精準醫療產業發展的趨勢

Chung-Liang Chien, Ph.D.

Professor, College of Medicine,
National Taiwan University

CEO, Institute for Biotechnology and Medicine Industry

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主題

1. 臺灣生技產業國際地位

2. Taiwan Healthcare plus

3. 臺灣的生技聚落規劃與服務

4. 精準醫學發展與未來產業運用

Strength of Taiwan in Biotech Development

- **Representative Population** in East Asia
- Excellent **Health Care System,** National Health Insurance: **≥ 99%**
- Strong **R&D Activities** and **Manufacturing Capabilities** in Computer Sci., Electric Engineering, Clinical Medicine, *etc.*
- **Government's Investment** and **Support**
- **Integrated** Government-Industry-Academia-Hospital, **Transparent Regulatory Environment**
- **Center of Excellence for Clinical Trials** in East Asia
  Pfizer, GSK, BI, MSD, Novartis, Eli Lilly, Roche, AZ, Bayer, etc.

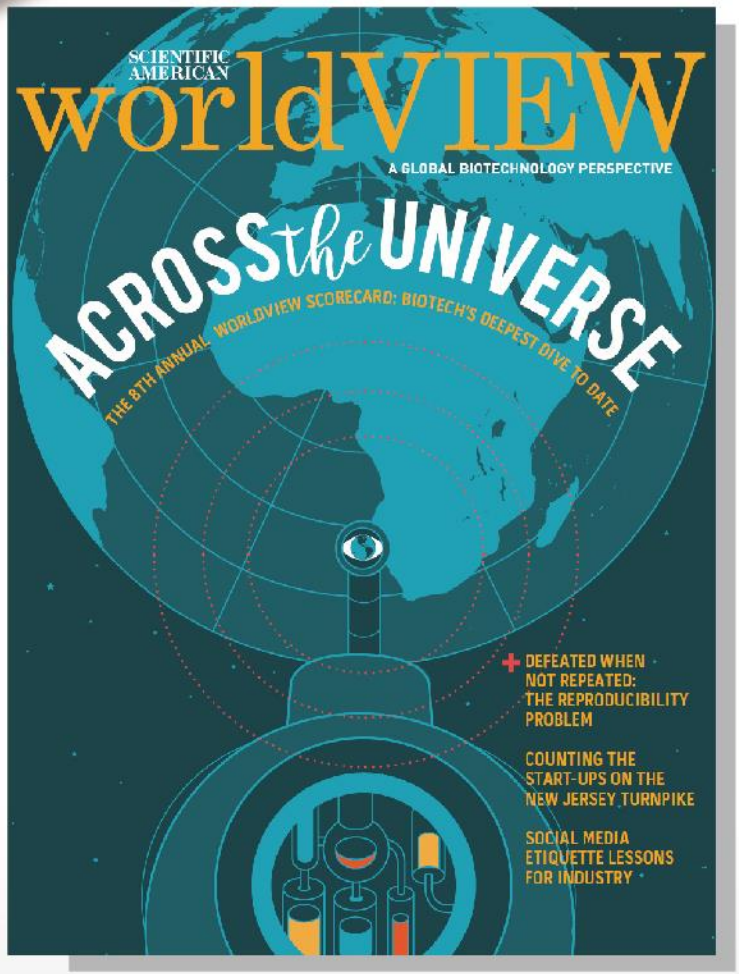
TAIWAN

Where innovations are shaping a new era of intelligent healthcare

World-class medical centers and hospitals
Over **1800 biotech** companies
Best healthcare system in the world
Top-ranked life science research institutes and universities
Most influential ICT & electronics industry in the world
Growing number of **emerging biotech startups**

Health	Pharma	×	Electronics
Medical	Biotech		IT

Endless Potential & Opportunities



2016 Scientific American

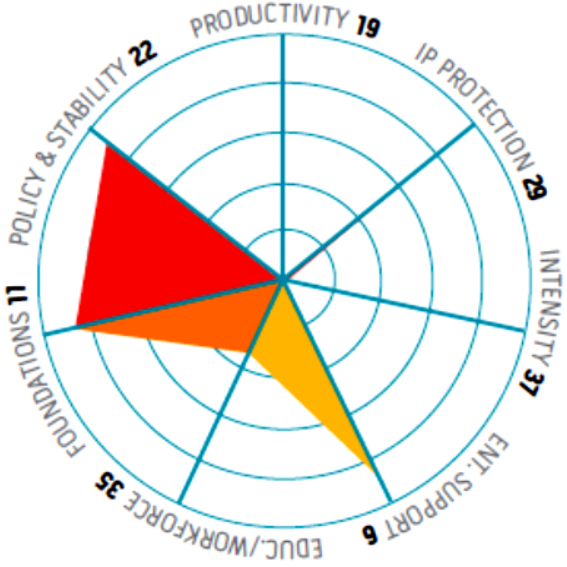
WORLDVIEW SCORECARD

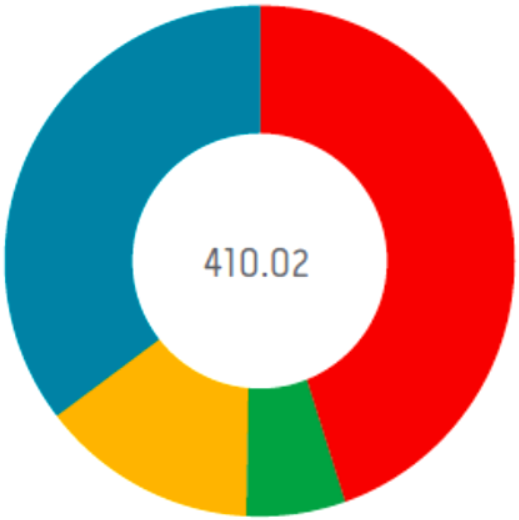
- PRODUCTIVITY
- IP PROTECTION
- INTENSITY
- ENTERPRISE SUPPORT
- EDUCATION/WORKFORCE
- FOUNDATIONS
- POLICY & STABILITY

Enhanced with a new guidebook and region-specific ratings, the 2016 Scorecard ventures deeper than ever to track down the latest in biotech innovation

Taiwan,

SAWV SC rank: 23
Population: 23,359,928
GDP: 489
R&D/GDP: 0





With an overall average of 22.4 on the SC, Taiwan's ranking of 23rd in 2016 is just about on par, and it performs even better on the *Nature Index 2015 Global,* with an 18th place overall ranking and its National Taiwan University landing in the top 100. Moreover, Taiwan advertises its biotechnology capabilities through international events, including BioTaiwan 2016. This will be the 14th annual event, and it will include presentations from companies around the world, as well as one-on-one partnering, seminars and workshops. A large exhibition is also expected, including more than 1,200 booths from 600 companies. On August 20, 2015, *Taiwan Today* reported, "A wide-ranging development plan targeting Taiwan's biotechnology-based economy is set to kick off next year, according to Premier Mao Chi-kuo." The report continued: "Focusing on agriculture, biomedicine, food, health care and medical instruments, the 10 year initiative will potentially expand the scale of the local bioeconomy to NT$4 trillion (US$123.2 billion) in 2026." With respectable scores on the SC's Foundations and Enterprise Support categories, Taiwan's commitment to innovation is clear. Like many other countries, however, Taiwan's Education/Workforce category shows room for improvement.

2016 Scientific American Worldview
-A Global Biotechnology Perspective

Asian Countries' Performance

Country	Global Ranking	Productivity	IP Protection	Intensity	Enterprise Support	Education/ Workforce	Foundations	Policy & Stability
Singapore	2	---	8.3	3.8	9.2	4.5	6.6	9.6
Hong Kong	11	0.0	7.1	1.6	8.6	1.6	6.7	9.0
Japan	15	0.1	9.2	0.6	4.5	3.6	7.9	8.0
Taiwan (Score/Rank)	23	0.0/19	5.8/29	0.1/37	7.0/6	2.6/35	6.9/11	7.2/22
South Korea	24	---	5.6	0.6	4.8	3.9	8.3	6.3
Malaysia	27	---	5.5	1.1	8.0	2.1	4.9	5.9
China	41	0.1	4.7	0.6	4.5	1.3	4.0	2.9
Thailand	45	---	2.3	3.0	3.4	2.7	3.0	1.8
India	49	0.0	4.3	0.8	3.5	0.2	1.6	2.0

Source: 2016 Scientific American Worldview

Enterprise Support

The only industry to benefit from specially legislated R&D investment incentives

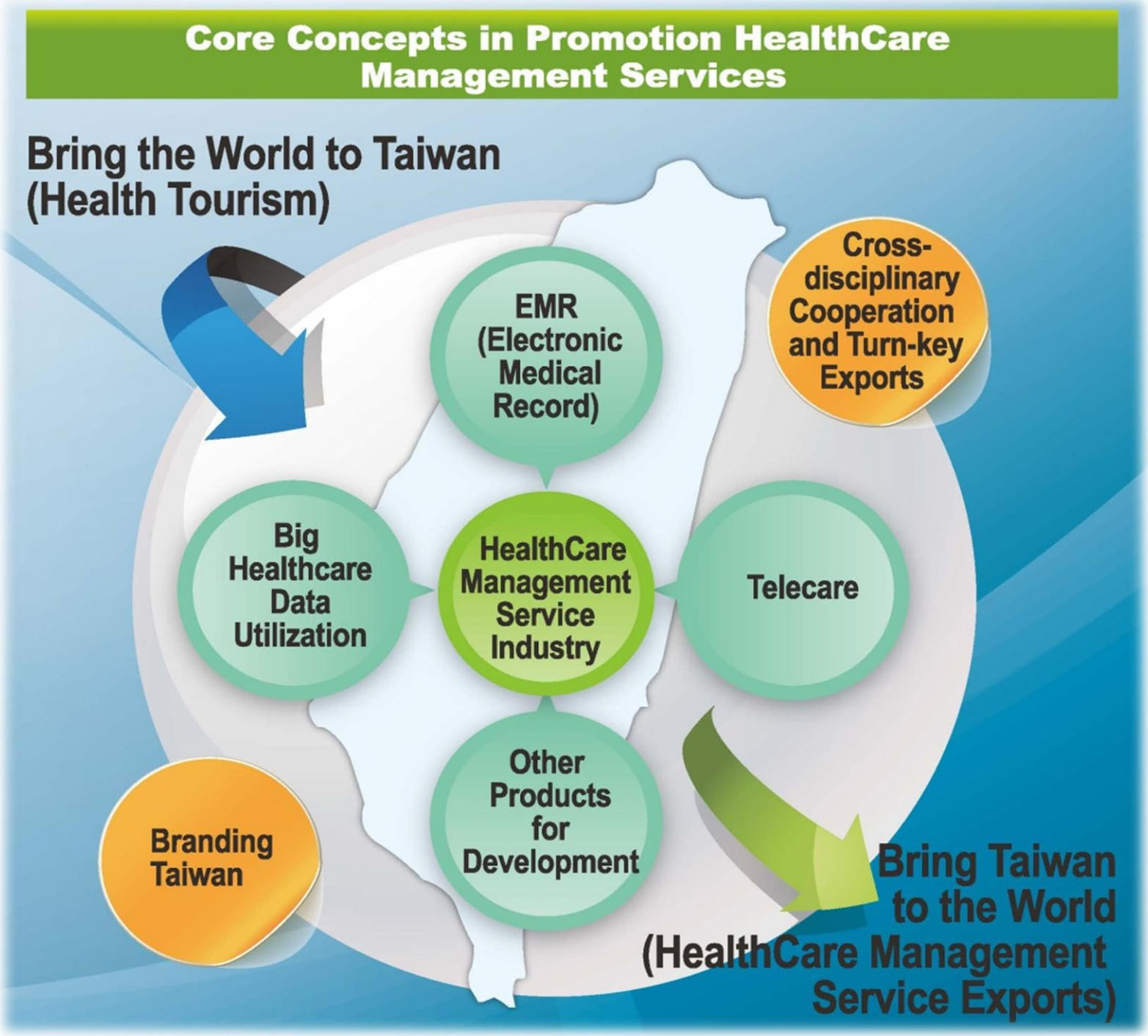
- Biotech and New Pharmaceutical Development Act

Taiwan features a unique listing regime and capital market environment

- Go Incubation Board for Startup and Acceleration Firms (GISA)
- Emerging Stock Board System (ESB)
- IPOs of Technology-Based Enterprises
- IPOs of Evergreen VC Firm

Active VC funds from the government and private sector

- National Development Fund
- Diamond BioFund
- Taiwan-Silicon Valley Technology Fund


Core Concepts in Promotion HealthCare Management Services
Bring the World to Taiwan (Health Tourism)
EMR (Electronic Medical Record)
Cross-disciplinary Cooperation and Turn-key Exports
Big Healthcare Data Utilization
HealthCare Management Service Industry
Telecare
Other Products for Development
Branding Taiwan
Bring Taiwan to the World (HealthCare Management Service Exports)

Taiwan Healthcare plus: A Portal Leads to World-Class Medical Teams and Excellent Bio Companies in Taiwan

Medical for All

Taiwan Healthcare

Ex.

- Joint Replacement
- Artificial Reproduction
- (Living) Liver Transplantation
- Craniofacial and Microtia Surgery

Taiwan Healthcare Expo

2018 台灣醫療科技展

台北南港展覽館1樓

Taipei Nangang Exhibition Center 1F

11.29 Thu.-12.02 Sun.

主辦單位 Taiwan Healthcare 衛生福利部 臺北市政府 行政院農業委員會

壹、關於台灣醫療科技展

臺灣醫療科技展，是臺灣，也是全球首次以醫院為主的展覽。從全人醫療照護需求全方面串連電子、資通訊、生技製藥、創新醫材、機密機械、精準醫療和健康照護產業。為展現臺灣之大健康產業全方位規模，2017臺灣醫療科技展首登場，以出生到終老作為串連主軸，由超過300企業、醫院共同展出、超過1050個攤位之規模，共同勾勒出大健康產業的藍圖，讓國內外開始認識臺灣大健康產業之能量與聲量。

當下值全球大健康產業科技快速蛻變、嶄新市場布局的關鍵時刻，我們亟需跨領域強強聯手，以在新型態醫療大健康產業發展局勢中取得反轉先機！**2018臺灣醫療科技展，希望引領大健康產業產業趨勢，擴大議題關注，將聚焦三大核心主題：**

- **效率醫療**（Efficient Healthcare）
  應用臨床大數據、AI人工智慧及創新醫材達到高品質、精準的效率醫療
- **智慧照護**（Smart Healthcare）
  連結行動與物聯科技、友善輔具與新照護服務模式，達到安心、人性的智慧照護
- **科技健康** (Innovative Healthcare)
  運用個人健康管理新科技與工具、創新製藥技術與產品，達到預防醫學與有效治療

以台灣最具特色之醫療 x 科技出發，臺灣醫療科技展今年更擴大串聯國內重量級醫學會合作，同期並結合舉辦「全球華裔整形外科醫師大會暨亞洲整形外科論壇」，深度探討醫療臨床與產業合作之應用；另將透過首屆展會成立的華人醫藥創新聯盟，擴大兩岸四地於技術、資金和市場渠道對接規模，並陸續邀請法國、韓國、新加坡、印度和日本等代表團來台商洽合作、以及目標市場之媒體合作，強化展會的商貿能量與國際曝光機會，成為**提供國內外最佳醫療、健康、照護等全方面解決方案之規模會展。**

農委會 李退之主委　衛福部 呂寶靜次長　陳維昭 召集人　蔡英文 總統　王金平 董事長　柯文哲 台北市長　中國醫藥大學 蔡長海董事長

參、展會規劃

◆展出項目

・特色醫療館(僅限醫療院所進駐)

國際級醫療技術、創新手術與照護模式
特色醫療專科、護理照護與社區醫療網
醫事檢驗、醫務管理與醫資系統

・智慧醫療館

智慧系統解決方案、人工智慧(AI)、大數據醫療
智慧照護、醫療機器人
醫療物聯網、行動醫療科技

・醫用設備館

醫療設備、檢驗、診斷及監測醫材及各項元件
醫院設施、病床、用品、衛材與各專科手術醫材
實驗儀器、設備與規劃、實驗耗材、防疫與感染管控產品

・精準醫療館

基因檢測及遺傳、腫瘤、用藥、疾病風險評估
疾病生物標記檢測、試劑或儀器
免疫細胞療法、儲存服務、再生醫學產品、試劑或設備

・生技製藥館

原料藥、藥品委託研發與製造服務
生技新藥、疫苗、優質學名藥與藥物製劑
藥品研發、檢驗、產製設備與建廠服務

・健康照護館

長照機構、專科診所、社區藥局等
長照與醫療保險、居家健康與遠端照護服務
居家保健與長照用品、復健與安全輔具

・預防醫學館

個人健康管理、生理評估與健康促進服務、防疫用品
營養補充品、運動醫學、輔助科技、訓練產品

・農科健康館

天然健康原料開發、有機農業培養與生產
食安、動植物與水產檢驗服務與試劑、有害物監測
動植物安全用藥、健康飼料與添加物

・新創商化館(科研單位與新創生技企業進駐)

科研與學術機構創新技術、研發服務與合作育成
初創企業、技術募資與商拓合作
財務、智財、法規與顧問諮詢服務

伍、展會推廣

◆目標對象

- **國內外專業人士**
  - 醫院決策及管理層級
  - 臨床與專科醫師
  - 產品採購人員
  - 經銷代理與通路商
  - 投資和創投機構
  - 媒體
- **國人與一般大眾**

◆媒體推廣與行銷規劃

Taiwan Healthcare + 國際入口平台	國際廣告與宣傳	國內廣告與宣傳
・國際買家/會員資料庫 ・展出機構/展品主題定期推薦 ・展出機構/展品影片聯播行銷	・全球500個代表性專業網站聯播廣告 ・國際專業媒體投放與展會專題合作 ・亞太地區國際會展/醫學年會宣傳合作 ・海外代表團邀集(陸、港、澳、新、法、日、韓陸續增加中)	・電子與網路媒體影片行銷 ・醫療體系各院長聯合代言(廣播/平面) ・公車車體廣告 ・展出機構/展出新聞議題發布

政府首長協力推薦

柒、附錄-2017台灣醫療科技展回顧

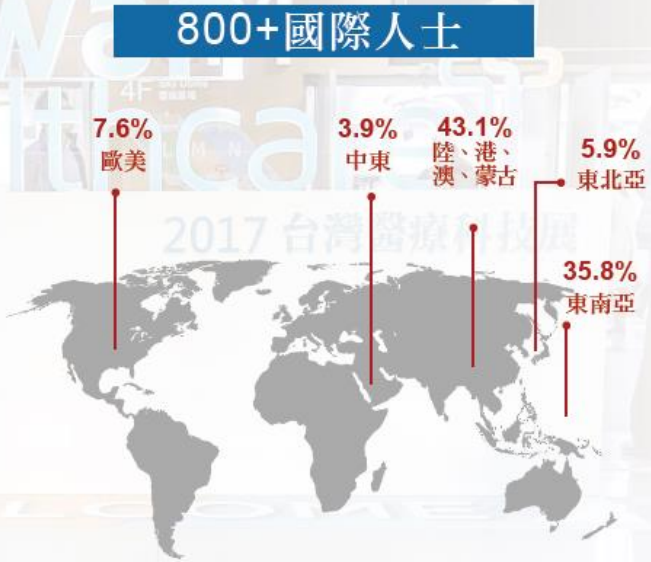
◆政府對大健康產業的支持與重視，將與產業界一起努力，讓台灣醫療科技走進世界！

蔡英文 總統

賴清德 院長

柯文哲 市長

◆2017醫療科技展分析



IV. Appendix – 2017 Taiwan Healthcare+ Expo Exhibitors (Selected)

◆Medical Centers

- Kaohsiung Veterans General Hospital
- National Taiwan University Hospital
- Chung Shan Medical University Hospital
- National Cheng Kung University Hospital
- Taichung Veterans General Hospital
- Changhua Christian Hospital
- National Yang-Ming University Hospital
- Kuang Tien General Hospital
- Ten-Chen Medical Group
- Taipei Veterans General Hospital
- Chi Mei Medical Center
- Far Eastern Memorial Hospital
- Kaohsiung Medical University
- Shin Kong Wu Ho-Su Memorial Hospital
- Mackay Memorial Hospital
- Lo-Hsu Medical Foundation, Lotung Poh-Ai Hospital
- Taipei Hospital, Ministry of Health and Welfare
- Taoyuan General Hospital, Ministry of Health and Welfare
- Taichung Hospital, Ministry of Health and Welfare
- Tungs' Taichung MetroHarbor Hospital
- Wei Gong Memorial Hospital
- Buddhist Tzu Chi Medical Foundation
- Taipei Medical University Hospital
- TMU Taipei Cancer Center
- China Medical University and Healthcare System
- Linkou Chang Gung Memorial Hospital
- Kaohsiung Chang Gung Memorial Hospital
- Taipei Beitou Health Management Hospital
- Tri-Service General Hospital
- CHC Healthcare Group
- Ditmanson Medical Foundation Chia-yi Christian Hospital
- Cathay General Hospital
- Ministry of Health and Welfare
- Taipei City Hospital
- Show Chwan Memorial Hospital
- Landseed Hospital, Taiwan
- E-Da Healthcare Group

◆Companies & Organizations

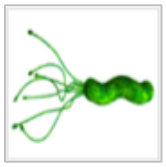
This page only shows a partial list of all exhibitors

Taiwan Clinical Trial Consortium (TCTC)

Disease-specific consortia involving multiple hospitals

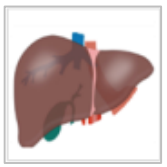
肺癌臨床試驗聯盟

Lung Cancer Consortium



胃腸疾病與幽門桿菌合作聯盟

Gastrointestinal Disease And Helicobacter Consortium



肝炎及肝癌臨床試驗聯盟

LiverNet Consortium

乳癌臨床試驗合作聯盟

Breast Cancer Consortium

高血壓相關疾病聯盟

Hypertension Associated Cardiac Disease Consortium

慢性阻塞性肺病聯盟

COPD Consortium

婦科癌症研究聯盟

GYN Oncology Group

血脂和動脈粥樣硬化聯盟

Lipid and Atherosclerosis Consortium

精神疾病臨床試驗聯盟

Mental Disorders Consortium

癌症早期臨床試驗聯盟

Oncology Phase I Consortium

小兒感染症聯盟

Pediatric Infectious Diseases Alliance

成人感染症臨床試驗聯盟

Adult Infectious Diseases

中風臨床試驗聯盟

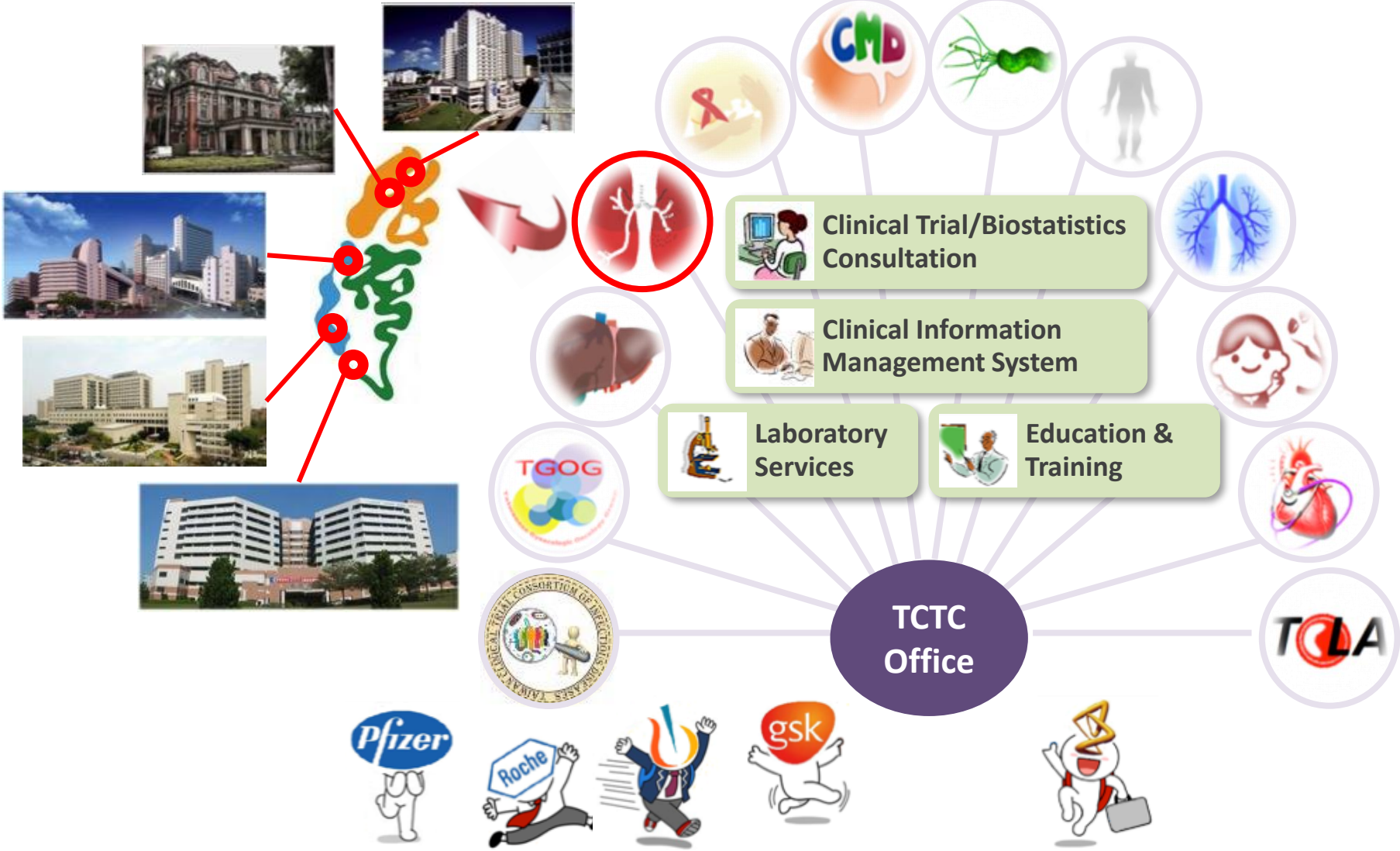
Stroke

腎臟疾病臨床試驗聯盟

Acute Kidney Injury & Renal Diseases

Taiwan Clinical Trial Consortium (TCTC): http://tc2.ntu.edu.tw/

One-stop shop for your clinical trials



Taiwan as an Asian partner for UK-/Swiss based giant pharma

The China Post

TAIWAN

GlaxoSmithKline

Wednesday, May 8, 2013

Photo 1 of 1011

GSK pharmaceutical partnership to help patients 'do more, feel better, live longer'

Officials from the National Research Program of Biopharmaceuticals (NRPB) and GlaxoSmithKline (GSK) pose in Taipei yesterday. They are, from left, Andrew H.J. Wang, co-director of the NRPB; Dr. Pan-Chyr Yang, director of the NRPB; Dr. Emilio Ledesma, vice president of GSK Vaccines Asia Pacific; and Thomas Willemsen, general manager of GSK Taiwan.

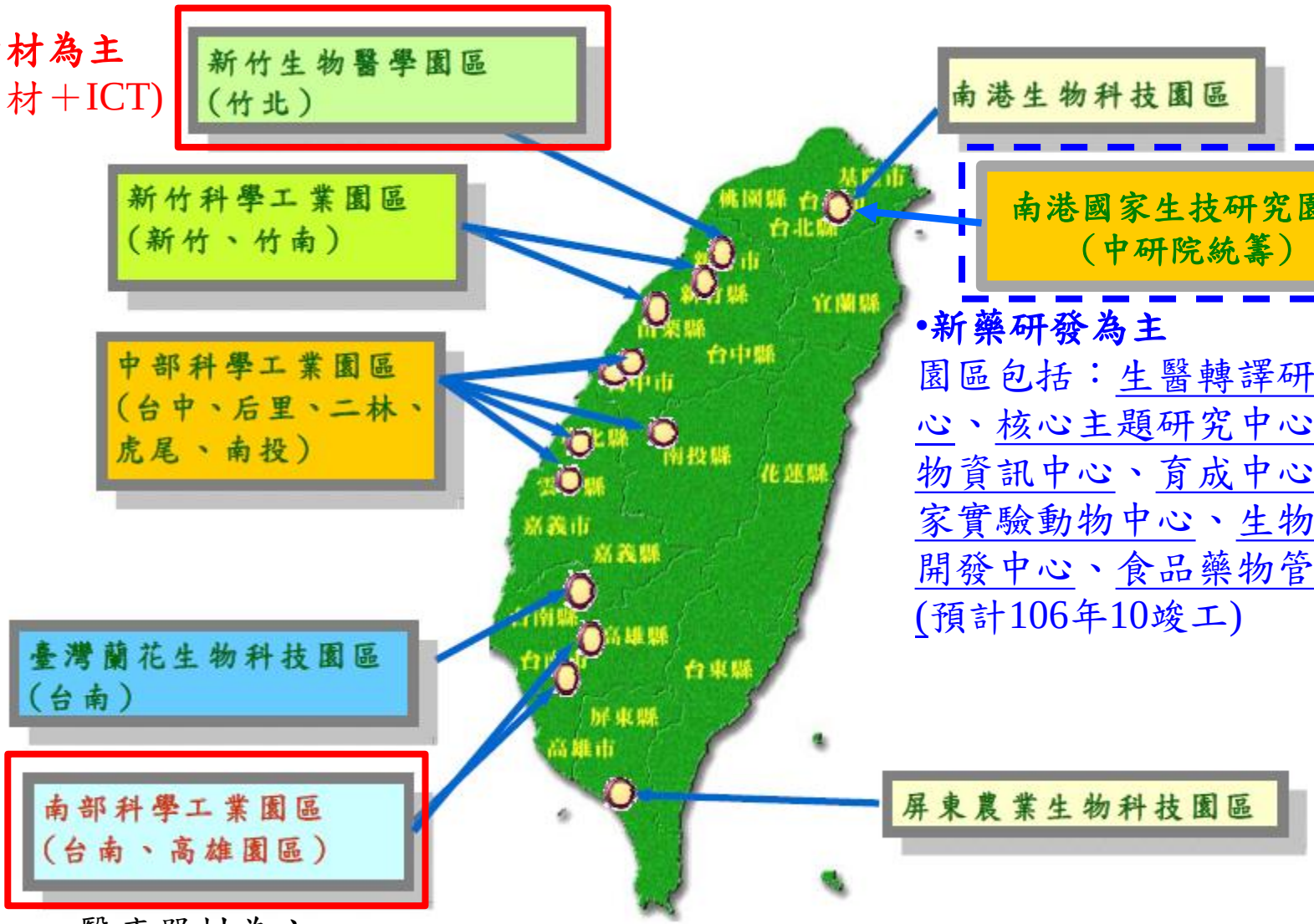
NOVARTIS

NRPB is to collaborate with Novartis on Translational Medicine.

Ongoing discussion for collaboration on open innovation with several big Pharmas, incl. Roche, Medimmmune, JPMA (Japan Pharmaceutical Manufacturing Association) and others

Includes over 20 intra-hospital clinical research projects, ranging from vaccine, rare diseases, NSCLC therapeutics, TB, quadrivalent influenza

生技聚落規劃


•醫療器材為主
(醫療器材＋ICT)
新竹生物醫學園區
(竹北)
新竹科學工業園區
(新竹、竹南)
中部科學工業園區
(台中、后里、二林、
虎尾、南投)
臺灣蘭花生物科技園區
(台南)
南部科學工業園區
(台南、高雄園區)
•醫療器材為主
(骨科、牙科材料)
南港生物科技園區
南港國家生技研究園區
(中研院統籌)
•新藥研發為主
園區包括：生醫轉譯研究中心、核心主題研究中心、生物資訊中心、育成中心、國家實驗動物中心、生物技術開發中心、食品藥物管理局
(預計106年10竣工)
屏東農業生物科技園區
桃園縣
台北縣
宜蘭縣
台中縣
南投縣
花蓮縣
嘉義市
嘉義縣
高雄縣
台東縣
屏東縣
高雄市

新竹生物醫學園區

Hsinchu Biomedical Science Park (HBSP)

(新竹生醫園區鳥瞰圖)

HBSP Hospital

2020

Biomedical R&D Centers
Incubation Center

第二生技大樓

Biotech Building

- 園區之規劃用地共約38.1公頃
- 資通訊、生技、醫療跨領域創新技術價值與產業化平台
- 扮演生物醫學產業化與臨床試驗重鎮的角色

國研醫材創價聯盟


財團法人醫藥品查驗中心
Center for Drug Evaluation, Taiwan
經濟部標準檢驗局
財團法人台灣電子檢驗中心
Electronics Testing Center, Taiwan
NARLabs 國家實驗研究院
儀器科技研究中心
Instrument Technology Research Center
塑膠中心
PLASTICS INDUSTRY DEVELOPMENT CENTER
金屬工業研究發展中心
METAL INDUSTRIES RESEARCH & DEVELOPMENT CENTRE
原型試製
規格及功能驗證
NARLabs 國家實驗研究院
科技政策研究與資訊中心
Science & Technology Policy Research and Information Center
國家級卓越臨床試驗與研究中心
NATIONAL CENTER OF EXCELLENCE FOR CLINICAL TRIAL & RESEARCH
中國醫藥大學附設醫院
China Medical University Hospital
研發創意能量
累積與育成
NARLabs 國家實驗研究院
國家實驗動物中心
National Laboratory Animal Center
Level Biotechnology Inc.
進階生物科技
畜產試驗所
臨床前
動物試驗
國家級卓越臨床試驗與研究中心
NATIONAL CENTER OF EXCELLENCE FOR CLINICAL TRIAL & RESEARCH
成大醫院
National Cheng Kung University Hospital
臺北市立聯合醫院
TAIPEI CITY HOSPITAL
臺中榮民總醫院
Taichung Veterans General Hospital
中國醫藥大學附設醫院
China Medical University Hospital
義大醫院
E-DA HOSPITAL
臺北醫學大學附設醫院
TAIPEI MEDICAL UNIVERSITY HOSPITAL
高雄醫學大學
醫學院
Kaohsiung Medical University
College of Medicine
臨床試驗
UL優力國際安全認證有限公司
TÜVRheinland®台灣德國萊因技術監護
顧問販份有限司
互貴興業生物科技股份有限公司
HUKUIBIO
安永聯合會計師事務所
上市輔導
財務規劃

檢測驗證實驗室

- 醫材產品規格設計
  -提供正確之驗證程序、驗證數據
- 第三方建置聯合實驗室

Testing Laboratory
3291

滅菌實驗室(竹北)

AST 台灣艾思特 科技股份有限公司
ADVANCED STERILIZATION TECHNOLOGY

CBC 中國生化科技股份有限公司
CHINA BIOTECH CORPORATION

國研院國家實驗動物中心服務

進駐生技聚落，提供在地化服務

標準化實驗動物設施，支援臨床前藥品與醫療器材功效測試

(轉譯醫學/生技新藥)

台北中心 (總部)
(25,200 m²)

(高階醫材)

臨床前測試實驗室
(1,000 m²)

(轉譯醫學/生技新藥)

南部設施 (15,954 m²)

(高階醫材)

臨床前手術及照護設施
(1,000 m²)

精準醫療動物試驗平台

➢ 基因改造技術

- 基因與細胞治療
- 疾病動物模式開發

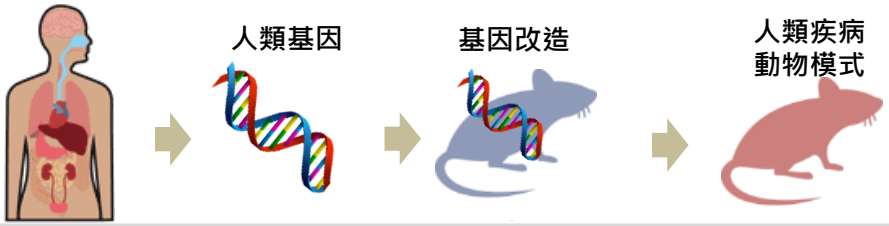
➢ 源自病患之腫瘤移植

- 個人化藥物篩選
- 腫瘤免疫治療

➢ 人類腸道微生物移植

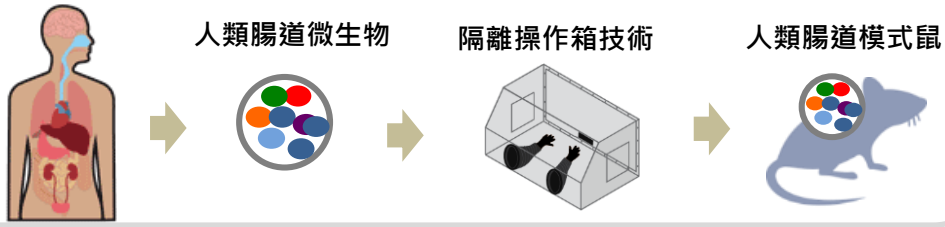
- 慢性疾病研究與治療
- 高齡化研究與治療

基因改造鼠平台



藥物功效試驗平台

無菌鼠平台



臨床前手術及術後照護服務

試驗設計溝通、實驗動物代訂、動物檢疫及代養、手術室及設備租借等

手術團隊

- 建立人與動物良好互動、動物飼育照護、術後照護
- **專業獸醫團隊**執行動物麻醉與術中生理監控、術後照護
- **專責試驗主持人** 與客戶充分溝通，**手術助理**全場協助

術前準備

實驗豬手術台定位

氣管插管/麻醉

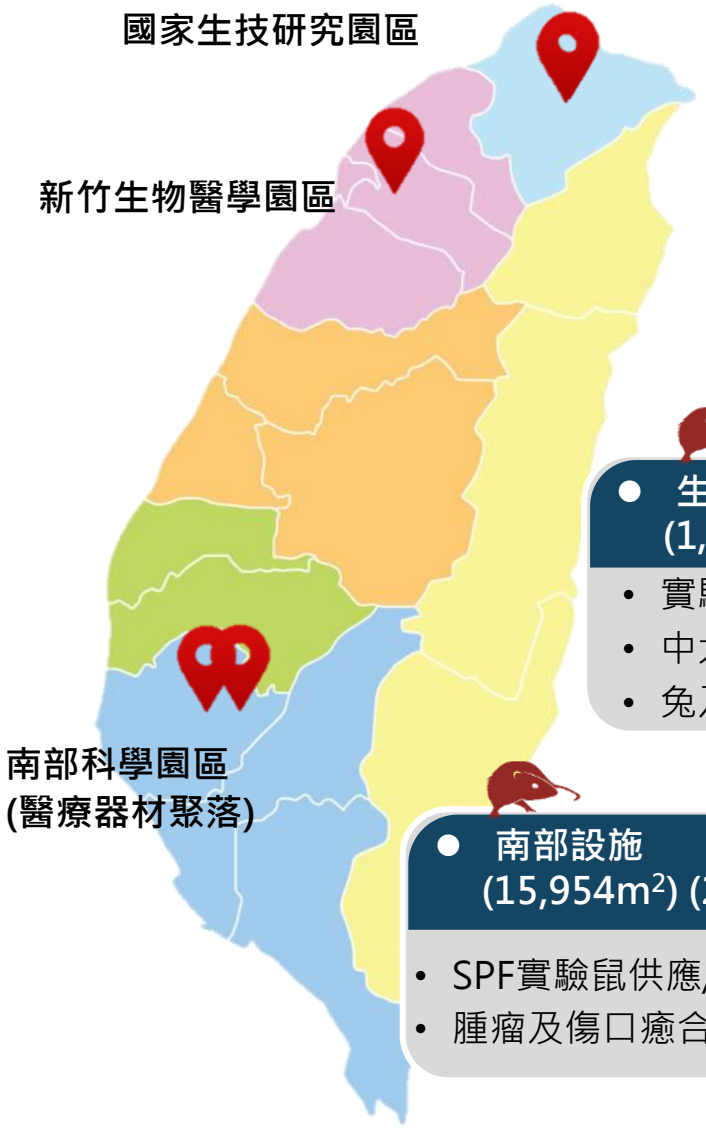
術中生理監測及記錄

服務據點

國家生技研究園區

新竹生物醫學園區

南部科學園區
(醫療器材聚落)



台北中心 (總部)
(25,200 m²) (2017)

- SPF實驗動物供應/ 種原庫主庫
- 品管及診斷實驗室
- 疾病模式及藥品功效試驗（免疫、腫瘤、神經退化性疾病、代謝）

生醫臨床前測試實驗室
(1,000m²) (2016)

- 實驗豬手術平台（心血管、肝腎、腦）
- 中大動物腫瘤模式
- 兔及天竺鼠之生物相容性試驗

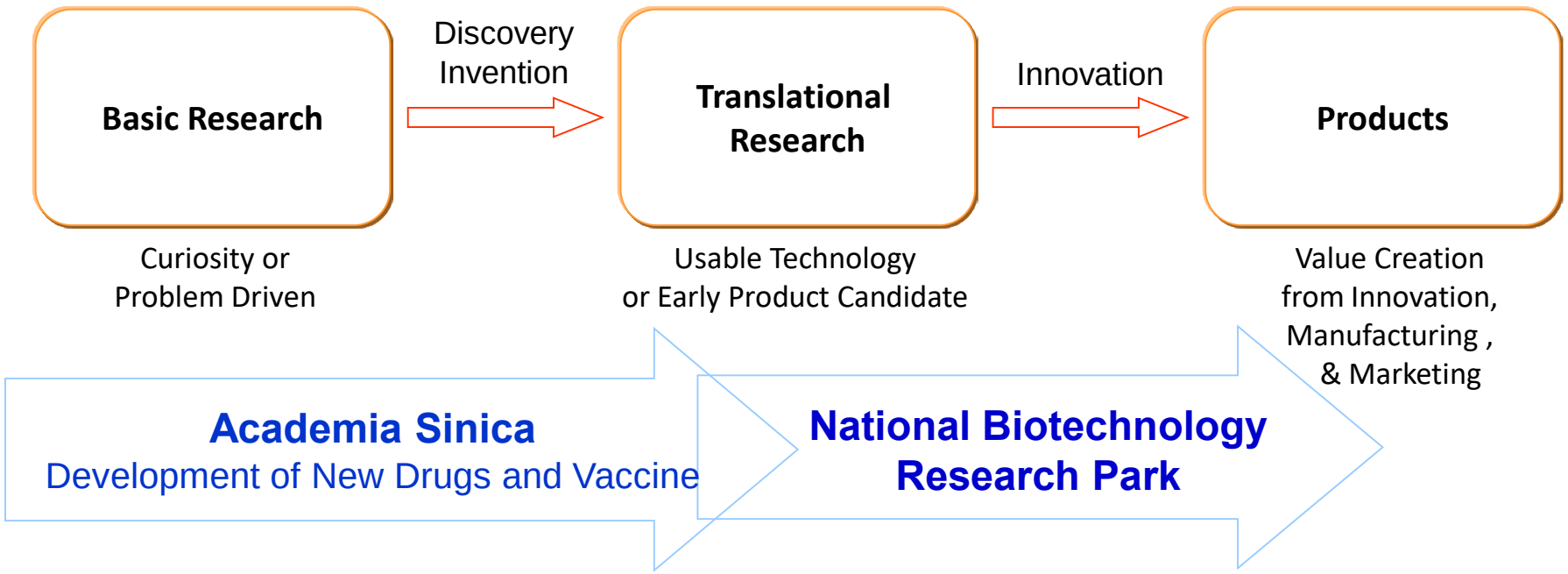
南部設施
(15,954m²) (2008)

- SPF實驗鼠供應/ 種原庫分庫
- 腫瘤及傷口癒合試驗

臨床前手術及照護設施
(1,000m²) (2015)

- 骨科、齒科植入試驗（實驗兔、犬、豬）
- 實驗豬傷口癒合及敷料試驗
- 內視鏡教學及設備驗證

Major Bio-medicine Research Plans in Academia Sinica



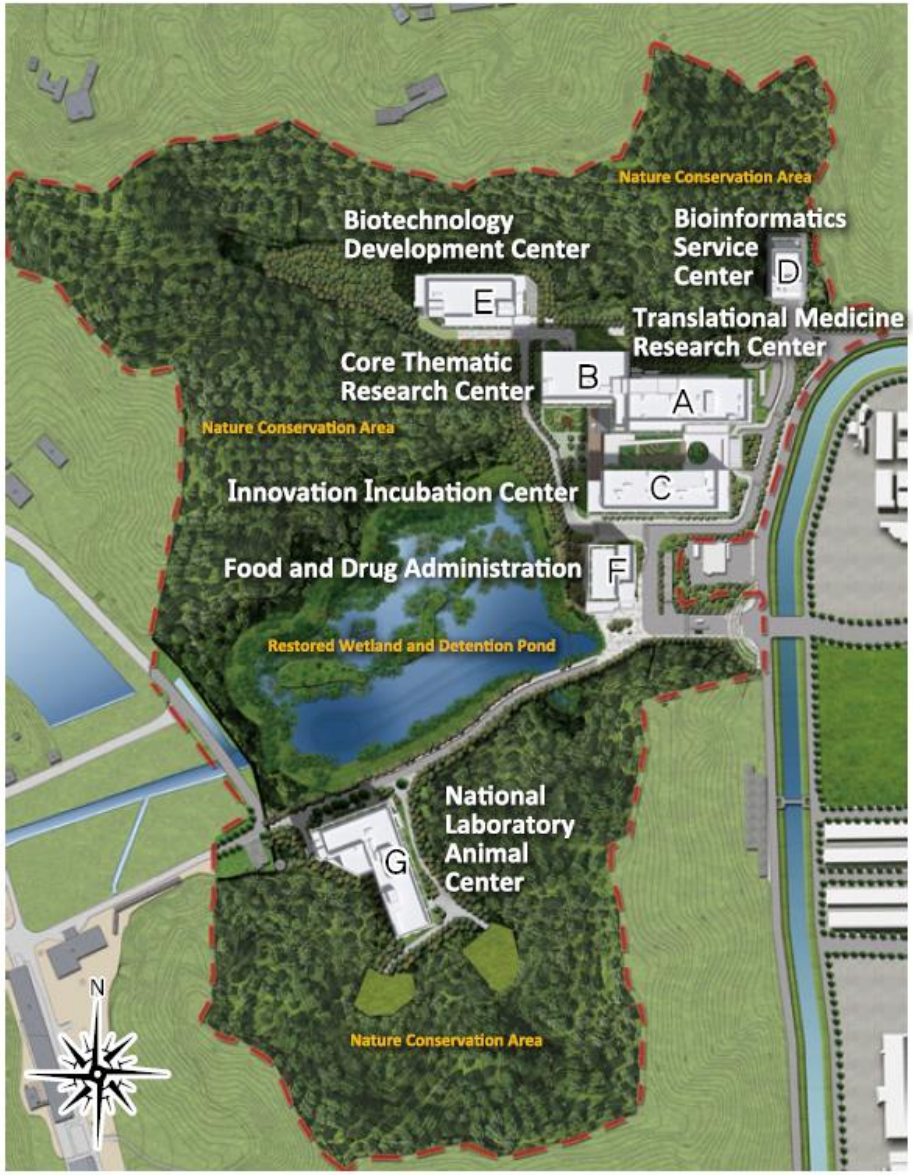
Three areas of focus

- **Cancers**
  liver cancer, breast cancer, lung cancer, pancreatic cancer, etc
- **Infectious diseases**
  G(-) bacteria, Mycobacterium tuberculosis, Influenza, viral hepatitis, dengue, etc
- **Regenerative medicine**
  cancer stem cell, iPSC, etc

台北南港·國際級生技產業廊帶

資料來源: 台北生技電子報第三期

國家生技研究園區是以研發為主的國家型研究 研究中心及生物資訊中心，以利將基礎研究銜接至動物及臨床試驗階段；另設置育成中心便於讓進駐廠商育成早期研發成果。此外與園區研發密切相關的國家實驗動物中心(NLAC)、生物技術開發中心(DCB)、衛生福利部食品藥物管理署(TFDA)、台灣生技整合育成中心(Si2C)、生策會及生策研究中心等亦將共同進駐，提供生技醫藥產業由新藥探索階段至臨床試驗階段所需的相關資源。



台北南港·國際級生技產業廊帶

臺北市生技產業聚落計畫

補足國家生技研究園區在生技產業發展價值鏈臨床試驗「臨床試驗」階段之缺口，整合南港忠孝營區(原址)暨西側市有地、僑泰興麵粉廠工業區都市計畫變更回饋土地、南港轉運站東側第三種商業區(特)等可利用基地，發展生技產業聚落中心。忠孝營區基地已提供生技企業臨床試驗研發實驗室(wet lab)，小型試量產工廠(pilot plant)為主；僑泰麵粉廠及商三特等2基地，則規劃提供生技企業暨其他支援性服務產業之辦公空間(dry lab)使用。

南港可成為台灣生技產業驅動核心
預計提供7000名就業人口
帶動生技產業產值500億元/年

資料來源: 台北生技電子報第三期

Toward Precision Medicine:

Building a Knowledge Network for Biomedical Research and a New Taxonomy of Disease

2011

Committee on A Framework for Developing a New Taxonomy of Disease

Board on Life Sciences

Division on Earth and Life Studies

NATIONAL RESEARCH COUNCIL
OF THE NATIONAL ACADEMIES

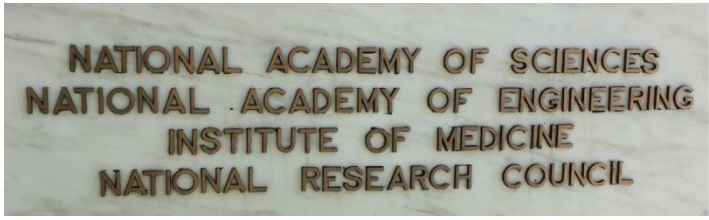
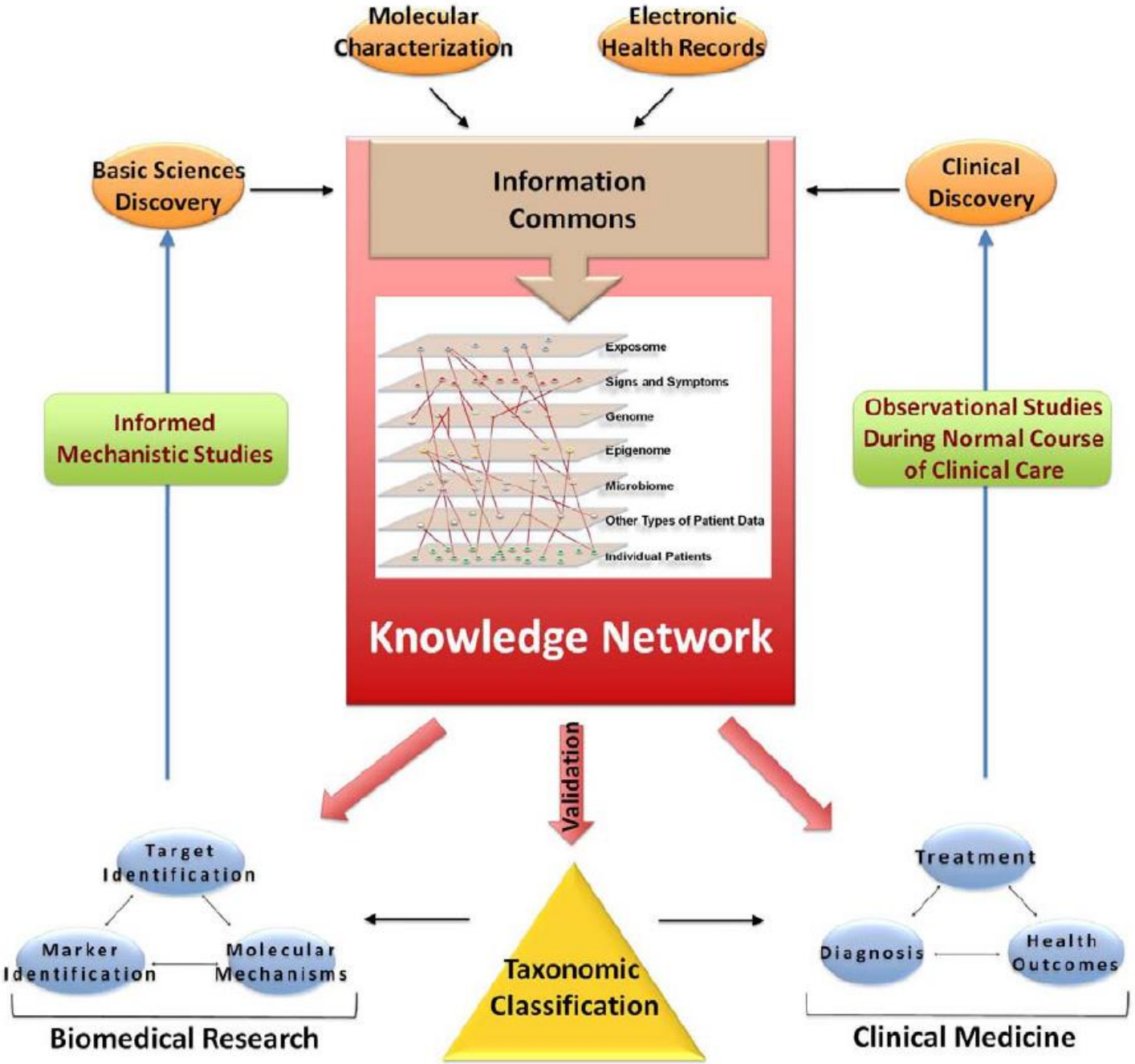
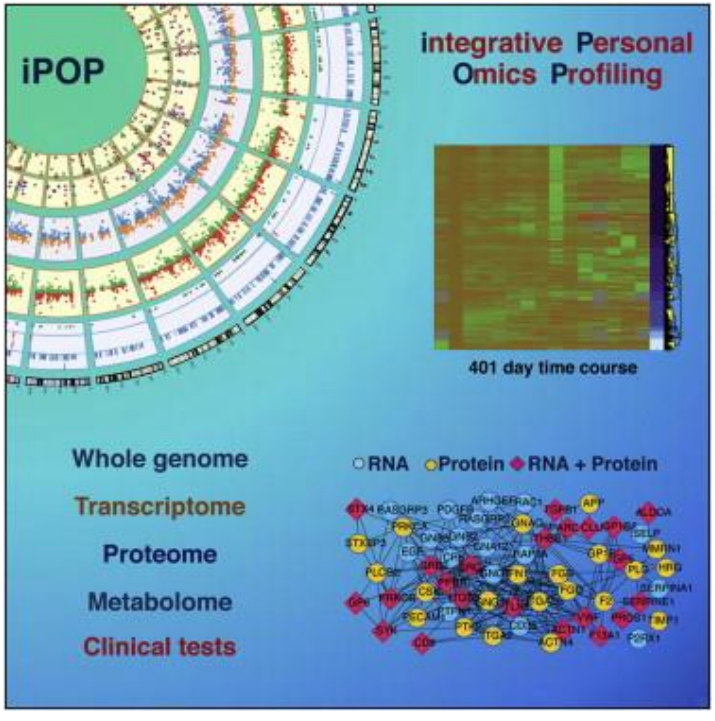


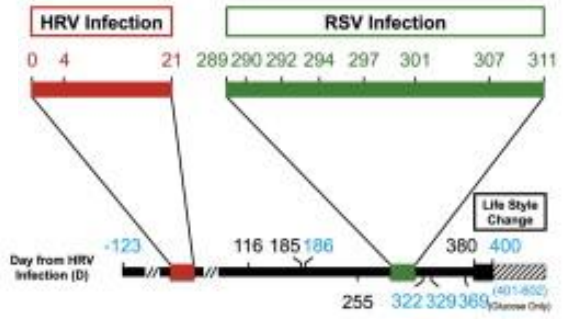
Figure 3-1: Building a Biomedical Knowledge Network for Basic Discovery and Medicine.

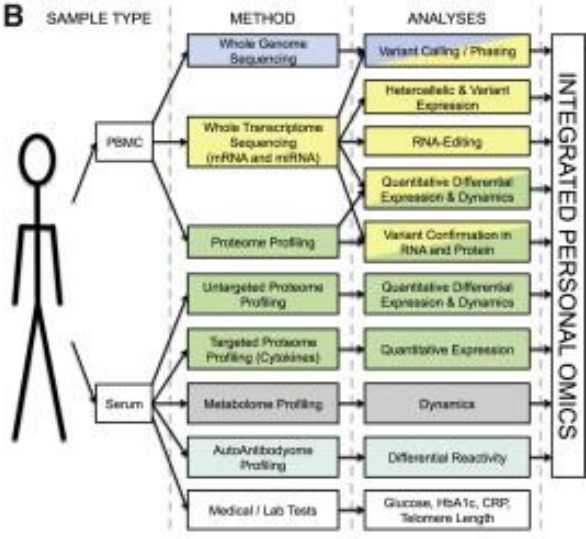


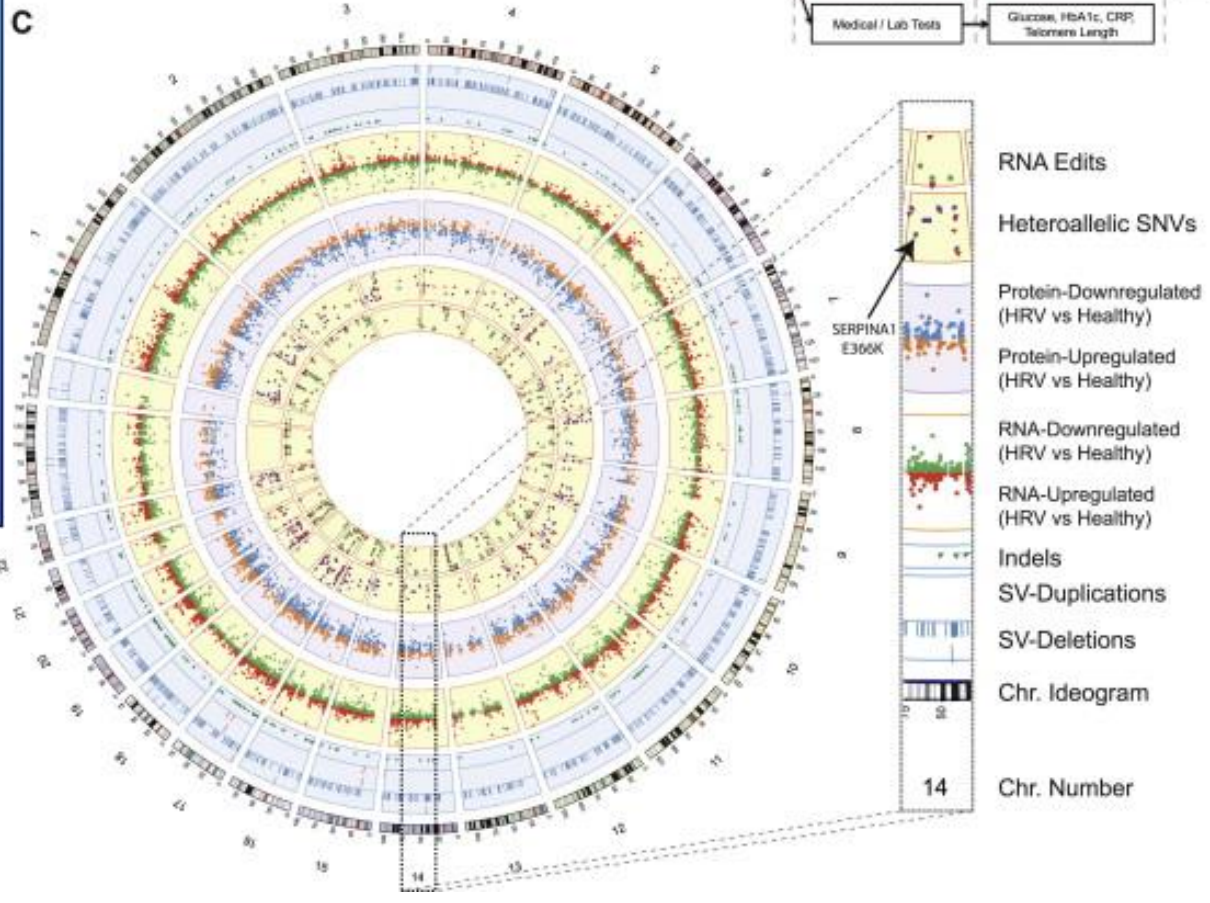
Cell *148*, 1293–1307, March 16, 2012

Personal Omics Profiling Reveals Dynamic Molecular and Medical Phenotypes









NATURE BIOTECHNOLOGY | NEWS AND VIEWS

Omics gets personal

Laura DeFrancesco

Nature Biotechnology **30**, 332 (2012)
Published online 10 April 2012

Biology Has Become a Data-Intensive Science

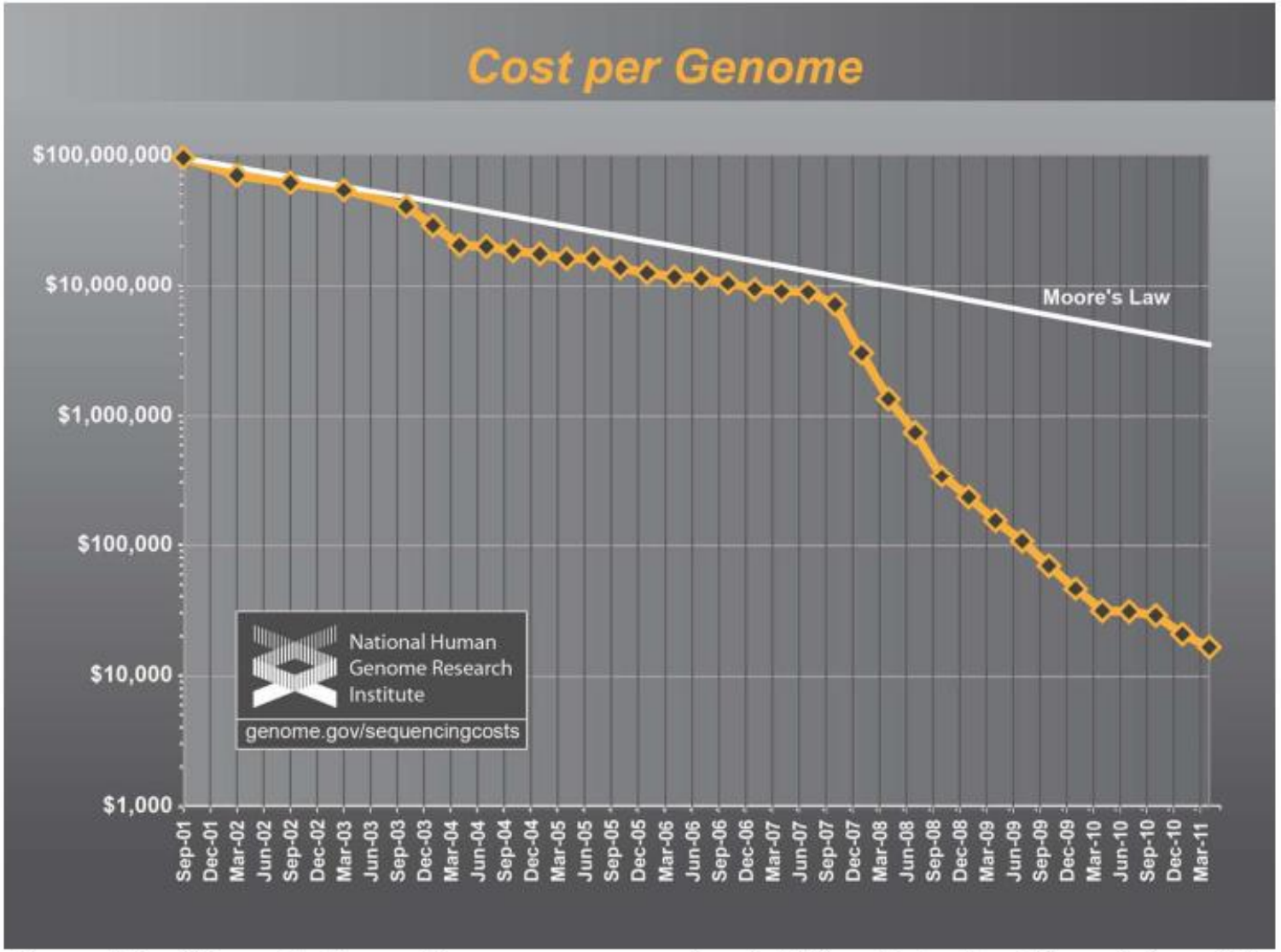


Figure 2-1: The cost of complete genome sequencing is falling faster than Moore's Law. The cost is still dropping rapidly, with a "$1000 genome" becoming a realistic target within a few years. Source: Wetterstrand 2011.

Cancer Research: Lung Cancer

at NTU Center of Genomic Medicine

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 JANUARY 4, 2007 VOL. 356 NO. 1

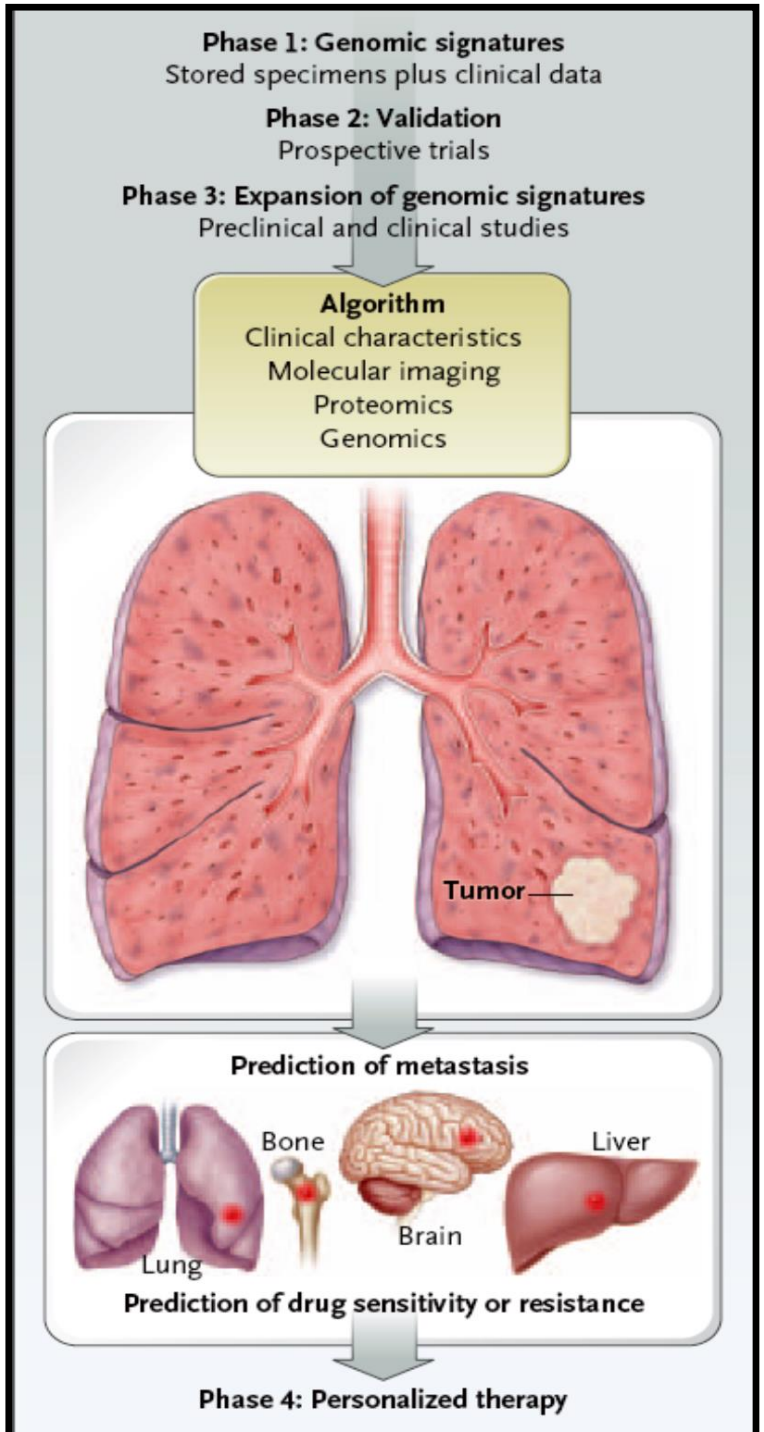
A Five-Gene Signature and Clinical Outcome in Non–Small-Cell Lung Cancer

Hsuan-Yu Chen, M.Sc., Sung-Liang Yu, Ph.D., Chun-Houh Chen, Ph.D., Gee-Chen Chang, M.D., Ph.D., Chih-Yi Chen, M.D., Ang Yuan, M.D., Ph.D., Chiou-Ling Cheng, M.Sc., Chien-Hsun Wang, M.Sc., Harn-Jing Terng, Ph.D., Shu-Fang Kao, M.Sc., Wing-Kai Chan, M.D., Han-Ni Li, M.Sc., Chun-Chi Liu, M.Sc., Sher Singh, Ph.D., Wei J. Chen, M.D., Sc.D., Jeremy J.W. Chen, Ph.D., and Pan-Chyr Yang, M.D., Ph.D.

EDITORIAL

Molecular Signatures of Lung Cancer — Toward Personalized Therapy

Roy S. Herbst, M.D., Ph.D., and Scott M. Lippman, M.D.



The Opportunity to Integrate Data-Intensive Biology with Medicine

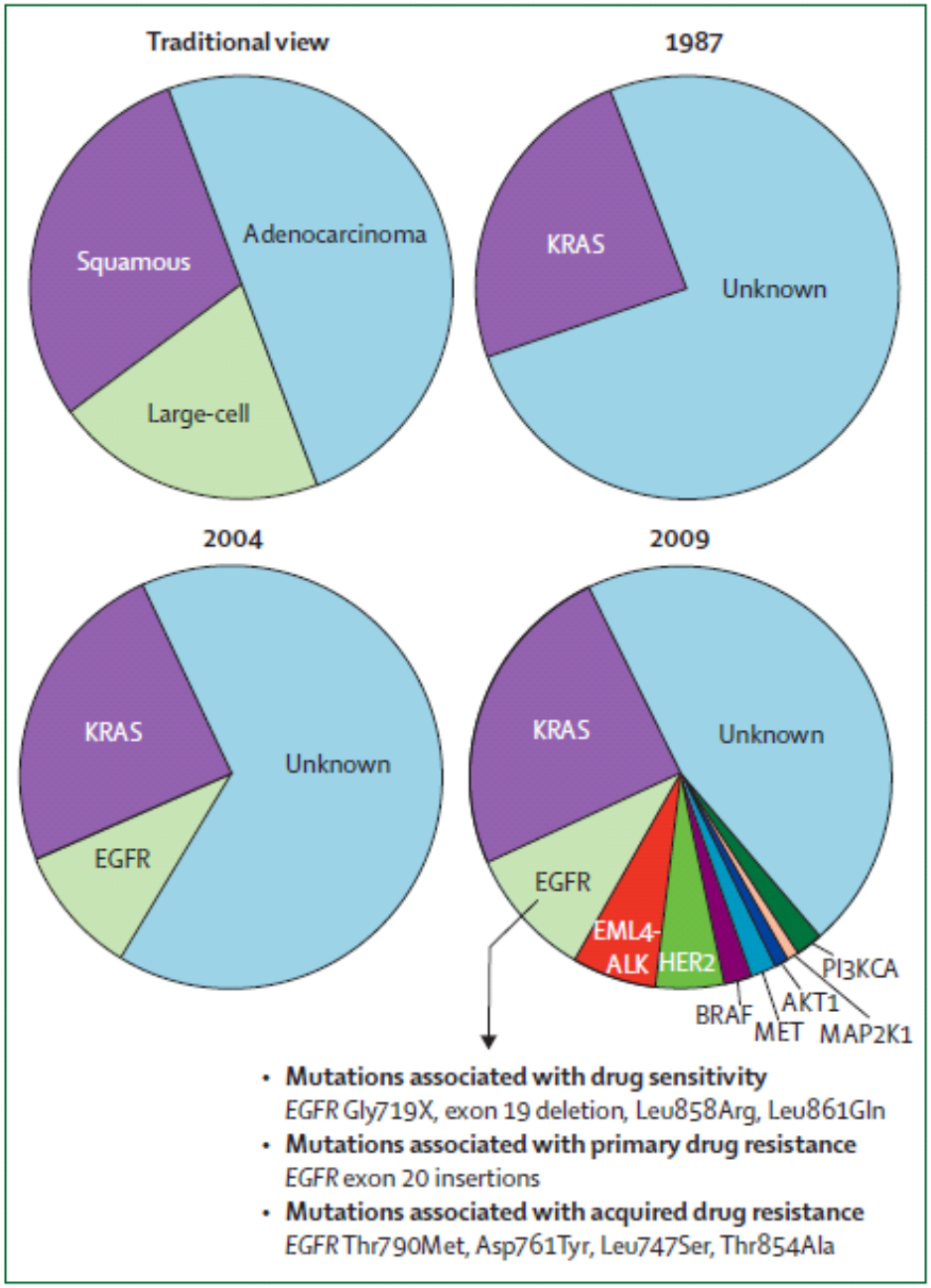


Figure 2-2: Knowledge of non-small-cell lung cancer has evolved substantially in recent decades.

The traditional characterization of lung cancers based on histology has been replaced over the past 20 years by classifications based on driver mutations. In 1987, this classification was rudimentary as only one driver mutation had been identified, KRAS. However, the sophistication of this system for molecular classification has improved with the advent of more genetic information and the identification of many more driver mutations. Similar approaches could improve the diagnosis, classification, and treatment of many other diseases.

Source: Pao and Girard 2011

Science
AAAS

Precision cancer medicine and immunology in China

Xu-Chao Zhang[1,2] and Yi-Long Wu[1*]

[1]Guangdong Lung Cancer Institute and [2]Medical Research Center, Guangdong General Hospital and Guangdong Academy of Medical Sciences, Guangzhou, China

1 Feb. 2018

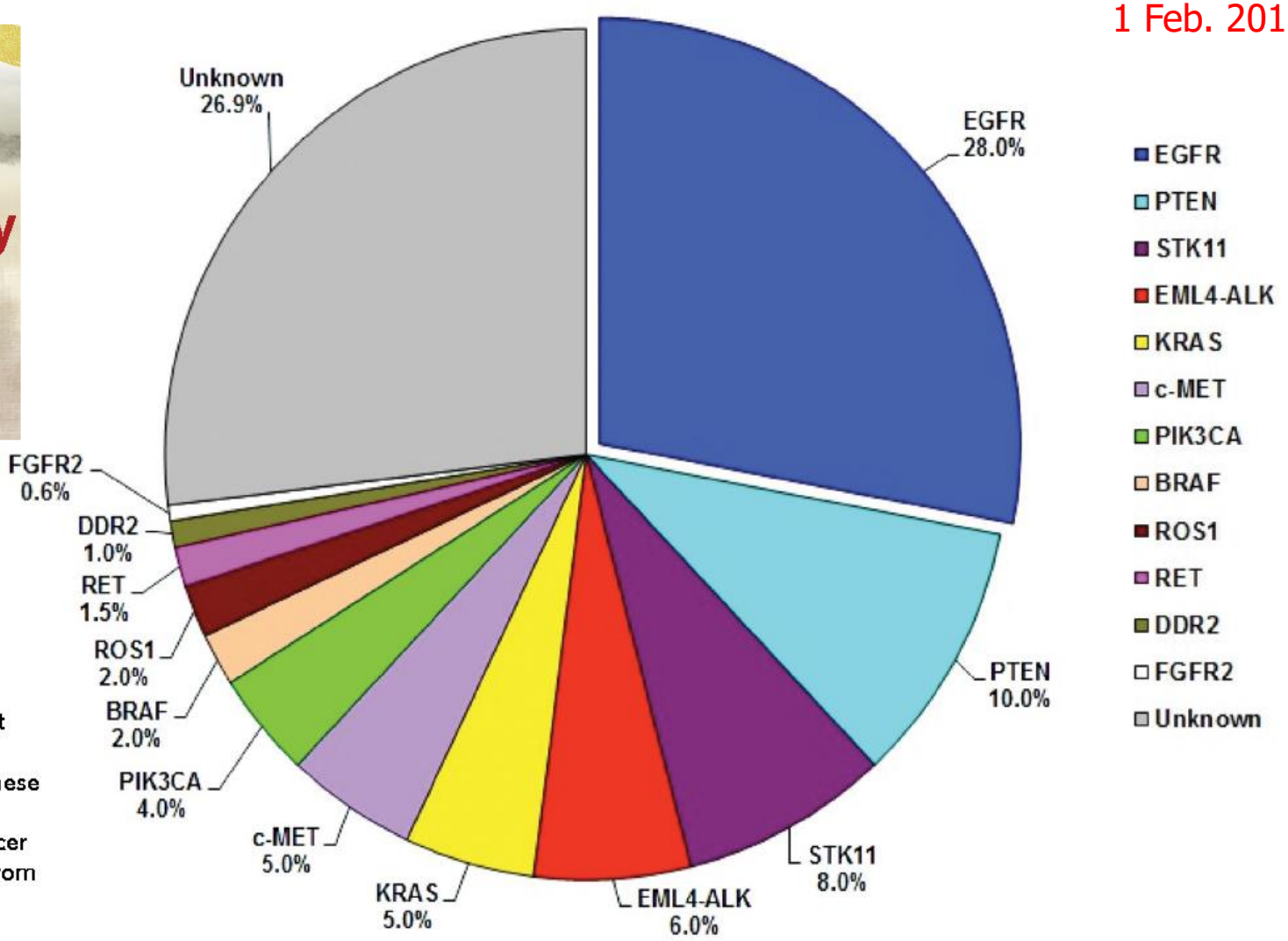


FIGURE 1. Pie chart of the driver gene distribution in Chinese patients with non-small cell lung cancer (NSCLC) (revised from Guangdong Lung Cancer Institute).

Next-generation sequencing–based testing for cancer precision medicine in China: A review of technologies and validation procedures

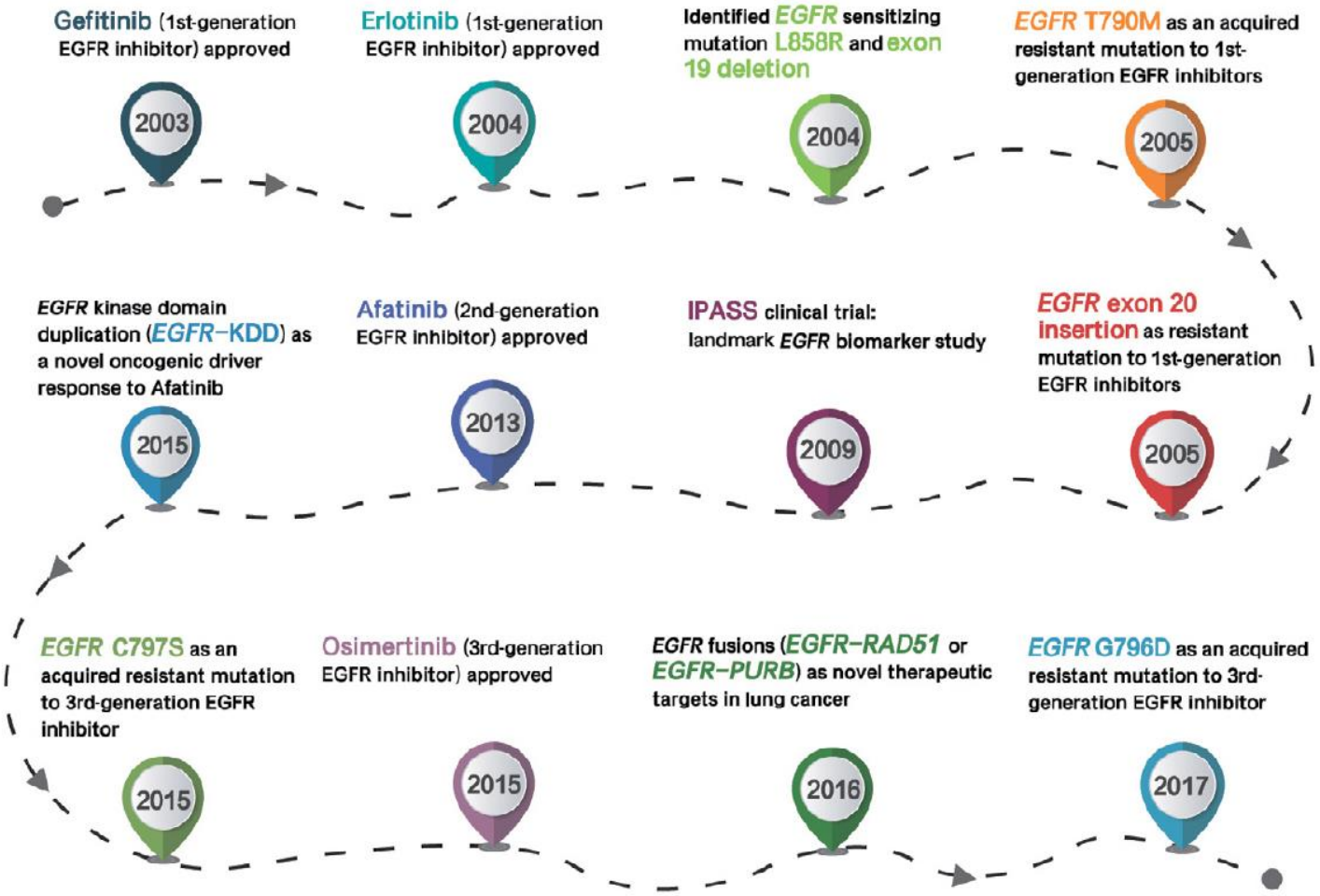


FIGURE 1. Timeline for the past 15 years of detecting *EGFR* genomic alterations and corresponding targeted therapies.

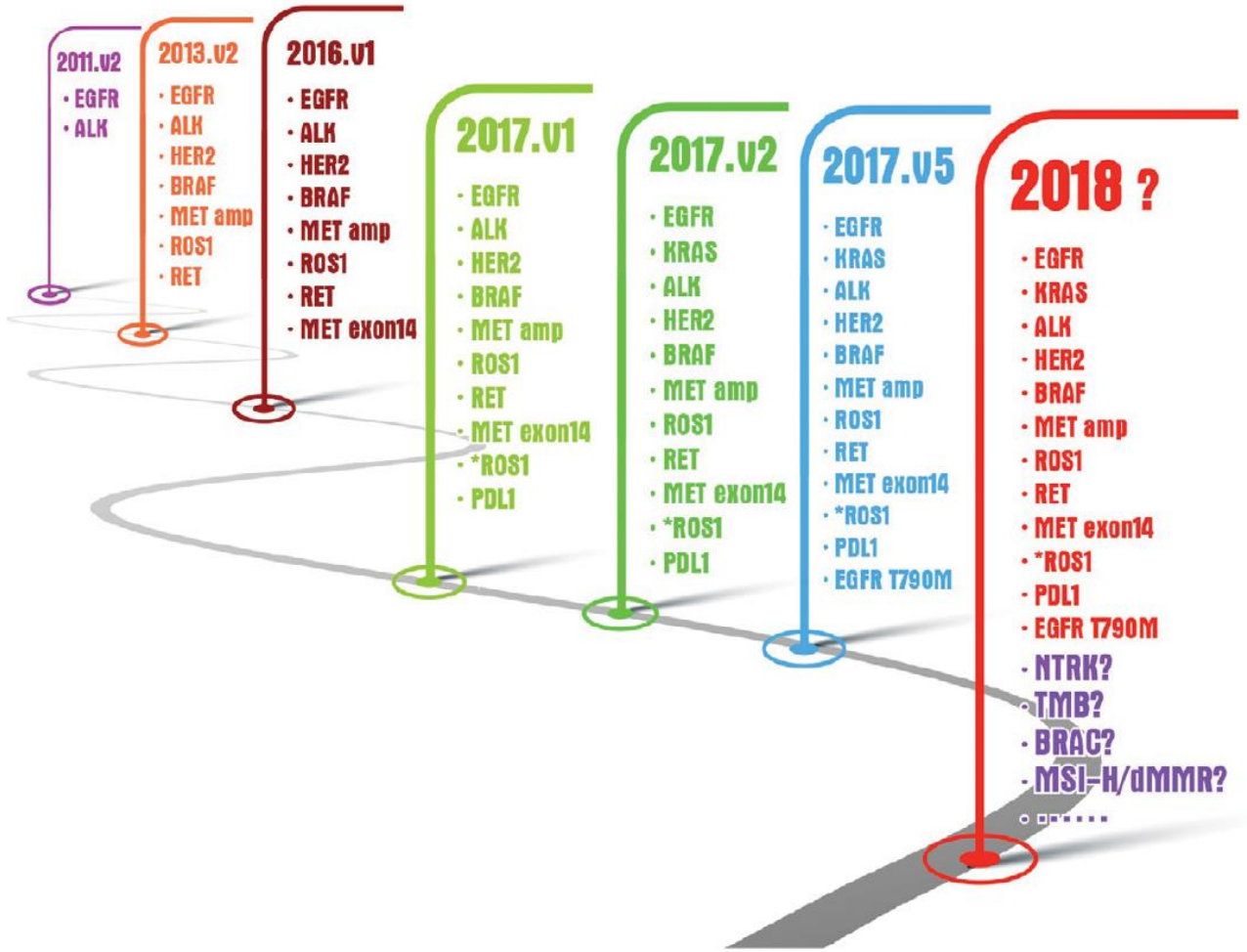


FIGURE 2. The timeline of recommendations from the National Comprehensive Cancer Network for genes detected in non-small cell lung cancer.

Adoptive cell transfer therapy: A strategic rethinking of combination cancer therapy

Minghui Zhang

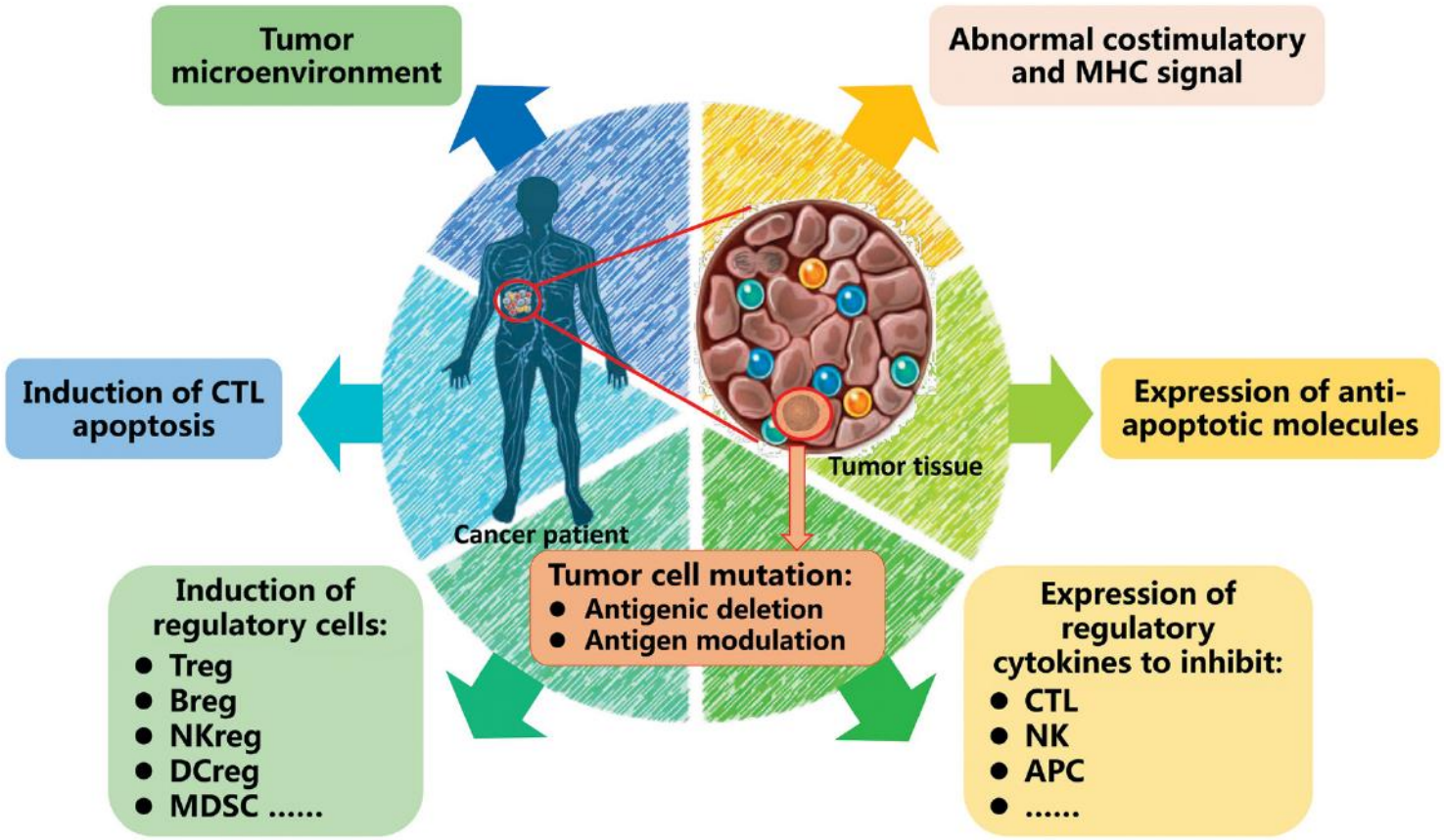


FIGURE 1. Factors that allow for tumor development. MHC, major histocompatibility complex; CTL, cytotoxic T-lymphocyte; Treg, regulatory T cell; Breg, regulatory B cell; NKreg, regulatory natural killer (NK) cell; DCreg, regulatory dendritic cell; MDSC, myeloid-derived suppressor cell; APC, antigen-presenting cell.

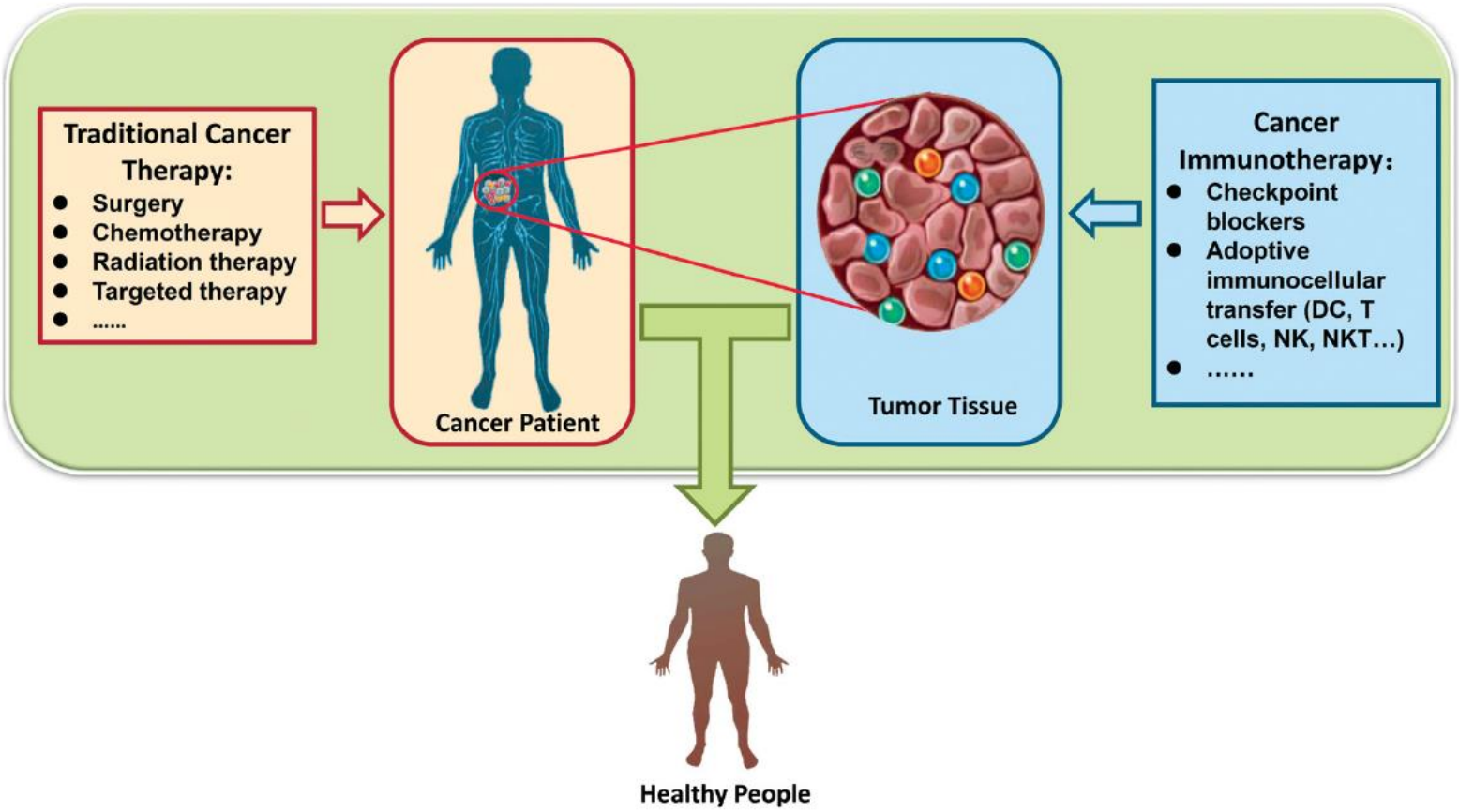


FIGURE 2. Combinatorial cancer treatment. DC, dendritic cell; NK, natural killer cell; NKT, natural killer T cell.

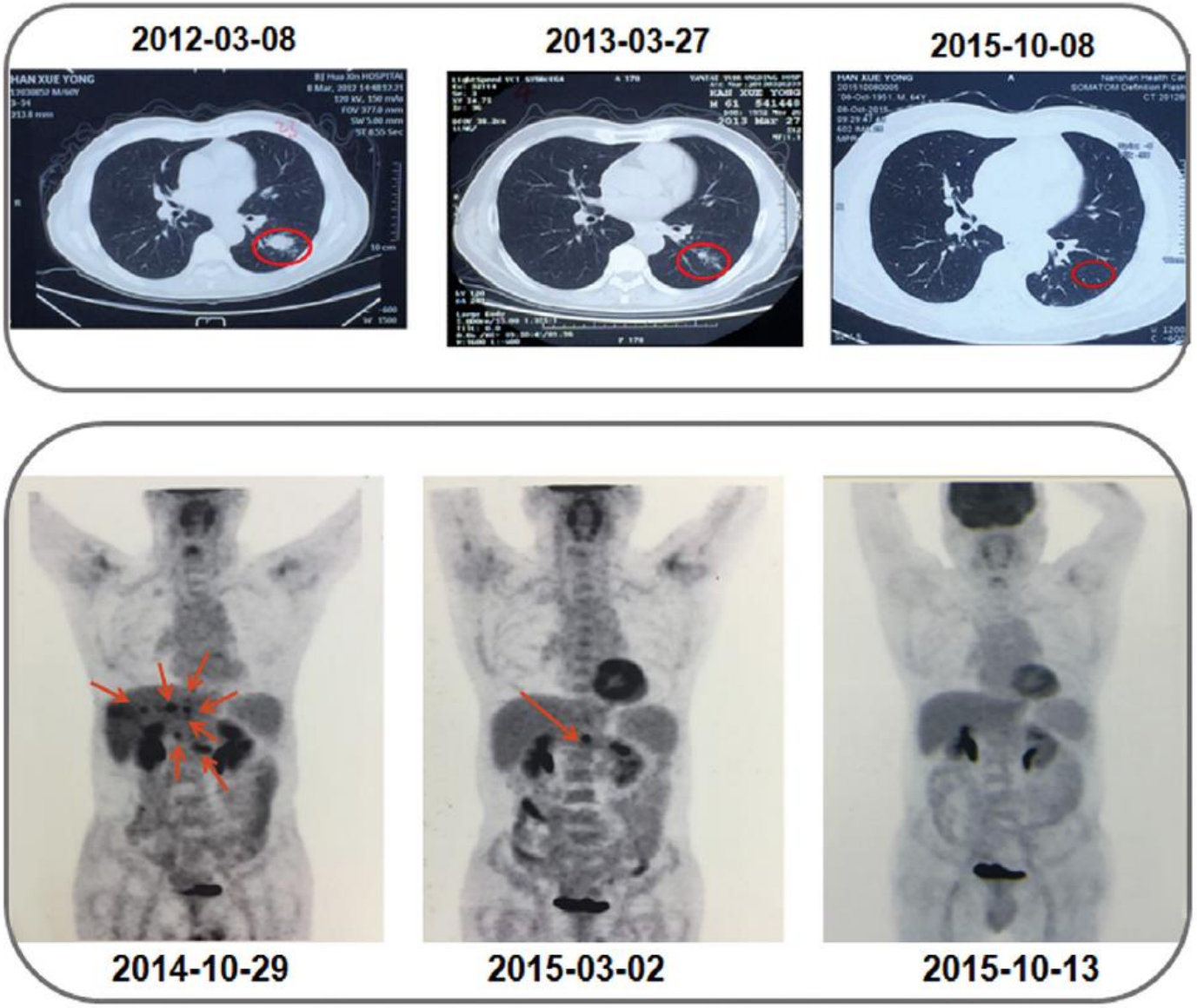


FIGURE 3. The clinical benefits of adoptive novel NKT cell transfer in two patients. A gastric cancer patient with lung metastasis (upper panel) and a pancreatic cancer patient with liver metastasis (lower panel) were treated with adoptive transfer of NKT cells after surgery. The images show that the tumors in both cases shrink and eventually disappear completely.

Precision medicine and cancer immunology in China

Science
1, Feb, 2018

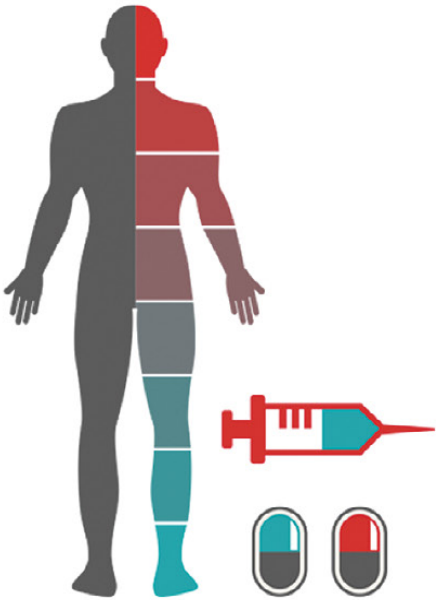
From big data to knowledge in precision medicine

Large Population-Based Cohort Study

Data Acquisition

Multi-omics	Electronic Medical Records	Wearable Devices Data
genomics	medical history	heart rate
transcriptomics	family history	blood pressure
proteomics	biochemical testing	weight
epigenomics	imaging	body temperature
metabolomics	diagnosis and treatment	sleep information
metagenomics	follow-up	sports activities
exposomics		

Data Acquisition

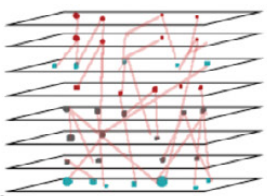


Clinical Decision and Health Management

Data Storage

Data

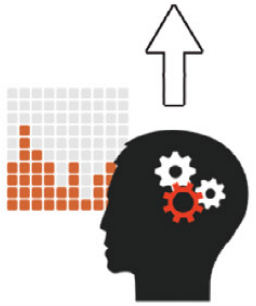
Bioinformatics Analysis



phenotypes
genotypes
gene expression
protein expression
DNA/histone modifications
metabolites composition
microbial diversity
exposure assessment

Information

Knowledge Extraction



Knowledge

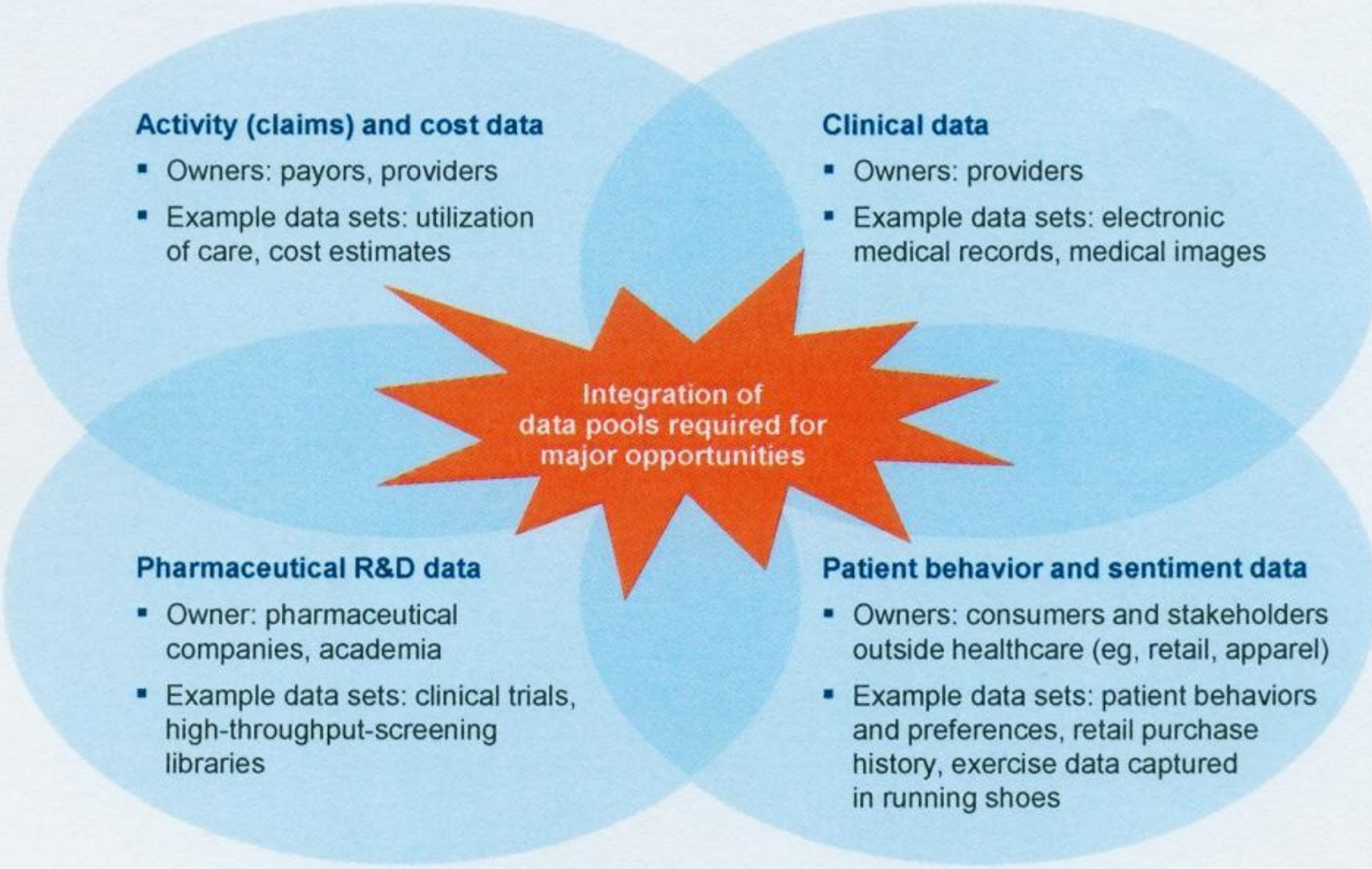
McKinsey,
Jan. 2013

Center for US Health System Reform
Business Technology Office

The 'big data' revolution in healthcare

Accelerating value and innovation

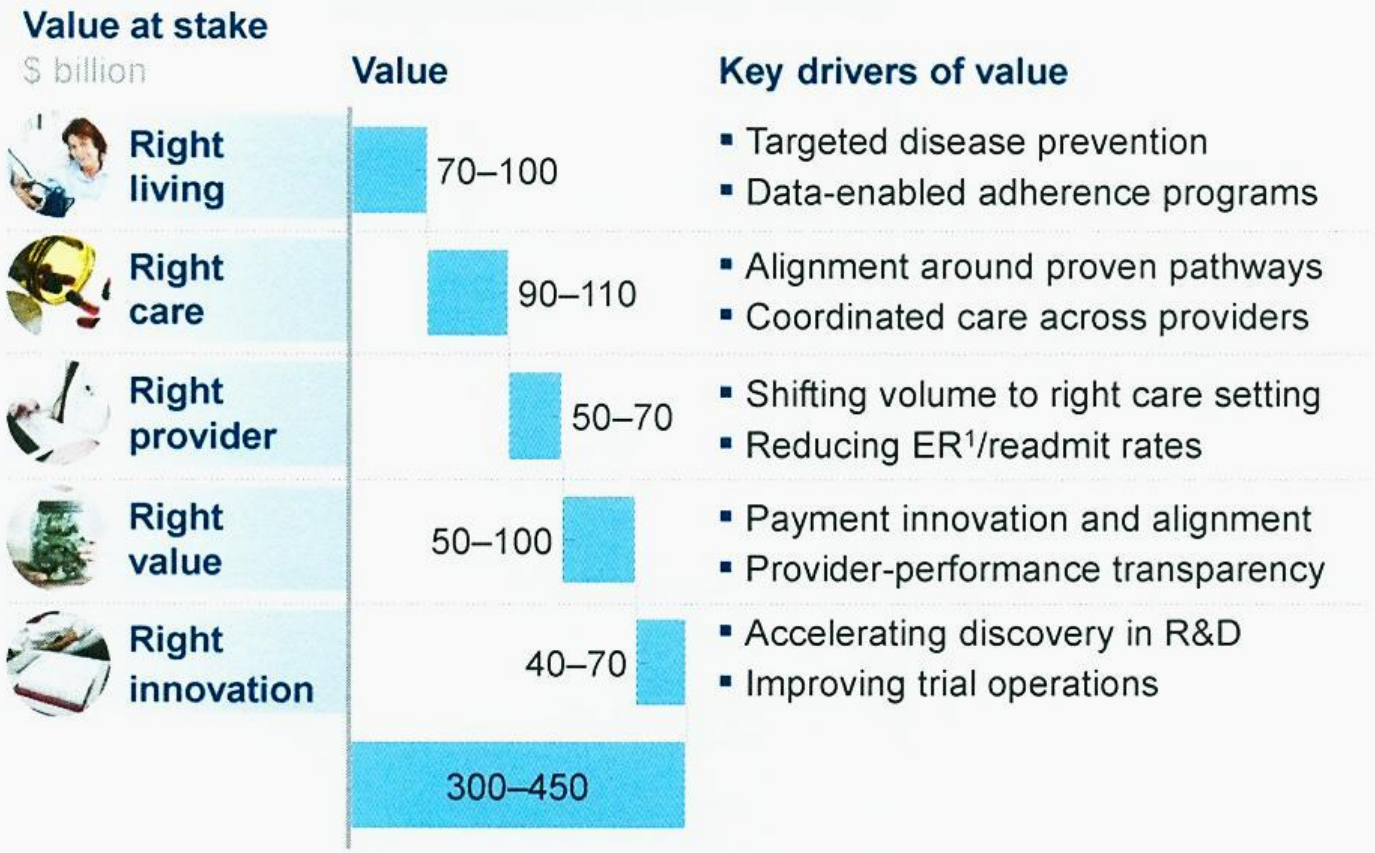
Exhibit 2: Primary data pools are at the heart of the big-data revolution in healthcare.



Source: McKinsey Global Institute analysis

The value of big data in health care = $300-450 billion

Exhibit 4: Applying early successes at scale could reduce US healthcare costs by $300 billion to $450 billion.



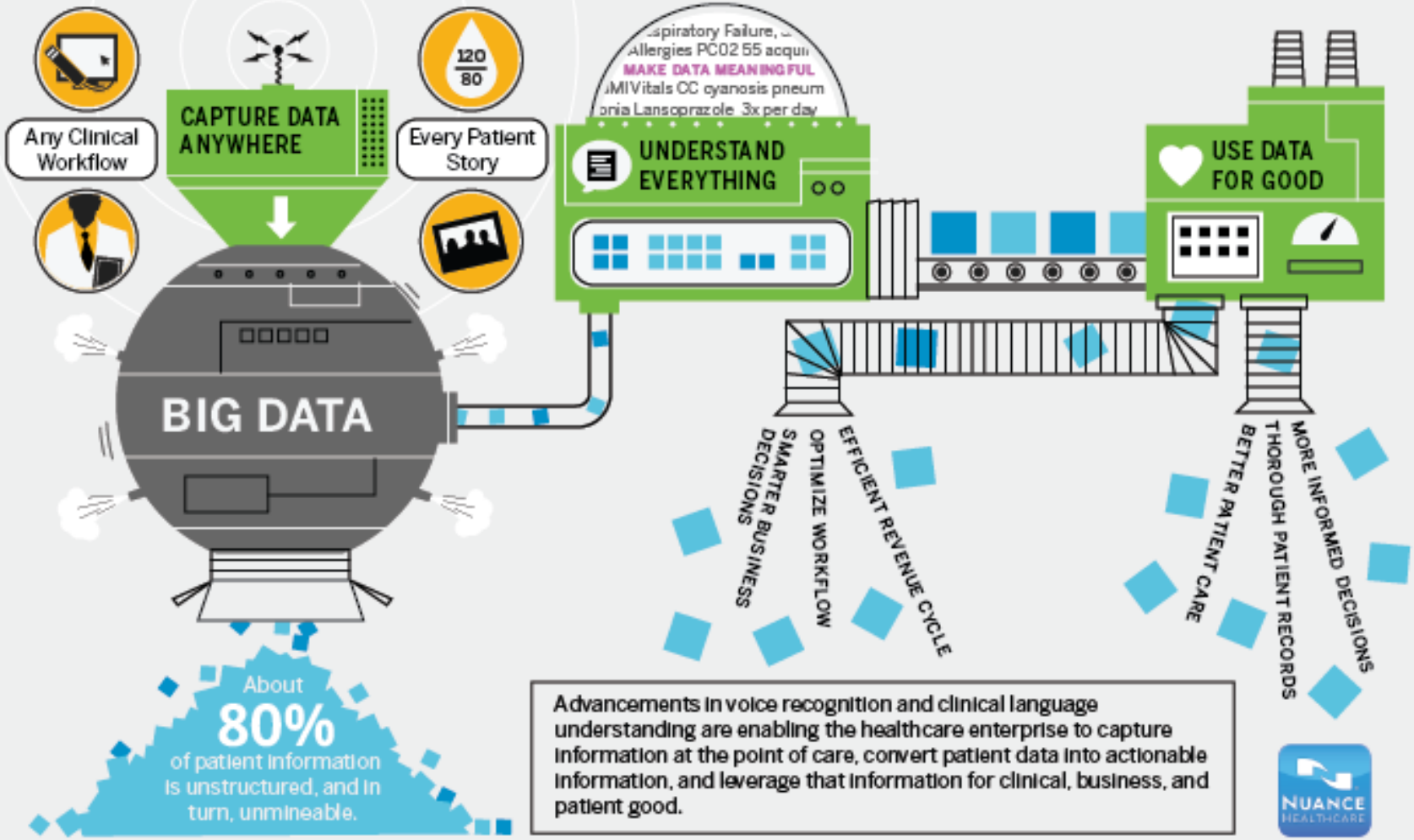
1 Emergency room.

Source: American Diabetes Association; American Hospital Association; HealthPartners Research Foundation; McKinsey Global Institute; National Bureau of Economic Research; US Census Bureau

HEALTHCARE'S DATA CONUNDRUM

FROM DISPARATE DATA TO MEANINGFUL INFORMATION

We can empower healthcare organizations, providers and payers to unify the capture, analysis, and use of data to drive smarter care and business.



www.nuance.com/for-healthcare

6 Keys to the Future of Big Data in Healthcare Marketing

Big data is forecast to make a big difference in the future of healthcare, according to a report by the **Ewing Marion Kauffman Foundation**.

1. **Figure Out How to Organize and Use Big Data**
2. **Develop Technology That Taps Into Big Data**
3. **Use Big Data for Better Decision Support**
4. **Turn To Big Data to Ease the Flow of Information**
5. **Use Big Data to Increase the Quality of Care and Decrease Costs**
6. **Develop More Mobile Apps and Social Media That Capitalize on Big Data**

Data is rapidly becoming the foundation for a Smarter Planet

Watson Healthcare Products – 1H 2013

Watson Clinical Insights Advisor

Therapy Designer

Assists with efficient trials and reduces time to market with new cancer therapies

Accelerate Research and Insights

Watson Diagnosis & Treatment Advisor

Oncologists

Assists in identifying individualized treatment options for patients diagnosed with cancer

Improve Diagnosis and Treatments

Watson Care Review and Authorization Advisor

Nurses

Streamlines manual review processes between a physician and health plans

Improve Decisions and Outcomes

Acknowledgement

行政院科技會報