



Supporting globalisation of Traditional Chinese Medicines

支持中医全球化

Institute of Pharmaceutical Innovation
英国**IPI**制药创新研究院

What is the IPI?

- **A world-class research centre in predictive pharmaceuticals, focused on designing and improving medicines, including TCMs**

世界一流的擅长于预测制药学的研究中心，致力于加快医药研发的速度

- **A Centre for new Bioscience Businesses**
新生物科学中心
- **An accredited Centre of Industrial Collaboration**

英国政府授权的工业合作中心



IPI support to Traditional Medicine

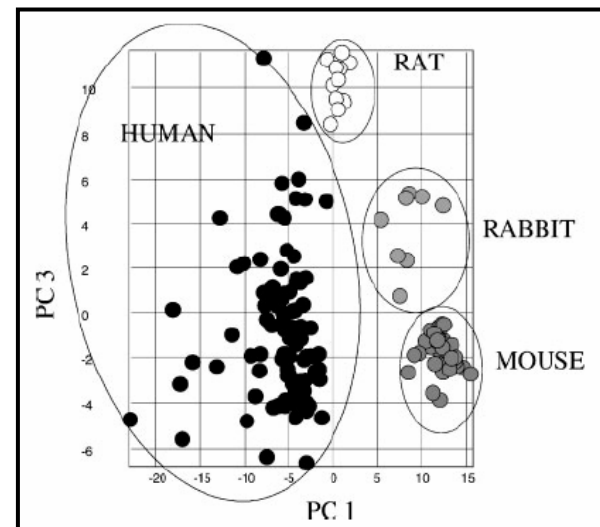
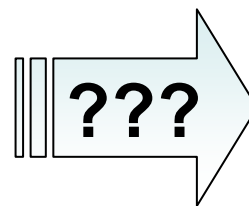
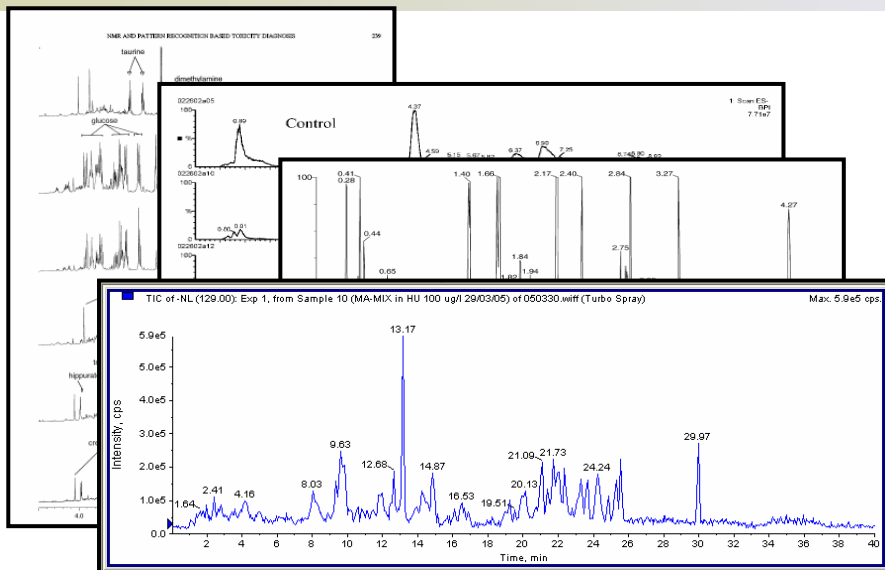
- **Developing underpinning science**
开发支撑学科
 - **Knowledge engineering - finding new relationships in data**
知识工程 – 在数据中寻找新的相互关系
 - **Development of analytical techniques**
分析技术的开发
 - **Deformulation and reformulation**
混合物的分离和再合成
- **Contributing regulatory advice to MHRA**
Chemistry and Pharmacy standards
向**MHRA**提供有关化工和制药法规方面的建议
- **UK-China Health Care Working Group**



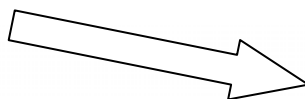
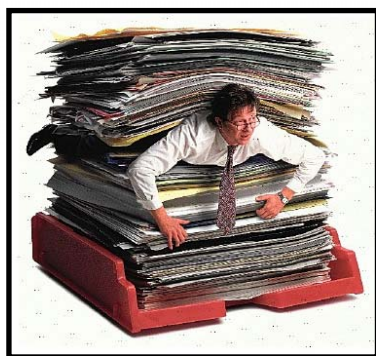
What is knowledge engineering and how can it help?

- **Conventional approaches to clinical research use statistical methodologies, which can only deal with a limited number of clearly defined variables** 现在的临床研究应用传统的统计学手段，这种方法只能有效地处理有限的和定义清楚的变量
- **Knowledge engineering (artificial intelligence) based approaches can deal with a large number of variables, including fuzzy (e.g. 'warm') data** 基于知识工程（人工智能）理论的技术可以处理大量的变量，包括模糊数据（例如，暖和）
- **Knowledge engineering can find hidden rules and new relationships in data** 知识工程技术可以找到隐藏在数据中的规律和新的交互关系
- **In some circumstances knowledge engineering can explain why TCM works** 在某些情况下，知识工程技术可以解释中药的治病机理

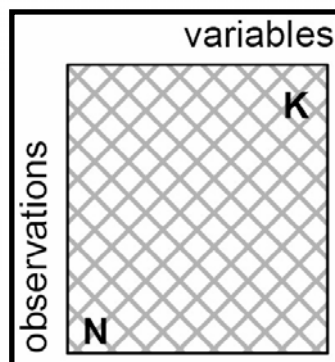
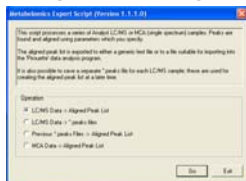
Data \neq Knowledge



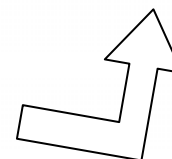
Visualisation



Metabolomics
Export Script

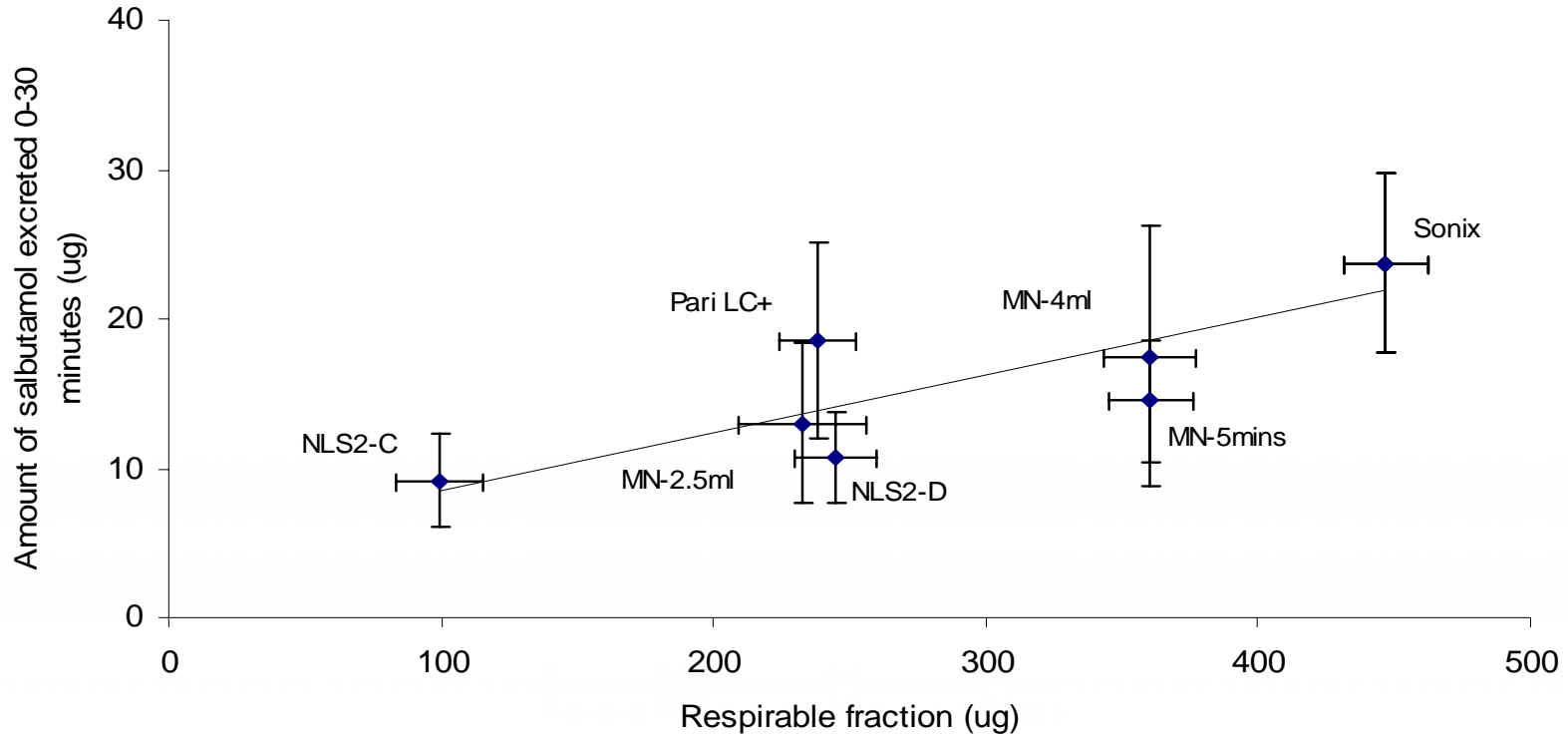


Matrix



SIMCA-P

IVIVC for inhalation therapy



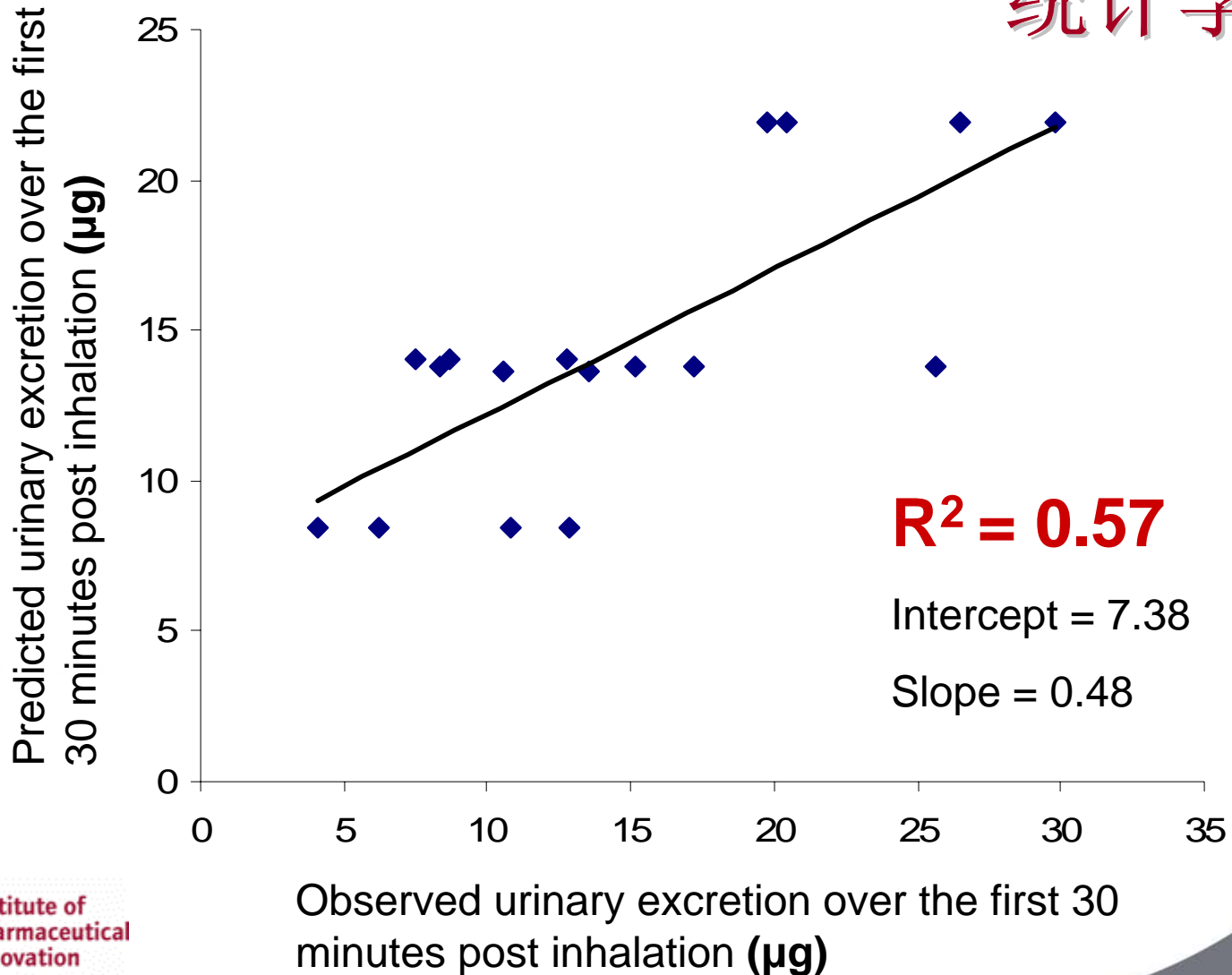
General trends observed but full understanding of all causes of variability and factors affecting in-vivo performance not fully defined

Variables	The data range
Gender	F, M
Age (years)	24 – 55
Body surface area (m²)	1.69 – 2.23
Amount of particles in size range 14.8 – 21.8 μ m inhaled (μ g)	3.5 – 32.8
Amount of particles in size range 9.8 – 14.8 μ m inhaled (μ g)	11.6 – 87.8
Amount of particles in size range 6 – 9.8 μ m inhaled (μ g)	39.9 – 97.3
Amount of particles in size range 3.5 – 6 μ m inhaled (μ g)	42.2 – 250.4
Amount of particles in size range 1.55 – 3.5 μ m inhaled (μ g)	34.2 – 170.1
Amount of particles in size range 0.93 – 1.55 μ m inhaled (μ g)	9.6 – 37.4
Amount of particles in size range 0.52 – 0.93 μ m inhaled (μ g)	4.8 – 37.7
Amount of particles in size range less than 0.52 μ m inhaled (μ g)	2 – 15.5
Breath-enhancement	Yes (1)/No (0)
Mode of nebulization	Constant(0)/Dosimetric (1)
Urinary salbutamol excreted at 30 minutes post inhalation (μ g)	4.1 -35.3

The list of variables evaluated using ANNs and associated data ranges

Statistical modelling approach

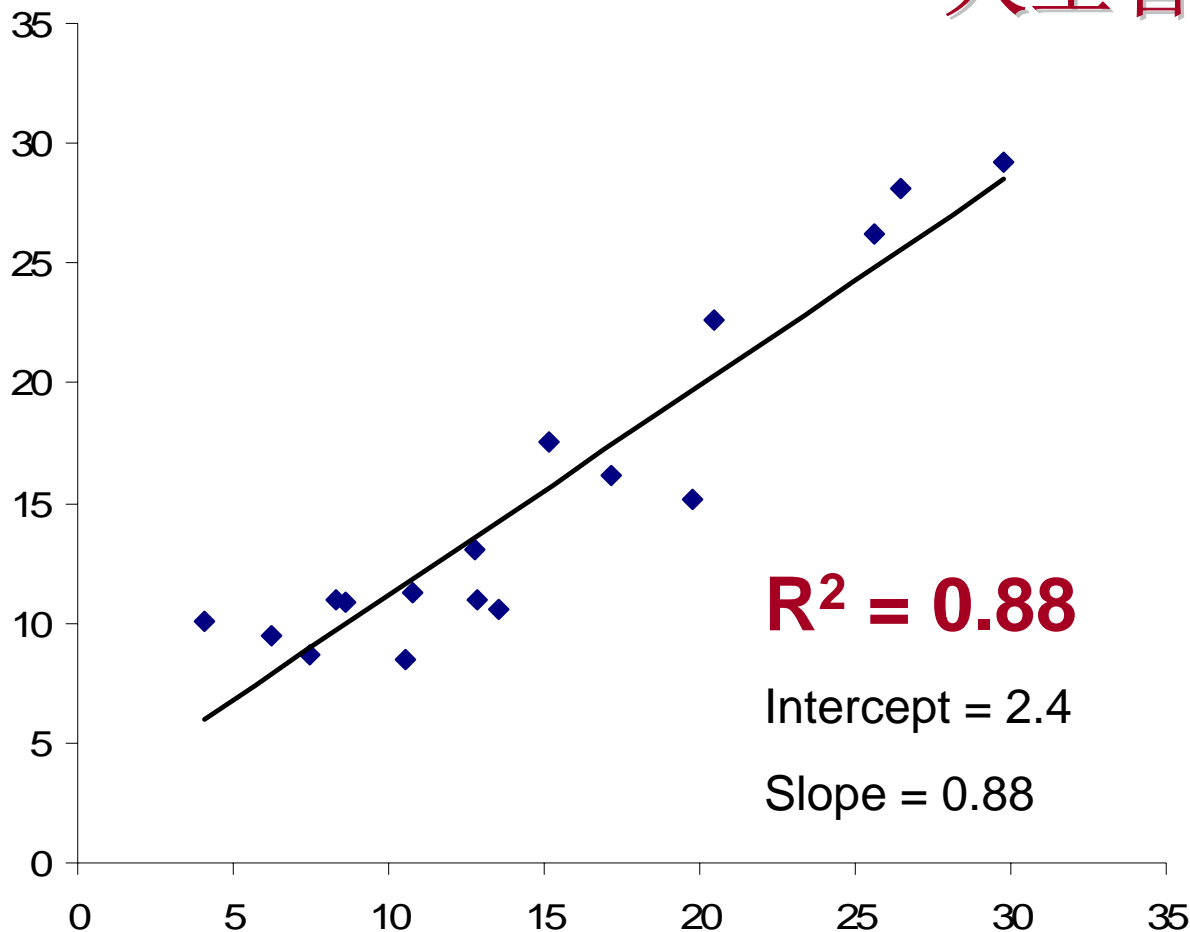
统计学方法



Artificial intelligence approach

人工智能方法

Predicted urinary excretion over the first 30 minutes post inhalation (μg)



Observed urinary excretion over the first 30 minutes post inhalation (μg)

Ongoing IPI research collaborations in TCM (1/2)

- **TCM diabetes research programme**

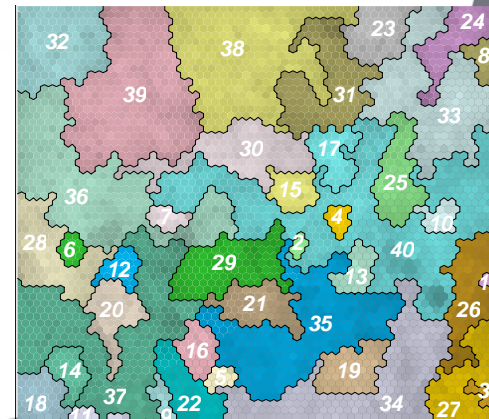
中药糖尿病复方的研究

- **Explaining how current TCM diabetes therapies work**
解释中医糖尿病疗法的致病机理

- **Finding new therapies**
寻找新的疗法

- **Partnership between IPI, Zhejiang Chinese Medicine University, Shanghai Institute of Material Medica, Jilin University**

合作伙伴包括英国**IPI**只要研究院，浙江中医大学，上海药物研究所，吉林大学



TCM and Modern Biopharmaceutics Theory

中医和现代生物制药学理论

- **Apply advanced bioanalytical science to clinical regimens of TCM medicines and treatment**
将先进的生物分析技术应用于中医药临床治疗
- **Link 'input' and 'output' data using computer based data interrogation technologies**
应用基于数据分析手段的计算机技术，将“输入”和“输出”数据关联起来
- **Discover determining factors in achieving patient benefit and 'hidden knowledge' using KE/AI tools**
应用知识工程/人工智能工具，发现获得疗效的决定性因素和“隐藏的知识”

TCM diabetes research programme

Chemical Fingerprints

化学指纹

Metabonomic Fingerprint

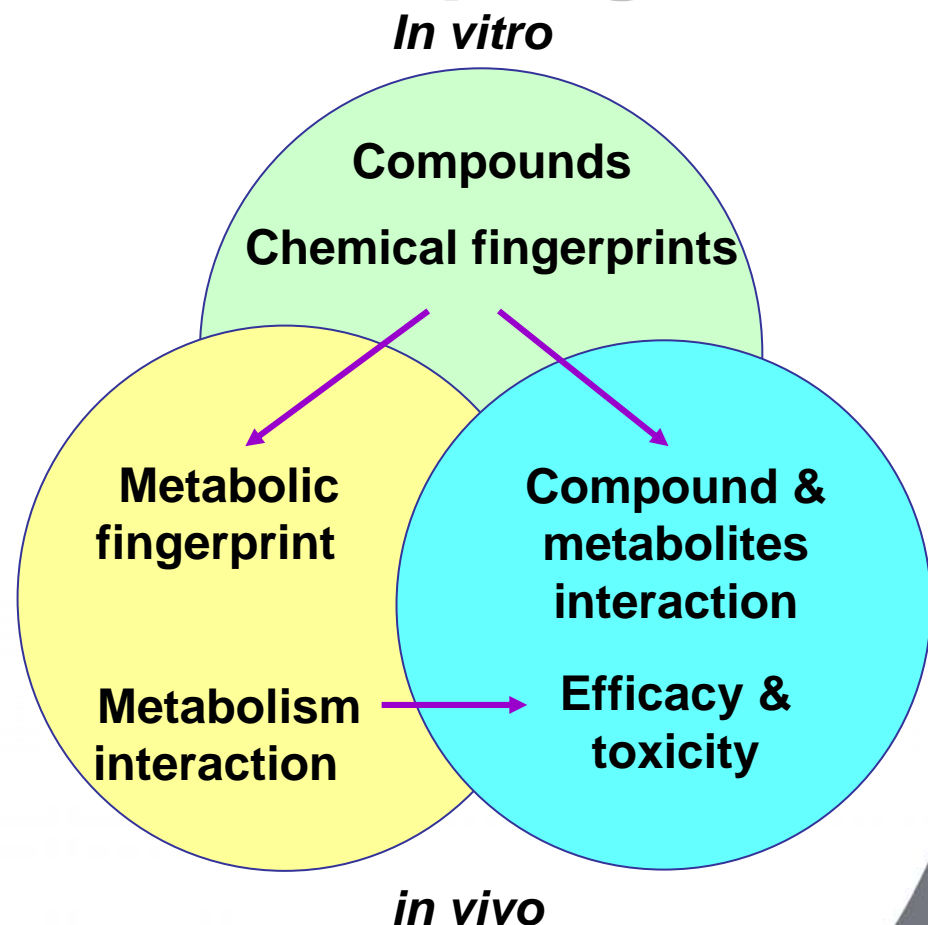
代谢组指纹

Pharmacodynamic Profile

药效动力学特征

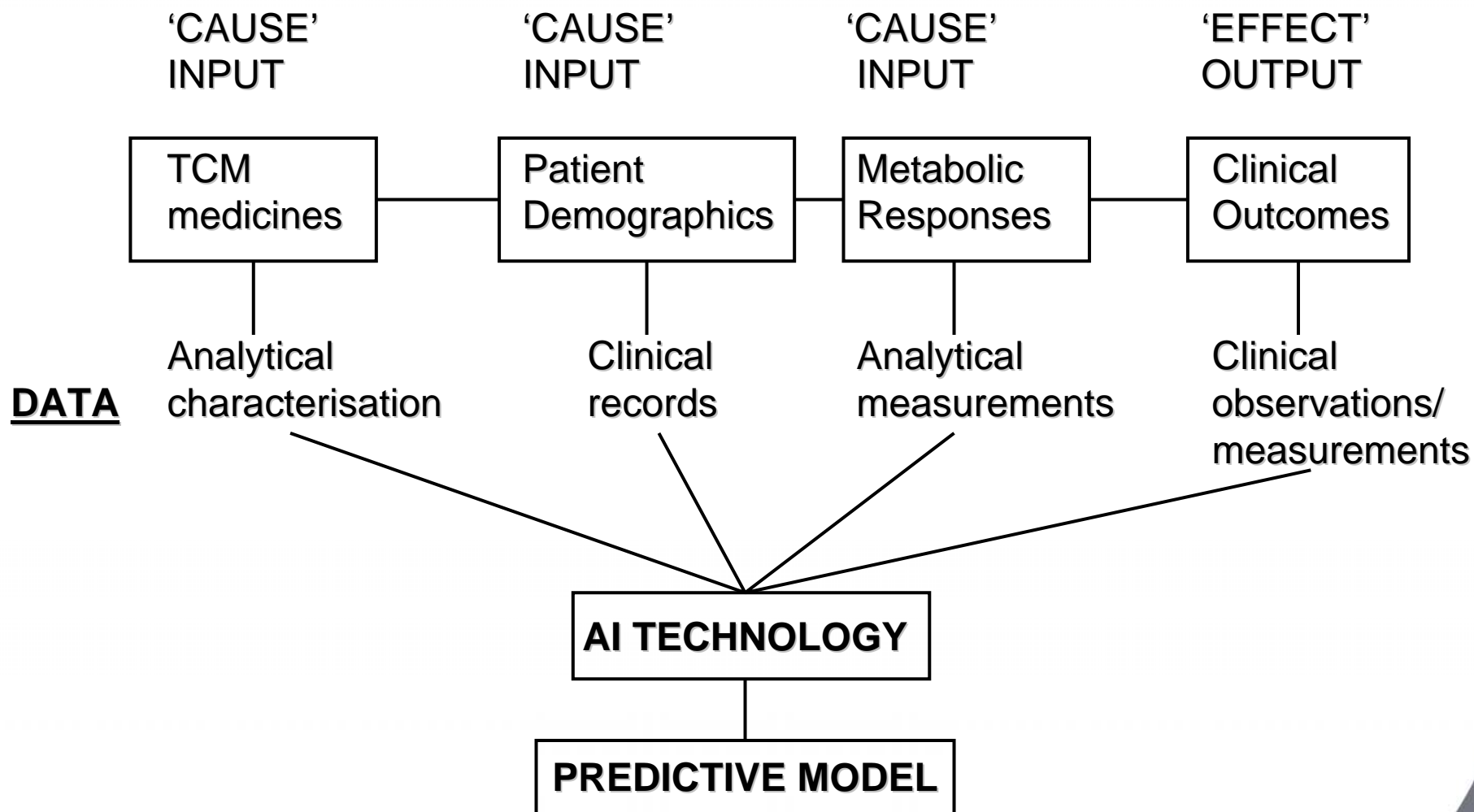
Toxicological Profile

毒理学特征



Data Mining plays key role in research of TCM with multiparametric data and their correlation

数据挖掘技术在中药多因素数据及其相关性研究中的重要作用



- Apply to diabetes therapy in first instance



浙江中醫藥大學

Zhejiang Chinese Medical University

**Clinical Diagnoses
and Sampling**
临床诊断和取样

**Chemical Analysis
Data Preparation**
化学分析和数据准备

**Data Analysis and
Interpretation**
数据分析何解释



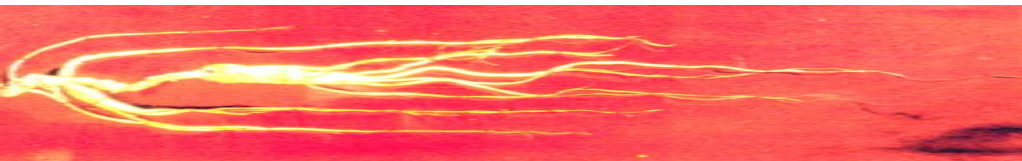
SIMM



Institute of
Pharmaceutical
Innovation

Ongoing IPI research collaborations in TCM (2/2)

- **Cambridge based centre for Chinese Medicine research**
剑桥中药研究中心
 - **Initially developing a new (T)CM cardiovascular drug**
初期的项目将是开发一个新的治疗心血管疾病的中药产品
 - **Funded by Xiangxue Pharma (China), MoST and Guangdong province**
 - **Xiangxue have established a new company in the UK to lead this research**



Thank you for listening



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