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# Biomedical Sciences

Factsheet 2009

## Singapore - The Biopolis of Asia

### At a Glance

Located at the heart of Asia, Singapore presents an ideal home-base for global businesses, innovation and talent in the region.

Singapore has established its position as a global site for pharmaceutical and medical technology manufacturing. In addition, more than 50 biomedical sciences companies are carrying out R&D activities that include drug discovery, translational and clinical research as well as medical technology innovation, many of them through new partnerships and business models. A growing number of companies have also established their regional headquarters in Singapore to expand their outreach into Asian markets.

Since the year 2000, when Singapore launched its biomedical sciences initiative, the Singapore Economic Development Board (EDB) has worked closely with other agencies, such as the Agency for Science Technology and Research (A\*STAR), the Ministry of Health (MOH), and our universities, to build up scientific and clinical excellence. In 2006, we launched phase II of the biomedical sciences initiative, which will focus on building up strong translational and clinical research expertise, while strengthening our basic science capabilities.

Singapore's vision is to be the Biopolis of Asia, a leading international biomedical sciences cluster advancing human health by achieving excellence across the entire value chain. The Government has invested in more than S\$5 billion in building up industrial, human and intellectual capital thus far, and remains fully committed to developing this sector.

## 1. National R&D Survey

For Year 2007	
Gross Expenditure on Research and Development (GERD)	S\$6.3 billion
GERD as a Percentage of GDP	2.61%

Equivalent figures for Year 2007 for (Source: OECD, Main Science and Technology Indicators, December 2008)	
Finland (2008)	3.41%
Japan (2006)	3.39%
Korea <sup>1</sup> (2006)	3.22%
USA <sup>2</sup> (2006)	2.68%
Germany (2007)	2.53%
United Kingdom (2006)	1.78%
China (2006)	1.42%

Number of Research Scientists and Engineers (RSEs <sup>***</sup> ) in Singapore	28,600
Number of Research Scientists and Engineers (RSEs <sup>***</sup> ) per 10,000 labour force in Singapore	104
Number of Research Scientists and Engineers (RSEs <sup>***</sup> ) with Ph.D. degree	5,641 (20% of RSEs)
Number of Research Scientists and Engineers (RSEs <sup>***</sup> ) with Master's degree	7,525 (26% of RSEs)
Number of patents applied	1,739
Number of patents awarded	941
*** Data includes full-time postgraduate research students.	

Source: National Survey of R&D in Singapore prepared by A\*STAR

## 2. R&D in Biomedical Sciences

For the Year 2007	
Gross Expenditure on Research and Development (GERD)	S\$1,143.79 million
Private Sector	S\$ 426.76 million
Public Sector	S\$ 717.03 million
A*STAR	S\$ 387.43 million
A*STAR publications <sup>3</sup>	392

	Private Sector	Public Sector	A*STAR
Number of RSEs	1,179	2,822	983
With Ph.D. degree	322 (27.3%)	1,289 (45.7%)	575 (58.5%)
With Master's degree	260 (22.1%)	610 (21.6%)	109 (11.1%)
With Bachelor's degree	597 (50.6%)	923 (32.7%)	299 (30.4%)

Source: National Survey of R&D in Singapore prepared by A\*STAR

### Biomedical Research Highlights 2008

- Bioprocessing Technology Institute (BTI) researchers have developed a monoclonal antibody that is able to specifically target undifferentiated human embryonic stem cells (hESCs) and cause them to undergo induced cell death. The research team's findings were published online on 20th March 2008 in the journal *Stem Cells*. Work has already started by the team to determine the molecular mechanisms behind the process of cell killing.
- Genome Institute of Singapore (GIS) researchers, led by Dr Yu Qiang, have concluded a collaboration with the University of California, San Francisco in developing a novel pharmacological approach to kill colon cancer cells, as published in the June 9, 2008 issue of *Cancer Cell*. The team is now working with other A\*STAR Research Institutes and industry partners to develop potential drug candidates based on this technology.
- A collaborative team of researchers from the Institute of Cell and Molecular Biology (IMCB) and NUS Yong Loo Lin School of Medicine, led by IMCB Principal Investigator Dr Yoshiaki Ito, established the link between the disruption of RUNX3 gene and colon cancer. This research finding holds great promise for the early detection and therapy of colon cancer, and was reported in the top tier journal *Cancer Cell* on 09 September 2008.

<sup>1</sup> Excluding R&D in the social sciences and humanities

<sup>2</sup> Excludes most or all capital expenditure, Provisional

<sup>3</sup> Data is for financial year 2007 (April 2007 - March 2008)

- Sciencewatch.com, a comprehensive web resource for tracking trends and research performance, has named a publication on mesoporous materials by Dr Jackie Ying, as one of the top 3 papers in the past 10 years. Published in *Angewandte Chemie* (38 [1999] 56-77), the paper entitled “Synthesis and Applications of Supramolecular-Templated Mesoporous Materials” by J. Y. Ying, C. P. Mehnert and M. S. Wong received its top 3 rating based on 971 citations.
- A team led by Prof Jackie Ying, Executive Director of the Institute of Bioengineering and Nanotechnology (IBN) and Dr Andrew Wan, Principal Investigator (IBN), has invented a unique user-friendly thixotropic gel synthesised from a nanocomposite of silica and polyethylene glycol (PEG), that can liquefy on demand and has the potential to revolutionise three-dimensional (3D) cell culture for medical research. This research has been published in the September 2008 issue of the prestigious journal *Nature Nanotechnology*.

**3. Translational & Clinical Research**

Singapore has committed S\$1.55 billion to drive translational and clinical research. Initiatives include training schemes to expand our base of clinician scientists and clinical research publications. In 2007, our hospitals published more than 600 clinical research publications.

Singapore has also launched five S\$25 million Translational and Clinical Research (TCR) Flagship Programmes that will bring scientists and clinicians together to work on key diseases. The five TCR Flagship Programmes are awarded in 2007-2008. They are as follow:

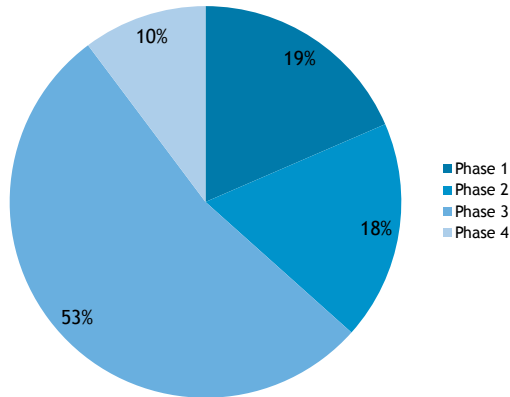
- Singapore Gastric Cancer Consortium (Cancer)
- Translational Research Innovations in Ocular Surgery (Eye Disease)
- Vulnerability, Disease Progression and Treatment in Schizophrenia and Related Psychoses (Neuroscience)
- Developmental pathways to metabolic diseases (Metabolic Diseases)
- Scientific exploration, translational research, operational evaluation of disease prevention and preventive measures through new treatment strategies against Dengue (STOP Dengue)

Number of Approved Products (2008):

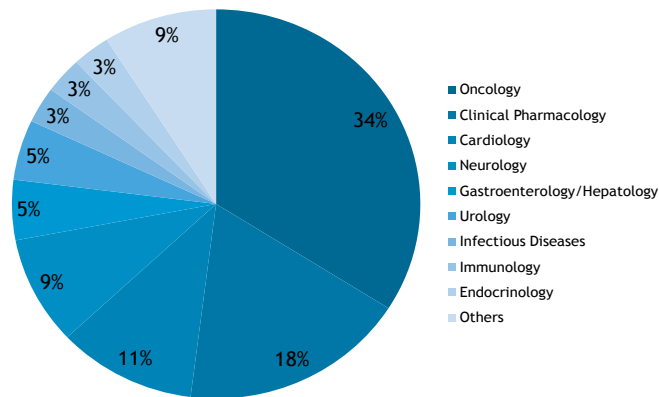
For year 2007:

Number of Approved Clinical Trials Certificates: 253

- Stage of Study



- Therapeutic Areas



Source: Health Sciences Authority, Singapore

## 4. Manufacturing

Singapore has established its position as a trusted and competitive site for biopharmaceutical manufacturing. Today, 12 leading biopharmaceutical companies and 25 leading medical technology companies have invested in more than 50 commercial-scale manufacturing facilities. These facilities have also received validation from international regulators such as the US Food and Drug Administration (FDA) and the European Medicines Agency (EMA).

For Year 2008*		
BMS Manufacturing Output	S\$19.0 billion (US\$12.7 billion) (7.6% of Total Manufacturing Output)	
BMS Manufacturing Value-Add	S\$10.6 billion (US\$ 7.1 billion) (4.1% of GDP)	
Manufacturing Employment	Total	12,450
	Pharmaceutical	4,169
	Medical Technology	8,281
Value-added per worker	S\$0.8 million	
* US\$ figures are based on an exchange rate of US\$1.00 = S\$1.50		

Source: Singapore Economic Development Board

## About the Singapore Economic Development Board

The Economic Development Board (EDB) is the lead government agency for planning and executing strategies to enhance Singapore's position as a global business centre and grow the Singapore economy. We dream, design and deliver solutions that create value for investors and companies in Singapore. In so doing, we attract economic opportunities and jobs for the people of Singapore, and help shape our country's economic future.

For more information on how EDB can help in your biomedical sciences business and investment, please visit [www.biomed-singapore.com](http://www.biomed-singapore.com)

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