

# Creating and Boosting the Life Sciences Industry, National Models: Singapore

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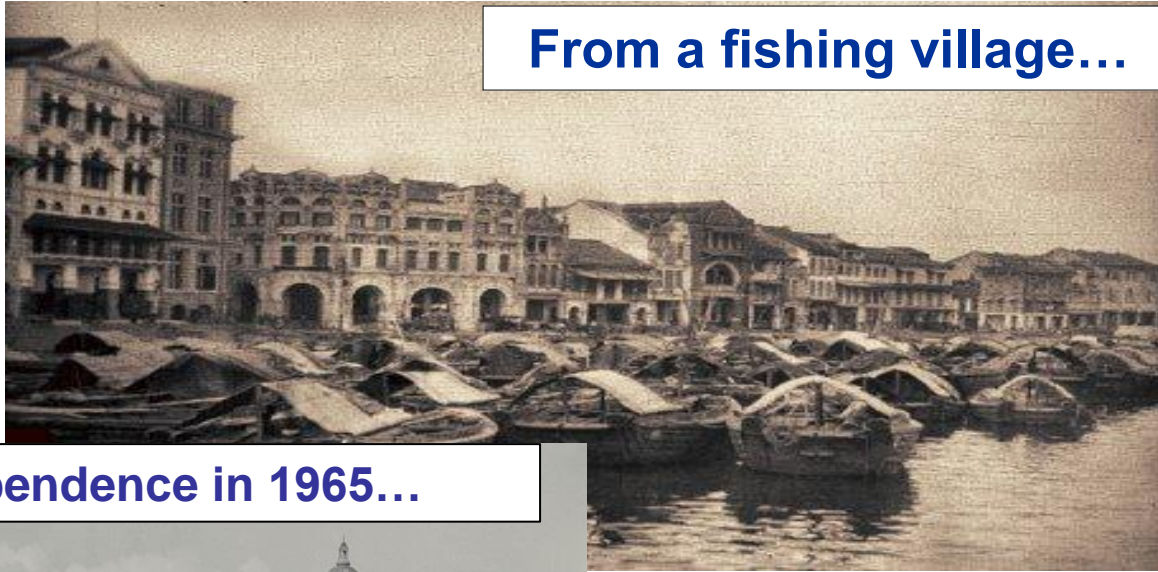


# Singapore

a little red dot on the map



**From a fishing village...**

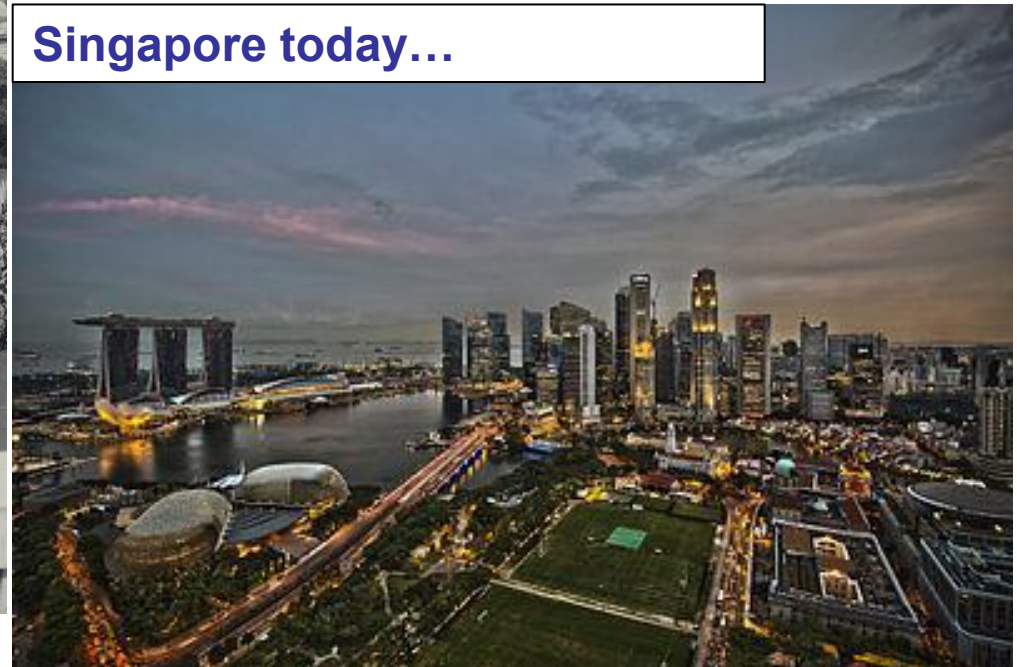


**To Independence in 1965...**



<http://www.city-infos.com/singapore/>

**Singapore today...**





# Innovation in Singapore



NUS Enterprise



*Petrol-chemical*



*Resources - Water*



*Port / Logistics*



*Tourism / Entertainment*



*Biopolis + Fusionopolis*



*Education, Research & Enterprise*

# Stages of Singapore's Economic Development & National Innovation System Change



NUS Enterprise

	1960s-1970s	1970s-1980s	1980s-late1990s	From late 1990s-	2010 and beyond
Economic Development	Beginning of DFI-Driven, Export led Industrialization	Transition to NIE	Transition from NIE to Developed Economy	Transition to Knowledge-based Economy	Sustaining growth through skills, innovation & productivity
National Innovation System	Primary focus on developing Operative Capability to man Production	Primary focus on developing Adaptive Capability to support Process Technological Deepening	Primary focus on developing Innovative Capability to support applied R&D	Primary focus on developing Intellectual Capital Creation and Commercialization/Entrepreneurial Capability to support Knowledge-based economic growth	Deepen commitment to Public Sector R&D. Push to derive commercial value from R&D, leveraging on public sector and university R&D. Integrate capabilities of public & private sectors for innovative solutions

Note: The Economic Strategies Committee recommends that R&D Expenditure as % of GDP (GERD) be increased to 3.5% by 2015 (from current 3%). This will be mainly driven by increased investment in public sector R&D.

# Some History

## 1990's – Looking beyond the region

- Asian Financial Crisis sparks repositioning oriented toward “global knowledge economy”
- Developing an external economy linked to domestic economy
  - **Create new economic space by tapping on land and manpower resources of other countries to establish industrial parks**
  - **Companies investing in these parks, use Singapore to control operations, etc; and working in an environment similar to Singapore's work ethics**
- Shift toward knowledge-based innovation-driven economy
- Welcomes talent from around the world to work in Singapore



**China-Singapore Suzhou Industrial Park, China**



**International Tech Park Bangalore, India**

**Vietnam-Singapore Industrial Park, Vietnam**



**Batamindo Industrial Park, Indonesia**



**Sino-Singapore Tianjin Eco-City, China**

# Worked on Our Strengths ...

## Singapore's Economy

- Use our core strengths:
  - Geographical position
  - Apt Infrastructure
  - Integrated communications system
  - Political stability
  - Workforce; People

## Economic Development – has to be pragmatic

- Reinforce position as an entreport
- Foray into banking, finance & high value-added sectors, i.e., knowledge economy



# Identified Areas of Focus



NUS Enterprise

## 4 Pillars of the Singapore Economy:

**Chemicals**

**Electronics**

**Engineering**

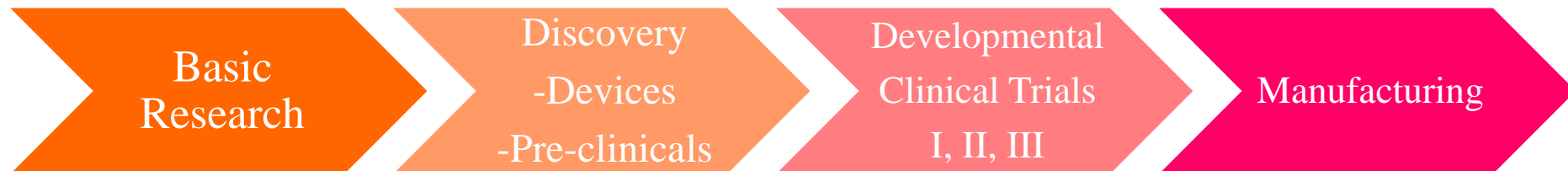
**Biomedical Sciences**



“The 21<sup>st</sup> century has been termed the “Biocentury” ... **Our goal is to develop our research capabilities across the full value chain: from basic to applied and clinical research.**”

**Philip Yeo, then-Chairman of EDB, 8 September 2000, speech at NUS**

[http://www.biomed-singapore.com/bms/sg/en\\_uk/index/newsroom/speeches/2000/life\\_science\\_-\\_the.html](http://www.biomed-singapore.com/bms/sg/en_uk/index/newsroom/speeches/2000/life_science_-_the.html)



Competitive  
Manufacturing Hub  
Bringing Quality  
Products to Markets



# A Competitive Hub for BioPharmaceutical Manufacturing

## Highly-skilled Manufacturing Workforce



Ensuring a pool of highly skilled workforce through education and continuous education

## Leadership in Process R&D



Ensuring the sustainability of Singapore's pharmaceutical manufacturing industry



## Quality Manufacturing Track Record



FDA & EMEA approved manufacturing facilities with zero major observations with regulators



## Scalable Manufacturing Needs



cGMP Biologics Manufacturing Facility  
cGMP Cell Therapy Facility  
BioProcess Development



Courtesy of EDB



# Highly Skilled Manufacturing Workforce\_

## Skill Development Programme



### Manufacturing Manpower Development

- Targeted at Technician/Operators
- Co-developed with industry players
- Focus: Practical & Soft-skills certification and diplomas

## Talent Pool With Relevant Skills



### Number of Graduates Yearly

Pharmacy (124)  
Chemical Engineering (450)  
Chemistry (250)  
Process Engineering  
Bioengineering (173)



Courtesy of EDB

## Science & Engineering Talent Base

### Strong Focus on Science & Engineering

>40% (32,000 a year) of graduates are trained as engineers or science-based

### 10 Institutes of Technical Education



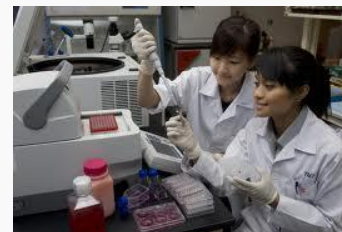
### 5 Polytechnics



### 3 Universities



## Pilot Scale Facility for Training



### Integrated Primary and Secondary Pilot Plant Facility for Training

Diploma in Pharmaceutical Sciences  
Diploma in Food Sciences  
Diploma in Molecular Biotechnology

# Scalable Manufacturing Needs\_

## Lonza

Providing scalable manufacturing solutions



### Biologics Manufacturing Facility

cGMP Commercial scale manufacturing 40,000 Litre

### Cell Therapy Facility

cGMP Autologous and Allogeneic cell therapy manufacturing

### BioProcess Development

Enabling new products to enter into commercial-scale manufacturing

## Local Contract Manufacturing Solutions

### cGMP Certified Contract Manufacturing Organisation



### Customised Manufacturing Solutions

- Tableting
- Packaging & Labelling
- Solid/liquid dosage manufacturing
- R&D pilot facility

### Commercialisation

- Regulatory Affairs & Registration
- Marketing & Distribution

# Process development\_

## Recent Announcements



2011 – Abbott opens new formulation and drug delivery technology lab



2009 – 3M's lab for inhalation and transdermal products to Asia-Pac customers



2008 – GSK opens first small-molecule pilot plant in Asia (\$84 mil)



2011 – Lonza opens new bioprocess development facility (\$30m)



2006 - Nanomaterials set up a new facility for High Gravity Controlled Precipitation

# Research & Development Early Phase Clinical Trials





# First in Man Facilities

## Investigational Medicine Unit



### 3 Public Investigational Medicine Units

- Located in academic medical centres
- For POC and first in man trials, latter phased studies also supported
- 4-6 week trial approval process with parallel submission to hospital ethics board and HSA

### NUHS Strengths

- PK/PD Analysis
- Biostatistics
- Cardiovascular Imaging
- Clinical Pharm
- Genetics & Genomics
- 16 bed unit

### SingHealth Strengths

- Oncology
- Haematology
- Cardiology
- Gastroenterology
- 30 bed unit

Courtesy of EDB

## Other Hospitals, Specialty Institutions & Medical Schools



And others...



# Contract Research Organisation\_

## Niche CROs



**Pre-clinical research organisation with specialised animal models**  
Services including Toxicology & safety pharmacology, PK/PD & biomarker



**Fully integrated drug discovery, development, and manufacturing services.**  
cGMP Manufacturing, Aseptic Fill & Finish and Project Management

## Drug Development Vehicle

**Alternative drug development model for the Asian market**



- In-license pre-clinical compounds
- Bring the compound through to Proof of Concept
- Out-license compound back to partner

## Big 5 CROs

**Top 5 CROs for pharmaceutical company's research needs**



### **Clinical development**

Clinical Trial Coordination Hub  
POC Trial Services  
Data Management

### **Commercialisation**

Sale Solution  
Market Access Implementation  
Medical Science Liaisons

### **Consulting**

Regulatory Filing  
Market Access Strategy/ Intelligence  
Late Phase trials

# Research & Development Integrated Location for Pharmaceutical Research needs and Early Phase Clinical Trials



# BioPharmaceutical Research & Development

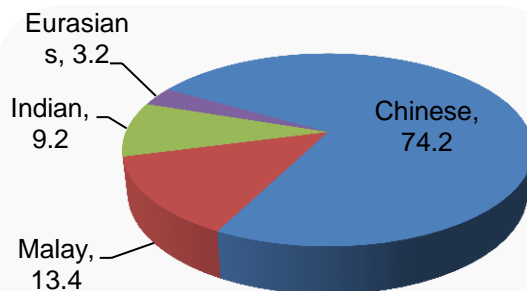
## 5 key Asian Prevalent Research Area



### Specialisation in Asian diseases

Supported by S\$125million on translational clinical research of the 5 diseases

## Diverse Asian Population



Multi-Racial patient assets representing Asian population

## CROs as Innovation Enablers

**Top 5 CROs**

- QUINTILES
- ICON (A Symbol of Excellence)
- COVANCE (THE DEVELOPMENT SERVICES COMPANY)
- PAREXEL
- PPD

**Niche CROs**

- AMRI
- maccine
- ASLAN PHARMACEUTICALS

DDV

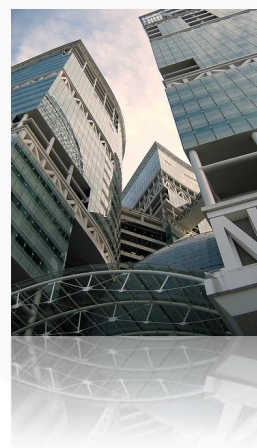
## Investigational Medicine and Early Phase trials



### 3 Public Investigational Medicine Units

Safety, dosage, PK/PD, ADME, Toxicity. POC

## Integrated Research Campus



### Biopolis & Fusionopolis

6 Consortia and Centres

14 Research Institutes

20 Companies

A world-Class research hub with a culture of collaboration between private and public institution



# Research in Asia for Asians\_

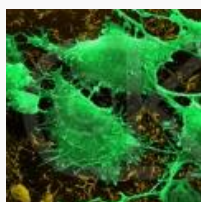
## 5 key Asian Prevalent Research Area

### Translational Clinical Research Flagship Programme

S\$125 mil for 5 programmes pooling together clinicians & scientists to better understand pathogenesis of diseases in Asia.



Infectious Diseases



Oncology



Neurosciences

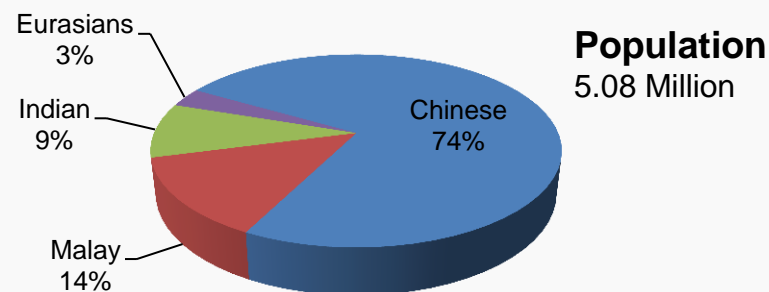


Metabolic Diseases



Ophthalmology

## Diverse Asian Population



Representing the demographical population of the Asian population

### Different diseases & disease biology

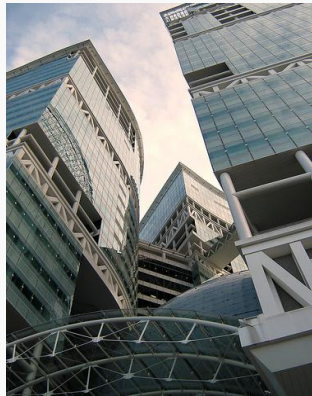


Rising Asian affluence and demand for better healthcare

Fastest aging population in Asia

# Biopolis an Integrated Research Campus\_

## World Class Infrastructure



### Biopolis & Fusionpolis

Shared scientific facilities  
2,000 scientists  
20 companies  
4.1 million ft<sup>2</sup>



Abbott



NOVARTIS

## World Class Talent



## Biomedical Research Institutes



### 7 Biomedical Research Institutes:

Bioinformatics Institute, Bioprocessing Technology Institute, Experimental Therapeutics Centre, Genome Institute of Singapore, Institute of Bioengineering and Nanotechnology, Institute of Medical Biology, Institute of Molecular and Cell Biology

### BMRC Consortia

Bioimaging, Stem Cells, Immunology Network, clinical sciences and neurosciences

Courtesy of EDB

Home in Asia  
to Accelerate Growth in  
Emerging Businesses



# Home in Asia for Top Pharmaceutical Companies\_

## Pharmaceutical companies that have Regional HQs in Singapore

Johnson & Johnson



Abbott

NOVARTIS

SANOFI



QUINTILES  
TRANSNATIONAL

AstraZeneca



## Highlights of Headquarters in Singapore



### GSK's Emerging Markets & Asia-Pacific Hub

Shared services hub supports all BD's operations in Asia-Pacific region.



### Quintiles's Asia-Pac Regional Headquarters

Quintiles Singapore functions as Asia-Pac headquarters providing a full range of clinical development and commercialization services



### Novartis's Regional Headquarters for Asia Cluster

Regional headquarters for pharmaceutical operations across Asia cluster (7 countries)

# Home to Strategic Headquarters\_

## Asia Pacific Function in Singapore to Accelerate Business Growth Worldwide



- **Asia Pacific HQ**
- **Company's First and Largest Asia Manufacturing facility** for nutritional powder manufacturing
- **Center of Excellence for Drug Product Development** Formulation R&D Lab and Analytical Research Lab

## Eastern Hemisphere Headquarters in Singapore that Manages one third of GSK's Revenue



- **Emerging Markets & Asia-Pacific Hub**
- **Training Hub** for health policy and regulatory talent
- **Strategic Global Manufacturing Location** with new product introduction capabilities
- **R&D - Drug Performance Unit (DPU)** for Neuroscience R&D, Regional Clinical Coordination hub

Courtesy of EDB





# BioPharmaceutical Investment Highlights\_

## R&D

### Roche Hub for Translational Medicine



Roche opens 1<sup>st</sup> hub for translation medicine in Asia to focus on enhancing personalised treatment approaches.

### MSD Translational Medicine Research Centre



MSD Translational Medicine Research Centre focuses on biomarker discovery and development

Courtesy of EDB

## Manufacturing

### Lonza Cell Therapy Manufacturing Facility



Lonza Group opens new facility for cell therapy manufacturing. This will be Lonza's global allogeneic cell therapy hub.

### GSK Vaccine Manufacturing Facility



GSK opens first vaccine manufacturing facility in Asia. This facility will be one of the two global sites producing purified bulk polysaccharides and conjugates

## Headquarters

### GSK Headquarters for Eastern Hemisphere



GSK manages its businesses in emerging market out of Singapore. This HQ accounts for one third of GSK's world wide revenue.

### Novartis Regional Headquarters



Novartis manages 7 Business Units regional headquarters out of Singapore.

# Home to Global Pharmaceutical Leaders\_

Top 10 Pharmaceutical Companies in 2010

Johnson & Johnson

 **gsk**  
GlaxoSmithKline  
Biologicals

 **Roche**

 **MERCK**

 **Abbott**  
A Promise for Life

 **Pfizer**

 **Lilly**

 **NOVARTIS**

 **SANOFI**

 **AstraZeneca**

**50** Manufacturing Plants  
**S\$23B output in 2010**  
**13,000 employees**  
Courtesy of EDB

**50** R&D Centers  
**S\$1B R&D expenditure**  
**4,300 Researchers**

**30** leading RHQs  
**Top 10 Pharma & Biotech companies**

# A World Class Hub for Business\_

## A Globally Competitive Business City

- Home to 7,000 MNCs
- Located in the **heart of Asia-Pacific**: 7h flight-time radius from key markets
- Competitive tax regime and tax incentives to **facilitate business growth** and expansion



“World’s Easiest Place to Do Business” – World Bank

## Access to Asia’s Top Business Talent

- With 1.2 million resident expatriates, the best place in Asia to live, work and play
- A “**Global Schoolhouse**” – with a host of world class management and business universities and programs
- Human Capital Leadership Initiative – to develop business **thought leadership in Asia**



“First Choice for Asian Expatriates” – ECA International  
Courtesy of EDB

## A Vantage Point to Capture Business Growth Opportunities

- A neutral location to **manage** Asia and international operations
- A home to **integrate** and closely manage key activities across HQ, R&D and manufacturing operations
- A base to **accelerate** new business and market growth strategies, e.g. for emerging markets, fast-growing business segments

- *Novartis opens Asia cluster regional headquarters*

- *Lonza opens biosciences regional headquarters in Singapore to manage Asia’s business*

- *GSK manages Eastern hemisphere business (1/3 of total revenue) out of Singapore*



# Thank You

