转化医学研究（电子版）2011，1（2）：1－7
Translational Medicine Research（Electronic Edition），2011，1（2）：1－7

Monograph



Yu-pei Zhao, *president of Peking Union Medical College Hospital, the famous professor of surgery, doctoral tutor. He has done a number of pioneering work in the liver, thyroid, gastrointestinal surgery area, especially in pancreatic surgery, he has systematically developed the basic and clinical research on pancreatic cancer and get fruitful results.*

Editorial note: *Translational medicine is an emerging field for international medical researchers in the past 10 years breaking inherent barriers between basic medicine and drug development, as well as clinical medicine, thereby establishing a direct link between these different fields shortening the processes from research laboratory to clinical application. This article introduced the history and future direction of Translational Medicine Research of Peking Union Medical College Hospital (PUMCH). PUMC Translational Medicine Center currently focuses on common and rare diseases and has found 3 points of penetration in translational medicine, namely, pancreatic disease, lung and respiratory diseases and metabolic diseases. Readers will understand the that an efficient, mature translational medical system can competently lead China's medical field toward a more universal, beneficial, and standardized direction which will provide better prevention and prediction bringing health benefits to more people.*

Translational medicine at Peking Union Medical College (PUMC): past, present and future

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Translational medicine is an emerging field for international medical researchers in the past 10 years breaking inherent barriers between basic medicine and drug development, as well as clinical medicine, thereby establishing a direct link between these different fields shortening the processes from research laboratory to clinical application. Translational medicine involves verification and transformation of laboratory findings into new ways for diagnosis and treatment, thus benefitting patients with medical, biological, pharmacological mechanics and information technology. Therefore, translational medicine has drawn wide attention of governments and academic institutions of many countries, worldwide.

The concept of translational medicine is new, while in fact, the focus of which is not. The former Peking Union Medical College (PUMC) is deemed to be one of the cradles of "Translational Medicine" in China, and since its establishment PUMC began to emphasize on translation between basic and clinical research, making major contributions in many fields. PUMC has cultivated a large number of great masters in medical fields for our country, who were the earliest pioneers and practitioners in translational medicine in China.

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In the middle of the last century, Professor Xian Wu of Biochemistry Department of PUMC, performed penetrating and intensive researches on the relationship between biochemistry and clinical medicine proposing the "Blood System Analysis" in 1919. He postulated, according to which, protein-free blood could be prepared and the important components of blood (such as amino acids, creatine, creatinine, urea, non-protein nitrogen, glucose and lactic acid) could be detected. Besides the Blood System Analysis Professor Xian Wu also proposed the theory of protein denaturation during the IUPS 13th World Congress in Boston in 1929 in that natural protein molecule is not a long straight-chain, but a tight structure. A molecular structure formed by a connection of different sites of peptide chains via other linkages rather than only peptide linkage, causing the structure to be easily broken by physical and chemical forces changing from a regular folded type of arrangement to an irregular and loose format. This theory had important value in study on advanced structure of large protein molecules. In 1927, Professor Xian Wu began to study Chinese people's nutrition highlighting the advantages and disadvantages of vegetarian diet and meat diet in which he formulated *Minimum Nutritional Requirements for Chinese People*. He also developed numerous other creations and discussions in clinical chemistry, protein chemistry, immunochemistry, nutrition and related fields.

Professor Shihao Liu a renowned endocrinologist in China and a Professor in Biochemistry and a clinical physician in Endocrinology in PUMC devoted his life's work to the establishment and development of endocrine disciplines in China having completed much of the pioneering work in this field. Professor Liu recognized that endocrinology plays a very important role in both clinical medicine and basic medicine. He first established metabolic wards and a laboratory at PUMC early in the 1930's. In 1965 he first established insulin radio immunoassay and aldosterone assay in China. Shihao Liu's most important contribution was the study on calcium and phosphorus metabolism and partnering medical expertise with endocrinologist Xianyi Zhu. Together they performed studies on "calcium and phosphorus metabolism in osteomalacia", penetrating researches on renal osteodystrophy, fibrous gastritis, calcium and phosphorus metabolism of sepsis with 17 papers published. During the 1930s and 1940s, Professor Shihao Liu proved that osteomalacia was mainly caused due to vitamin D deficiency, internationally confirmed for the first time that vitamin D can cure rickets among infants through breast milk and first applied dihydrotachysterol for the treatment of renal osteodystrophy.

Kesheng Lin a renowned worldwide physiologist had committed himself to algesic physiology and analgesics research. He was one of very few scientists who could conduct high-level scientific research early in China making outstanding contribution to digestive physiology and algesic physiology. He was the first scientist who designed and conducted scientific experiments internationally which effectively distinguished pharmacology between peripheral and central analgesic drugs, and proved that aspirin could block impulses of sensory nerve endings which transmit pain, so as to reveal the peripheral analgesic principle of aspirin. He once injected bradykinin into his own artery and then used aspirin to relieve the resulting pain for experiencing the process and the principle of aspirin's analgesic effects. His creative researches in medical fields had been highly praised by global medical and health authorities. Kesheng Lin's scientific experiments on aspirin analgesic mechanism were considered as classic work by Wilhelm, both a Nobel Prize winner and British scientist.

After the founding of New China, the PUMC adhered to the essence of "Keep improving, and study tirelessly" and had been applying concepts of Translational Medicine throughout their scientific and medical researches. Currently, PUMC is one of National Treatment Centers for Complicated Diseases with 3 Class－1 discipline doctor degree authorization programs, 14 Class－2 discipline doctor degree authorization programs, 21 master degree authorization programs, 104 doctoral supervisors, 206 master tutors, 1 academician with Chinese Academy of Sciences, 3 academicians with Chinese Academy of Engineering, 17 young experts with outstanding contributions (both national and ministerial) and 150 elite personnel with special government allowances. PUMC has the access to a large amount of clinical information and a biological standard library, a team of the best of clinical experts, the most advanced technology and equipment and the ability to integrate, share medical advantages of resources from numerous medical institutes. PUMC has its own internationally integrated clinical pharmacology base, key endocrine laboratories with the Ministry of Health, key Medical Molecular Biology State Laboratory and National Medical and Biomedical Information Center Library. These facilities provide a solid base for the establishment of Translational Medical Center within PUMC allowing adequate preparation to establish a fully functional Translational Medical Center.

Since 2007, PUMC, cooperating with the Institute of Basic Medical Sciences, Chinese Academy of Medical Sciences has successively organized "Basic and Clinical Medicine Forum", "Translational Medicine Research" and "Translational Medicine Research Salon" as well as a

series of "PUMC Translational Medicine Forum" and "Sino-US Clinical and Translational Medical Research Forums". On September 16, 2010, PUMC Hospital officially formed the translational medical research platform (i. e. PUMC Translational Medicine Center) involving 54 academicians based in hospitals and existing medical research institutions. The Center has been recognized that Translational Medicine is not only a concept, but requires practical actions. The aim of Translational Medicine is to thoroughly analyze scientific issues with the view of major clinical demands, try to apply basic and clinical medicine in resolving problems, improving diagnosis, treatment and prevention. The development objective of PUMC Translational Medicine Center is to become a national Translational Medicine Center consistent with the establishment objective of PUMC Hospital to become one of the best hospitals in China and internationally as well. Furthermore, the study platform in PUMC Translational Medicine Center is centering on clinical research, integrating many internal departments and carrying on researches in cooperation with several research institutions across the country. PUMC Translational Medicine Center has gathered a group of top experts from medical fields to form an advisory body and set to work independent operation mechanisms in order to provide a high starting point for the Center.

The PUMC Translational Medicine Center will establish a Bilateral Contractual Employment and Special Employment system to attract outstanding Chinese talent and other countries setting up a mutual exchange and resource sharing mechanism with national and international high-level institutions. In the interim, the Center will apply overall management and coordination opening a mobile operating system to realize integration among different Institutes of Medical Science performing translational trials and research by using different modes while rapidly transferring and applying available achievements that resulted from basic medicine and drug research. Moreover PUMC will realize translation from basic medicine (identify problems) to clinical medicine (perform further research via advanced molecular biology techniques and animal models), then back to basic medicine (clinical trials) to solve major problems in clinical practice. Beijing PUMC Translational Medicine Center will make good use of abundant medical cases, clinical specialists, advanced technology and equipment and other resources to establish a national and international high-level medical research platform.

The foreseeable future will see PUMC Translational Medicine Center carry out translational medical research from the following aspects: Training specialized personnel, raising sufficient funds, establishing tissue sample bank and patient database, setting up a fully operational system through practical situations and overall planning.

The first key point is training specialized medical personnel to promote sustainable development of Translational Medicine, thus PUMC Translational Medicine Center will not only attract talent from China and other countries but also try and set up a personnel training system schooling part of the clinical research staff into becoming investigative doctors and nurses.

Secondly, development of Translational Medicine requires financial support. Current funding used is mainly from the medical institutions and national investment, while little comes from pharmaceutical companies and little non-governmental capital. Thus, a liaison mechanism should be established integrating various financial chains, to acquire financial support via other approaches such as pharmaceutical companies and non-governmental capital in addition to Government investment. This will promote various business communities to participate in research in Translational Medicine, especially from the industrial sector.

Thirdly, to establish primary platforms for Translational Medical research especially through the National sample bank of human tissues, patient database and electronic medical files of healthy people.

Fourthly, a complete system shall be established to focus on national platforms for Translational Medical research. Forty different types of translational medicine centers have been established since 2009. Evaluating this from a positive view point, China sees vigorous development of Translational Medicine, with excellent expectations anticipated and interest shown in Translational Medicine by various academic circles. But on the other hand, rapidly emerging of these centers indicates a lack of overall planning for Translational Medicine, an aspect that allows inexact, conflicting, and overlapping conditions placing this medical discipline into a "isolated" field. Allowing this to happen will lead to a waste of resources, duplication of research, low efficiency, and disunity. The PUMC is therefore attempting to build Translational Medical Research Centers on national levels, to integrate the currently available domestic resources in this field and then to involve the surrounding cities and research institutions.

Fifthly, formulate a practical program. PUMC Translational Medicine Center currently focuses on common and rare diseases and has found 3 points of penetration in Translational Medicine, namely, pancreatic disease, lung and respiratory diseases and metabolic diseases. The Center will expand the disease range depending on

the situation gradually enlarging research on Translational Medicine.

After combined efforts of several generations, Translational Medicine retained its status steadily at PUMC, taking roots, sprouting and keeping growing and we believe that PUMC will make greater progress and prove further success in this medical field. Now, penetrating research on Translational Medicine should be widely carried out in China by integrating basic medicine and clinical medicine further achieving universal health programs thereby improving the wellbeing level of all citizens. Translational Medicine industrializes research achievements which will eventually be applied to the whole population contributing to the improvement of health awareness levels of the people forming a virtuous circle. We believe that an efficient, mature Translational Medical system can competently lead China's medical field toward a more universal, beneficial, and standardized direction which will provide better prevention and prediction bringing health benefits to more people. Furthermore we expect that PUMC Translational Medicine Center can make greater contributions in this specialized field.