

DISEASE FIGHTERS: DRUGS FROM THE DESERT AND BEYOND



Zhou Demin is developing new bio-therapeutics by integrating chemistry with biology.

Peking University (PKU)'s School of Pharmaceutical Sciences has been committed to improving health through drug discovery translation since its founding in 1941. Renowned for its outstanding faculty, cutting-edge research and quality education, the school provides an exciting and engaging environment for students, preparing them as next-generation leaders in pharmaceutical sciences. Its notable alumni include Tu Youyou, whose discovery of Artemisinin, an anti-malaria drug, led to her becoming China's first Nobel laureate in natural sciences.

The school is a consistently innovative force in drug discovery, and has made unprecedented progress in vaccine research with the generation of live replication-incompetent virus vaccines. Led by Zhou Demin, the school dean, the PKU research team expanded the genetic code of the influenza A virus genome via a transgenic cell line and generated viruses with premature termination codons (PTCs), which, while fully infectious, could not replicate in normal cells, and are unable to cause disease. Vaccination with such live viruses elicited stronger protective immune responses in mice, ferrets, and guinea pigs when compared with conventional flu vaccines.

This technique can be used to generate vaccines of almost any viruses, without the need for knowledge of their biology, as long as their genomes can be manipulated and

packaged in a cell line, said Zhou. "It may become a standard means of generating safer and more potent live virus vaccines efficiently, assisting control of pandemics of influenza and other life threatening viruses."

PKU School of Pharmaceutical Sciences has launched China's first drug innovation centre, the State Key Laboratory of Natural and Biomimetic Drugs. In the tradition of integrating natural medicine with modern sciences, the laboratory has a vibrant culture of openness, cooperation and cross-disciplinary work.

A key member of the laboratory, Tu Pengfei, also the chair of the Department of Natural Medicines, spearheads research on traditional Chinese medicines (TCMs), including their bioactive constituents, repurposing and quality evaluation. In their attempts to decode the therapeutic mechanisms of *Cistanches Herba*, a perennial parasitic desert herb often used as a tonic in TCM for treating kidney deficiency and impotence, his team's in-depth phytochemical investigation isolated and identified 172 compounds, including 26 effective ones. They also purified 17 novel polysaccharides, including six with immunologic competence. Their uncovering of the therapeutic potential of phenylethanoid glycosides (PhGs), a water-soluble natural extract from *Cistanche tubulosa*, for Alzheimer's, Parkinson's, and coronary artery diseases has led to the development of a new drug against vascular

dementia (Memoregain®), expanding the use of *Cistanches Herba*.

In response to ecological destruction of the endangered wild species of *Cistanche*, Tu's group has also developed approaches for cultivating these parasitic plants, solving the resource shortage problem and contributing to sustainable desert control in western China.

Another professor from the laboratory, Zhang Qiang, is an expert in designing drug delivery systems. Applying nanotechnology, his pioneering work in molecular pharmaceutics has yielded nanomedicines for targeted cancer therapy. By designing and engineering different nanoparticles, he disclosed the mechanisms for interactions between nanocarriers and cells or tissues, and found a way to increase cell uptake. The work shed light on better manipulating the bio-nano interaction to improve biocompatibility and diagnostic or therapeutic efficacy of nanomedicines.

Zhang's research has resulted in more than 40 domestic and international patent applications, and a series of novel drug delivery products approved for clinical studies or marketing. One oral nanomedicine has become the star product of a major domestic pharmaceutical company, having brought in significant economic and social benefits. As one of China's most prolific authors in drug delivery, Zhang's research was highly cited, garnered numerous awards, and boosted pharmaceutics research at PKU and nationally. ■



Tu Pengfei and his group have been studying *Cistanche* plants for 27 years.



Zhang Qiang's molecular pharmaceutics research has led to improved drug delivery systems.