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Translational Medicine: New Power in Modern Medical Development

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Translational medicine is a class of medical research that proposes a two-way interaction between laboratory and clinical research[1]. Elias A. Zerhouni, the director of the National Institutes of Health (NIH), put forward the concept of "translational medicine" in the NIH Roadmap in 2003[2]. The core of the concept is to transform the basic research achievements of medical biology into practical theory, technology and methods that will bridge laboratory and clinical practice.

In recent years, translational medicine has developed rapidly worldwide. Many countries have set up translational medicine institutions and established it as a focus of research; at the same time, core journals around the world have added translational medicine columns[3-4].

Translational medicine in China can be traced back to the early 20th century. Professor LIU Shih-Hao, the founder of Chinese endocrinology, should be honored as a pioneer. The great success he gained stemmed from paying attention to the close integration of basic sciences and clinical research. He emphasized that scientific research should come from the clinic and, in turn, be applied in the clinic[5].

1 Currently, government, academia and clinicians in China are paying increased attention to translational medical research[6]

Dr. CHEN Zhu noted that translational medicine should be a "people-oriented" medical practice. With rapid social transformation and economic development, the Chinese public health system is facing a great challenge [7]. Therefore, China must accelerate the development of translational medicine and accomplish rapid application transformation from scientific research, aiming for benefits to public health.

Dr. LIU De-Pei emphasized that the establishment of translational medicine centers and the cultivation of talent should be given first priority. He also proposed "9p-3p" medicine as the goal of translational medicine in the future[8].

As a clinician, Dr. ZHONG Nan-Shan noted the developmental routes of Chinese translational medicine: "from bench to bedside", "from empirical to evidence-based practicing", and "from bedside to bench to bedside"[9].

2 Translational medicine research in China has made tremendous progress and is getting peer recognition worldwide

First, in cancer research, a series of new therapeutic targets have been found. For example, CUEDC2 plays an important role in endocrine resistance, and it can be used as a potential therapeutic target in breast cancer [10]. Dr. GENG Jian-Guo evaluated the effects of the Slit2-Robol interaction in colorectal epithelial cell carcinogenesis[11]. Dr. WANG Hong-Yang found that P28GANK was highly expressed in hepatocellular carcinoma, and deleting it

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may affect tumorigenesis [12]. Dr. SONG Jian-Guo revealed the positive correlation between FOXA2 and EMT, suggesting that FOXA2 is a prognostic marker for tumor metastasis [13]. Using a Top-flash reporter gene assay, Dr. LI Lin discovered a novel small molecule, NC043, as a new inhibitor of Wnt/beta-catenin signaling,which may be a potential compound for colorectal cancer treatment[14].

Second, in host immune research, Dr.SHI Yu-Fang revealed that leukemia inhibitory factor (LIF) can inhibit TH17 cell differentiation, which illuminated the mechanisms of neural progenitor cell (NPC) therapy in multiple sclerosis (MS) [15]. Dr. QIAN You-Cun identified that IL-17C can induce antibacterial molecules and proinflammatory molecules, elucidating the IL-17C-IL-17RE pathway as a crucial regulator in early mucosal immunity to intestinal pathogens [16]. IL-17-producing cells/dermal γδ T cells play a key role in skin inflammation, and this discovery may present a novel target for psoriasis treatment [17]. Dr. SHAO Feng expounded the mechanism of the NLRC4 inflammasome in the innate immune signaling pathway[18].

Third, in stem cell research, Dr. HUI Li-Jian presented a novel strategy to convert mouse fibroblasts into hepatocyte-like cells (iHep). More importantly, the iHep cells did not seem to be tumor prone. This study provided a new strategy for the treatment of liver cancer [19]. Dr. LEI Hu-Long studied the effect of myostatin and arginine on adipogenic differentiation and proposed a new method to improve the intermuscular fat (IMF) content in animal products[20]. In communicable disease research, a small molecule, DIDS, could partially block chloride-dependent current and disrupt the viral cycle, suggesting a new approach for developing potential anti-EV71 drugs[21]. Dr. ZHANG Xi-Zhen constructed HIV-1 virus-like particles by co-transfecting two types of plasmids into HEK293 cells, and the VLPs could elicit a specific humoral and cellular immune response, thus providing a basis for improving HIV vaccines [22]. In chronic disease study, through image-based screening, Dr. WU Jia-Rui identified that a small molecule activator of nPKCs could promote glucose-dependent insulin secretion[23].

In addition, the application of many technologies and new methods has improved the diagnosis of diseases. For example, surface-enhanced Raman spectroscopy combined with multivariate analysis can be used to detect gastric cancers [24]. Molday ION Rhodamine-B™ (MIRB) is useful for tracking transplanted stem cells through multimodal imaging[25]. Ultrasound combined with quantitative acoustic parameters provides valuable information for the early diagnosis of articular cartilage diseases [26]. A novel dual S-shaped logistic model can quantify the kinetic curves of breast lesions and effectively differentiate between benign and malignant lesions [27]. Surface electromyography (sEMG) and the Borg scale can be used to evaluate local muscle fatigue[28].

Translational medicine is a multi-disciplinary medical practice with the ultimate goal of improving the health and longevity of human. The study of translational medicine still has a long way to go before this goal is achieved. In China, the development of translational medicine is excepted to promote the integration of basic research and clinical cases, to upgrade original innovation ability of China's bio-pharmaceutical research and development, and to achieve a breakthrough in the pathogenesis of major diseases, and ultimately to improve China's comprehensive strength.

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