The Biomedical Industry and Medical Tourism in Singapore

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Introduction

- The Biomedical industry in Singapore
- Role of the Economic Development Board
  - Agency for Science, Technology & Research
  (A*STAR)
- Recent Development of Medical Tourism
- Comparisons of Medical Tourism in Singapore, Malaysia and Thailand
- Future Development of Research and Training
- Policy Implications from Singapore Experience
- Conclusion
Four Pillars of Economic Growth in Singapore (circa 2000)

- Trade
- Tourism
- Financial Services
- Manufacturing
- Electronics
- Information technology
- Chemicals
- Life sciences
Singapore Government Initiatives for Biomedical/Life Sciences

- Ministerial Committee for Biomedical Sciences Industry
- International Advisory Council
- $1 billion Biomedical Sciences Investment Fund
- Bioethics Advisory Committee
- National Science & Technology Board restructured into Agency for Science, Technology & Research (A*STAR)
- Biomedical Research Council to oversee R&D
- Bio*One Capital – biomedical sciences capital investment arm of Economic Development Board
Vision of the Singapore Economic Development Board

To become a Global Medical Hub providing a comprehensive range of world-class value-added Medical Services
Value Chain of Healthcare Services

VERTICAL & HORIZONTAL INTEGRATION
Key Agencies for Biomedical Development in Singapore

- EDB Biomedical Sciences Group (BMSG)
  - Responsible for investment promotion, industry planning and development
- EDB Bio*One Capital
  - Supports strategic investments in business spin-offs
- Agency for Science, Technology and Research (A*STAR)
  - Biomedical Research Council (BMRC)
  - coordinates and funds R&D
  - grooms scientific leadership and talent
Biomedical Industry Promotion by the Economic Development Board

- By year 2010, EDB aims for Singapore to be key business base for 15 world-class companies, and a regional centre for clinical trials and drug development. EDB has invested in R&D and HRD, and nurtured start-up companies through co-investments and venture capital.
- By 2008, 11 top pharma & biotech companies have invested in 25 plants.
- 7 biomed plants will open in 2008-2010.
- Biologics will grow 13% annually.
- Biomedical industry will grow to over $20 billion, employing 10,000 in 2010.
SingaporeMedicine – Promotion of Healthcare Services by the Singapore Tourism Board

Economic Review Committee (ERC) 2003 – recommendation targets of the Health Services Working Group

Aims:
• Attract 1 million foreign patients with 1,000 daily admissions by 2012
• Grow market share from 1% - 3% of GNP
• Generate $3 billion in health expenditure or $2.6 billion value-added to economy
• Create 13,000 new jobs
# Foreign Patients in Singapore

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Number of foreign patients (public &amp; private hospitals)</td>
<td>13,291</td>
<td>12,801</td>
<td>15,844</td>
<td>10,698</td>
<td>12,746</td>
<td>1,000,000?</td>
</tr>
<tr>
<td>Total no. of hospital admissions</td>
<td>214,657</td>
<td>235,650</td>
<td>272,186</td>
<td>270,048</td>
<td>306,880</td>
<td></td>
</tr>
<tr>
<td>% of foreign to total hospital admissions</td>
<td>6%</td>
<td>5%</td>
<td>6%</td>
<td>4%</td>
<td>4%</td>
<td></td>
</tr>
</tbody>
</table>

![Bar chart showing the number of foreign patients and total hospital admissions from 1993 to 2002.](chart.png)
Total Expenditure of Foreign Patients in Singapore, 2004-2008

# Top Healthcare Groups in Asia

<table>
<thead>
<tr>
<th>Company</th>
<th>Country</th>
<th>Sales (US$m)</th>
<th>Market Capitalization (US$million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nichii Gakkan</td>
<td>Japan</td>
<td>535.1</td>
<td>3,768.1</td>
</tr>
<tr>
<td><strong>Parkway Holdings</strong></td>
<td>Singapore</td>
<td>228.3</td>
<td>1,003.6</td>
</tr>
<tr>
<td>Prasit Patana</td>
<td>Thailand</td>
<td>51.5</td>
<td>0.6</td>
</tr>
<tr>
<td>Bumrungrad</td>
<td>Thailand</td>
<td>42.6</td>
<td>5.7</td>
</tr>
<tr>
<td>Bangkok Dusit Medical</td>
<td>Thailand</td>
<td>36.3</td>
<td>15.1</td>
</tr>
<tr>
<td><strong>Raffles Medical</strong></td>
<td>Singapore</td>
<td>31.4</td>
<td>279.3</td>
</tr>
<tr>
<td>Pantai Holdings Bhd</td>
<td>Malaysia</td>
<td>30.1</td>
<td>186.3</td>
</tr>
<tr>
<td>KPJ Healthcare Bhd</td>
<td>Malaysia</td>
<td>28.3</td>
<td>40.8</td>
</tr>
<tr>
<td>Samitivej Public</td>
<td>Thailand</td>
<td>26.3</td>
<td>5.2</td>
</tr>
</tbody>
</table>
## Medical Tourism in Southeast Asia

<table>
<thead>
<tr>
<th>Country</th>
<th>Year</th>
<th>Estimated earnings</th>
<th>No. foreign patients</th>
<th>Origin of patients (in order of volume)</th>
<th>Specialties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thailand</td>
<td>2006</td>
<td>Baht 36 billion (US$1.1 billion)</td>
<td>1.4 million</td>
<td>Japan, USA, South Asia, UK, Middle East, ASEAN countries</td>
<td>Cosmetic and sex change surgery</td>
</tr>
<tr>
<td>Singapore</td>
<td>2007</td>
<td>S$1.7 billion (US$1.2 billion)</td>
<td>348 000</td>
<td>Indonesia, Malaysia, Middle East</td>
<td>Cardiac and neuro-surgery, orthopaedic joint replacements, liver transplants</td>
</tr>
<tr>
<td>Malaysia</td>
<td>2007</td>
<td>253.84 million MYR (US$78 million)</td>
<td>341 288</td>
<td>Indonesia, Singapore, Japan, India, Europe</td>
<td>Cardiac and cosmetic surgery</td>
</tr>
</tbody>
</table>

Sources: Ministries of Tourism, Malaysia, Singapore and Thailand; media sources
# Comparative Health Systems in Thailand, Malaysia and Singapore

<table>
<thead>
<tr>
<th>Health System</th>
<th>Thailand</th>
<th>Malaysia</th>
<th>Singapore</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Structure and Functions</strong></td>
<td>Pockets of excellence in private hospitals and certain specialties</td>
<td>Growing private health sector with movement of qualified workforce</td>
<td>Regional service hub Medical R&amp;D support Corporatized public hospital sector Economic growth strategy for health/biomedical industry</td>
</tr>
<tr>
<td><strong>National Strategy</strong></td>
<td>Supportive tourism infrastructure</td>
<td>Industrial strategy to develop tourism</td>
<td></td>
</tr>
<tr>
<td><strong>Quality and Standards</strong></td>
<td>+ Good value + Good hospitality</td>
<td>++ Good quality + Acceptable service</td>
<td>+++ High quality +++ High efficiency</td>
</tr>
<tr>
<td><strong>Costs</strong></td>
<td>++ Relatively moderate</td>
<td>+++ Relatively cheap</td>
<td>+ Relatively high</td>
</tr>
<tr>
<td><strong>Socio-cultural</strong></td>
<td>++ Buddhist and tolerant + Foreign languages available</td>
<td>+ Muslim/multi-racial ++ English widely used</td>
<td>+++ Cosmopolitan +++ English as working language</td>
</tr>
<tr>
<td><strong>Regulation</strong></td>
<td>+ Acceptable but lack of transparency/consistency</td>
<td>++ Moderately strong but lack of efficiency</td>
<td>+++ Very strong laws and enforcement</td>
</tr>
</tbody>
</table>
Investments in Biomedical Industry in Singapore

- Total venture capital $10.2 billion raised (1983-2000)
- $1 billion Biomedical Sciences Investments Fund (2000)
- $5 billion (2000-2005) total funds to $7 billion (2006-2010)
- Government venture capital fund – $20 million for R&D
- Pfizer plans US$350M API plant (2000)
Past Pharmaceutical Industry Investments in Singapore

- 1971 Smith Kline Beecham US$118M API plant
- 1979 Glaxo Wellcome US $147M API plant
- 1990 Glaxo Wellcome US$153M API plant
- 1993 Rhone-Poulenc Rover US$59M API plant
- 1995 Glaxo Wellcome US$47M NPMD pilot plant
- 1996 Schering-Plough US$118M API plant and US$100M manufacturing plant
- 1998 Rhone-Poulenc Rover US$41M API plant
- 1999 Schering-Plough US$18M formulation facility
  Aventis (formerly RPR) US35M API plant
- 2001 Merck US$400M plant
- 2003 Merck expanded US$100M plant
- 2003 Pfizer US$350M API plant

API- Active Product Ingredient
# Share of Biomedical Industry in Manufacturing Sector

<table>
<thead>
<tr>
<th></th>
<th>1999 BMI</th>
<th>1999 Share (%)</th>
<th>2007 BMI</th>
<th>2007 Share (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment (No.)</td>
<td>5600</td>
<td>1.65</td>
<td>11,518</td>
<td>3</td>
</tr>
<tr>
<td>- Pharmaceutical</td>
<td>4,192</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Medical Technology</td>
<td>7,325</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output (S$M)</td>
<td>6.2</td>
<td>4.64</td>
<td>24,000*</td>
<td>10.1</td>
</tr>
<tr>
<td>Value Added (S$M)</td>
<td>5.2</td>
<td>14.89</td>
<td>13,400*</td>
<td>24.4</td>
</tr>
</tbody>
</table>

Sources:

* Figures are in S$ million.
## Growth of the Biomedical Industry in Singapore

<table>
<thead>
<tr>
<th></th>
<th>2004</th>
<th>2005</th>
<th>2010 Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment (No)</td>
<td>9200</td>
<td>&gt;10,000</td>
<td>15,000</td>
</tr>
<tr>
<td>Manufacturing Output (S$ billion)</td>
<td>15.8</td>
<td>18</td>
<td>25</td>
</tr>
<tr>
<td>Fixed Asset Investment (S$ million)</td>
<td>849</td>
<td>860</td>
<td></td>
</tr>
<tr>
<td>Total Value Added (S$ billion)</td>
<td>1.49</td>
<td>2.57</td>
<td>12.5</td>
</tr>
</tbody>
</table>

Public-Private Mix of R&D in Biomedical Sciences, Singapore

Public
- S$277 million
- 934 research scientists
- 453 PhDs (48.5%)
- 161 MSc (17.2%)
- 318 BSc (34.0%)

Private
- S$531 million
- 1,089 research scientists
- 286 PhDs (26.3%)
- 226 MSc (20.8%)
- 485 BSc (44.5%)

Biomedical/Life Sciences Training and Research Institutes in Singapore

- 1987 – Institute of Molecular & Cellular Biology (IMCB)
- 1990 – Bioprocessing Technology Institute (BTI)
- 1993 – Centre for National Products Research
- 1996 – Bioinformatics Institute (BII)
  - Lilly-NUS Centre for Clinical Pharmacology
- 1998 – Centre for Drug Evaluation
  - Kent Ridge Digital Labs
- 2000 – Johns Hopkins-NUH Centre
  - Singapore Genomes Program (SGP)
- 2001 – SGP renamed Genomes Institute of Singapore (GIS)
  - Novartis Institute of Tropical Diseases
- 2002 – Institute of Bioengineering and Nanotechnology (IBN)
- 2003 – BioPolis hub for biomedical research
- 2004 – Regional Emerging Diseases Intervention (REDI) Center
  - Centre for Molecular Medicine
- 2007 – Duke-NUS Graduate Medical School
- 2010 – NUS-GSK Initiative for Health in Asia (NIHA)
Biomedical/Life Sciences in the National University of Singapore

• $30 million Office of Life Sciences
• Main biomedical thrust on basic mechanisms of human diseases - prevention and treatment
• Main activities – 1) education 2) research 3) training & recruitment
• New life sciences curriculum jointly launched by faculties of science and medicine in 2002
• Linkages with other institutes and centres
• $100 million re-development of medical school - renamed the Yong Loo Lin School of Medicine
• Duke-NUS Graduate Medical School - production and training of clinician-scientists
Strategic Life Sciences Research in National University of Singapore

- Coordinated research involving faculties of medicine, science, engineering and computing; also law, arts & social sciences and business for ethical, legal, social and economic implications
- 5 target diseases
  - cancer, ageing/neurobiology, cardio-vascular, liver and infectious diseases
- 5 platform technologies
  - bioinformatics, bioengineering, experimental therapeutics, immunology and structural biology (genomics, proteomics, etc)
R&D Areas of Interest in the Biomedical Industry

• Genes, Genomes and Medicine
  - Human Genome
  - Molecular Breeding
  - Human Stem Cells

• Research to Business
  - Bioscience, Biotechnology
  - Global Biotech Investing

• Intellectual Property Rights
  - Publication, Research Products
  - Patent Laws, Licensing

• Emerging Technologies

• Social & Ethical Issues
  - Gene Testing
  - Whole Genome Scanning
Conclusion

- Strategic development of biomedical niche industries based on regional hub status and comparative advantages
- Integrated participation of public-private partnership with medical tourism industry – funding, regulations (IP protection), quality control, training & HRD, etc
- Proactive recruitment and management of international scientific talent
- Good governance in policies and systems