the treatment of chronic, noncancer pain in adults. It has clinically proven to be effective for pain management. Pain is a result of the meridians being blocked. Hence, the key to relieve pain depends on dredging the meridians. And clinical evidence showing the benefits of other aspects of TCM are not similarly available, making

it challenging for them to be acceptable in mainstream healthcare (16,17).

The global acupuncture market was worth US \$ 24.55 billion in 2017. The market was led by Europe with a 32.7 % share, followed by Asia-Pacific with a 29.4 % share and the Americas with a 25.3 % share (18). It is estimated that the industry will reach a market size of US \$ 55 billion by 2023.

Implementation science has been recognized as a potential catalyst for health system reform. Chaos theory (19,20), also called nonlinear systems theory, provides new insights into processes previously thought to be unpredictable and random (21). Well-developed theory is what enables knowledge to emerge out of seeming chaos and for translation of that knowledge to be widely and reliably implemented into routine practice so that health and well-being of patients is maximized by delivery of interventions that are rooted in that knowledge (22). Hence, the chaos theory suggests that we cannot predict the future, yet it is human nature to try (23).

People have looked for predictive signs since the dawn of time. Here we consider the present as a seed for the future in terms of trends, education, market demands, social systems and policy. It will be necessary for us to brand ourselves, to highlight and identify who we are, what we do, giving the public a clear message. At the moment, the public recognizes, best understands, and has the most affinity for the word TCM.

Universal access to the basic health services and health improvement of the whole world are the important goals of the comprehensive development of well-off society. TCM has made great contributions to the continuance and thriving maintaining health and providing preventive and therapeutic health services to Chinese people before the Western medicine was introduced to China. It reflects both the brilliance and richness of the Chinese culture. It is a holistic system of medical knowledge that organically integrates humanities and life sciences. It has done tremendous contribution to the healthcare of the Chinese nation. At the same time, TCM keeps developing all the time and becomes popular among patients. It is believed that TCM will become the common medical resource and treasure for the mankind to some degree. One of the biggest obstacles to progress in TCM development in Western countries is the difficulty of applying the traditional concepts to the Western medicinal plants, which are not traditionally described in ancient literature.

WHAT IS TCM AND HOW IS ITS INITIATION?

TCM is one of the oldest medical systems in the world. TCM is originated and developed in China. It is a medical science by which the Chinese nation used to study the process of human life, maintain health and fight against disease. It represents a combination of natural sciences and humanities, embracing profound philosophical ideas of the

Chinese nation. It is a theoretical system to study the rhythm of life, as well as the occurrence, progress, prevention and treatment of disease. It takes a holistic view as guidance and is based on the physiology and pathology of Zang-fu (24) and the theory of meridians and collaterals (25) with features of determining the treatment according to the differentiation of syndrome. It embodies the rich Chinese culture and is a systemic and comprehensive study of medical knowledge, which organically integrates humanism and life sciences. As a great product of the Chinese nation, and TCM is a priority of Chinese nation with dependent intellectual property right. For thousands of years, it has made significant contributions to the prosperity and development of the Chinese nation, making positive influence on world cultures.

TCM theory developed and expanded mainly from practice and experience. The core concept of preventive treatment of disease applied in TCM and its cultural identity of the humanities together build the unique characteristics and advantages of TCM, which is integrated with modern medicine system to form the healthcare system and would also play a key role in exploring the development of our healthcare system. As early as 4000 years ago, the ancient Chinese created primitive medicine in their struggle with nature and diseases. In finding food, they soon understood that some food could relieve or even eliminate some diseases. Thus, this was the origin of development and application of Chinese herbal medicine. In utilizing fire for warmth, they found applying stones or sand wrapped with leather or certain types of bark could relieve some disease. Gradually they developed the method of using hot compresses and moxibustion. In process of using stones as production tools, they found that when a portion of the body is stabbed, the disorder in another portion of the body can be relieved. Hence, they created the method of using stone or bone needles for treatment. Through these experiences, acupuncture was developed, which further turn into the theory of meridians. Two thousand years ago, the earliest known TCM book, "Huangdi Neijing" (26) (Huangdi's Classic of Internal Medicine), was written. This book summarizes the therapeutic experiences and medical theories of that time period. Assimilating achievements of other natural sciences at that time, it comprehensively examines the physiology and pathology of the body, along with diagnosis, prevention and treatment of diseases. It laid a foundation of TCM theory.

The rapid progress in TCM in the late Eastern Han Dynasty brought up a passel of renowned doctors. Hua Tuo (27) is one of them. He is a celebrated ancient Chinese doctor. He invented an anesthetic called Mafei San (boiled anesthetic), and became the first person who used narcotic drug in the world and his skill in this field was about 1600 ~1700 years ahead of that of the west. Hua Tuo often practiced medicine as a traveling doctor in the presently designated provinces Jiangsu, Shandong, Henan and Anhui. He miraculously cured diverse illnesses and brought the dying back to life time and

again. His prescriptions were astonishing effective. Just the once, Hua Tuo had two patients, both of who had a headache with the same symptoms. After feeling their pulses, Hua Tuo prescribed purgative to the patient whose name is Ni Xun, and sudatory to the other patient Li Yan. Both of them took their medicine respectively and their headaches were both eliminated. When he was asked why he had prescribed different medicines to treat the same illness, Hua Tuo put it this way, "Ni Xun's cause of illness roots internally, so the purgative works. However, Li Yan's is external, so sudatory is the right remedy." This case demonstrate that Hua Tuo was in good command of the tenet of TCM dialectic remedies.

Zhang Zhongjing (28) is another outstanding physician of Hua Tuo's contemporaries, who lived in the Eastern Han Dynasty. He specialized in the study of typhoid fever. From 196 to 219 AD, warlords dogfought in chaos and plagues spread widely. Numerous people died of contagions. In Zhang Zhongjing's kindred there were over two hundred kinship members. Two thirds of them had died result from disease within ten years, seventy percent of which died was risen from the contagious typhoid. The so-called typhoid at that time includes cholera, dysentery, pneumonia, influenza (flu) and some other acute contagious diseases. In the late period of Eastern Han Dynasty, most doctors felt helpless to these diseases, for there was no remedy right to kill them. As a result, thousands of people lost their lives. For that reason, Zhang Zhongjing labored over the diseases for years which resulted in a complete system of theories on pathology, diagnosis, therapy and prescriptions for typhoid fevers. He maintained that the typhoid developed gradually from the initial attack till the crucial dying state. Treatments should be varied according to different individuals at the different stages of disease development. Zhang Zhongjing kept on summing up his clinic experience while he was practicing medicine, noting down those effective prescriptions. Based on his years' practicing experience, he worked out a monograph, "Treatise on Febrile and Miscellaneous Diseases." (29) This is a classic work on TCM which is a must for doctors of all generations. Now all the TCM universities assign it as a compulsory course. As a result, Zhang Zhongjing was admired as a medical sage in honor of his significant contribution to TCM.

During the Sui and Tang Dynasties, with TCM having reached a high level, a number of excellent doctors came forth. Sun Simiao is one of them. In Sun Simiao' hometown is widely bandied such a tale. One day when Sun Simiao was on his way home, he came across four guys who were carrying a coffin to the wildness. Out of the blue, he saw drips of blood seeping out of the coffin. He hurried up to the porters and asked, "Who's the dead in the coffin? When did the dead breathe her last breath?" He was told that in the coffin lies a pregnant woman. He had gone through a difficult labor and failed in delivering the baby. She died only a moment ago. Sun Simiao demanded, "Is it OK to open the coffin and let me take a look? I am probably able to bring her to life." When the family of

the dead learned that Sun Simiao was a doctor, they decided hesitatingly to have the coffin opened, though they were still in doubt. Sun Simiao felt the pregnant woman's pulse to find it beating weakly and then pricked an acupuncture needle into a acupoint. Soon afterward, the woman came to herself and the baby came out with a cry as well. Wow! One needle saved two lives. The family got shocked at it. Sun Simiao composed his book, "Prescriptions Worth a Thousand Gold for Emergencies" in 652 AD (30). Thirty years later, when Sun Simiao was over 100 years old, he wrote another, "A Supplement to Prescriptions Worth a Thousand Gold", which records more than 6500 prescriptions he collected in the 30 years subsequent to the first book. The book was descended to later generations popularly.

ARE YOU AWARE OF THE FAMOUS MEDICAL OF WORK, "AN OUTLINE OF HERBAL MEDICINE" ?

It is a monumental work of pharmacology. This book, known as an earlier-composed encyclopedia in the biology field, acts not only as a brilliant achievement in TCM development, but also a momentous contribution to the world's medicine and biology. After being published in the Period of Ming Dynasty (1573 ~1619 AD), "An Outline of Herbal Medicine" was spread rapidly to Japan, Korea and Vietnam, and then to Europe in the 17th and 18th centuries. It lured a world-wide attention and was highly valued by the world. It was also published successfully in English, French, German, Russian and Latin. In Human Variation and Origins : An Introduction to Biology and Evolution (31) written by British biologist Charles Robert Darwin (1809 ~1882), the description that golden fish varies color was cited from "An Outline of Herbal Medicine" as a principal evidence for Darwin's scientific arguments. It is obvious that "An Outline of Herbal Medicine" is considerably valuable and influential. The author of this colossal work is Li Shizhen, who was a great physician and pharmacologist in the Jiajing Period and Wanli Period of Ming Dynasty. His most significant contribution falls on the study and organizing of herbal medicines. "An Outline of Herbal Medicine" is a monograph on medication. In his age-long medical experience and research, Li Shizhen discovered that there had been a great amount of mismatches and deficiencies and even some inaccuracies in herbal medicine books, which, Li Shizhen affirmed, might lead to dangerous consequences. Given this fact, he was determined to write a book on herbal medicine. Li Shizhen dedicated all his lifetime to this immortal work. It is a pity that he passed away no sooner than the manuscript had just been finalized. He failed to witness the published book in his lifetime.

WHAT ARE THE ESSENTIAL CHARACTERISTICS (32~34) OF TCM?

The theoretical system of TCM mainly embodies the following two essential characteristics.

The Concept of Wholism

Wholeness means unity and integrity. TCM pays attention

to the unity and integrity of the body, and interrelation between the human body and nature. The human body itself is seen an organic whole. Every part composing the body is inter-cooperative and inter-influenced. The human body is also closely related to external natural surroundings. This idea of unity between interior and exterior conditions, and wholeness of the body itself is called the "concept of whole". The human body as an organic whole. The human body is composed of a number of viscera, organs and tissues, which have their own respective functions. Every function, however, is a component of the general activity, and inter-influence pathologically. Humans are tied to nature, and there is in nature an essential condition for people to live. Changes in nature, therefore, may directly or indirectly influence the body, and accordingly cause physiological or pathological reactions.

Treatment Determination (35~37) Based on Syndrome Differentiation

This is an essential principle; in TCM in understanding and treating disease. It is a specific research and treatment method of disease in TCM, and also one of the essential characteristics of TCM. Treatment determination includes deciding on an appropriate therapeutic measure according to syndrome differentiation. Syndrome differentiation is the prerequisite and basis for determining treatment. Syndrome differentiation includes analyzing, differentiating and recognizing syndromes of disease. Treatment determination is the means to treat disease, and also involves examination of whether syndrome differentiation is correct or not. Syndrome differentiation and treatment determination are inseparable in the process of diagnosis and treatment of disease, and embody the combination of theory and practice.

Treatment determination based on syndrome different both from common symptomatic treatment and treatment according to different disease in modern medicine. In different stages of a disease, there may appear different syndromes, and in different diseases, the same syndrome may appear. So, different syndromes (38) in one disease should be treated by different treatments, while different diseases, as long as they express the same syndrome, can be treated with the same treatment. It should be noted that syndrome is a summary of the cause, place and nature of a disease, and a situation of mutual conflict between pathogenic factors and resistance.

WHAT ARE YIN-YANG AND THE FIVE-ELEMENT DOCTRINE?

Yin yang (39~41) is rooted in ancient philosophy in China and it summarizes the properties of the opposite aspects or phenomena of the universe. Yin yang represents two aspects in opposition, and two opposite sides of a single entity. What is more mobile, external, upward, ascending, warm, intangible, bright and active may be classified as yang. What is more stable, internal, downward, cool, tangible, dark and less active may be classified as yin.

The Chinese philosophy about the concept of qi is a bit more complicated (42~ 45). First, we believed that our human body was filled with and animated by an invisible life-giving force which we called qi (pronounced “chee”) and when the qi was flowing well and going to all the right places, then a person would experience good mental and physical health. When the qi was flowing incorrectly (blocked or deficient) that would result in illness. It means that disruption of the energy flow can cause disease. Second, think of qi as your body’s natural inner workings. Sometimes you are more prone to illness when feeling stressed or anxious. When you are relaxed and healthy, your body physically reflects that too. After all, your mood, mental health, and general well-being do affect your physical health. Any imbalance to qi can cause disease and illness. And TCM therapies aim to restore the body’s balance between the forces of yin and yang. This imbalance is most commonly thought to be caused by an alteration in the opposite and complementary forces that make up the qi. These are called yin and yang. In other words, these imbalances are believed to block the flow of qi and cause disease.

During recent years, new advances in the field of understanding yin-yang aspects (46~48) from a modern bioscientific point of view have led to the conclusion that antioxidation- oxidation concepts might mirror a yin-yang relationship (49,50).

Over thousands of years people in ancient China recognized that wood, fire, earth, metal and water are the five indispensable materials in human life. Later, people abstract evolved the properties of these five materials to explain the whole physical world. They also believed that the five materials not only inter-promotion and inter-restriction, but are also in a constant state of motion and change. This soon became what is now known as the five-element doctrine theory. The five- element doctrine has been used in TCM to explain physiological and pathological changes in the human body, and the relation of the body to the external environment. Thus, treatment determination based on syndrome differentiation can be carried out to prevent or treat disease.

The theory of five elements classifies the five Zang organs of the human body into five elements and it illustrates the physiological functions of the five Zang organs with the properties of the five elements. For example, wood is no characterized as growing, germinating and freely spreading out. The liver prefers to free movement, rather than blockage, acting on promoting qi and blood flowing and emotional balance. Hence, the liver corresponds to wood. Fire is hot, flaring-upward and bright. The heart is the yang Zang. It dominates the mind and it is the master of the five Zang and six Fu organs. Hence, the heart corresponds to fire. Earth is characterized as sowing and growth of life. The spleen dominates the transportation and transformation of food and fluids. It transforms essential materials to nourish Zang-fu

organs. It is the source of qi and blood. Therefore, the spleen corresponds to earth. Metal is characterized by descending. Hence, the lung corresponds to metal. Water is characterized as moisture, downward movement and storage. The kidney stores essence and governs water transformation. Hence, the kidney corresponds to water.

Yin-yang and the five elements can be traced to ancient Chinese philosophy. Yin and yang are two aspects of the unity of opposite of things. The five elements refer to the most basic elements in nature and include wood, fire, earth, metal and water. Each has its own properties, and yet promote and restrict each other. In ancient China TCM doctors applied yin-yang and the five element doctrine to physiological functions, pathological changes of the human body, diagnosis and treatment. It is important component of theory in TCM.

WHAT IS THE MERIDIAN AND COLLATERAL (JING LUO)? (51~54)

Jing Luo, is a general term for the Jing Mai (meridians) and Luo Mai (collaterals), which are the pathways through which the qi and blood (55) circulates within human body.

Jing means go through or a path. They are the main trunks, thick and large. They run longitudinally and are deep-level distributed within the body. They include the twelve regular meridians, the eight extra meridians (56,57) and the twelve divergent meridians.

Luo means something that connects or a net. They are branches of the meridians, thin and small. They run transversely and are distributed superficially, and crisscross and net the whole body. They include the fifteen collaterals, the minute collaterals and the superficial collaterals. The theory of meridians-collaterals (58) is theoretical doctrine that analyses the course and distribution, physiological function, and pathological changes of the meridians-collaterals of the human body and their relationship between with the Zang-fu organs. It is an important component in the basic theory of traditional Chinese medicine and the core of theory (59,60) underlying acupuncture-moxibustion. It permeates physiology, pathology, diagnostic theories and treatment principles in Chinese medicine, together with the theory of yin-yang and the five elements and the theory of Zang-fu. It forms commonly the theoretical basis of Chinese medicine.

The meridian-collateral system (61~63) is composed of the twelve regular meridians, the eight extra meridians, the twelve divergent meridians, the twelve muscles regions and the twelve cutaneous regions, the fifteen collaterals, and the minute and superficial collaterals. Among these, the twelve regular meridians can be seen as the primary system. Running transversely and longitudinally, they intersect with each other, both in the interior and exterior of the body, forming a complete system. The twelve meridians are the main body of the meridian system, so they are also called the main meridians. The twelve meridians are the three

yin meridians of the hand (Lung meridian of hand - Taiyin, Pericardium meridian of hand - Jueyin, Heart meridian of hand - Shaoyin), the three yang meridians of the hand (Large Intestine meridian of hand - Yangming, Sanjiao [Triple Energizer] meridian of hand - Shaoyang, Small Intestine meridian of hand - Taiyang), the three yang meridians of the foot (Stomach meridian of foot - Yangming, Gallbladder meridian of foot - Shaoyin, Bladder meridian of foot - Taiyang), and the three yin meridians of the foot (Spleen meridian of foot - Taiyin, Liver meridian of foot - Jueyin, Kidney meridian of foot - Shaoyin) collectively. The directions of the twelve meridians are the three yin of the hand go through chest to the hand, the three yang of the hand go through the hand to the head, the three yang of the foot go through the head and the foot, and the three yin of the foot go through the foot to the abdomen and chest. The inner and outer yin and yang meridians meet at the ends of the heart, the two yang meridians of the same name meet at the head and face, and the connected two yin meridians meet at the chest. The inflow of the twelve meridians is transmitted from the lung meridian to the liver meridian, and then back to the lung meridian, and it starts again and again, like an endless loop.

Jing Luo is the general term for meridian and collateral system which is the pathway for qi and blood which circulates in the whole body. It connects Zang-fu organs and orifices of sensory organs. It communicates the upper with the lower, and the internal with the external. The meridians and collaterals pertain to Zang-fu organs in the interior and connect with joints in the exterior, communicate Zang-fu organs with the body surface, thus, Zang-fu organs, tissues and orifices of sensory organs are integrated as an organic whole of the human body so that the functional activities of every part of the human body help the body be in harmony and balance.

Jing Luo has been introduced above, here let us continue to study in depth. Jing Luo is composed of meridians, collaterals, twelve muscle regions and twelve cutaneous regions. The meridian is the trunk of the system of meridian and collateral, including three categories:- the regular meridian, divergent meridian and extra meridian. There are twelve regular meridians:- three yin meridians of hand, three yin meridians of foot, three yang meridians of hand and three yang meridians of foot. The divergent meridians are the important branches which separate from the twelve regular meridians, also called twelve divergent meridians. They started from the regions above the elbows and knees of the limbs, enhancing the connection and supplementation of the external and internal relationship of twelve regular meridians. There are eight extra meridian:- governor vessel, conception vessel, thoroughfare vessel, belt vessel, yang heel vessel, yin heel vessel, yang link vessel and yin link vessel. The eight extra meridians govern, connect and regulate qi and blood of the twelve regular meridians. They are different from twelve meridians, not the primary pathways for qi and

blood flow and directly related with Zang-fu organs, nor related externally and internally. The collaterals are small branches of meridians, including the divergent collaterals, superficial collaterals and tertiary collaterals. The divergent collaterals are the larger collaterals, with fifteen in all. This include the main collaterals derived from the twelve regular meridians, the governor vessel and conception vessel and together with the great collateral of the spleen, together fifteen divergent collaterals. The tertiary collaterals are the finest collaterals, sub-derived from the divergent collaterals and distributed all over the body. The superficial collaterals are those extensively distributed in the superficial layer of the body. The superficial collaterals are those extensively distributed in the superficial layer of the body, communicating with the meridians and muscle (64,65).

WHAT IS THE SYNOPSIS OF TRADITIONAL CHINESE MEDICINE DIAGNOSTICS?

It embraces two parts: the four diagnostic methods, and differentiation of syndromes. The four diagnostic methods are: Inspection, auscultation and olfaction, inquiry, and pulse-feeling and palpation.

(a) Inspection --- It refers to examining the general condition of the body, the mental faculty, signs, secretions and excretions of patients. In a word, it includes inspection of the physique, facial expression, color of the complexion, and physical condition and behavior.

(b) Auscultation and olfaction --- It is a method to gather information about the body from the sounds of the voice and breathing, and smelling of the odor of the body. It is a way to interview the patient, his or her family to determine the patient's health state, major complaints, progress and duration of an illness.

(c) Pulse-feeling and palpation --- Pulse-feeling is an approach by which a physician understands the condition of a disease, meridians and collaterals (66~68), qi and blood and the relative strength of pathogenic factors and the antipathogenic qi. Palpation means to examine various parts of the body by touching to find out abnormal conditions.

In TCM, "symptom", "syndrome" and "disease" are different in nature, but they are closely connected (69). "Symptom" means a change in the body or mind which shows disease or disorder, including abnormal tongue and pulse manifestation, e.g. fever, aversion to cold, bitter taste in the mouth, stuffiness sensation in the chest, loose stools, yellow tongue coating and wiry pulse. Syndrome refers to a collection of medical symptoms at a certain stage in a disease course. For instance, common cold has two types --- syndrome of wind-cold and syndrome of wind-heat. Differentiation of disease is a process in which a disease name is established in light of the main clinical manifestations and characteristics.

Syndrome differentiation is the most basic diagnostic method in TCM (70).

The differentiation of syndromes includes differentiation of syndromes in accordance with the eight principal syndromes, differentiation of syndromes in accordance with the state of qi, blood and body fluid, differentiation of syndromes in accordance with the state of Zang-fu organs, differentiation of syndromes in accordance with the theory of the six meridians, differentiation of syndromes in accordance with the Wei, qi, ying and Xue systems, and differentiation of syndromes in accordance with the theory of Sanjiao.

The eight principal syndromes serving as guidelines in diagnosis are yin, yang, exterior, interior, cold, heat, deficiency and excess. It is a method of differential diagnosis used to determine the nature --- heat or cold, and the location --- deep or superficial, the confrontation between the antipathogenic qi and pathogenic factors and the category of diseases --- yin or yang (71), based on a comprehensive analysis of all the data obtained by means of inspection, auscultation and olfaction, inquiry, pulse-taking and palpation.

As already mentioned, yin and yang are two guidelines in differentiation of syndromes. Clinically, though syndromes are complex and changeable, but they are always divided into two classes --- either yin or yang. Thus on diagnosis, yin and yang must be differentiated first. Thus, syndromes of the exterior, heat, and excess conditions are classified as the yang syndromes, while those of the interior, cold, and deficiency conditions are the yin syndromes.

Traditional Chinese medical doctors rely on the subjective observation and the patient's subjective description to obtain the functional status and characteristics of human body. This leads to difficulty in making an accurate quantitative description, lack of quantitative concepts and low diagnosis rate, so it needs improvement and innovation. New technologies and methodologies offer the possibility for solving key problems of interpreting the scientific connotation of TCM and for the great-leap-forward development of TCM. With the support of high-tech, the modernization of TCM will produce important impacts on the development of biomedicine, life science, and the whole modern science and further improve human's understanding on life and diseases.

More and more modern drugs derived from traditional Chinese herb have played an important role in national and international health industry (72~75) and pharmaceutical innovation researches. The integration of TCM and modern scientific technologies, which will promote the generation of new theories (76), new technologies, new methods, and new discipline and also acquire more scientific inventions, scientific discoveries and technological innovation achievements, will definitely promote the development of TCM related industries, and is significant for developing the products with Chinese independent intellectual properties rights, promoting medical economic development, accelerating industrial restructuring and improving the international competitiveness. The development of TCM related industries will supply rich medical and healthcare

resources (77,78) for the public and greatly satisfy the medical and healthcare needs of the whole society.

TCM market is rapidly developing since later of 1990s. In 2010, the output value of TCM amounted to RMB ¥ 317.2 billion (about € 36.8 billion), which increased 24 %. The net yield and profits of TCM production are much higher than the average of the country's medical industry. The total TCM market in China will rise to € 96,2 billion in 2025.

Nanotechnology (79,80) is the science of engineering materials and systems on a molecular scale. It is a new technology that was born and grew in 1980s and is taken for the source of various emerging technologies of 21st century (81,82). Its application to medicine, nanomedicine (83~85), has enabled the development of nanoparticle drug-delivery vehicles. These nanocarriers are generally less than 100 nm in size and have the ability to carry and deliver therapeutics to disease sites. It also enabled the development of Chinese medicine in the international society, and expand the use of a range of Chinese medicinal materials.

Standardization (86,87) of TCM, is the requirement for academic development of TCM, the urgent need for standardized management of TCM, and the demand for internationally widespread of TCM. Standardization of TCM, representing the crucial reflection and concrete manifestation of unique characteristics and advantages of TCM, is the important basis for clinical practice guidelines and the internal needs of development. Develop diagnosis and treatment system of TCM based on international standard and through systematic summarizing the effective clinical experiences and methods of diagnosis and treatment. Establishing the standardized diagnosis and treatment system of TCM is the strategic issue for promoting clinical efficacy to better serve national health.

Ethnomedicine (88~90) is a Chinese minority traditional medicine, and is an important part of Chinese medicines, including Tibetan (91) medicine, Mongolian (92) medicine, Uygur (93) medicine, Dai (94) medicine, Zhuang (95) medicine, Miao (96) medicine, Yao (97) medicine, Yi (98) medicine, Dong (99) medicine, Tujia (100) medicine and Hui medicine. Ethnic minority medicine has a long history, an extensive mass foundation, a unique treatment method, and significant clinical efficacy, which has played an important role in the maintenance of minority health and disease prevention. And the development of ethnomedicine is imbalanced with some problems due to various reasons. However, we should carefully research into the basic situation of ethnomedicine, scientifically and actively utilize ethnomedicine and develop modern ethnomedicine, to find a good starting point and seize the key, so as to promote its all-round development and play a greater role in maintaining people's health.

The concept and method of advocating health wellness and preventive treatment of disease applied in TCM has the

forward-looking strategic significance for implementing the policy of prevention first⁰ and the focus downward strategy. The individualized mode of diagnosis and treatment based on syndrome differentiation and the experiences of TCM against therapeutic dominant diseases could provide the solid foundation for prevention and treatment of catastrophic diseases and modern intractable diseases. The characteristics (101,102) of effective, convenient, safe, low-cost of TCM allows most people to access basic medical services, which particularly has broader prospect in rural areas.

The basic knowledge and appropriate technologies of TCM are still under low popularity in health industry. The doctors of Western medicine have mastered few knowledge and poor understanding of indications and appropriate technologies so that they could not use TCM correctly. Therefore, many clinically effective treatments, traditional Chinese drugs and appropriate technologies could not better serve the public. At the same time, the recognition of knowledge of TCM and of understanding of TCM culture among people need to be raised and enhanced. The key reason why TCM develops lastingly and increasingly is its efficacy. To save health resources and reduce healthcare costs. Compared with general hospitals, TCM provides healthcare services at lower costs. Thus, the advantages (103,104) of effective, convenient, safe, low-cost of TCM can supply sustainable source and power for development of medical and healthcare. Based on the concept of holism and syndrome differentiation, TCM is a focus on both physical health and mental health, which emphasizes the correspondence of human body and natural world, and the unity of manifestation and spirit. Meanwhile, the unique theory and approaches of health science applied in TCM, which has long-term been rooted in the Chinese culture and TCM culture and won extensive awareness and acceptability of population, owns the social basis of lasting survival and continuous development.

Developing TCM and playing its full role, so as to improve our healthcare services, is the choice of history and the requirement of the times, and is the overall and strategic event. Since 1962, in China the government began to organize research for ancient books designedly. After nearly 60 years' efforts, more than 1200 kinds of TCM books and a large number of huge reference books of TCM had been published, besides, some e-book has been created. After decades of efforts, some achievements has made in the modernization of TCM diagnosis method, various TCM diagnosis instrument is developed by using modern science and technology. To a certain extent, these instruments expand the vision of TCM and restore the error and uncertainty of intuitive feeling in the diagnosis process.

To conduct comprehensive and systematic arrangement and research of TCM literature resources, and to transform them to digital knowledge using computer and information technology which makes it new resources to adapt to the development of the new age. Its core technology is building

TCM literature database and intelligent analysis and processing system. And our key tasks include the collation of ancient medical books. Study nearly twenty thousands TCM literature systematically and deeply, including the ancient version, cataloging and annotation of content. The book received is expected to be more than 10,000 species, about 600 million words. To establish model of the database structure. To complete data establishment of more than 10,000 kinds of TCM literature and digitized data indexing (105,106) through TCM medical literature processing model. At the same time, to strengthen the ability of differentiating the false in classical literature of TCM in order to make more experienced, reliable, feasible and effective arrangements and to make the work more scientific.

Internet technology was advancing by leaps and bounds. Through mixing TCM theory, precision sensing technology, medical engineering, computational mathematics, nonlinear science, information engineering and the latest achievements in different disciplines creatively, to create a modern integrated diagnostic system which inherits TCM theory and extends it in someway. To clarify the Chinese herbal characteristics and mechanisms of action through pharmacological experiments is not only the inevitable requirement for Chinese herb modernization and internationalization, but also the key way to direct the clinical rational administration. Combine the disease and mechanism theory of TCM with modern medical pathological and pathophysiological theory system, and determine the effect target of traditional Chinese medical effect mechanism analysis (107). Standardize methodology in accordance with multi-level curative effect mechanism analysis to solve the technical problems of traditional Chinese medical multi-link and multi-point effect mechanism's comprehensive analysis. Establish and evaluate systemic technology of traditional Chinese medical compound, comprehensive treatment methods playing the role of integrated regulation in many link, to solve the problem of TCM complex treatment efficacy advantages' evaluation.

In the field of theory, method and technology of comprehensive effect and mechanism analysis of TCM extensive research work has been done, such as the therapeutic mechanism research of TCM in the treatment of catastrophic diseases. The basic study of modern biological basis at the multi-levels of body-organ-cell-molecular, and the systematic research combined genes, proteins and metabolomics has great theory and technology foundation for the integrated research for efficacy and mechanism analysis technique and innovation of methodology. Hence, exploring systematic analysis technical route and method with combination of TCM and modern medicine theory, able to integrate related technologies, is the way to get the effect mechanism research and efficacy evaluation of TCM breakthrough.

To deal with the problems of current medical and health work. There are a lot of urgent problems existing in current

medical world with the changing of disease spectrum, destruction of ecological environment, increase of iatrogenic diseases and drug-induced diseases, and the prevalence of sub-healthy state. The experiences of TCM in preventing and treating chronic diseases and functional disorders, and the advantages of TCM at adjusting overall physical and mental state and its function, as well as the ideas and methods of advocating health wellness, can be totally borrowed in theoretical and methodologically level for solving the contradictions.

Starting from TCM's clinical advantages and characteristics, apply clinical epidemiology, evidence-based medicine and information technology, learn from modern medicine clinical efficacy evaluation methodologies and result, to establish recognized, authoritative and comprehensive clinical efficacy evaluation TCM methods, indicators system, standards and other key technologies which embodies the advantage of TCM. TCM has shaped much effective medical knowledge during the long-term clinical practice, which could supply the references for prevention and treatment of diseases. Therefore, it should not only popularize the medical knowledge of TCM for health professionals, which let them get the opportunity of knowing the basic principles and methods of TCM, the utilization of commonly used Chinese medicines and appropriate technologies, but also supply references for clinical practice. It is also necessary to promote and popularize the medical knowledge of TCM to the public for guidance of choosing right methods of TCM for prevention and treatment.

Our goal is to establish a platform for international cooperation (108) --- promotion for a combination of worldwide colleges and universities, research institutions, hospitals and production enterprises, utilization of the international scientific and technological resources, carrying out cooperation in diseases prevention and treatment technology strategies, mechanism research programs, etc., and thus providing conditions for promoting the internationalization of TCM.

Big data analysis (109,110) is becoming more prominent in modern research and even TCM needs to adapt. Of course, TCM, rooted in thousands of years of wisdom, will continue to provide the same excellent repertoire of techniques to heal a broad variety of ailments. It has created unique views on life, on fitness, on diseases and on the prevention and treatment of diseases during its long history of absorption and innovation. As ideas on fitness and medical models change and evolve, TCM has come to underline a more and more profound value. Through many innovations, its theoretical base covered more ground and its remedies against various diseases expanded, displaying unique characteristics.

In 2019, the World Health Organization (WHO) recognized TCM and included its details in the 11th version of the organization's global compendium --- known as the International Statistical Classification of Diseases and Related

Health Problems (ICD). For the first time, the ICD will include details about traditional medicines (111,112).

One of the simplest and most straightforward definitions of Artificial Intelligence was presented by John McCarthy, a professor of computer science at Stanford University, as the science and engineering of making intelligent systems. The intelligent systems could be in the form of software, hardware, or a combination of both. Hence, the central goals of AI are to make computers more useful and to understand the principles which make intelligence possible (113~115). The growth of AI is referred to as the beginning of the fourth industrial revolution (116~118). TCM rely on culture and imagery thinking, modern technology relies on objective material basis, respects the ontological characteristics of TCM, and incorporates new technologies and methods, such as the application of AI speech recognition, commercial trial of 5G communication, development of micro-sensors, virtual reality technology, high-precision sensors, construction of big network big data network platform, and self-learning knowledge system, etc., which will contribute to the construction of a new model of TCM diagnosis combining human and machine, which will be an important way to individualize and develop TCM. And high sensitivity enables AI to demonstrate its advantages over human resources in early disease identification, diagnosis, prediction, prevention, healthcare, treatment, and rehabilitation. As the integration of AI (119) and medicine accelerating in various fields, healthcare and biomedical research trends are gradually changing. AI also shows the possibility of a clinical decision support system (120~122) of Alzheimer's disease with training functional magnetic resonance imaging (fMRI). Likewise, the application of the AI system has expanded to diagnostics, interpretation, preventative, and prediction and support medical staff (123~128). AI robots can also measure mental states and changes, and even have the ability to communicate with and teach autistic children.

To summarize, the key technology of AI in the field (129~134) of TCM mainly includes image recognition, voice interaction, phonetic transcription, data mining, cognitive computing, and NLP (135). --- NLP (Natural Language Processing) is a branch of AI that allows machines to use and understand human language. Intelligent TCM will not completely replace a traditional Chinese physician for diagnosis and treatment but combine human biological intelligence with AI. There are still many variables and challenges to be addressed with more research (136), innovative thinking, and collaborative efforts for the implantation of intelligent TCM.

The virus travels through the air in a number of ways. Coughing, sneezing, or touching a contaminated surface are common ways for the virus to spread.

SARS (137) appeared suddenly in the news during March 2003, but cases of the syndrome had been observed at least be five months earlier as an unusual type of pneumonia described in Guangdong province, China. SARS is due to a

coronavirus (named for the array of projections), and this one was genetically mapped following three weeks of day and night work by Canadian researchers. SARS has been renamed Corona Virus Pneumonia (CVP), but the original term is still used.

In December health workers there had relayed their worries about this disease to authorities who, unfortunately, did not respond effectively. The first official case, with the disease being named SARS, was described later by a visiting Italian doctor in Vietnam. On February 26th, a man was admitted to a hospital in Hanoi with high fever, dry cough, muscle soreness, and mild sore throat. Over the next four days, he developed increasing breathing difficulties, severe thrombocytopenia (low platelet count) and signs of respiratory distress syndrome requiring ventilator support.

By March 18, over 200 cases and 4 deaths had been reported. During a period of just three weeks afterward, the number of SARS cases soared to over 2,000, with about 75 deaths, which triggered the alarms worldwide. The spread of the disease slowed from this exponential growth rate seen in March and early April, to a linear rate of nearly 1,000 new cases per week until mid-May while frantic steps were taken to inhibit its spread. The disease was then largely confined to China (including Hong Kong and Taiwan), where the infection rate that has since slowed further to about 600 per week.

At the end of May 2003, the WHO cites about 8,300 cumulative cases worldwide, most of them in China, Hong Kong, and Taiwan, with about 750 deaths (about 9% of those infected); the rate of new cases has declined dramatically to less than 300 per week.

Other coronaviruses are a common cause of mild to moderate upper-respiratory illness in humans; they are associated with respiratory diseases in animals; animals may also experience gastrointestinal, liver, and neurologic diseases from coronaviruses. These viruses are known to survive in the environment for as long as three hours; but with SARS there is evidence already that it can remain in the environment for longer under optimal conditions. For example, it was found to survive for two days on plastic at room temperature.

The Coronavirus Disease-2019 (COVID-19) is a grave reminder that biological threats (138), whether naturally occurring, accidental, or deliberate, can have significant and potentially existential consequences for humanity. Coronaviruses are a large family of viruses that are known to cause illness ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS) and SARS. They are a group of related RNA viruses that cause diseases in mammals and birds. In humans and birds, they cause respiratory tract infections that can range from mild to lethal. Mild illnesses in humans include some cases of the common cold (which is also caused by other viruses, predominantly rhinoviruses), while more lethal varieties

can cause SARS, MERS and COVID-19 (139), which is causing the ongoing pandemic. In cows and pigs they cause diarrhea, while in mice they cause hepatitis and encephalomyelitis. They have a large host range, which includes humans. However, the greatest amount of coronavirus diversity is seen in bats. Both COVID-19 and SARS are caused by coronavirus. And the pathogen responsibility for COVID-19 is Severe Acute Respiratory Syndrome-Coronavirus-2 (SARS-CoV-2) (formerly named as 2019-nCoV). Studies have shown that SARS-CoV-2 is a positive RNA virus with a wide natural host range, which could affect multiple system systemic functions in the human bodies. There are also other types of human coronaviruses. COVID-19, flu (influenza), and RS (Respiratory Syncytial) are all contagious respiratory illnesses but are caused by different viruses. Respiratory syncytial (sin-SISH-uhl) virus, or RSV, is a common respiratory virus that usually causes mild, cold-like symptoms. Most people recover in a week or two, but RSV can be serious, especially for infants and older adults. RSV is the most common cause of bronchiolitis (inflammation of the small airways in the lung) and pneumonia (infection of the lungs) in children younger than 1 year of the age.

Flu is a contagious respiratory illness caused by influenza viruses that infect the nose, throat, and sometimes the lungs. It can cause mild to severe illness, and at times can lead to death. The best way to prevent flu is by getting a flu vaccine each year.

For the first time since 1998, global poverty is increasing. Nowhere will the effects of this pandemic be more devastating than on the world's most vulnerable communities. The pandemic is reversing hard-fought gains in global health, including routine immunizations, maternal and child health, and the fight against tuberculosis, malaria, and HIV/AIDS, and is increasing the risk of gender-based violence. The pandemic disrupted supply chains around the world. It tested the resilience of global healthcare and systems and exposed weaknesses in public procurement processes. But the pandemic has also provided us an opportunity to learn valuable lessons. The pandemic has also disproportionately affected women and girls and significantly deepened existing gender inequalities around the world. At the same time, it will be impossible to plug urgent holes in the leaky global pandemic supply chain, outdated biological early warning and alert system, and weak public health infrastructure unless we simultaneously lay the foundation for the system we need for a better future.

The WHO plays a critical role in coordinating the international response to COVID-19 and improving the health of all people. In December 2019, there was an outbreak of unexplainable pneumonia in Wuhan City, Hubei province, China. By January 7, 2020, it was confirmed that a new type of coronavirus named SARS-CoV-2 had emerged. The WHO named the Wuhan pneumonia as COVID-19 on February 11, 2020. The COVID-19 patients showed typical respiratory symptoms

(such as cough, fever, and lung damage) and some others symptoms such as fatigue, myalgia, and diarrhea (140). As of February 17, 2020, a total of 73,332 cases of the SARS-CoV-2 infected pneumonia has been reported in China and 25 other countries, of which 72,528 cases was found in China (141).

Many respiratory diseases occur every winter but influenza is one of the most severe. Influenza typically infects 10% to 20% of the total population during seasonal epidemics, resulting in between three and five million cases of severe illness and at least 250,000 to 500,000 deaths each year worldwide. Influenza vaccine is safe and effective, and while some influenza vaccinated people may still contract mild influenza, the vaccine does protect from the most dangerous consequence of the disease, pneumonia. The influenza vaccine does not prevent other respiratory diseases (142,143) and, importantly, it does not provide protection from SARS (144,145). High vaccination coverage may reduce the number of pneumonia cases caused by influenza that might raise suspicion of SARS. Suspected SARS cases (146,147) can result in considerable disruption of health services as well as costly precautionary measures and investigations. Also, decreasing the number of pneumonia cases, through influenza vaccination, can help in the early identification of a true SARS (148,149) outbreak --- should the disease recur. Early detection is essential to keep the disease contained. As important as it is, influenza vaccine remains chronically under-used. An estimated one billion persons worldwide are at high risk of severe illness, but only 250 million are vaccinated each year, mainly in industrialized countries. Vaccination coverage of health workers is also low in most countries.

SARS is a viral respiratory disease caused by a SARS-associated (150,151) coronavirus. It was first identified at the end of February 2003 during an outbreak that emerged in China and spread to 4 other countries. SARS is an airborne virus and can spread through small droplets of saliva in a similar way to the cold and influenza. It was the first severe and readily transmissible new disease to emerge in the 21st century and showed a clear capacity to spread along the routes of international air travel. It can also be spread indirectly via surfaces that have been touched by someone who is infected with the virus. Most patients identified with SARS (152,153) were previously healthy adults aged 25~70 years. A few suspected cases of SARS have been reported among children under 15 years. The case fatality among persons with illness meeting the current WHO case definition for probable and suspected cases of SARS is around 3% (154,155).

The incubation period of SARS is usually 2~7 days but may be as long as 10 days. The illness generally begins with a prodrome of fever (more than 38°C), which is often high, sometimes associated with chills and rigors and sometimes accompanied by other symptoms including headache, malaise, and myalgias. At the onset of illness, some

cases have mild respiratory symptoms. Typically, rash and neurologic or gastrointestinal findings are absent, although a few patients have reported diarrhea during the febrile prodrome.

After 3~7 days, a lower respiratory phase begins with the onset of a dry, non-productive cough or dyspnea that may be accompanied by or progress to hypoxemia. In 10%~20% of cases, the respiratory illness is severe enough to require intubation and mechanical ventilation.

Large patch of infiltration, large area of consolidation, ground-glass shadow, diffuse lung lesion and involvement of both lungs were the main X-ray image characteristics of patients with severe SARS. Large area of ground-glass shadow with air bronchogram in both lungs indicated a bad prognosis. Chest radiographs may be normal during the febrile prodrome and throughout the course of illness. However, in a substantial proportion of patients, the respiratory phase is characterized by early focal infiltrates progressing to more generalized, patchy, interstitial infiltrates. Some chest radiographs from patients in the late stages of SARS have also shown areas of consolidation. Hence chest X-ray provides a sensitive and specific method for the diagnosis and treatment of SARS, and those present with symptoms and signs should undergo chest X-ray scanning every 1~3 days.

Early in the course of disease, the absolute lymphocyte count is often decreased. Overall white cell counts have generally been normal or decreased. At the peak of the respiratory illness, up to half of patients have leukopenia and thrombocytopenia or low-normal platelet counts (50,000~150,000/ul). Early in the respiratory phase, elevated creatine phosphokinase levels (up to 3000 IU/L) and hepatic transaminases (2- to 6- times the upper limits of normal) have been noted. Renal function has remained normal in the majority of patients.

Treatment regimens (156,157) have included a variety of antibiotics to presumptively treat known bacterial agents of atypical pneumonia (158, 159). In several locations, therapy has also included antiviral agents such as ribavirin. Steroids have also been given orally or intravenously to patients in combination with ribavirin and other antimicrobials. At present, the most efficacious treatment regime (160,161), if any is unknown.

At the end of the 19th century, TCM (162,163) was eclipsed by the profound effect of Western medicine on another epidemic that swept through China. The main western method was quarantine. Today, quarantine along with biological testing and rapid drug and vaccine development are clearly in the forefront. Yet, Chinese medicine (164) has played a role, at least to the extent of providing some action that millions of worried people in China could take while awaiting the progress of modern medical methods. TCM is not much affected by the mutation of the virus, as the herbal drugs we use have been used for thousands of years and never need to be changed.

The rate of fatality in Hong Kong and Singapore was approximately 18%, while the rate for Beijing was initially more than 52% until the 5th of May and decreased gradually to 4%~1% after the 20th of May in 2003. The dramatic reduced fatality from late May in Beijing was believed to be associated with the use of TCM as a supplement to the conventional therapy.

SARS Coronavirus (SARS-CoV) may have originated in bats and were transmitted to other animals before infecting humans. It can be transmitted from human to human through respiratory droplets, contact, and even fecal-oral transmission. The SARS-CoV-2 can manifest principally as severe pneumonia, ARDS, and Multiple-Organ-Failure (MOF), which can lead to death. The goal for the radiological emergency department is to quickly undertake the diagnosis and the evaluation of patients with suspected SARS-CoV-2 and provide frontline diagnosis and confirmation of the disease. The most common X-ray pattern is multifocal and peripheral, associated with interstitial and alveolar opacities. Chest X-ray, compared to CT, can be considered a reliable diagnostic tool, especially in the Emergency setting. So a chest X-ray may help in early detection of lung abnormalities for screening outpatients with highly suspected disease, especially in patients with an initial vegetative RT-PCR screening result.

Imaging plays an important role in the diagnosis and management of SARS-CoV-2, in particular in the case of pneumonia. CT is considered the first-line imaging modality in highly suspected cases and helps to monitor pathological changes during treatment. Typical CT feature is the bilateral distribution of ground-glass opacities (GGOs) with or without consolidation in posterior and peripheral areas of lungs, as the cardinal hallmark of SARS-CoV-2. And WHO announced that the last chain of human transmission of SARS coronavirus was broken on 5 July 2003, and thus the epidemic was over.

TCM's objective is to regulate the spirit and restore qi (the body's vital energy) to achieve optimization, to strengthen vital qi, eliminate pathogens and restore the harmony of yin and yang. According to TCM theory, there are two main strategies in antiviral treatments, namely "dispelling evil" and "fu zheng". Dispelling evil corresponds to the direct inhibition of virus growth and fu zheng corresponds to immune regulation, inflammation control, and tissue protection in the host. TCM works differently to antiviral Western medicines such as remdesivir and Paxlovid. Western medicine and Western drugs target the virus. TCM modifies our body's resistance to the virus so that our body can easily fight the virus in case one is infected.

There are mainly two ancient formulae :- (a) Sang Ju Yin [Morus and Chrysanthemum Combination]; (b) Yu Ping Feng San [Jade Screen Formula], which will include herbal ingredients that have been clinically proven to be effective for antiviral effects (for example, isatis). (a) Sang Ju Yin

(made with chrysanthemum, mulberry leaf, and six herbs) is well-known in China as a therapy for the early stages of common cold and influenza. (b) Yu Ping Feng San (made of three herbs :- astragalus, siler, and atractylodes) is a common therapy to prevent illness, its name indicating that it provides protection-like a screen of jade against invaders.

In general, there are two Chinese herbal prescriptions or formulae for SARS prevention.

Formula 1 Ingredients List

Isatis root (banlangen) --- 12g; Lonicera (jinyinhua) --- 15g; Pseudostellaria (taizishen) --- 15g; Forsythia (Lianqiao) --- 15g; Coix (yiyiren) --- 15g; Atractylodes (baizhu) --- 15g; Licorice (gancao) --- 9g

Formula 2 Ingredients List

Pogostemon (huoxiang) --- 15g; Lonicera (jinyinhua) --- 12g; Morus leaf (sangye) --- 15g; Atractylodes, fried (baizhu) --- 15g; Pseudostellaria (taizishen) --- 18g; Eupatorium (peilan) --- 9g; Forsythia (lianqiao) --- 12g; Isatis root (banlangen) --- 9g; Coix (yiyiren) --- 18g; Licorice (gancao) --- 9g

Formula 1 is for general use and formula 2 is for those of weak constitution with dampness. In both formulae, the inclusion of atractylodes and pseudostellaria reflects the idea that the pathogenic influence involved with SARS is one of damp-heat that damages qi and yin, causing weakness, fever, and dryness. Atractylodes addresses the damp syndrome and the antitoxin herbs (e.g. lonicera, forsythia, and isatis) address the heat syndrome; pseudostellaria is considered an ideal herb for tonifying qi and replenishing yin, somewhat like tremella.

We now confront COVID-19 with TCM from a unique perspective. Instead of treating COVID-19, we look towards the prevention of COVID-19. Our aim is to stop the spread of this highly infectious disease. Hence, we look to Chinese herbal medicine to tonify qi to protect and provide defense from external pathogens, disperse wind and discharge heat, and resolve dampness with aroma. Applying the qi, yin (the dampness), yang (the heat), and the five elements help to strengthen the body against the pathogens (COVID-19). If there is dampness in the body, the spleen (earth) is prohibiting the flow of the qi in the liver (wood), which creates a buildup of heat (yang). Having just one issue in the body such as the dampness sets off a chain reaction that ends up throwing off the whole-body system. One obvious symptom expressed in the quotation is the dispersing wind, which refers to an imbalance in the liver (wood) causing headaches. Another factor that we consider is the varying climates of the people who will take herbal medicine. And this concept of prevention is a classic TCM idea.

There are several ancient TCM texts that describe the application of TCM in severe flu-like disease, such as "Treatise on Febrile Diseases" or "Treatise on Cold Pathogenic Diseases" (Shang Han Lun) in the Han Dynasty and "Detailed Analysis of

Epidemic Warm Diseases“ or “Systemic Discourse on Warm Diseases“ or “Treatise on Differentiation and Treatment of Seasonal Warm Diseases“ (Wen Bing Tiao Bian) in the Ching Dynasty. These TCM texts may contain formulae which may have high potentials in treating COVID-19 cases. Another promising route is to use modern biomedical tools to identify and directly use the bioactive compounds in herbs.

We traced the origin of the formulae to an early source called “Detailed Analysis of Epidemic Warm Diseases“ (Wen Bing Tiao Bian) (165,166). We found three TCM formulae against COVID-19 in cases with mild to moderate status. (a) Sang Ju Yin; (b) Yin Qiao San; (c) Sang Ju Yin plus Xie Bai San. The following descriptions of the strategies taken by ancient TCM doctors are impressive. (a) If a patient displays symptoms of Taiyin wind-wen and keeps coughing and if the body is not very hot while feeling slightly thirsty, then prescribe the pungent-cool herbs. Sang Ju Yin is the first choice. (b) Patients with Taiyin wen disorder being afraid of wind-cold, doctors should let them take the Gui Zhi Tang first; afterwards, if the patients’ cold has been resolved but the other symptoms are still unresolved, then Yin Qiao San would be the first choice to overcome them. (c) All diseases of wen (wen bing means some kind of infectious disease) originated from the upper body part, at the hand-Taiyin (which means the lung).

That means Taiyin wind-wen, only cough, body being not very hot, light thirst, pungent and cool and drastic prescription, Sang Ju Yin is the first choice. Hence, based on the above description in classic text, Sang Ju Yin is indicated for COVID-19 patients with cough in the early COVID-19 stage. Although 80% of COVID-19 patients are classified as mild or moderate, they can develop into severe cases if viral infections in their respiratory tracts get worse. This would usually be presented as dyspnea and could develop into ARDS. In this case, Xie Bai San (167), invented by the TCM doctor Qian Yi (1032~1113 AD) will be used.

As of 4 April 2020, over one million infected patients and over 60,000 deaths were reported by the WHO COVID-19 Situation Report-75 (168). The case fatality rate of COVID-19 of 4.2% was 84 times higher than that of the flu pandemic. Although 80% of COVID-19 cases are mild or moderate, 20% of patients present with severe illness requiring further management such as hospitalization. A cohort study revealed that 201 patients with confirmed COVID-19 pneumonia who were admitted and regarded as severe status to a medical center in Wuhan City, China showing that 41.8% of them developed ARDS (critical status). As reported in hospital records, the mortality rate of ARDS was 52.4%. This implies that once developing ARDS, half of the patients could die. Therefore, interrupting the progression of pneumonia into ARDS holds the key to decrease the fatal rate of COVID-19.

From the above analysis, Sang Ju Yin and Xie Bai San could play a protective role prior to the development of ARDS, especially at the beginning of dyspnea.

DISCUSSIONS

The outbreak of the novel coronavirus (COVID-19) has posed a significant global health challenge, with TCM emerging as a potential treatment option. This article explores the role of TCM in combating the virus. This discussion aims to shed light on the effectiveness, challenges, and future prospects of integrating TCM into mainstream medical practices.

Effectiveness of TCM in Treating Coronavirus

Historical Significance

TCM has a long history of treating infectious diseases in China. Its holistic approach, with focuses on restoring the body’s balance and enhancing the immune system, has been shown to be effective in combating various ailments.

Clinical Observations

Reports from COVID-19 patients in China indicate that TCM treatments have contributed to symptoms relief, improved recovery rates, and reduced mortality. TCM therapies such as herbal medicine, acupuncture, and moxibustion have been used to alleviate symptoms like fever, cough, and fatigue.

Combination Therapy

The integration of TCM with conventional Western medicine has shown promising results. Combining antiviral drugs with TCM treatments has been found to enhance the overall efficacy of COVID-19 treatment.

Challenges and Controversies

Lack of Scientific Evidence

Critics argue that TCM lacks rigorous scientific evidence to support its efficacy in treating COVID-19. The absence of large-scale randomized controlled trials hinders its acceptance in Western medical communities.

Standardization and Quality Control

TCM involves complex herbal formulas, making it challenging to achieve consistent quality across different preparations.

Standardization and quality control measures need to be established to ensure the safety and effectiveness of TCM treatments.

Cultural Differences and Global Acceptance

TCM is deeply rooted in Chinese culture, which may pose challenges for global acceptance and integration into mainstream medical practices. Cultural differences, language barriers, and skepticism from Western medical professionals may hinder its wider adoption.

Future Prospects

Collaborative Research

International collaboration between TCM practitioners and Western medical researchers can bridge the gap between

traditional and modern medicine. Joint efforts can lead to the development of evidence-based protocols and guidelines for TCM treatments in the context of COVID-19.

Integration into Healthcare Systems

Governments and health organizations could consider integrating TCM into their healthcare systems, providing training and support for TCM practitioners. This would enable a more comprehensive and holistic approach to patient care.

Research and Development

Increased investment in research and development can help validate the efficacy of TCM treatments and identify potential active compounds. This would provide a stronger scientific basis for TCM's integration into mainstream medicine.

CONCLUSIONS

Science has proven that chronic, low-grade inflammation can turn into a silent killer that contributes to cardiovascular disease, cancer, type 2 diabetes and other conditions. As a result of this SARS experience, more research into the effects of Chinese herbs is likely to focus on the actual clinical responses to antiviral herbs. China has developed remedies for many viral infections, including hepatitis, influenza, viral myocarditis, and viral encephalitis; the population there relies on the herbs.

The most important philosophy of traditional Chinese medical ethics is that medicine is applied humaneness. The future for TCM is bright. The future for TCM profession depends on its communities of interest. It continues to gain acceptance in the consciousness of mainstream global world as a central pillar of a healthy life. When it goes global, it is necessary to understand local laws in order to protect the local development of TCM. But the professional side of practicing alternative therapies is always going to involve steps into the unknown. Practitioners must adopt to rapid changes in governance and regulation. They will have to deal with ever-evolving legal and professional responsibilities, the volatile and challenging world of health insurance, and staying relevant in a competitive market. However, to sustain the success, it is imperative to always gear up to meet the changing challenges and needs of our society.

This article highlights the significant role TCM has played in combating COVID-19. While challenges and controversies exist, the integration of TCM into mainstream medical practices shows promise. Collaborative research, standardization, and quality control efforts, as well as cultural understanding, will be crucial in harnessing the full potential of TCM in the treatment of coronavirus and other infectious diseases.

The journey of a thousand miles starts with one bold step. Last but not least, medical professionalism is important for establishing public trust in doctors.

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Citation: Prof. Dr. Willie Sai Ho Chan, "Encyclopaedia of Epoch-Making of Traditional Chinese Medicine in the Treatment of Coronaviruses", *Universal Library of Medical and Health Sciences*, 2024; 2(1): 01-21. DOI: <https://doi.org/10.70315/uloap.ulmhs.2024.0201001>.

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