Editorial

Nobel Prize for Artemisinin Inspires Modern TCM Research

De-An Guo

Institute of Materia Medica, Chinese Academy of Sciences, Shanghai 201203, China, E-mail: daguo@simm.ac.cn

Half of the 2015 Nobel Prize in Physiology or Medicine was awarded to Chinese scientist Youyou Tu in recognition of her pioneering work on the antimalarial artemisinin, extracted from *Artemisia annua*, a traditional Chinese herbal remedy used to treat fever. This is clearly a great encouragement for scientists who engage traditional medicine research. As Youyou Tu stated in her Nobel Prize awarding lecture, artemisinin is a gift from traditional Chinese medicine (TCM) to the world, this definitely will generate great interest in not only TCM but also other traditional medicine systems from other parts of the world, including Europe, Africa, India, Americas, etc. Though the Nobel Prize selection committee did not confess that the prize is to award traditional Chinese medicine, rather a new drug discovery inspired from TCM, this is indeed the exciting and encouraging event for Chinese TCM scientists. In my opinion, it is meaningless to dispute if artemisinin is still belonging to TCM or western medicine. Any contribution or new discovery derived from TCM to benefit for the human health should be recognized and respected. TCM needs to be developed and modernized. Any standpoint that developed or modernized TCM does not belong to TCM may drastically hinder the TCM modernization and integration with modern medicine process, or even deepen the gap between TCM and modern medicine. Evidence-based medicine is the future of TCM by means of modern biomedicine advances and novel approaches.

In the past 20 years, TCM has undergone rapid development period evidenced by a number of achievements including the geometric growth of TCM research papers, booming TCM industry, TCM new drug research and development, etc. However, TCM is still facing grand challenges in the future development. Shortage of modern scientific evidence for safety, effectiveness, quality and mode of action should be emphasized and dealt with solutions. TCM experienced-based feature should be turned into evidence-based and science-based one. Following several aspects are suggested for the future modern TCM research: a) TCM-based new drug discovery. TCM is still a non-fully explored treasure house for new drug discovery and development. According to TCM resource survey, there are over 12000 TCM species, among which majority are herbs. Apart from artemisinin and its derivatives, a number of single chemical entity drugs have been developed and successfully marketed, such as arsenic trioxide, ginsenoside Rg_3, bifendate, β-elemene, indirubin, etc. It is anticipated that more new drugs could be discovered from this vast TCM resource with modern drug discovery technology and methodology. b) Research on the holistic TCM quality control. The current quality control approach is more focused on a single marker or a few marker determinations, which follows the western drug quality control model and hence, could not really monitor the quality of TCM products. Systemic and comprehensive quality control method should be developed for the TCM crude drugs, prepared slices and finished products, especially for those multiple-ingredient herbal products. c) Research on TCM processing. All TCM crude drugs should be processed in different extent before they can be used either for decoction or for herbal production. TCM processing method is mainly based on the traditional knowledge or experience. Mechanism of processing either for the purpose of enhancing efficacy or eliminating toxicity should be thoroughly investigated and clarified. d) TCM efficacy and safety research. During the development of TCM, greater attention needs to be paid to the integrated evaluation of the effectiveness and safety based on TCM theory and modern scientific research. New evaluation methodology fit for TCM complex feature should be developed with international collaborations. Globally recognized evaluation criteria should be constructed. Other TCM research focuses include pharmacokinetics, geo-authenticity, active principles and giant data library. It is firmly believed that TCM will contribute more than ever to the human health along with the rapid advances of biomedicine science and eventually developed into an evidence-based medicine system.