Traditional Chinese Medicine Research at the Hong Kong University of Science and Technology

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The Hong Kong University of Science and Technology (HKUST) was established in 1991 and research on traditional Chinese medicine (TCM) is one of the earliest areas of focus of the University. The HKUST looks at TCM from two different perspectives — the BRI (Biotechnology Research Institute) TCM Center focuses on the scientific and technological development of TCM in the areas of bioassay and new drug development, safety and standardization as well as reformulation; whereas the Hong Kong Traditional Chinese Medicine Research Center (HKTCMRC) researches and develops proprietary Chinese medicine products.

BRI TRADITIONAL CHINESE MEDICINE CENTER

HKUST recognizes the importance of using established scientific methods and criteria to characterize Chinese medicines, in terms of efficacy, pharmacological profile, mechanisms of action and chemical composition, so that their full medical potential could be harnessed and new insights into disease processes could be uncovered.

In 1997, TCM was designated a High Impact Area, an area of research which the HKUST regards as having a potentially profound impact on the needs of Hong Kong and mainland China. With a start-up grant from the Industry Department in July 1997, BRI at HKUST set up the BRI TCM Center. A multi-disciplinary team of experts has since been consolidated into structured TCM programs that are striving to improve the acceptance and marketability of TCM products as well as to develop new therapeutic agents.

Bioassay and New Drug Development

A variety of well-characterized bioassay systems are being utilized for screening TCM herbs/products for specific biological activities. Samples are carefully selected for investigation based on the research strengths of the faculty as well as the relevant literature information on these medicinal herbs/products. These assays are being used to identify active fractions or lead compounds for new drug development. The therapeutic areas of interest include neuro-degenerative diseases (Alzheimer’s disease, Parkinson’s disease and amyotrophic lateral sclerosis), pain and drug addiction, stroke, cancer, immune system enhancement, epilepsy, menopausal syndrome, anti-tussives and antioxidants.

In addition, the BRI initiated the High Throughput Drug Screening (HTS) Center for TCM and subsequently received funding from the Industry Department in October 1999. The Center intends to build up an integrated HTS capability to discover and identify novel drug leads from TCM. The HTS Center will develop bioassays for high throughput format, offer services in drug screening, and identify potential drug candidates for development with strategic industrial partners.

Safety and Standardization

To ensure continued growth in popularity and acceptance worldwide, TCM products must be tested and proven to meet strict regulatory guidelines. The Safety and Standardization Facility of the BRI TCM Center offers state-of-the-art analytical testing to the TCM industry. Other BRI scientists are developing new methodologies and tools for standardization. In particular, gene-chip technology is being developed for application in TCM standardization.

Reformulation

The BRI TCM Center is reformulating existing TCM products as well as developing new formulations. Reformulation of TCM products can improve their efficacy, taste, smell and appearance. Improved stability and method of delivery can also be achieved with new formulations. The BRI TCM Center is equipped for the reformulation of TCM into liquid, jelly, powder, capsule or tablet forms.
To ensure quality control, analytical testing is also being performed. For selected therapeutic indications, concurrent bioassays are available.

HONG KONG TRADITIONAL CHINESE MEDICINE RESEARCH CENTER

The fruition of a three-year project on the development of Chinese herb-based health products funded by the BRI has led to the establishment of HKTCMRC, a collaborative research venture between HKUST and Lee Kum Kee Group Ltd., in July 1996. It is the first-of-its-kind collaboration between academia and industry in Hong Kong in the area of research and development of proprietary Chinese medicine products.

Notwithstanding the long history of traditional Chinese medicines, establishing the efficacy and safety of proprietary Chinese medicine products by scientific means is important for the modernization of this practice. To this end, HKTCMRC aims to promote research on Chinese herbal medicine, particularly those used for safeguarding health, to establish the efficacy and safety of proprietary Chinese herbal medicine products by scientific methods, and to promote the standardization of Chinese medicine products in terms of efficacy and safety. So far, two Chinese herb-based health products have been launched in the Hong Kong and mainland China markets.

In summary, a wide spectrum of TCM research activities, spanning the basic to applied moieties, is carried out at the HKUST. The coordinated and concerted effort aims to pave the way for developing Hong Kong into an international center for TCM.

WHAT WILL INFLUENCE THE FUTURE OF ALTERNATIVE MEDICINE?

A World Perspective

This book provides an overview of factors that have influenced and will continue to influence the development of “alternative” (traditional) medicine in the world. Traditionally, the lack of relevant good quality scientific research is often the reason why a large number of healthcare practices are labeled “alternative”. However, nonscientific factors may be at least as important as the scientific ones. Among such factors are cultural, political, administrative, and economic considerations. The articles in this volume provide an international perspective on how such pervasive factors impact on the development, research, and practice of alternative medicine in the world.


Readership: Professionals and lay people interested in understanding the non-scientific factors that influence science and medicine.

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The Faculty of Medicine at the University of Hong Kong (HKU) has one of the longest histories in the Asia-Pacific region. It was first established as the Hong Kong College of Medicine for Chinese in 1887. With the formation of HKU in 1911, it became the Faculty of Medicine and was one of the founding faculties. Traditional Chinese medicine (TCM) was the main form of healthcare at that time. One of the objectives of the College of Medicine was to provide training for the local people in western medicine in order to facilitate the introduction of western medicine to Hong Kong and China.

Paradoxically, Hong Kong is now in a situation where western medicine plays the dominant role in the healthcare system. Although TCM continues to be used by the local people, it was not recognized by the Government until new legislations to regulate the practice of TCM was passed in 1999. Incidentally, there has been a resurgence of interest in TCM with an accompanied increase in research activities within the Faculty of Medicine as well as in other faculties in recent years. The HKU’s School of Professional and Continuing Education (SPACE) is a pioneer in TCM education. A School of Traditional Chinese Medicine was established in 1998 in order to better coordinate all the activities related to TCM. The HKU, at present, offers a wide range of TCM programs and courses at different levels for over 2000 students each year. One of the objectives of the School of Traditional Chinese Medicine at HKU is to promote research and education of TCM, a reversal of role of the Hong Kong College of Medicine, the predecessor of HKU.

According to a survey conducted in 1997, 34 projects related to basic research on TCM were carried out at HKU. These research projects were conducted by staff from seven different departments involving ten different diseases. Their research efforts have resulted in many international publications and training of postgraduate students. One of the earliest documentation of postgraduate student (graduated in 1969) research activity can be traced to the study of the hypotensive effect of *Eucommia ulmoides* Oliver (Eucommia ulmoides) Studies on the potential effect of TCM in causing neonatal jaundice were conducted in the early 1970s. More recently, seed funding was made available to encourage research in TCM. In addition, many scientists have been successful in getting funding from the Research Grant Council of Hong Kong to support their research. HKU has also received a grant from the recently established joint funding scheme by the National Science Foundation of China and the Research Grant Council of Hong Kong. With the completion of the Kadoorie Biological Science Building in 1999, researchers from the Faculty of Science have enjoyed the facilities provided by this building with state-of-the-art facilities. A new medical complex is under construction and the Faculty of Medicine will further enjoy much needed additional research space. There will be dedicated space for basic research on TCM in the new medical complex.
There is a wide variety of basic research projects ranging from the potential of *Angelica sinensis* (當歸) for the treatment of gastric ulcers, the effect of *Astragalus membranaceus* (黃芪) on neonatal immunologic functions, effect of *Salviae miltiorrhizae* (丹蔘) on intracellular signaling and cardiovascular function, suppressive effect of *Trypterygium wilfordii* Hook F. (雷公藤) on immune response, effectiveness of TCM including green tea and ginseng on lipid metabolism, and so on. Other studies include the mechanism of action of “yunzhi” (雲芝) on cancer and inhibition of cancer cell growth through programmed cell death (apoptosis) by triptolide, a compound extracted from *Trypterygium wilfordii* Hook F.

Some of the projects have been extended to clinical studies. For example, the effect of “yunzhi” on gynecological cancer patients with regards to the quality of life and recovery of the immune system after these patients have been treated by conventional therapies have been studied. The effect of “yunzhi” on lung cancer has also been studied.

Other clinical studies include the use of tongue acupuncture and certain TCM on children with short attention spans and the use of TCM in the prevention and alleviation of mucositis associated with radiotherapy in nasopharyngeal carcinoma. A double blind placebo controlled clinical trial on a health food supplement based on TCM on its cholesterol lowering effect has just begun. A pilot study on the use of TCM for the treatment of dyspepsia unrelated to peptic ulcer has also been initiated.

Although basic research is the cornerstone of most university research programs, HKU also realizes the need to bridge basic research to applied research and technology transfer. Several projects are being considered for collaboration with industrial partners to bring new products into the market. Additional research is also being conducted by team members from the International Research Program on Traditional Chinese and Natural Medicine in the Faculty of Medicine. This unique program will utilize a special platform for batch-to-batch consistency of TCM and natural products. ChemBioPrint® is a patented technology used to provide not only a chemical fingerprinting of the chemical constituents but also the biological fingerprinting of the herbal product.

Chemistry researchers from HKU also have a drug development program. They use lead compounds identified from TCM for further studies. These new compounds may not only have unique properties but can also be patented as new drugs in the future. In collaboration with the Ministry of Science and Technology, the Innovation Center for Drug Development was established to work closely with the School of Traditional Chinese Medicine.

There has been increasing awareness on the need for implementing Good Clinical Practice (GCP) in clinical studies. To this end, the establishment of a Clinical Trial Center in the Faculty of Medicine and the provision of GCP training will be invaluable for the development of new products from TCM for specific clinical use. The need for institutional human ethic approval, informed consent, data management, data monitoring and the use of case report forms will be emphasized. Furthermore, the HKU is gaining experience in quality of life assessment, an important element in the evaluation of the usefulness and effectiveness of TCM, in addition to the assessment of primary and/or secondary outcomes of the treatment with TCM.

In order to further its efforts on TCM research, several visiting professors have recently joined HKU. Their experience and expertise range from the phytochemistry of TCM plants, pharmacology of TCM, clinical know-how and practice of TCM to the authorship of very successful books on herbal medicine. Several more visiting professor appointments will be made shortly to enhance the university’s research efforts and capability.

From the discussion above, it is clear that HKU has adopted multi-disciplinary as well as collaborative approaches in the development of its research program in TCM. In conclusion, the university hopes that collaborations within Hong Kong and with leading institutions in China and western countries, the School of TCM will contribute to the development of Hong Kong into an international center for TCM research. It also hopes that more research towards further understanding of the science and art of TCM will be conducted.
At the Department of Community, Occupational and Family Medicine at the National University of Singapore (NUS), a group of scientists are carrying out research on several traditional Chinese herbs and their effects on cancer.

Professor Ong Choon Nam, the principal investigator of the project, explained that the study of traditional Chinese medicine (TCM) can be divided into two main aspects — treatment and prevention using TCM methods, and medical use. His main focus is on the latter, and his team is looking at general toxicology and the prevention of illnesses using certain compounds, also known as chemoprevention.

HEPATOCELLULAR CARCINOMA

In a project funded by the National Medical Research Council (NMRC) and carried out in collaboration with the Kandang Kerbau Children and Women’s Hospital, Professor Ong’s team is looking at the efficacy of “danshen” against chronic hepatitis and other liver diseases. Known scientifically as *Salvia miltiorrhiza*, “danshen” is a herbal plant used extensively in TCM for the treatment of cardiovascular and liver diseases. Recent findings by Professor Ong’s team have also suggested that it has some anti-oxidative capabilities against cytotoxicity and carcinogenicity of aflatoxin B1 (AFB1).

Aflatoxins are toxins produced by a mold that grows on crops such as peanuts, tree nuts, corn, wheat, and oil seeds. Epidemiological studies have suggested a strong association between exposure to contaminated foods and a high incidence of liver cancer.

In both in-vitro and animal studies, the NUS team has found that “danshen” causes death of cancer cells. Oxidative damage usually refers to the impairment of cellular components, such as enzymes and nucleic acids, by free radicals. In experiments conducted on AFB1,-
infected rat cells, “danshen” was found to reduce the level of free radicals and the scientists deduce that “danshen” may be functioning as a scavenger. However, the actual mechanism for “danshen”’s efficacy is still a mystery.

Interestingly, although the scientists have isolated the active compounds in “danshen”, they found that the extract actually works better than the pure active compound. Indeed, research has shown that consumers receive more nutrients from eating an orange than merely taking vitamin C tablets. The mechanism for such a phenomenon still needs to be investigated, although scientists believe that other compounds present in the extract could have contributed to the better overall performance.

NASOPHARYNGEAL CARCINOMA

Nasopharyngeal carcinoma, or cancer of the nasal passage, has the highest occurrence in Guangzhou, China and according to Professor Ong, it affects mostly people from the southern parts of China. In Singapore, it is ranked sixth among the various incidences of cancers. However, this type of cancer appears to be uncommon among Caucasians, Indians and Malays.

As this disease seems to predominantly affect Chinese, the China Medical Board has established a tie-up with the NUS to sponsor Chinese researchers to spend about six months in Singapore to carry out research on this subject.

As the team went through literature on nasopharyngeal carcinoma, it found that chrysanthemum is frequently used in TCM as an anti-inflammatory agent. At the same time, European medical literature also describes the use of a type of chrysanthemum, known as “feverfew” (and as the name implies) to reduce the temperature of fevers. Chrysanthemum, like danshen, appears to exhibit antioxidative properties.

Upon selection of the herb, the team decided to study the effects of chrysanthemum on colorectal and nasopharyngeal carcinomas. It will attempt to isolate the active ingredients that would contribute to anti-inflammation and study how it will affect apoptosis and gene regulation. Certain studies have shown that some of the active compounds can affect the expression of genes which affect inflammation. On the other hand, colorectal carcinoma was also chosen as an area of study because literature references in this area are relatively rich.

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