The field of psychoneuroimmunology – the study of relationships between the nervous and immune systems – has pioneered significant discoveries in areas like stress, mindfulness, ancient exercise, and dietary interventions. The Psychoneuroimmunology Research Society (PNIRS) formed a Chinese branch in 2012, and following its success, expanded to include all of Asia–Oceania. Keith W Kelley of the University of Illinois, and collaborators, review the growth of this endeavour and recent contributions to biomedical research from the countries of Asia–Oceania.

Psychoneuroimmunology is a relatively new field of biomedical scientific research that explores the relationship between the nervous system and the immune system. In recent years, countries in Asia–Oceania have made significant strides in this field. The Psychoneuroimmunology Research Society created an official Chinese regional affiliate in 2012, which was so successful in advancing science in this area that it expanded to the whole of Asia–Oceania. The growth of this endeavour is documented in this article, as well as recent developments of research in China, Taiwan, Australia, and Japan.

**Research Expenditure**

Expenditure on biomedical research and development is an indicator of a country’s wealth and the value it places on the health of its citizens. In addition to the country’s total spend, the trend in expenditure over time is an important indicator of development. The most recent summary of a six-year period from 2007 to 2012 shows that public and private research expenditures declined in all of Europe and the USA, but increased in Japan, Taiwan, India, Australia, Singapore, South Korea, and China. Thanks to this increase in biomedical investment, psychoneuroimmunology research is on the rise in the Asia–Pacific region.

The increased prosperity of the biomedical research industry in the countries of Asia–Oceania has facilitated competition between countries for the best research scientists. It has provided more opportunities for Asian–Oceania scientists who have trained elsewhere to return to their home countries to work. Many have developed collaborative research programmes with Western scientists with whom they trained. More opportunities were created for scientists from other countries to work abroad if they choose. The increased investment in biomedical research in Asia has therefore increased opportunities for scientists worldwide and resulted in advancements in biomedical discoveries.

**PNIRS China**

Biomedical research efforts in China and in Western countries were relatively independent of each other until the early 21st century. In 1993, a global non-profit society called the Psychoneuroimmunology Research Society (PNIRS) was formed to promote the study of interactions between the nervous and immune systems and the relationship between behaviour and health. The society formed the Chinese branch of PNIRS in 2012 to recognise the growing importance of biomedical research in China.

Traditional Chinese medicine (TCM) encompasses the balance between body and mind – namely the communication between the brain, hormonal, and immune systems. TCM has formed a conceptual basis for modern psychoneuroimmunology, so collaboration between Eastern and Western scientists enables better understanding of effective health practices for populations worldwide. The main goals of PNIRS China were outlined at its first meeting in Dalian, China, in 2013 and were threefold: 1) to conduct basic research that could be translated into clinically relevant health applications; 2) to promote relationships between scientists of different disciplines; and 3) to build a platform of academic communication for psychoneuroimmunology researchers. A committee was formed to organise symposia and other outreach approaches to share psychoneuroimmunology knowledge between Chinese and Western scientists. Since the initial meeting, six more symposia have taken place across China.

**Brain, Behavior, and Immunity**

Brain, Behavior, and Immunity became the official journal of PNIRS in 2000. Year after year, it is ranked in the top 15% of worldwide immunology and neuroscience journals, and the top 10% of all psychiatry journals. As such, Brain, Behavior, and Immunity continues to be recognised globally as ‘the best immunology journal in the neurosciences’.

Initially, American scientists were the main contributors to the journal. Now, 17% of all submissions originate from China, making it the second leading country to submit content to the journal. The papers published are of high quality, as shown by the number of citations (three of the top ten most highly cited papers between 2015 and 2016 were from Chinese laboratories).

**PNIRS Asia–Pacific**

Following seven successful symposia in China, efforts expanded to the whole of Asia–Oceania, including countries in North, South, and Southeast Asia, as well as Australia and New Zealand. PNIRS Asia–Pacific was therefore rebranded as PNIRS Asia–Pacific in 2017. Since then, nine further symposia have taken place in countries outside of mainland China, including Taiwan, Australia, Japan, South Korea, and New Zealand. A summary of all symposia, as well as photos of the speakers, can be found online here: www.pnirs.org/pnirsasia-pacific

**Global Research Connections**

According to data on post-doctoral training, collaborative studies with each other and with laboratories around the world. Any interested scientist can register here: pnirs.illinois.edu

**China**

China is now the second leading country publishing in top-ranked science publications, thanks to increased expenditure on medical research and development. The Chinese Academy of Sciences is now the fifth most prestigious institution in the world. The first Chinese academic to receive a Nobel Prize in Physiology or Medicine was Professor Tu Youyou in 2015. Her interest in Chinese herbal medicine contributed to the discovery of a plant extract known as artemisinin, which is effective against the organism responsible for malaria. TCM is one of the world’s oldest medical approaches and is based on achieving balance between the mind and body. Some practices include tai chi, herbal medicine, acupuncture, meditation and massage. Integrative medicine takes into account all aspects of lifestyle and combines alternative therapies with conventional medicine. Research in the past two decades has produced increasing evidence that immune disorders can be a feature of nervous-
The coronavirus pandemic makes it more necessary than ever to promote global collaboration to discover solutions to improve health worldwide.

Keith W Kelley

Bio
Keith W Kelley is Professor Emeritus at the University of Illinois. He was awarded 30 consecutive years of NIH grants and has published more than 350 peer-reviewed scientific papers and book chapters. Professor Kelley served as Editor-in-Chief of Brain, Behavior, and Immunity from 2003–2017. Brain, Behavior, and Immunity is ranked in the top 15% of all immunology, neuroscience and psychiatry journals. Dr. Kelley initiated the concept of promoting East-West communication for PNIRS and continues to lead the organisation of collaborative PNIRSAsia–Pacific symposia throughout Asia.

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Personal Response

What are the next plans for PNIRSAsia–Pacific?

Although the coronavirus pandemic is currently challenging the goals of PNIRSAsia–Pacific plans are being made for moving forward. We continue to seek opportunities to identify new scientific societies that would like to learn more about the newest discoveries in immune–brain interactions. The PNIRSAsia–Pacific committee will then identify expert speakers and organise a symposium for their annual meeting. Biomedical research scientists throughout the whole of Asia will be identified using the PNIRSAsia–Pacific Global Connections website to establish a broad database. Collaborative research endeavours among scientists in Asia and throughout the world will be promoted and highlighted.

Keith W Kelley and co-authors

Behind the Research

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