

Pharma Innovation at Korea

- Business Opportunities in Korea -

October 23, 2014

Dahee JEONG

Director of Bio-Medical Industry,
Investment Promotion Department



Location: Traditional Korean Houses, Seoul
Source: KOREA TOURISM ORGANIZATION



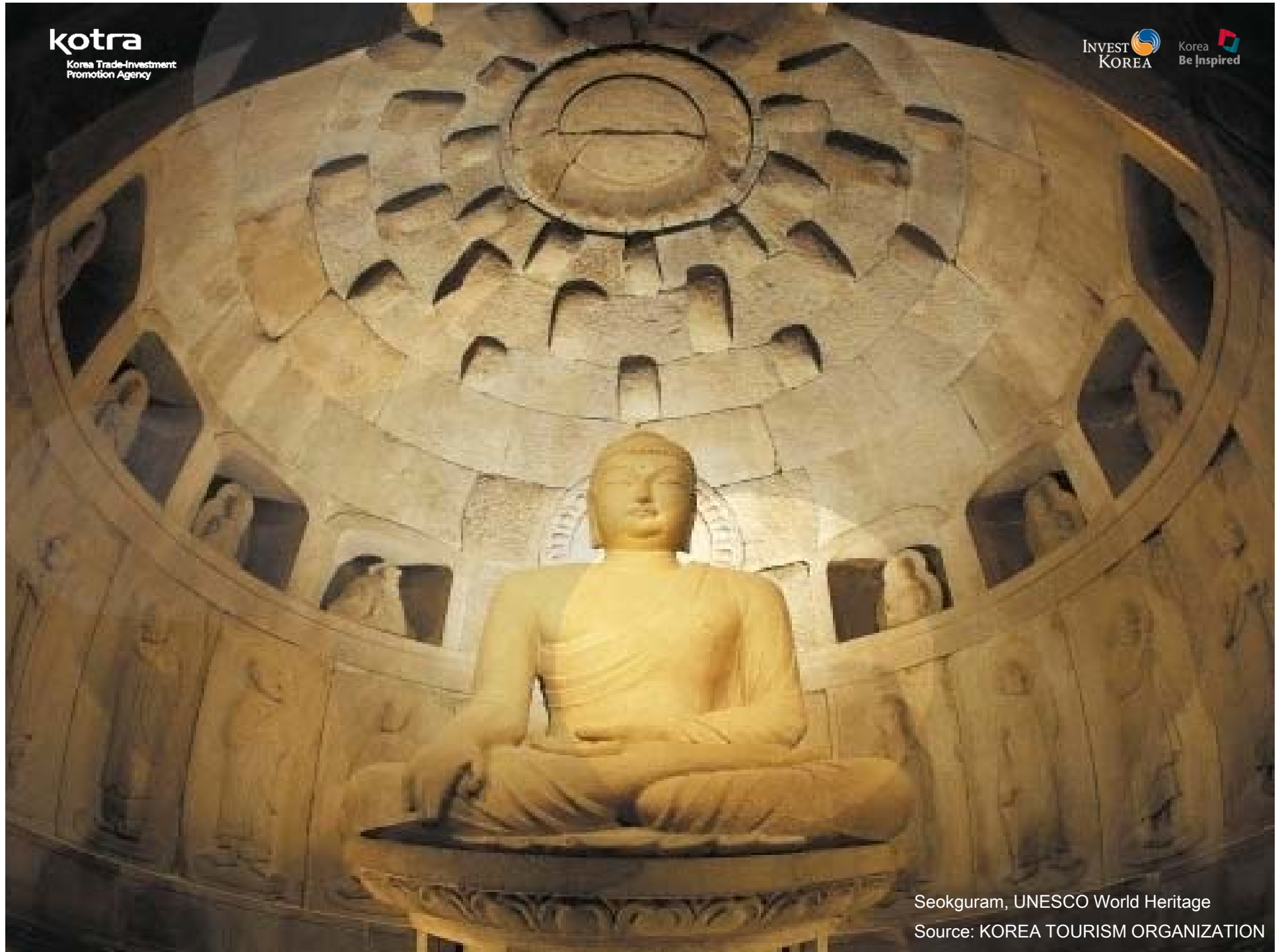
Location: Gyeonghwaeroo at Gyeongbokgung Palace

Source: KOREA TOURISM ORGANIZATION

Location: Haeinsa Temple, Hapcheon
Source: KOREA TOURISM ORGANIZATION



Seokguram, UNESCO World Heritage
Source: KOREA TOURISM ORGANIZATION



kotra

Korea Trade-Investment
Promotion Agency

INVEST
KOREA

Location: Seorak Mountain





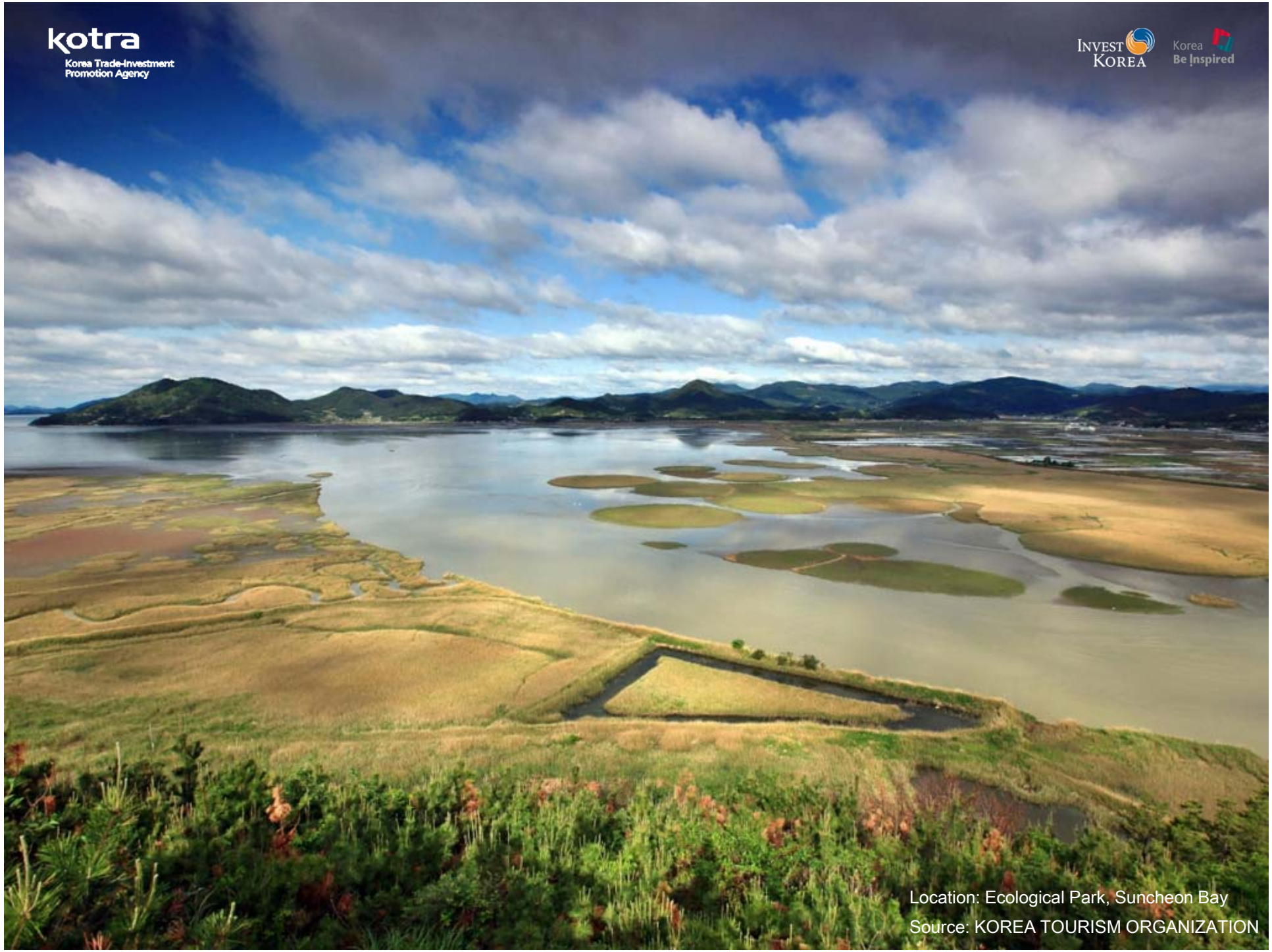
Location: Bulguk Temple in Gyeongju



Location: Sol Island, Kangwon Province
Source: KOREA TOURISM ORGANIZATION



Location: Ole Trail, Jeju Island
Source: KOREA TOURISM ORGANIZATION



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Korea Trade-Investment
Promotion Agency

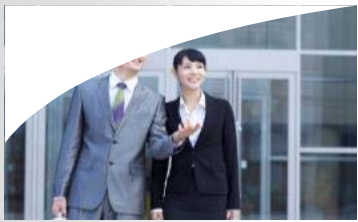


Location: Jeju Island

Source: KOREA TOURISM ORGANIZATION

Korea's Tangible Strengths

**World-Class
Human Resource**



**Sophisticated
Domestic Market**



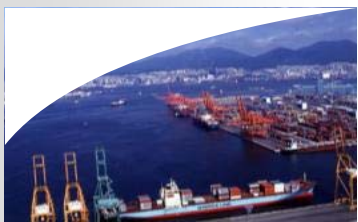
**Global Leading
Industries**



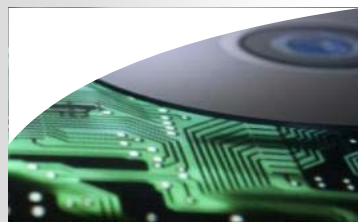
**Superior
Logistics**



Industrial Zones



High-Tech Clusters



IT Power



Profitability



Free Trade Agreements of Korea

61% of world GDP, 46.2% of world trade volume, 39.7% of world population



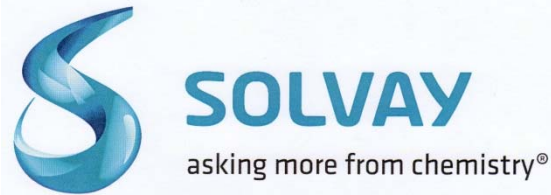
| In Effect | Concluded | Under Way |
|---|--------------------------------|---|
| USA , EU, Chile, Singapore, EFTA, ASEAN, India, Peru, Turkey | Australia, Canada, Colombia | China Indonesia, Vietnam, Korea-China-Japan |

Korea, *the* innovation center

| | Country | R&D intensity | Mfging capability | High-tech density | Tertiary efficiency | Researcher concentration | Patent activity |
|---|----------|---------------|-------------------|-------------------|---------------------|--------------------------|-----------------|
| 1 | S. Korea | 3 | 2 | 3 | 3 | 6 | 2 |
| 2 | Sweden | 4 | 22 | 5 | 13 | 8 | 26 |
| 3 | USA | 10 | 24 | 1 | 37 | 12 | 5 |
| 4 | Japan | 5 | 6 | 8 | 30 | 9 | 3 |
| 5 | Germany | 9 | 3 | 6 | 25 | 17 | 6 |

- **R&D intensity** : R&D expenditure as a percentage of GDP
- **Mfging capability** : Mfging value-added as a percentage of GDP and as a share of world total mfging value-added
- **High-tech density** : Number of high-tech public companies as a percentage of all publicly listed companies
- **Tertiary efficiency** : Annual science and engineering graduates as a percentage of the labor force and as a percentage of total tertiary graduates
- **Researcher concentration** : Professionals engaged in R&D per 1 million people
- **Patent activity** : Resident patent filings per 1 million residents and per \$1 million of R&D spent

Case of Industry-University Cooperation



Research & Innovation(R&I) center

Solvay's "Global Business Unit Specialty Chemicals"



Based at the campus of Ewha Univ., Solvay will have access to a strong national and international network with universities and research institutes.



1 Overview of **KOTRA**

2 Pharma Industry in Korea

3 Innovative Business Trends

KOTRA Headquarters



National IPA : Invest Korea

Ministry of Trade, Industry & Energy

KOTRA

Korea Trade-Investment Promotion Agency

TRADE Promotion

INVESTMENT Promotion

INVEST KOREA 

**Contribution to the sustainable growth of
Korean economy**

One-Stop Service for Foreign Investors



Overseas Network
42/122 Business Centers

- Government agencies
- Local governments
- Project Managers

Pre-Investment

Market research,
Partner Search,
Site Survey ...

Execution

Gov's Incentive Consultations,
Administrative support, ...

Aftercare

Grievance resolution,
employees search

Supporting Process of GOV. Incentives



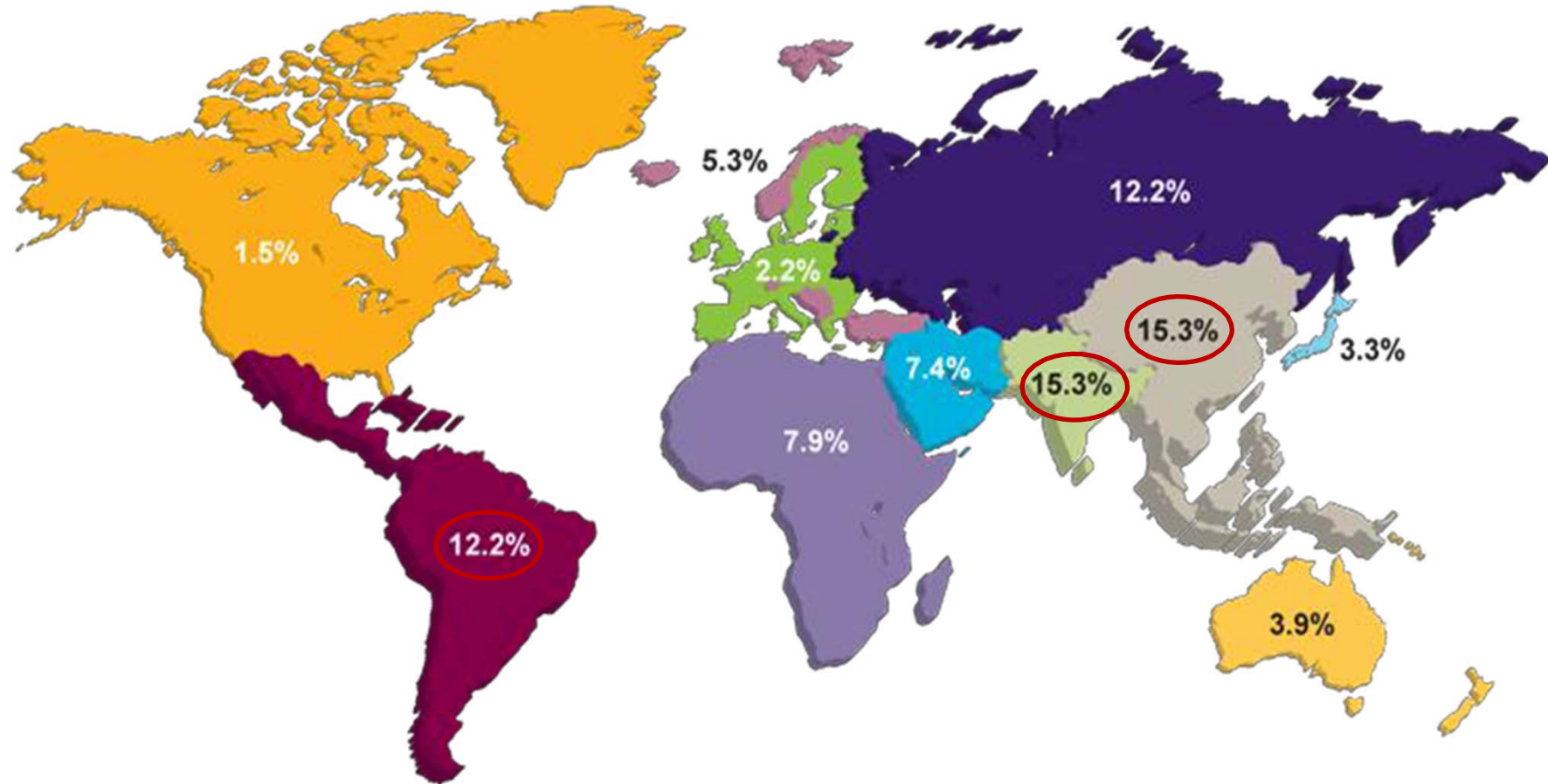


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Pharmaceutical Market Prognosis



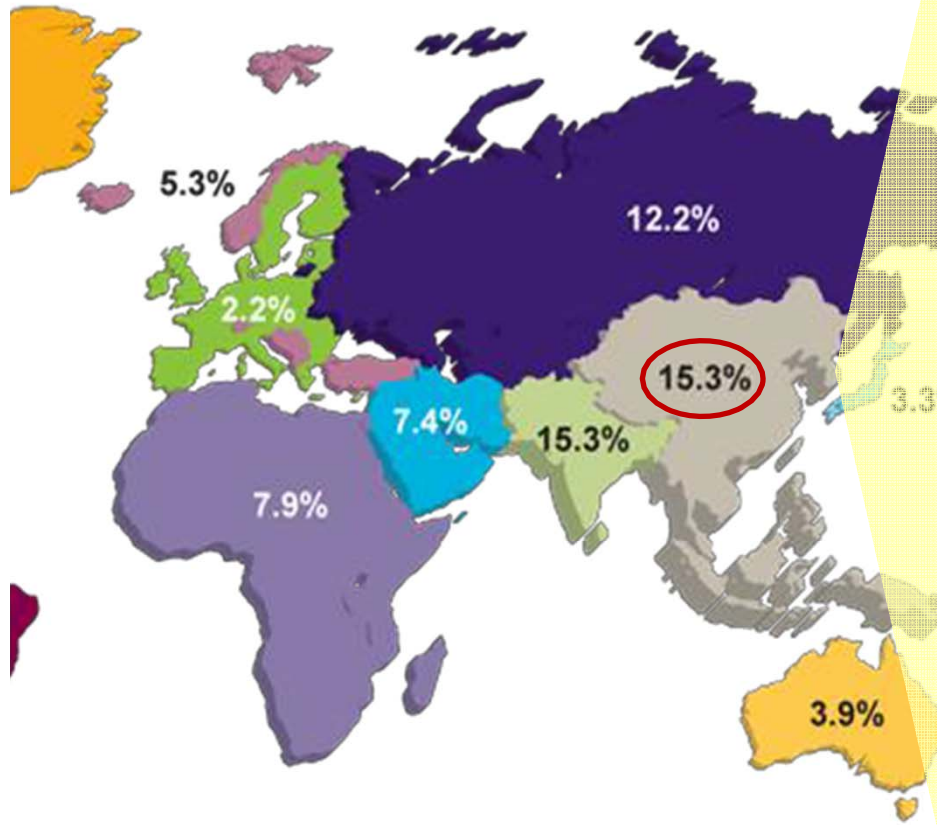
Key
 Estimated sales – 2015*
 Estimated growth – 2010-2015 (compound annual growth rate)

■ North America Sales \$357.4bn Growth 1.5%
■ Europe (EU countries) Sales \$237.4bn Growth 2.2%
■ South East & East Asia Sales \$147.1bn Growth 15.3%
■ Japan Sales \$120.6bn Growth 3.3%

■ Latin America Sales \$100.9bn Growth 12.2%
■ CIS Sales \$33.5bn Growth 12.2%
■ Indian Subcontinent Sales \$32.1bn Growth 15.3%
■ Europe (Non EU countries) Sales \$27.6bn Growth 5.3%

■ Africa Sales \$25.0bn Growth 7.9%
■ Oceania Sales \$16.7bn Growth 3.9%
■ Middle East Sales \$15.4bn Growth 7.4%

Sustainable Growth in Korea



·Test-bed Market
·High-Tech, Mid-Labor Cost

KOREA

CHINA

JAPAN

·Large Market
·Low Labor Cost

·Sophisticated Market
·High Labor Cost

ktetra
 America Sales \$100.9bn Growth 12.2%
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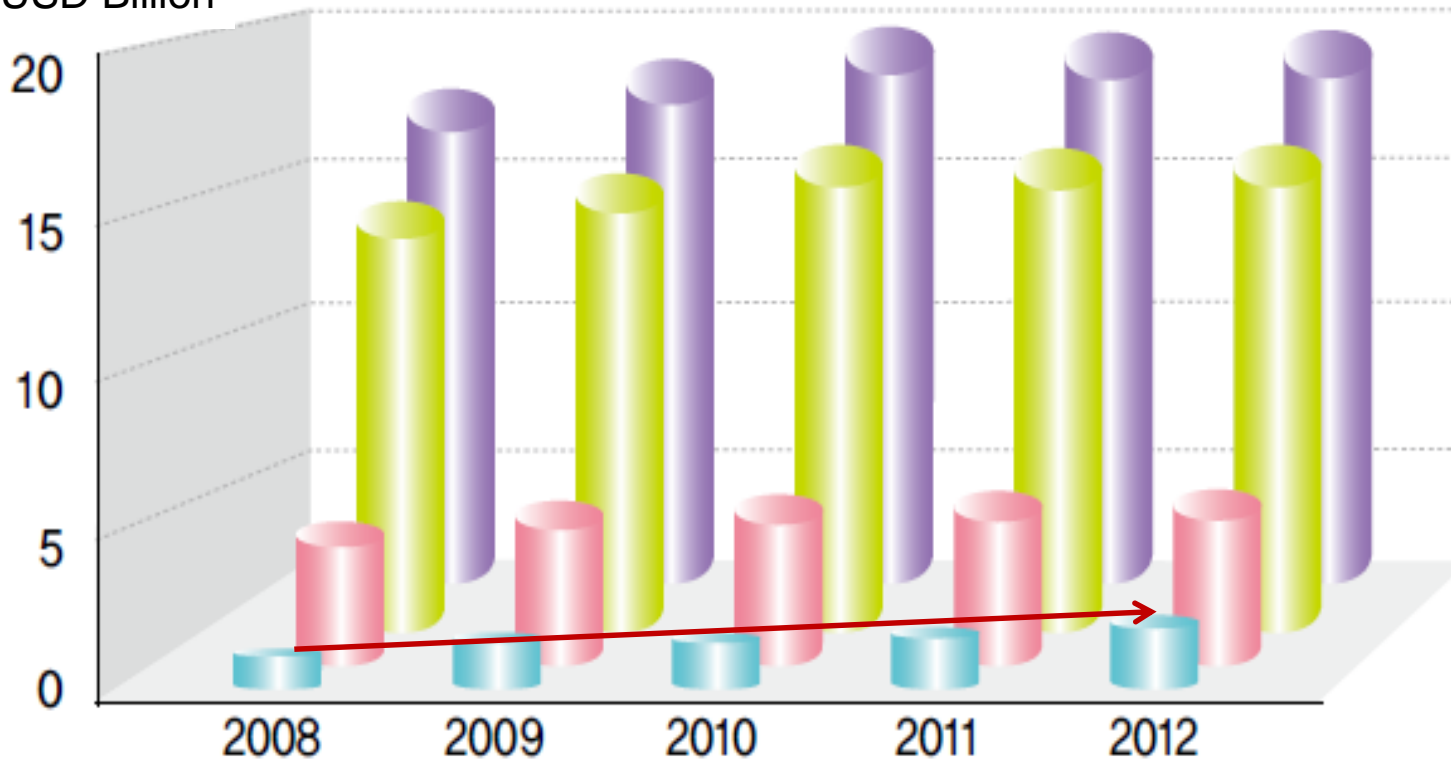
Korea Pharmaceutical Market

US\$16billion Market with CAGR 7% ('02-'12)

14th ~ 15th Global Ranking

20% Annual Increasing Rate of Export

Unit : USD Billion



Source: KFDA (2014.2)

Export Import Production Market Size

Korean Pharmaceutical Market

Major Exporting Countries (~11)

| Rank | Country | API | Product | Total |
|-------|---------------|-----------|---------|-----------|
| 1 | Japan | 233,637 | 140,935 | 374,572 |
| 2 | Vietnam | 17,427 | 144,472 | 161,899 |
| 3 | China | 70,628 | 66,296 | 136,924 |
| 4 | Turkey | 37,338 | 48,577 | 85,915 |
| 5 | U.S. | 66,960 | 18,581 | 85,541 |
| 6 | India | 59,348 | 25,856 | 85,204 |
| 7 | Brazil | 16,421 | 63,027 | 79,448 |
| 8 | Pakistan | 1,586 | 69,495 | 71,081 |
| 9 | Germany | 56,306 | 14,428 | 70,734 |
| 10 | Italy | 45,944 | 7,351 | 53,295 |
| - | Rest of World | 444,868 | 395,012 | 839,880 |
| Total | | 1,055,463 | 994,030 | 2,049,493 |

Unit : USD thousand

Source: KFDA (2014.2)

Well-Established Local Players

- 60% Final drug's production from Top 30, **Top 5 Local players**

(Unit: KRW Billion, %)

| Rank | Company | Total Sales | | | |
|------|--------------------------------------|-------------|-------|-------|-------------|
| | | 2010 | 2011 | 2012 | Growth Rate |
| 1 | Dong-A | 846.8 | 907.3 | 930.9 | 3% |
| 2 | Yuhan Co. | 649.3 | 667.6 | 762.7 | 14% |
| 3 | Green cross | 791 | 698.9 | 715.5 | 2% |
| 4 | Dae-woong | 672.2 | 711.1 | 664 | -6% |
| 5 | Hanmi | 595 | 512.5 | 543.7 | 6% |
| 6 | GSK Korea | 465 | 506.2 | 473.2 | -6.5% |
| 7 | Novartis Korea | 435.8 | 478.8 | 463.5 | -3.2% |
| 8 | CKD Pharm | 419.6 | 442.2 | 461 | 4% |
| 9 | Pfizer Korea | 422.8 | 452.7 | 418.8 | -7.5% |
| 10 | Jeil Pharm | 431.3 | 462.9 | 426.8 | -8% |
| 11 | LG Life Science | 334.3 | 372.5 | 397.6 | 7% |
| 12 | Choong-wae | 443.3 | 431 | 397 | -8% |
| 13 | Kwang Dong | 289.4 | 313.3 | 331.8 | 6% |
| 14 | Bayer Korea | 342.8 | 355.5 | 330.9 | -6.9% |
| 15 | Il-dong | 338 | 338.5 | 326 | 2% |
| 16 | Handok | 321 | 333.2 | 314.6 | -5% |
| 17 | Boryung | 301 | 308 | 312 | 1% |
| 18 | Sanofi -Aventis Korea | 428 | 344 | 283.6 | -17.5% |
| 19 | Astrazeneca Korea | 247.3 | 261.8 | 270.2 | 3.2% |
| 20 | Roche Korea | 252 | 218.9 | 262.9 | 20.1% |
| 21 | Dongwha | 215.3 | 234.6 | 223.3 | -5% |
| 22 | Janssen Korea | 210.3 | 232 | 218.6 | -5.8% |
| 23 | Shin Poong | 225.7 | 224.9 | 212 | -6% |
| 24 | Wyeth Korea | 161.7 | 184.2 | 201.4 | 9.4% |
| 25 | Berna Biotech | 277.9 | 248 | 186.4 | -24.8% |
| 26 | Samjin | 200.4 | 201.8 | 185.7 | -7.96% |
| 27 | Roche Diagnostics | 143.7 | 170 | 183.4 | 8% |
| 28 | Dong Kook | 140.4 | 160.3 | 180.2 | 12% |
| 29 | Bboehring er- ingelheim Korea | | 148.8 | 175.2 | 18.3% |
| 30 | Abbot Korea | | 174.4 | 169.2 | -3% |

Exporting High-Tech Production Facilities

Exporting construction know-hows to the developing countries



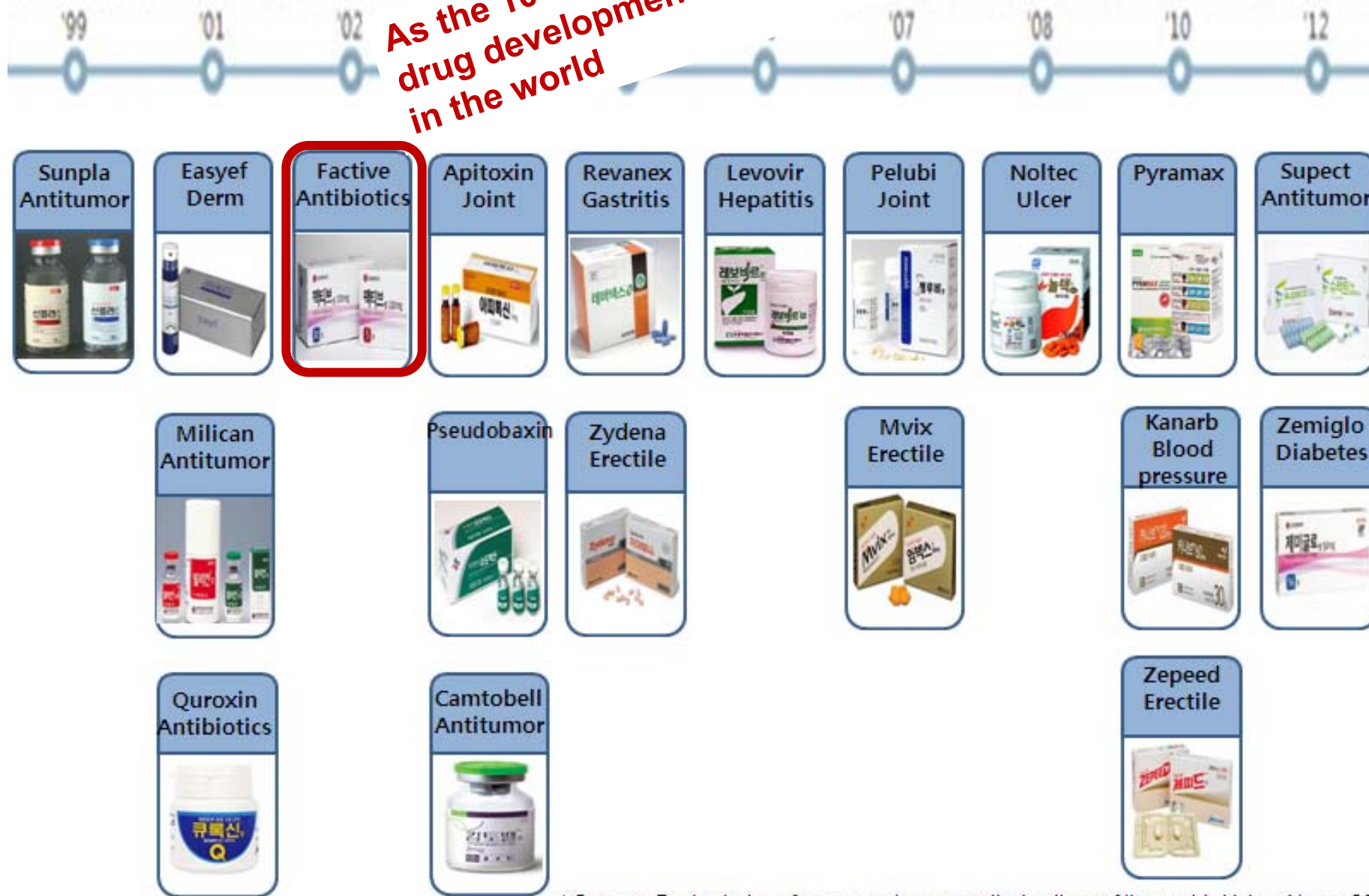
**Blood Preparation Plant of Green Cross
in Thailand**



**IV Solution MFG Plant of JW pharm
in Kazakhstan**

New Drug Development

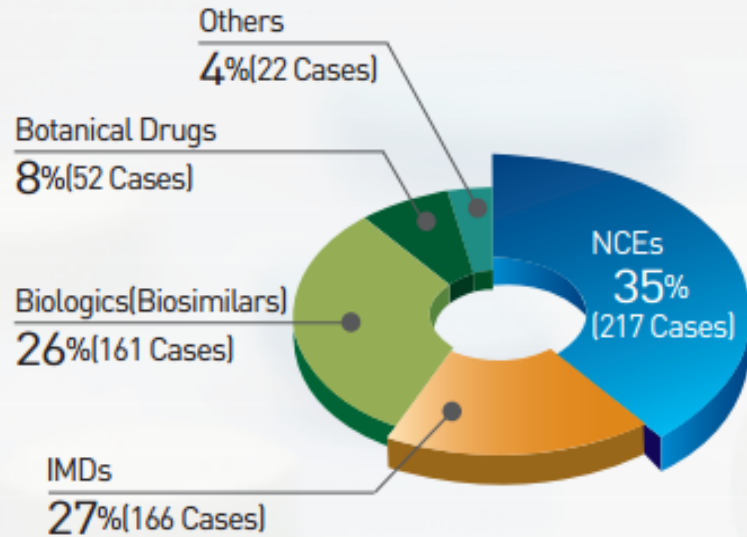
As the 10th US FDA new drug development country in the world



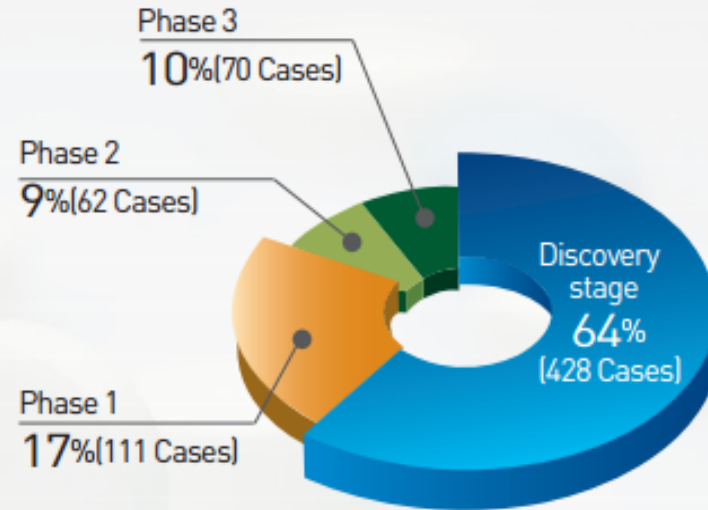
* Source : Basic strategy for seven pharmaceutical nations of the world , Yakup News, 2013.8.16

Potential for Korea Pharmaceutical Industry

By Product Type



By Stage



1 43 Innovative Company Pipelines : 671

· 68% - Incrementally Modified Drugs, Generics, or Biosimilars that Can be Commercialized Soon

2 124 to be Commercialized in the Global Market by 2014~2016

· Possible Reinvestment Quantum Leap by Securing Jump-up Momentum

3 Considering the Success Possibility, 31 of NewDrug Expected by 2020

· Introduction of 20~30 Candidate Substances to Secure Global Blockbusters

Their 5yrs. Planning is to invest US \$9billion into R&D

Biosimilar Development

Remsima™, the world first antibody biosimilar (approved in 2012 by KFDA)



- **Indications:** Rheumatoid Arthritis, Ankylosing Spondylitis, Ulcerative Colitis, Adult Crohn's Disease, Psoriasis, Psoriatic Arthritis
- **Protein type:** Monoclonal antibody (mAb)
- **Mechanism of action:** Neutralizes tumor necrosis factor- α (TNF- α), a common cause of autoimmune diseases such as rheumatoid arthritis
- **Market size:** Approximately USD 24 billion (2011 TNF antagonist market)



Samsung in Bio-healthcare Business

-Biologics CMO plant in *Incheon FEZ* ('11.5)



SAMSUNG MEDISON


-M&A ('11.2)



SAMSUNG BIOEPIS

-Biz for R&D, sales and marketing of Biologics ('12.1)





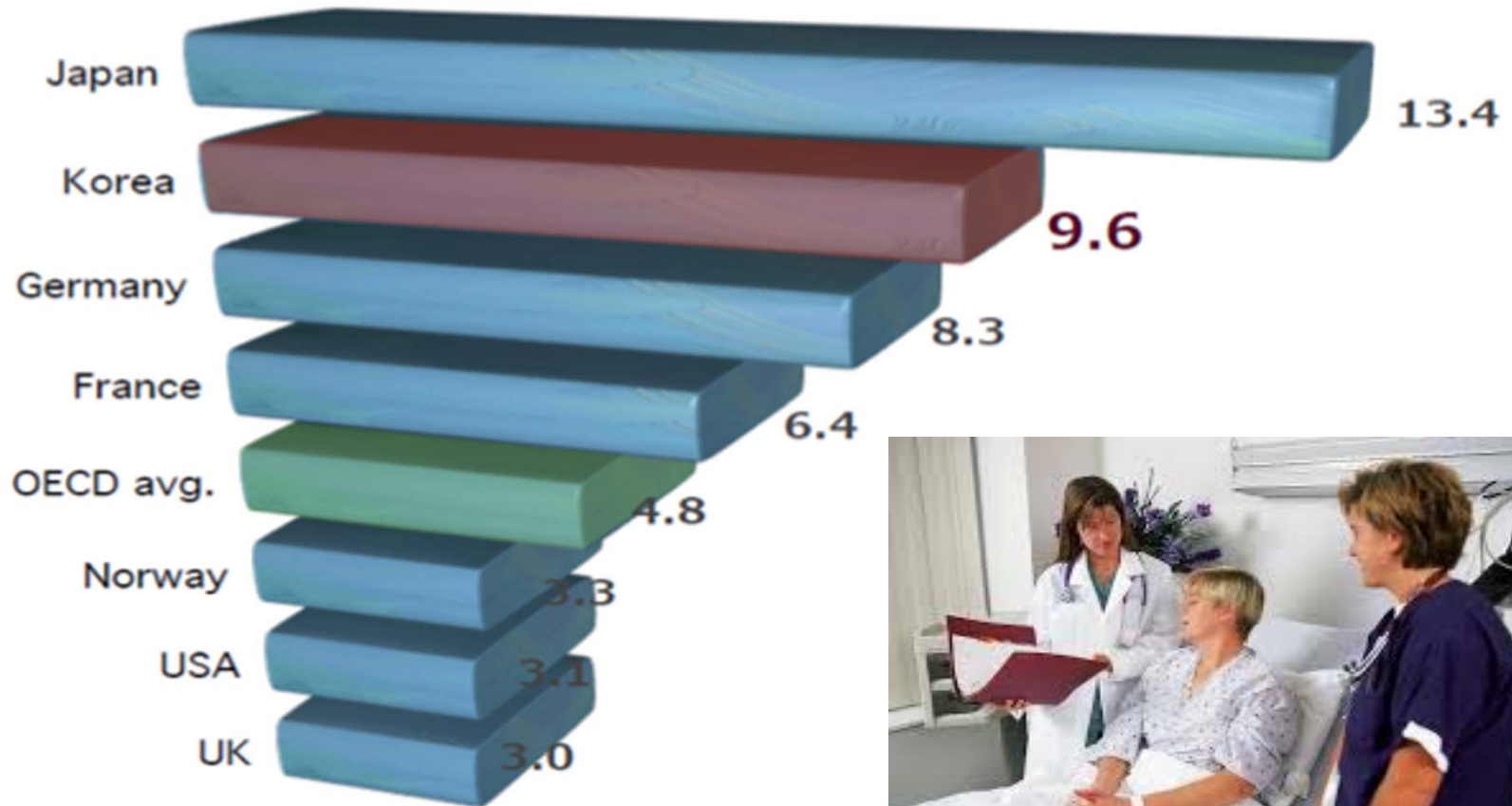
Korea: world's best medical test-bed

Approval status of clinical trials in Korea

Seoul ranks world's No. **1**

Superb Medical System

No. of in-patient beds per 1,000 inhabitants



Source: OECD Health Data 2013



Case of Pfizer



“As one of **the fastest growing country** in Asia in terms of clinical area, Korea has competitive factors thoroughly **in high level open research labor, cost and quality, etc.**”

Joe Feczko, Senior Vice President,
Chief Medical Officer

INSPIRE program



ASAN
Medical Center



No.1

Stem cell technology



Stem Cell Technology

World-First Stem Cell Therapeutics to Get Market Approval



Hearticellgram-AMI

2011.7.



Cupistem

2012.1.



MEDIPOST



Medipost

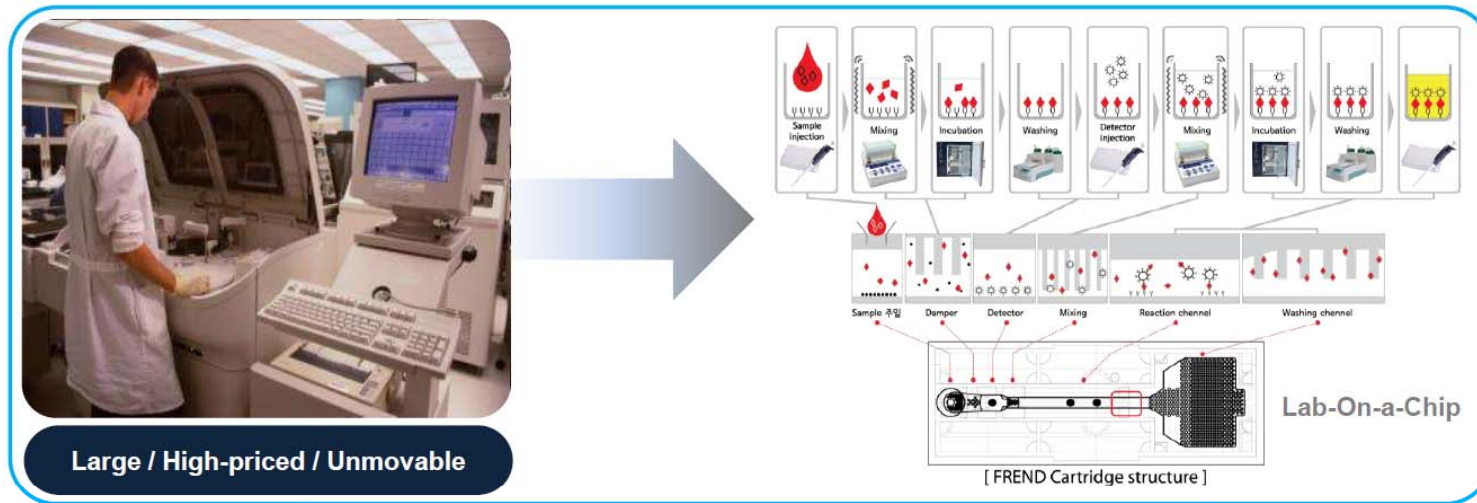
2012.1.

Medical Healthcare Technology



Molecular /Genetic Technology

Disruptive Innovation using Lab-On-a-Chip Technology



Disruptive Innovation

- Downsizing
- Down Prices
- Movable
- Multifunction



Personalized Tool



Networking Tool



Point-Of-Care Tool

U-Healthcare Technology

by NanoEnTek and SK Telecom

NanoEnTek POC device + SK ICT technologies(SI)

Home



Hospital



Government Policy and Support



Innovative Company Selection and Support (`13~)

- incentive expansion for companies to concentrate on R&D

Development and Commercialization Support

- CRO nurturing, CMO activation, Partnerships, M&A

Stem Cell Research / Brain Disease Research / Genome Projects

- Support for clinical trials, approval process, basic research

Korean Drug Development Fund (KDDF) : R&D matching fund (US\$1,000M, `11-`20)

National Onco Venture (NOV) : R&D matching fund (US\$240M, `11-`16)

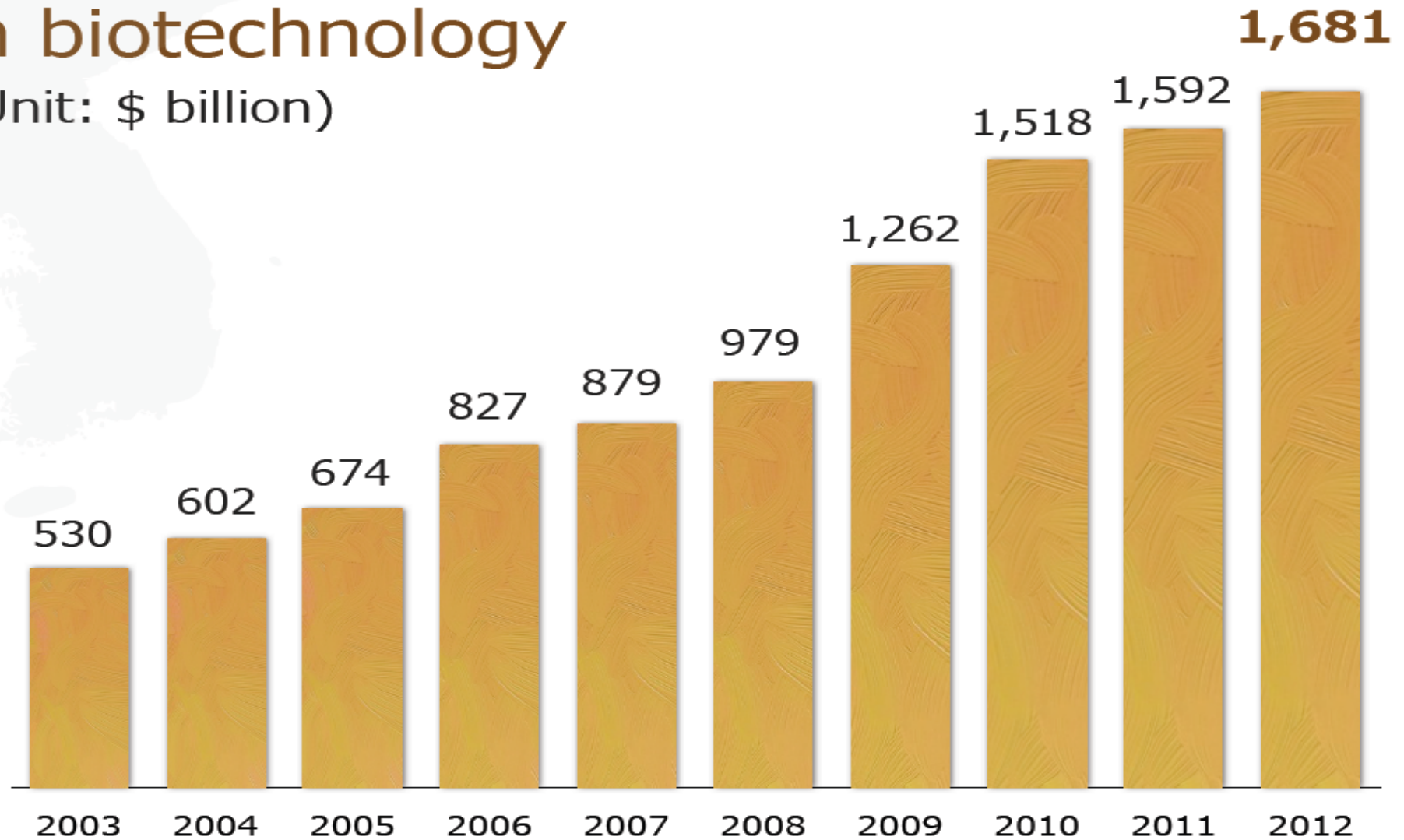
Promoting Bio clusters : Daegu Medivally, Osong Biovalley

Bio-Fund / Global Pharma Fund ...

Government Investment

Korean Government investment in biotechnology

(Unit: \$ billion)



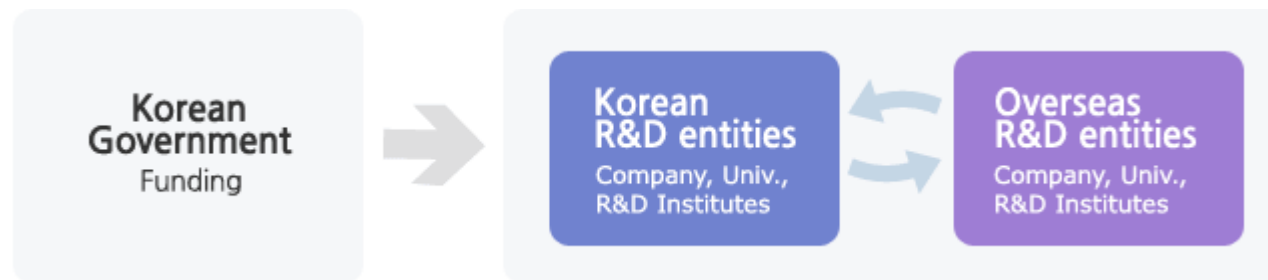
International Joint R&D Development Initiatives

- **Global Advanced Technology Development Program**

- Advance Technology Center : ATC track for foreign invested co.
- Target : SMEs, FDled R&D centers, research institutes and universities
- Organization : KEIT

- **Int'l Cooperation Programs**

- Bilateral Cooperation / Multilateral Cooperation
- Target : Global market-oriented technology development of Korean enterprise
- Organization : KIAT



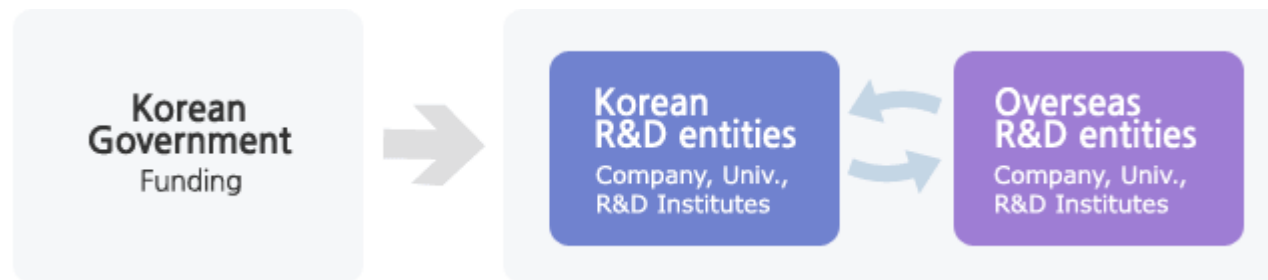
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Research Institutes for Biotechnology

Korea Research Institute of Bioscience and Biotechnology (KRIBB)

Founded in 1985, KRIBB conducts fundamental research on the origins of life phenomena as well as cutting edge biotechnology research about new drug discovery, novel bio-materials, development of bio-energy sources, and expansion of food production.

Mission

To carry out R&D and related projects in the field on bioscience and biotechnology in joint effort with other research institutes, academic, and businesses at home and abroad

To disseminate the results of its scientific research and technological development

For more information, please visit the website - www.kribb.re.kr



International Vaccine Institute (IVI)

The International Vaccine Institute (IVI) is an international nonprofit organization that was founded on the belief that the health of children in developing countries can be dramatically improved by the use of new and improved vaccines.

IVI is hosted by the Republic of Korea and is headquartered in the country's capital city, Seoul. The Institute's state-of-the-art facility was built with the generous support of the Korean government and houses Biosafety Level 3+ (BSL3+) laboratories, which allow vaccine research on dangerous pathogens such as those that cause avian influenza and tuberculosis.

Mission

Discover, develop, and deliver safe, effective and affordable vaccines for the world's developing nations



For more information, please visit the website - www.ivi.int

Korea Research Institute of Chemical Technology (KRICT)

Established in 1976, the KRICT has fueled the growth of Korea's chemical industry. The institute recently selected 4 key research areas for concentrated investment: the development of eco-friendly chemical process technology and high value-added green chemical materials, the acquisition of new substance pipelines for disease treatment, and the development of green convergence chemical technology to act as future growth engines.

Mission

KRICT seeks to improve the competitiveness of the chemical industry and promote the establishment of new national scale industries by developing and disseminating original chemical technologies and relevant convergence technologies; and by managing the public chemical technology infrastructure.

For more information, please visit the website - www.kRICT.re.kr



National Cancer Center (NCC)

Founded in 2000, the NCC has persevered to lessen the burden of cancer for Koreans by conducting and offering assistance to cancer research, diagnosing and treating cancer patients, assisting in the National Cancer Control Initiatives, and finally, educating and training cancer specialists.

Mission

The NCC strives to improve national health and welfare by reducing the incidence and mortality of cancer through research, patient care, education & training, and support for the national cancer control programs.



For more information, please visit the website - www.ncc.re.kr

Korea Institute of Oriental Medicine (KIOM)

KIOM is the only government-funded research institute for traditional Korean medicine. Since its establishment in 1994, KIOM has strived to develop future-oriented original technology for Korean medical treatments, develop core technology of Korean medicine-based herbal drugs to support the National Agenda, and establish Korean medical knowledge and the informatics infrastructure based on medical knowledge accumulated over centuries. Through these efforts, the institute is taking the lead in scientific advancement, standardization, industrialization and globalization of Korean medicine.

Mission

The mission of KIOM is to creatively develop Korean medicine, building its new values and contributing to healthy life.

For more information, please visit the website - www.kiom.re.kr



Korea Food Research Institute (KFRI)

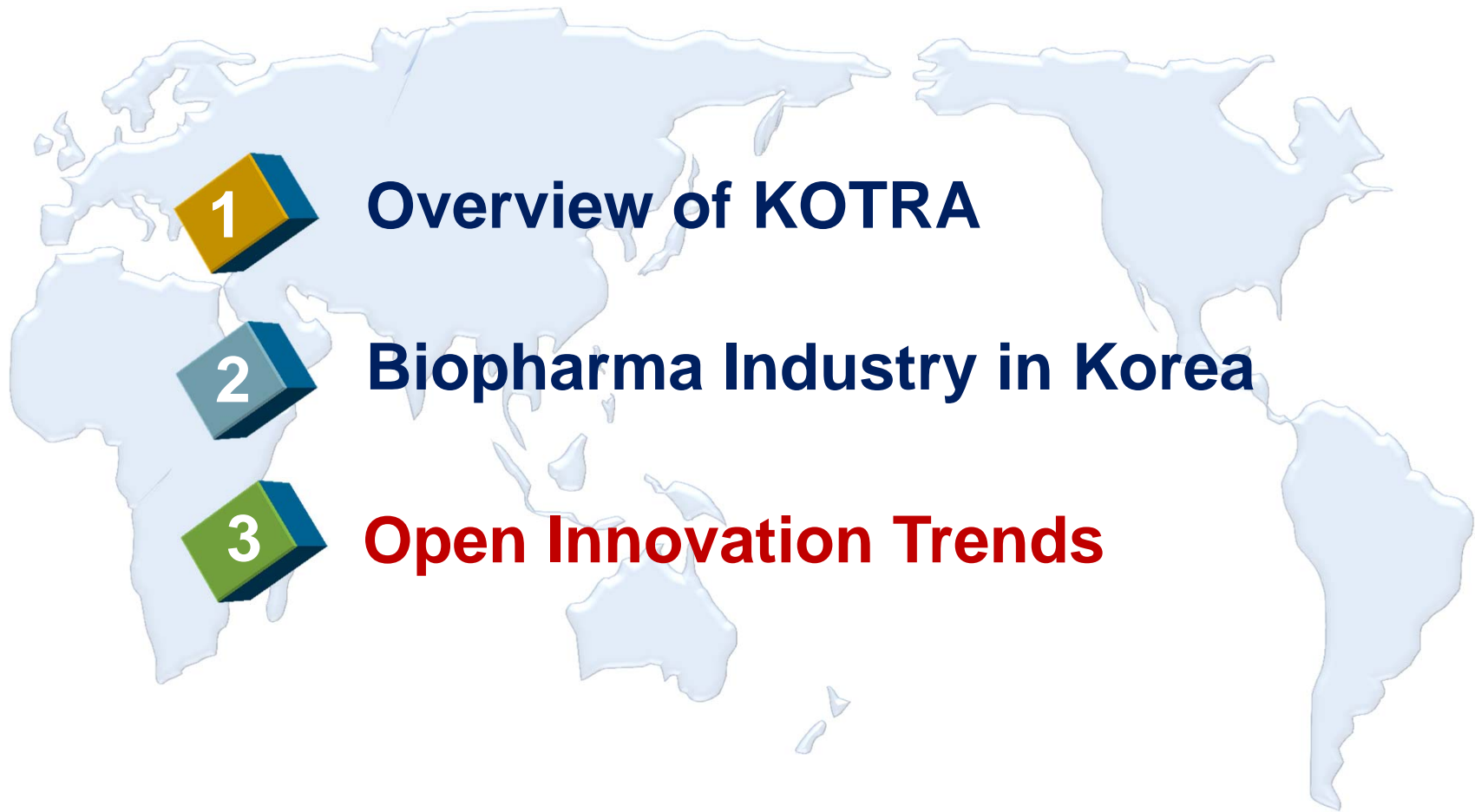
Korea Food Research Institute, the cradle of Korea's food science and technology, is a government-funded entity established in 1988 so as to contribute to the development of food, agriculture, forestry and fisheries industries and to the improvement in the quality life of the people by means of developing, diffusing and intensifying fundamental technologies in the field of food science.

Mission

Conducting researches on longevity science, functional foods, safe distribution and food processing technology to improve the health of the people and the quality of their life; spreading the research achievements; providing technological support



For more information, please visit the website - www.kfri.re.kr



1 Overview of KOTRA

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3 Open Innovation Trends

Venture Investment Cases



Global Alliance Projects ('08, '10)

- **KRW 20 Billion** investment plan only in Korea for next **5 yrs**
- **“Novartis Venture Fund”** invested in 3 Korean Bio-ventures **through GAPS**
- **Working group with KOTRA** and KHIDI, ...



GAPS Launching Conference, Seoul, Mar. 18th, 2010



• Neomics(2008)

- siRNA tech. for Novel cancer target; multiple modalities
- CEO: Mr. Chiuk In
- Founder: Prof. Sunghoon Kim, from Seoul National University



• PharmAbcine (2009)

- Bi-specific Ab against VEGF-receptor target
- **Affiliation with KRIBB**
- CEO&Founder: Dr. Jin-San Yoo
- **Syndicated investment** by OrbiMed (US), GrGreenCross investment(Kr)...(USD 6M)



• Quroscience (2010)

- PhenoScreen Platform Tech., Anti-HIV, Anti-TB, Anti-HCV
- **Affiliation with Institute Pasteur Korea**
- GATE II winner
- CEO : Dr. Ulf Nehrbrass

Joint Investment Cases



Dong-A Pharmaceutical Develops a Global Biopharmaceutical Industry Complex in Songdo(IFEZ), KOREA

Dong-A challenges global market through antibody based biosimilar production. **Dong-A and Meiji Seika Pharma. Co., Ltd.(President: Masahiko Matsuo) signed agreement to comprehensive collaboration on development of biosimilar** on September 14, 2011 in Tokyo, Japan. Dong-A and Meiji agreed to develop and commercialize three biosimilars including Herceptin, while the other pipelines are yet to be determined. A cGMP level plant is being designed to cope with the US, EU and Japan standard. Groundbreaking is expected in early next year and it is expected to be completed within following two years.



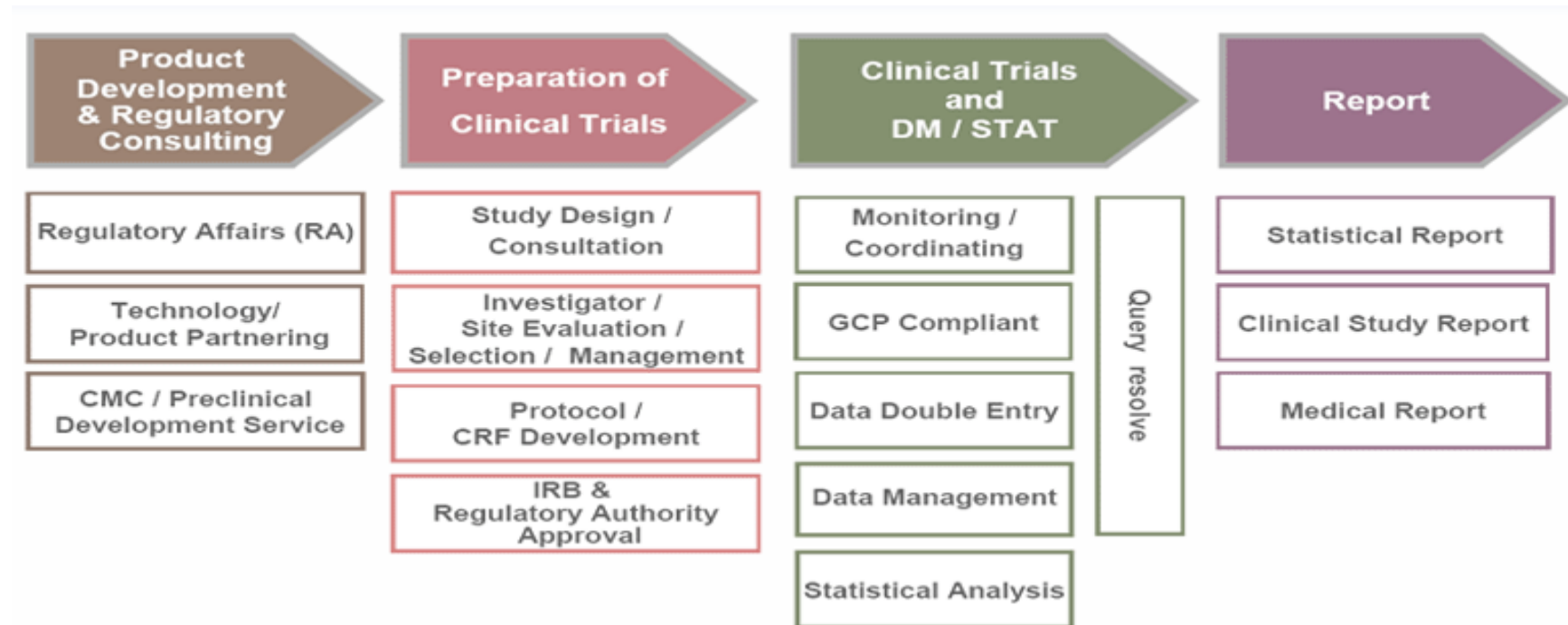
Battelle and YuYu Pharma Create the First "Joint Bioequivalence Test Experimentation Biz"...

Civic and business officials gathered in Chuncheon City Sept. 23, 2009 to open a worldwide bioequivalence research institute operated by **International Scientific Standard, Inc. (ISS)**, a joint venture company. BE testing services begin in the fall in the GLP-compliant laboratory, which will begin operation with 10 to 20 researchers. They'll conduct the work in a 1,090-square meter facility in Chuncheon City that is equipped with state-of-the-art LC/MS equipment imported from Japan and the US.

R&D Collaboration Cases



- Phase 1 Clinical Trial is in progress
- Lung and gastric cancer new drug candidate substance



Platform Technology of Korean bio-ventures

2012.05

BIONEER
Innovation • Value • Discovery



2012.08



“Platform for incurable disease“

Sanofi and Bioneer work together in solid cancer using nanoparticle medicine(SAMiRNA) developed by Bioneer

They will verify the effectiveness of target gene and start clinical trials about new drug candidates.

“Open Innovation“

New drug development and commercialization with Lego ChemBio.

Lego Chem Bio has new drug composite technologies (LegoChemistry) and the early pharmacometrics technologies.



Concluding Thoughts

- **OPEN INNOVATION AND NETWORKING**

- Offer opportunities to work within alliance with complementary companies

- **TAPPING INTO REGIONAL INNOVATIVE STRENGTHS**

- Source local capital, labor, knowledge and creativity

- **WE BID TO WIN**

- Jointly develop and win projects *aligned with policy initiatives*

For our Growth Proposition

We Need “Open Innovation”





THANK YOU.

Dahee Jeong

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