



PERSPECTIVES

Development of translational medicine in China: Foam or feast?



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Summary Translational medicine has been well accepted as a concept and trend in medical sciences. China is a late starter in the development of translational medicine, yet the Chinese medical community has already demonstrated its determination towards the realisation of this concept. There are many questions that need to be answered prior to when translational medicine can proceed from being a concept to reality. This paper highlights the essential requirements for developing “patients and clinic oriented” translational medicine and shares “an enriched stem cells technique” as an example of orthopaedic translation. Enormous collaborative and multidisciplinary work is required prior to when the results of scientific research can be translated into effective clinical practice.

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Introduction

“There was a widening gap between basic and clinical research”. “The clinical and basic scientists don’t really communicate”. These are the descriptions of the relationship between basic research and clinical practice by Elias Zerhouni and Barbara Alving from the National Institutes of Health (NIH) of the United States [1,2]. Actually, this gap

has already appeared during the rapid development of life sciences in the 20th century. In 101 papers published in *Science*, *Nature*, *Cell*, and other leading journals from 1979 to 1983, only five papers obtained approval for clinical application 20 years later, and only one paper showed a prominent impact on clinical practice. However, all these papers had stated that they would have significant value for clinical application [3]. It was pointed out by Professor Philip Greenland of the Northwest University that the mean time from the start of the development of a new drug until it eventually gains Food and Drug Administration approval was 14 years. Therefore, considerable efforts have been made to shorten the process from basic research to clinical application, and thus to promote the use of new drugs, new

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technologies, and new therapies for servicing our patients, which is also the initial intention of “translational medicine”.

In the United States, it took 8 years from the time “The NIH Roadmap” project was proposed in 2003 until the establishment of 60 clinical translational centres (2011). However, the development of translational medicine in China has been much faster. In just 4 years (from 2009 to 2012), more than 50 translational medicine institutions have been established in China, covering stem cells, regenerative medicine, drug development, cancer, musculo-skeletal system, leukaemia, cardiovascular, paediatrics, diabetes, etc. Academic conferences on translational medicine have been held in various cities. In the National Twelfth Five-Year Plan for the Science and Technology Development, the Chinese government also stated that “we are going to improve the level of medical sciences and strengthen the construction of key medical disciplines centred by translational medicine”, indicating that translational medicine has been regarded as a major strategy in the medical field of China. Although the establishment of translational medical platforms spread the concepts of translational medicine and met the requirement of the development of medicine in China, many issues have also cropped up during the process. For example, there are various opinions about translational medicine, but this only resulted in limited connections between laboratories and clinics, with no concrete results in practice. In addition, there is a lack of clarity in terms of the responsibility, work protocols, personnel, and evaluation systems for translational medicine projects. How translational medicine differs from conventional medical research remains an open question. Thus, it was asked: “What is the essential nature of translational medicine that distinguishes it from the conventional medical research? Isn’t what we have been doing just translational medicine? What is new about the translational medicine?”

It is true from a certain perspective that we and our medical pioneers have always been advocating and practising translational medicine. The legend of “Shennong Tastes a Hundred Grasses” is a good example, in that Shennong translated the knowledge of herbs into medications for the treatment of diseases. It can be said that the concept of translational medicine has been implemented from the very beginning of the development of medicine, but our ancestors just conducted their medical research and medical practice within the same group of like-minded individuals. The gap between basic research and clinical practice or health strategies widened as the medical sciences became more specialised. The translation between basic research and clinical application is no longer as simple and direct as it was in the past. Translational research is a grand “feast” in the medical field, so it is worthwhile to spend time on reflecting and exploring how to share the feast with everyone. Throughout those years, the practice of translational medicine in China has been focussing on “innovation”, such as the research on pathological mechanisms, treatment targets, and drug development. However, our international peers, especially those in the United States, also focused their efforts to translate current theories and technologies into effective clinical treatments, especially emphasising on the intermediate process of translation, so as to promote cooperation

between research teams and manufacturing enterprises, increasing investments in clinical trials, and optimising the approval process. Therefore, it is suggested that at least the following four aspects should be adjusted for the development of translational medicine in China.

Four aspects to be adjusted for the development of translational medicine

Aspect no. 1: adjustment of the research mode

Conventional medical research has the following trend: basic research → research findings → determine translational targets → patent application and approval → design and implementation of clinical trials and industrialisation → clinical application → find out issues → basic research. However, basic research usually did not go further after the publication of findings. Only a small part of the findings of basic research was considered relevant for clinical application(s). This approach is random in nature, and the researchers probably give up halfway through because of the time-consuming process required (Fig. 1). Even if they had persisted in their efforts, the efficiency of translation is very low because newer research projects greatly affected their progress, and may even have finally prompted them to abort their plans. This research mode is passive with a low probability and motivation towards clinical translation, because for this kind of research, the researchers are usually in the lead position and the major criterion for their performance evaluation is publication—and not clinical translation. We analysed the regenerative medicine-related patents applied from 2005 to 2009 by the Departments of Stomatology, Plastic Surgery, and Orthopaedics of the Ninth People’s Hospital, Shanghai Jiao Tong University School of Medicine. The results showed that 52% of the patents were not translated by 2011, only 3% have nearly finished the translation process (utilising the clinical application of patents as the completion of translation), 12% were being processed, and 33% were in the planning stage. Even when taken together with the patents of clinical techniques, only 7% of the patents went through the translation process. Therefore, we propose a novel research model: clinical issues and

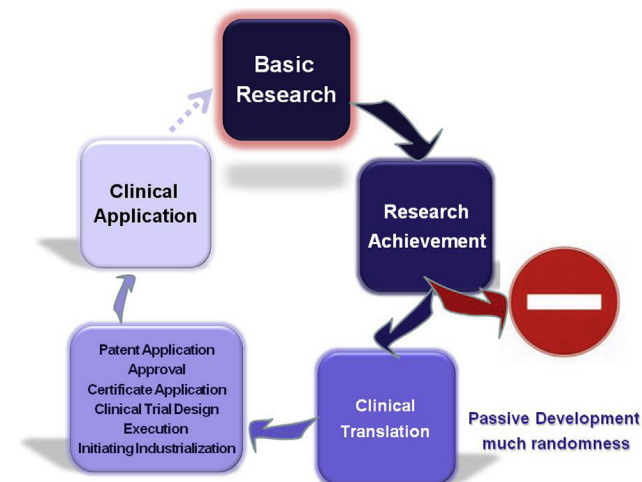


Figure 1 Traditional research pattern.

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