Capturing the opportunities to initiate an in-depth integration of traditional Chinese medicine and western medicine

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Traditional Chinese medicine and western medicine are two medical systems

Medicine is mainly categorized into traditional Chinese medicine (TCM) from the east and western medicine from the west. The abundant practical experiences and classical medical theories in ancient China show that TCM not only studies the diagnosis, therapy, and prognosis of diseases but also focuses on prevention before disease onset and rehabilitation after therapy. These factors are characterized by the application of treatment methods, including prescription, acupuncture, and moxibustion. By comparison, western medicine utilizes modern instruments and standardized index analytical tools to evaluate diseases and perform quantitative and qualitative research in biological morphology and local positioning of life and disease. Therefore, TCM and western medicine are two different medical systems with respective advantages.

Challenges in the post-genome era

In post-genomic era, international research has shifted focus from single gene rare disorders to polygenic complex disorders, such as hypertension and hyperlipidemia. Microscopically, complex diseases are caused by abnormalities of multiple components, including different genes, cells, and tissues. Macroscopically, complex diseases are related to the integrity of these components at a whole body level. Hence, different components constitute a complete and distinctive individual, which requires individualized treatment. Furthermore, current medical development faces challenges with the rapid emergence of scientific innovation and data.

Neither TCM nor western medicine is sufficient to address these challenges

TCM and western medicine are different medical systems. These categories are distinguished from each other in terms of many aspects, including theories, clinics, and basic research. In TCM, (1) researchers are adept in quoting scriptures; (2) TCM also focuses on the concept of holism at a macroscopic level and (3) applies the theory of Yin-Yang and Five Elements. Furthermore, (4) TCM focuses on the interactions between doctors (subjects) and patients (objects) and considers a human as a combination of “xing” (form) and “shen” (spirit). In addition, (5) “sizhen” (four techniques of diagnosis, i.e., inspection, auscultation-olfaction, inquiry, and palpation) and “bagang” (eight guiding principles, i.e., yin and yang, cold and heat, exterior and interior, deficiency and excess) are applied in TCM. Moreover, (6) TCM is adapted to the experimental paradigm of nonlinear dynamics. By contrast, western medicine (1) is applied in strict accordance with experiments and measurement verifications. (2) Western medicine also focuses on the concept of reductionism at a microscopic level and (3) emphasizes microscopic substances, such as molecules and cells. Considering western medicine, (4) doctors (subjects) analyze problems of patients (objects) by using standard and routine methods, (5) modern instruments, and standardized indices. Western medicine also (6) follows a paradigm of random control experiments.

TCM focuses on the macroscopic homeostasis of the body and explains “what” life is. By comparison, western medicine explores the microscopic details of life and disease processes; western medicine also discusses “why” a specific process happens. These two medical systems exhibit distinct advantages and can be applied to solve problems at their own features and strong points.

In clinical applications, TCM can be effectively used in syndrome differentiation and treatments with compound compositions and synergy; western medicine can be effectively employed in disease differentiation and is good at applications of instruments and indices. In basic research, TCM focuses on comprehensive studies involving the whole body whereas western medicine emphasizes natural details. In drug development, TCM is effectively used for multiple drug targets to some degree; by comparison, western medicine is effectively applied for specific targets and clear effects. However, separating their respective advantages fails to yield great outcomes.

The new era demands for all-directional, three-dimensional, and multi-perspective work. Neither TCM nor western medicine is sufficient to manage the challenges. An in-depth integration of these two medical systems accounts for their great potential to provide maximum benefits because a whole system is greater than the sum of its parts to some extent.

Excavation of the Lingqu Canal for an in-depth integration of TCM and western medicine to manage the challenges

Excavation of the Lingqu Canal to manage the challenges

The integration of TCM and western medicine deals with “how” to address the challenges in the post-genome era, that is, how should researchers grasp opportunities to develop medicine in the new era. However, the mechanism by which we can integrate these two medical systems is yet to be determined. In this regard, can we learn from the Xing’an Lingqu Canal?

The Lingqu Canal is located in Xing’an County, Guangxi Zhuang Autonomous Region. This canal is connected to the Hsiang River (Yangtze tributary) and the Lijiang River (Zhujiang tributary) to link the two major southern river systems (Yangtze and Zhujiang rivers). Similar to the two river systems, the two medical systems (TCM and western medicine) are associated with each other in terms of their perspective thought patterns and application potentials; thus, these systems should be connected by a tool similar to the Lingqu Canal.

Systems biomedicine can be used to excavate the Lingqu Canal between TCM and western medicine. The concept of systems biology was initially proposed by Hood at the beginning of the 21st century when the Human Genome Project was almost completed. In systems biology, the concept of systems is applied to study all biological components and factors [1]. For example, systems biomedicine is a specific application

of systems biology in the fields of medicine and pharmacy. Furthermore, systems biomedicine encompasses all components of a biological system under certain conditions in which several methods, such as bioinformatics, are employed to reveal the complex interactions of these components and factors. Systems biomedicine also advocates all-directional, three-dimensional, and multi-perspective studies on whole life and disease processes, in which subjects (doctors/researchers) treat objects (patients/participants) individually [2].

The Xing’an Lingqu Canal simultaneously and tactfully considers not only distance but also water potential of the two river systems. Likewise, the development of systems biomedicine cannot be accomplished in an action or by individual effort; instead, this development requires cooperation in many aspects, including TCM and western medicine. Given that these two medical systems have their respective advantages, these systems should be integrated in-depth to cope with challenges in the new era.

However, respective advantages cannot be easily identified and joint points cannot be accurately determined.

As life science is a complicated field of study, it is inappropriate to assess the strengths of TCM and western medicine simply or summarily. Based on the concepts of individualization and dynamics of TCM, the two medical systems show different advantages in different parts, processes, or levels. Therefore, we should analyze their “potential energy” advantages from multiple angles to determine the joint point elaborately. These advantages are then guided in terms of their general trends to build a fluent canal to transform “potential energy” into “kinetic energy” smoothly.

Integrating TCM and western medicine at both macroscopic and microscopic levels

This paper discusses issues from clinical studies to basic research. For example, patients with either hypertension or hyperlipidemia can be treated with either TCM or western medicine, but patients with both diseases are thorny to be cured with only one medicine. Previous advantages of TCM and western medicine should be considered to develop medicine in the new era at both macroscopic and microscopic levels. Now mass spectrometry and other integrated techniques can be applied to facilitate lipidomics and detect and characterize lipids and biosynthetic enzymes comprehensively. In the new era, this development helps elucidate diverse biological roles of lipids and provides the foundation of an in-depth integration of TCM and western medicine [3].

Clinical diagnosis and treatment

In western medicine, which is effective at “bianbing” (disease differentiation), advanced medical instruments and standardized indices are used to describe and evaluate the state and degree of diseases; specific diseases are also identified after diagnosis. In TCM, which focuses on “bianzheng” (syndrome differentiation), a disease is attributed to yin or yang at a macroscopic level, particularly to the profound relationships of opposition of yin-yang, mutual rooting of yin-yang, waxing and waning of yin-yang, and mutual convertibility of yin-yang. In TCM, four diagnostic techniques are also applied in “bianzheng” and “lunzhi” (planning treatment according to diagnosis). Systems biomedicine excavates the Lingqu Canal to inherit the “potential energy” advantages of disease differentiation and syndrome differentiation. Thus, a large clinical data platform can be constructed to assess the state of an illness systematically and treat illness comprehensively.

For example, neither hypertension nor hyperlipidemia has a corresponding TCM name. These two conditions are usually classified into the categories of dizziness and arthralgia. A syndrome in patients with both diseases is “heart liver-yang access and liver kidney-yin deficiency” [4]. TCM typically uses several classical prescriptions, such as Qiju Dihuang Pill for the therapy of “nourishing yin and suppressing yang” [5]. Qiju Dihuang Pill is composed of two additional drugs, namely, Gouqizi (*Fructus Lycii*) and Juhua (*Flos Chrysanthemi*), based on the famous prescription Liuwei Dihuang Pill and can delicately modify blood lipid and blood pressure [6,7]. Western medicine treatment, which alleviates single disease and targets certain factors, elicits a definite effect, particularly a decrease in blood pressure or blood lipid. However, illnesses are sometimes a consequence of multiple disorders that require attentions to the whole body. Therefore, systems biomedicine is the preferred field. Large data platforms, standardized procedures, and complete sample data of systems biomedicine can provide a strong association of Chinese and western medicines to maximize their corresponding advantages. Systems biomedicine dynamically connects blood pressure and blood lipid, which were previously considered mutually independent, to weave a complex systematic metabolic network. Systems biomedicine also encompasses genomics, particularly transcriptomic, proteomic, and metabolomic data from one individual for a certain period, and reveal different medical risks in diverse molecular components and biological pathways across healthy and diseased conditions. Furthermore, systems biomedicine combines the compound compositions and synergy of TCM and the targeted therapy of western medicine to administer individualized medical treatments, such as

modifying a whole lipid spectrum structure of an individual to reduce his blood pressure and blood lipid simultaneously.

Basic mechanism research

TCM shows a long history and medical records of famous Chinese physicians have been collected. With the concept of holism and simple natural philosophy, as well as four traditional diagnostic techniques used in TCM, phenotypes can be observed and recorded in detail. According to “Wuxing (five elements, i.e., wood, fire, earth, metal, and water) Theory” of TCM, the physical universe was composed of these five elements. These five elements were later used to explain various physical and pathological phenomena; for example, the five internal organs (i.e., liver, heart, spleen, lung, and kidney) are placed in the center and diseases are preliminarily classified into the five major organ systems. In this theory, the interrelationship between generation and restriction of the five elements is also considered. By comparison, western medicine investigates object particles in detail. According to the concept of reductionism, studies on genotypes are conducted at microscopic levels, such as molecular pathways and factor interactions. The purpose of systems biomedicine is to combine the advantages of TCM and western medicine and to excavate the Lingqu Canal between clinical phenotypic observation at a macroscopic level and basic genotype investigations at a microscopic level. With the help of the Lingqu Canal, studies can proceed smoothly from top to bottom, from the outside in, and at macroscopic and microscopic levels.

In TCM, hypertension and hyperlipidemia are possibly attributed to “the prosperous phlegm inside infringes upon vessels,” which results in “yin-yang disharmony.” In western medicine, the metabolic pathways of lipid molecules, such as triacylglycerol, low-density lipoprotein cholesterol, and high-density lipoprotein cholesterol, are studied intensively. With systems biomedicine, disease phenotypes are accurately recorded and large clinical data are used for basic research. Principal component analysis (PCA) is then adopted to analyze lipid spectrum data to construct an interactive network of internal blood pressure and blood lipid, contributing to studying metabolic mechanism. Systems biomedicine can then combine the “Five-Element Theory” of TCM and the “positive and negative feedback mechanisms” of western medicine to study homeostasis systematically.

Drug research and development

In TCM, life exhibits integrity and is composed of different systems and dynamic processes with various

conditions. Therefore, Chinese drugs are distributed not only to specific meridians but also to the whole body. On the contrary, western medicine focuses on the details of life or disease to determine a certain target for drug development.

Chinese medicine and herbology treat multiple components simultaneously and hold huge potential for treating polygenic complex disorders. For example, a non-toxic Chinese herb called Gouqizi (*Fructus Lycii*), with sweet taste and peaceful property, is distributed to the liver and kidney meridians; this herb is included in the Chinese medicine prescription of Qiju Dihuang Pill and commonly used to nourish liver kidney-yin and suppress heart liver-yang [8]. Western medicine studies have revealed that Gouqizi contains betaine and atropine, which contribute to modifying blood lipid and decreasing viscosity. Therefore, Gouqizi is supposed to downregulate blood lipid and blood pressure at the same time [9]. Systems biomedicine combines the essence of TCM and western medicine to form a new system, which maximizes the advantages of both medicines and solves problems at microscopic and macroscopic levels.

Systems biomedicine also considers the body as “holistic.” In this field, omics data are collected and analyzed at multiple levels and at various conditions. After combining these data, researchers can perform crossover bioinformatics analysis besides biological correlation analysis. Interactions between blood pressure and blood lipid are revealed, which were previously regarded as separate or irrelevant. Other drugs, such as Gouqizi (*Fructus Lycii*), which affects certain meridians and a whole body, should be developed and individualized drugs should be manufactured. In the new era, systems biomedicine could function as the Lingqu Canal to integrate TCM and western medicine at both macroscopic and microscopic levels, transform “potential energy” to “kinetic energy,” and speed up drug development.

Summary

TCM and western medicine are two different medical systems. TCM focuses on the macroscopic homeostasis of the body and explains “what” life is; by comparison, western medicine explores the microscopic

details of life and disease processes and discusses “why” these processes occur. Systems biomedicine is used to excavate a Lingqu Canal to link TCM and western medicine; this field also deal with “how” to manage challenges and understand life and diseases because whole life and disease processes are considered from all aspects by using three-dimensional methods and multiple points of view. In summary, several opportunities should be considered to achieve the goal that “TCM and western medicine are linked and fused by the Lingqu Canal with systems biomedicine to create a new medical system.”

Compliance with ethics guidelines

Jia-Hua Qu, Bing Liu, Zhu-Qin Zhang, and De-Pei Liu declare that they have no conflict of interest. This article does not contain any studies with human or animal subjects performed by any of the authors.

References

1. Ideker T, Galitski T, Hood L. A new approach to decoding life: systems biology. *Annu Rev Genomics Hum Genet* 2001; 2(1): 343–372
2. Zhang ZQ, Zhao ZG, Liu B, Li DG, Zhang DD, Chen HZ, Liu DP. Systems biomedicine: it's your turn—recent progress in systems biomedicine. *Quant Biol* 2013; 1(2): 140–155
3. Wenk MR. Lipidomics: new tools and applications. *Cell* 2010; 143(6): 888–895
4. Huang LN. The progress of Chinese medicine treatment on hyperlipidemia. *J Zhejiang Univ Tradit Chin Med (Zhejiang Zhong Yi Yao Da Xue Xue Bao)* 2008; 32(6): 851–852 (in Chinese)
5. Liang T. Clinical study on the use of Qiju Dihuang Pill on hypertension of liver, kidney-yin deficiency. *J Med Forum (Yi Yao Lun Tan Za Zhi)*, 2013. 1: 55 (in Chinese)
6. Li W, Chen HG, You W. 60 cases of treatment of hypertension with modified Qiju Dihuang Pill. *China Naturopathy (Zhongguo Min Jian Liao Fa)* 2012; 20(2): 37–38 (in Chinese)
7. Tian DL. *Internal Medicine of Traditional Chinese Medicine*. Beijing: People's Medical Publishing House. 2004 (in Chinese)
8. Gao XM. *Chinese Materia Medica*. Beijing: Chinese Press of Traditional Chinese Medicine. 2002 (in Chinese)
9. Zhu YF. Summary of the pharmacological effects of Gouqizi (*Fructus Lycii*). *Zhejiang J Integr Tradit Chin West Med (Zhejiang Zhong Xi Yi Jie He Za Zhi)* 2005; 15(5): 322–323 (in Chinese)