

# Big data analysis to boost TCM

Health scientists expect technology will lead to a better understanding of traditional Chinese medicine

By DAVID BLAIR

When the human genome was first decoded in the year 2000, scientists expected rapid progress in figuring out how genes affect human characteristics and disease. But that has taken longer than anticipated.

The problem is that most diseases are caused by the interactions of a large number of genes, not just by one or two individual genes.

Classical statistical analysis is used to find correlations between just a few factors. Additionally, it requires researchers to build models based on prior views of what is important.

But big data sets and the techniques used to analyze them are able to find much more complicated patterns that might not have been thought of by the researchers. So, since big data has become available, scientists have made much more rapid progress in genomic analysis.

Jay Siegel, dean of the Health Science Platform at Tianjin University, points out that traditional Chinese medicine (TCM) also depends on complex inputs and, therefore, can benefit from big data analysis.

"TCM looks at the whole system, as opposed to Western medicine, which is more reductionist and focuses on one or a few effective elements," he said.

"One of the problems when you have small data sets and when you use classical statistics is that you need a model that is relatively elementary in order to get statistically significant results. But when you have huge amounts of data and you can process this in a much more sophisticated way, you can start looking at analysis of entire complex systems.



Jay Siegel (right), dean of the Health Science Platform at Tianjin University, instructs his students at the university. He says the study of traditional Chinese medicine — a synergistic, complex system — can benefit from big data analysis.

"I think modern big data analysis is going to lead to a much better understanding of where and when and why some TCM preparations are effective and others are not," Siegel said. "I think that is going to lead us to a new understanding of this balanced health where you can take advantage of nutrition and your

daily behavior, but you can also take advantage of things that don't have to be reduced down to a single element.

"In TCM, there are these very complex ways of preparing groups of herbs, called *pao zhi*. You can't really easily say that one component in a plant is the active ingredient," he said.

"Western medicine tries to pull

out one molecule. Maybe mix it with another molecule to discover new therapies. In TCM, there are mixed quantities of these herbs, changes in the way you prepare them, changes in the season you collect them. So you have a very complex system which is not going to lend itself to just being simplified into one pure

substance. TCM is a synergistic, complex system and we need to find ways to study that," Siegel said.

"Big data is going to help. Having more data is going to allow us to analyze a more complex model, and that more complex model is going to give us a better understanding of how and why these things work."

## >> FROM PAGE 10

"The main issue about how China can be the world leader in smart health is the data-sharing mechanism. Every department has a lot of big data and perfect records. But no policy makes it easy to share the data in different departments. Every department has perfect data, but it is very hard to get data across to a different department."

Liu Guoen, professor of economics and director of the China Center for Health Economics Research of the National School of Development at Peking University, said: "One big condition for the development of big data in China is legal regulation and legal procedures for the efficient use of big data.

"Right now, for example, we do have so many big data sets all over

China from hospital claims data, hospital clinical data, insurance claims data, national insurance data and so forth. But we do not have good access to them. If we don't use it, it is a big waste," Liu said.

"The most important thing is to create legal and transparent rules that give access to big data, while still protecting legitimate needs for privacy, confidentiality and secrecy."

Treating chronic-disease patients is very expensive for the healthcare system because the patients need lifelong care. It is hard because it requires big changes in patient behavior. Wearables — such as watches with heart rate sensors and glucose sensors that can be embedded under the skin — combined with AI routines that give continuous real-time information to doctors



Dong Chaohui, vice-director of the National Institute for Social Security of the Ministry of Human Resources and Social Security.

and guidance to patients, have the potential to help solve this problem.

"I anticipate that within the next three to five years, you will see these things begin to roll out, particularly things using body sensors and real-time detection as a way to monitor diagnosis and treatment," said Siegel, of Tianjin University. "We are very close to seeing lots of advances in this."

In October last year, President Xi Jinping announced the Healthy China 2030 blueprint to reform the country's healthcare system.

The plan emphasizes that the current system, which is based on large hospitals in big cities, cannot deal effectively with the needs of the population. Increasing the capability of local clinics and family doctors is key, especially for patients

with chronic diseases or conditions such as diabetes, high blood pressure or cardiovascular disease. It also calls for more emphasis on helping people stay healthy, not just treating disease after the fact.

The blueprint emphasizes four core principles: Health as a development priority, innovation, scientific development, and fairness and justice. So technology is an enabler, but organizational change is needed to take full advantage of the opportunities, experts say.

Zhang Jianmin, health business director of Sunshine Insurance Group, said: "For the next 10 years, reform of the Chinese medical platform will have the biggest impact. What could be revolutionary is not smart health, but reform of the healthcare system."