Biotechnology in Korea 2013

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Biotechnology in KOREA

Amazing Korea!

It will be a miracle if this baby is able to walk tomorrow.
A little baby named 'Korea' has been growing amazingly
while living in times of miraculously rapid change.
A global leader who has held the G20 summit,
the world's third largest economic territory,
IT-based cultural power, new opportunities opened up
with creative economy – Korea makes more amazing
miracles even at this moment.

Korean miracle

Korea transforms from Recipient to Donor

Korea joined the Development Assistance Committee of the OECD in November 2009, becoming the first country to go from aid recipient to donor since the organization's birth.

Fourth High Level Forum on aid Effectiveness (Busan, Republic of Korea, 29 November-1 December 2011).

Fifty years ago, the scene in Busan, South Korea, would have been a familiar image of international aid : sacks of grain stacked precariously on a crumbling dockside. The backdrop would have been a country emerging from war and dependent on outside assistance to meet the most basic needs. But when national and development leaders gather in Busan this week to discuss the future of aid, they will see a very different place : the fifth-busiest commercial port in the world, transporting advanced technologies around the globe. This, writ small, is the Korean miracle - the transformation of a country from aid-dependent to aid donor.

(By Tony Blair, The Washington Post Published : November 26, 2011)

The G20 Seoul Summit

The 2010 G20 Seoul Summit was the fifth meeting of the G-20 heads of government, to discuss the global financial system and the world economy, which took place in Seoul, South Korea on November 11-12, 2010. Korea was the first non-G7 nation to host a G-20 Leaders Summit.

Korea, which has succeeded in developing economy, overcoming economic crises and acting as a mediator between advanced countries and emerging ones, suggested an agenda* regarding emerging countries, not advanced ones.

* Ensuring global economic recovery, Development issues, Strengthening the international financial regulatory system, Global financial safety nets, Framework for strong, sustainable, and balanced global growth, etc.

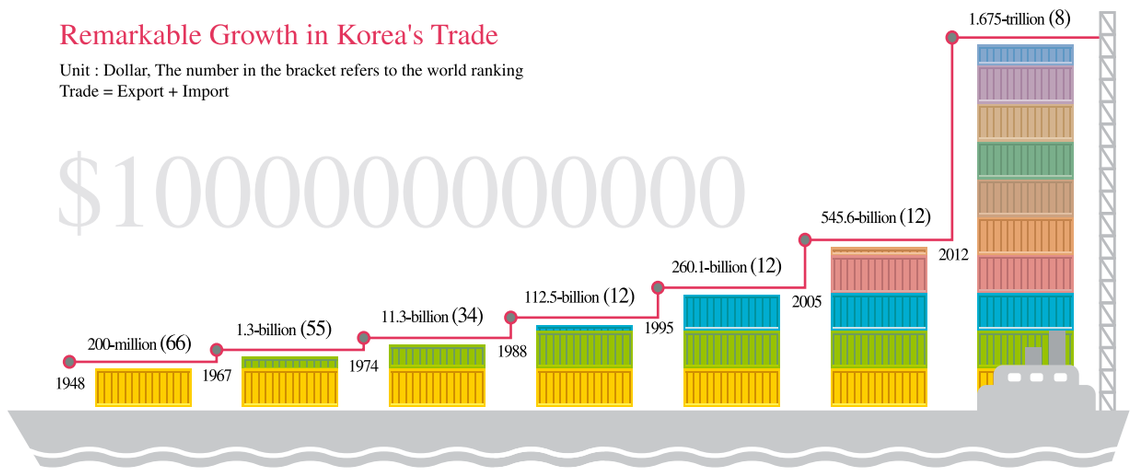
The G20 has dealt with global issues in depth since it was first held in washington after the 2008 global financial crisis. Now it has been realized as the new driving force behind global economy. Korea has showed leadership at the summit, stressing the need for trade liberalization, and as a result has been the first non-G7 Asian country to hold the summit.

Korea's trade volume reaching $1 trillion

Notwithstanding worldwide economic crisis, Korea recorded one-trillion-dollar trade volume two years in a row, 2011 and 2012, and has been one of eight trade giants.

Korea has achieved it 63 years after establishing its government in 1948, or 50 years after formulating the export-driven policy under the Five-Year Economic Development Plan in 1962. In particular, it is the first time a developing country has achieved it.

More noteworthy is that Korea made it two years in a row despite worldwide economic slowdown. As a result, it has been ranked 8th in the world in terms of trade volume by moving up one pace from the last time.



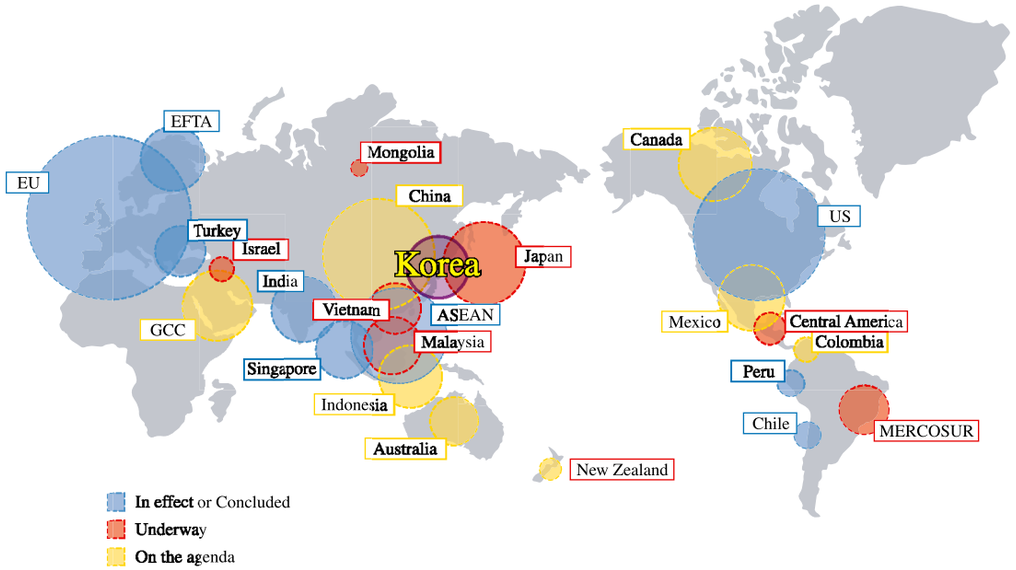
The world's third largest economic territory occupied with FTAs

Korea's geographic territory was divided into South and North, but its economic territory has been being expanded with FTAs going to effect with 45 countries.

In addition to Korea-US FTA that went into effect in 2012, Korea has entered into FTAs with EU, Chile, Singapore, EFTA, ASEAN and Peru and thus has built up a global network that connects Europe, Asia and Americas.

Moreover, 7 countries including Turkey, Canada and Mexico initialed FTAs with Korea. Since FTAs lead to the robust trade in goods and services, there has been increasing interest in world-class human resources.

※ Economic territory means a commingling of geographic territory, other party to FTA and GDP.



※ The size of a circle is proportional to the import market

* Source : Korea International Trade Association (KITA)

FTAs that took effect or negotiations have been concluded as regards 10 cases (47 countries) ; Negotiations that are underway as regards 6 cases (16 countries) ; FTAs are in the preparation stage as regards 9 cases (21 countries), as of June 26, 2012.

IT-based cultural power, The Korean Wave (Hallyu)

The Korean wave refers to the phenomenon of Korean entertainment and popular culture rolling over the world with pop music, TV dramas, and movies. Also known as "Hallyu" in Korean, the term was first coined by the Chinese press in the late 1990s to describe the growing popularity of Korean pop culture in China.

The Korean Wave began with TV dramas and K-pop, but now with the development of internet and social media such as YouTube, Twitter and Facebook a greater variety of cultural contents are provided in real time throughout Europe and Americas. The Korean Wave has entered upon a new phase.

The Korean style (K-Style), dominated by K-pop and TV dramas, has recently been accepted in various parts such as pure art, law and institution and social control system

Popular music, or K-pop : Due to the relatively small size of the Korean music market, songs are usually released onto YouTube for overseas consumption

Dramas, or K-dramas : Translated into English and other foreign languages by fans, often within 24 hours of release

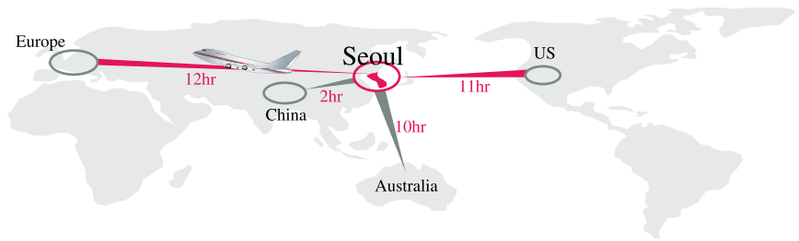
Language : The increasing interest in Korean language classes since 2009 has been attributed to the popularity of K-pop songs and K-dramas

Animated comics and films, Cuisine

General Status

Facts about Korea

Strategically located at the crossroads of Northeast Asia, Korea is neighbored by China to the west, Japan to the east, and the Russian Far East to the north.



General	Country Name	Republic of Korea (South Korea)
	Language	Korean (Writing system: Hangeul)
	Capital City	Seoul
	Territory	99,720 sq km
	Currency	won (US$ 1 = 1,112.5 won) (as of 2013.3.18)
	Illiteracy Rate	0% (people aged between 20 and 40)
People	Population	50,004,441 * Foreign Residents (including short-term sojourners) : 1.2 million
	Life Expectancy	Male, 77 years ; female, 83.8 years (2009)
	Religion	Buddhism (24%), Protestantism (23%), Catholic (8%), Others (0.8%), Religionless (44.2%)
Government	Political System	Republic with a president elected to a single 5-year term by direct popular vote Division of power among the executive, legislature (unicameral National Assembly), and judiciary branches
	President	Park Geun-hye since 2013
	Suffrage	Universal at 19 years of age
Economy	Gross Domestic Product	US$ 1,116 billion (2011)
	Per Capita GNI	US$ 22,489 (2011) GDP Growth Rate: 3.6% (2011)
	Major Industrial Products	Semiconductors, automobiles, ships, consumer electronics, mobile telecommunications, equipment, steel, and chemicals

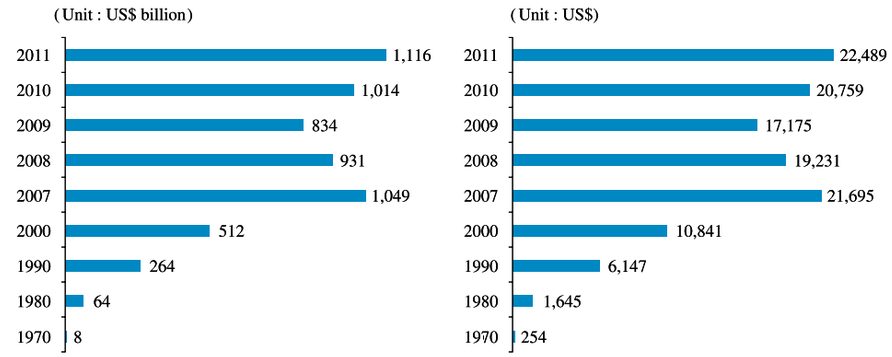
Economic Situation

On the basis of Korea's recovery from the global financial crisis, the government has been continuously making efforts to strengthen the groundwork for long-term growth and boost the real economy.

Thanks to the government's successful policies, the Korean economy posted a growth rate of 3.6 percent in 2011, and per capita income returned to the US$ 20,000 level.

Domestic demand has led the growth while private consumption and facility investment have posted excellent figures. Exports have increased in line with a rise in overseas demand amid the global economic recovery and backed by increased competitiveness of Korean products. Korea has leapt ahead to become world's No. 7 exporting nation, and achieved a trade surplus of over US$40 billion for the second year in a row.

GDP Growth / Per Capita GNI



KOSPI (The Korea Composite Stock Price Index) is the index of all common stocks traded on the Stock Market Division - previously, Korea Stock Exchange - of the Korea Exchange.

KOSPI, started at 122.52 point on January 4, 1983, reached 1997.05 point at the end of 2012 and thus increased by over 15 times (1,530%) in 30 years.

The number of companies listed on KOSPI increased by over 2 times (from 334 to 784) in 30 years, and the total market value increased by 34,873.4% (from 3.3-trillion won to 1.1543-quadrillion won).

Stock Price Index (KOSPI, Closing Price)	Mar. 13, 2013	Mar. 14, 2013	Mar. 15, 2013	Mar. 18, 2013
	1999.34	2002.13	1986.50	1968.18

Driving force

Science and Technology

To reinvigorate the development of advanced science and technology, the government established the Korea Institute of Science and Technology (KIST) and the Ministry of Science and Technology (MOST) in 1966 and 1967, respectively.

In 2013 Ministry of Science, ICT and Future Planning (MSIP) has been created to the effect that it takes charge of services regarding research, development, information and communication and builds up the foundation of creative economy based on creative science.

The National Science & Technology Commission (NSTC) was launched in April of 2011, and is in charge of establishing the National Science &Technology Basic Plan and coordinating and connecting trans-governmental science &technology policies based upon the plan.

Initially, Korea's national science and technology policies focused mainly on the introduction, absorption, and application of foreign technologies. In the 1980s, however, emphasis shifted to the planning and conducting of national R&D projects to raise the level of scientific and technological skills. This included programs to increase both public and private sector R&D investment and to nurture highly skilled R&D manpower.

Since the early 1990s, the government has been concentrating on three areas: fostering research in the basic sciences, securing an efficient distribution and use of R&D resources, and expanding international cooperation. These efforts are intended to increase Korea's technological competitiveness.

South Korea was ranked 22nd among 59 countries and regions in the 2012 global competitiveness rankings by the Switzerland-based International Institute for Management and Development (IMD).

S. Korea's national competitiveness ranks

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Overall Competitiveness	32	31	27	32	29	31	27	23	22	22
- Economic Performance	33	41	38	36	49	47	45	21	25	27
- Government Efficiency	33	32	28	41	31	37	36	26	22	25
- Business Efficiency	37	25	27	38	38	36	29	27	26	25
- Infrastructure	26	24	20	22	19	21	20	20	20	20
* Scientific Infrastructure	14	17	13	10	7	5	3	4	5	5
* Tech. Infrastructure	24	8	2	6	6	14	14	18	14	14

* Source : IMD 「The World Competitiveness Yearbook」, 2012

Information and Communications

Korea is a leader in the area of information and communications technology (ICT). This is demonstrated by its vast ICT-related production and exports, world-class technology, and the wide use of internet and mobile communication devices in the country.

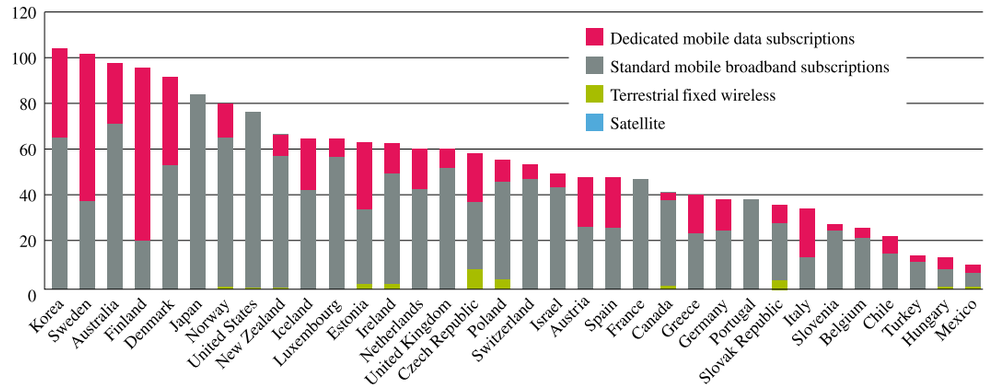
ICT industry-related products, such as computer chips and mobile phones, account for over 33% of Korea's total exports. As for communications services, nearly every Korean owns at least one mobile phone. Moreover, almost every household has a broadband connection. All sectors of industry from the food-service industry to public transportation are heavily dependent on computers and ICT.

Today, Korean semiconductors, mobile handsets, TFT-LCDs and other items have become the most coveted in the global market because of their high quality.

Korea has been ranked 1st among 34 OECD countries in wireless broadband penetration rate (2012). Switzerland and Korea continue to top the OECD ranking for fixed and wireless broadband respectively.

Mobile broadband has experienced healthy growth (18%) in the last 12 months, largely driven by continuing strong demand for tablets and smartphones. The average penetration in the OECD area is 56.6 subscriptions per 100 inhabitants, for a total number of nearly 700 million subscriptions (698.6 million). Korea (104.2) and Sweden (101.8) top the table, being the only two countries with more wireless broadband subscriptions than inhabitants.

OECD wireless broadband subscriptions per 100 inhabitants, by technology, June 2012



* Source : OECD broadband statistics, 2013.2

Political Changes

President Park Geun-hye, Korea's first female president

Park Geun-hye was inaugurated as the Korea's first female president on February 25, 2013.

The administrative vision of President Park Geun-hye's new government is "A new era of hope and happiness".

The five Administrative Goals of the government are "a jobs-centered creative economy", "tailored employment and welfare", "creativity-oriented education and cultural enrichment", "a safe and united society" and "strong security measures for sustainable peace on the Korean Peninsula".

The Park Geun-hye administration plans to create a trustworthy, clean, and capable government through carrying out these goals, related strategies, and tasks.

Reorganization of Executive Branches : The Korean government was expansively reshuffled into 17 ministries, 3 sub-ministries and 17 services.

Ministry of Science, ICT and Future Planning (MSIP) and Ministry of Oceans and Fisheries (MOF) have been newly established to create the future growth engine and more jobs, and a new position, the Deputy Prime Minister of Economic Affairs, has been made to overcome the global economic crisis and derive economic revival.

Ministry of Knowledge Economy and Ministry of Public Administration and Security were reorganized into Ministry of Trade, Industry & Energy and Ministry of Security and Public Administration respectively. The position, Minister for Special Affairs, was eliminated, and Korea Food and Drug Administration was upgraded to Ministry of Food and Drug Safety under the Office of the Prime Minister.

The Park Geun-hye Government's Administrative Organization

Ministry of Strategy and Finance	Ministry of Science, ICT and Future Planning	Ministry of Education	Ministry of Foreign Affairs	Ministry of Unification
Ministry of Justice	Ministry of National Defense	Ministry of Security and Public Administration	Ministry of Culture, Sports and Tourism	Ministry of Agriculture, Food and Rural Affairs
Ministry of Trade, Industry and Energy	Ministry of Health and Welfare	Ministry of Environment	Ministry of Employment and Labor	Ministry of Gender Equality and Family
Ministry of Land, Infrastructure and Transport	Ministry of Oceans and Fisheries			

New Renamed Unchanged

The Park Geun-hye government's policy on science & technology

The Creation of New Markets and Jobs Based on Creative Economy
– A New Economic Paradigm Grounded on Imagination, Creativity, Science and Technology –

Increase of national R&D expenditure up to 5% of GDP by 2017

National R&D expenditure (includes private sector) will be increased up to 5% of GDP by 2017 (4.03% as of 2011). Basic researches will account for about 40% of national R&D expenditure by 2017 (35.2% as of 2012).

The creative reform of the national R&D system

The national R&D system will be reformed so that it may go through due formalities (basic science ⟶ development and applied research ⟶ commercialization). The intellectual property of creative and versatile talent will be protected through an intellectual ecosystem (creation - application - protection).

Creative industries will be promoted through a new fusion technology combined between brainware and national welfare technology

The investment will be expanded in R&D in order to protect people's welfare, life, health, property and environment and to improve the quality of their lives. New industries such as brain nano-bio and brain nano-eco will be fostered, and brainware-based soft power technology will be promoted.

The Ministry of Science, ICT & Future Planning (MSIP) was launched

MSIP will be creating new added value, new jobs and new growth engines that are imperatively necessary for the nation's sustained growth.

Minister of Science, ICT and Future Planning

Growing Vision!

As good growth needs a well-designed exercise program and constant practice, biotechnological advancement needs government's full support, a life-based culture and realization with passion of prosperous bioeconomy. With the fulfillment of them, Korea has advanced biotechnology for 30 years, and now it develops a vision to become seventh in the world in biotechnology.

The History of Science and Technology in Korea

In the past 40 years the Korean government, in cooperation with private organizations, has concentrated on technological catch-up; specifically, it has introduced overseas advanced technologies and created added value from them. In recent times, however, its catch-up strategy has rapidly changed to the first-mover strategy.

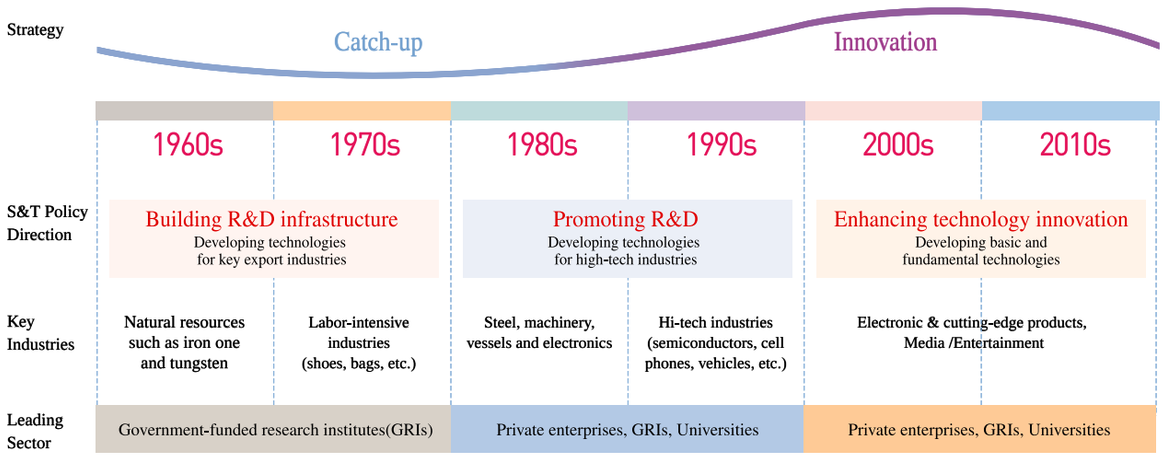
With economic development started in the 1960s, Korea began to recognize the importances of science and technology, since then it has promoted them at national level.

In 1966, Korea Institute of Science and Technology (KIST) was founded with a view to domestically develop technologies necessary for industrial development.

In 1967 Ministry of Science and Technology, an independent body to lead the promotion of science and technology, was created, and moreover 'Science and Technology Promotion Act' was enacted in 1967, as a part of legal mechanism that promotes basic science and technology.

Korea has been investing heavily in six promising new technologies (IT, NT, BT, ST, ET and CT) since 2000.

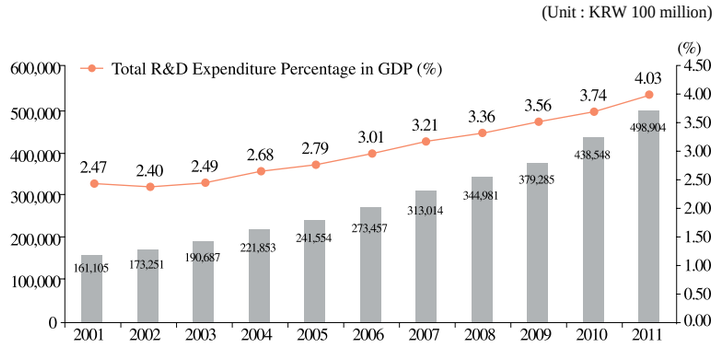
R&D Strategy : From catch-up to Innovation



Korea's total R&D expenditure reaches 50-trillion won, inclusive of the private sector, which is the sixth largest amount in the world. Notwithstanding worldwide economic crisis, R&D activities in Korea are on an upward trend and the investment increased by 13.8% from last year.

In 2011 it reached 49.8904-trillon won, which accounts for 4.03% of GDP and ranked 2nd in the world.

National R&D Expenditure and its Percentage in GDP



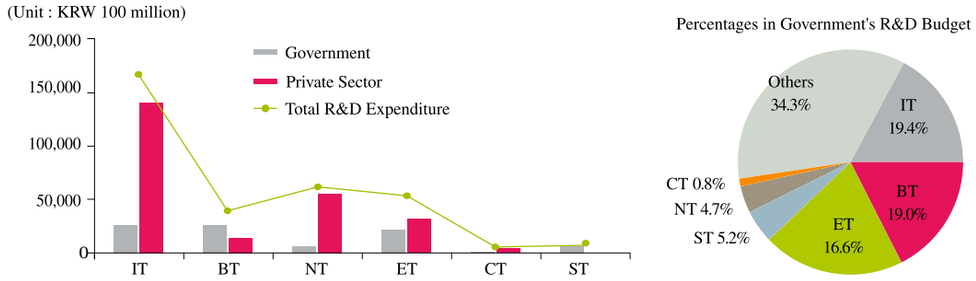
The Korean government has been investing heavily in promising new technologies (6T), especially in IT and BT that are expected to have great ripple effects and create new markets.

In 2011 the IT sector comprised the highest percentage (19.4%) of the government's R&D budget, followed by BT (19.0%), ET (16.6%) and ST (5.2%).

The percentage of the BT sector has been steadily rising, with an increase in investment in the biotech industry, new drug development and medical industry.

IT : 18.3% (2009) ⇨ 18.9% (2010) ⇨ 19.4% (2011), BT : 17.7% (2009) ⇨ 18.6% (2010) ⇨ 19.0% (2011)

Investment in Promising New Technologies (2011)



The 30-Year History of Biotechnology in Korea

Enacting 'Biotechnology Support Act' in 1983, Korea began to promote biotechnology. In 1994 it established the first National Framework Plan for Biotechnology (Biotech 2000) and a nationwide policy and began to invest heavily in R&D.

In 2004, biotechnology (Novel Biomedicine and Organs) was selected as one of the next-generation growth engines. A pan-governmental agency comprehensive plan known as "The 2nd national framework plan for biotechnology promotion (Bio-Vision 2016)" was established in 2006. The BT Committee under the National Science & Technology Commission has been operating since 2008. The second stage plan of Bio-Vision 2016 was established in 2012. Thus active support policies have been promoted to make biotechnology a growth engine for future national economic growth.

The National Framework Plans for Promotion of Biotechnology, a government-wide master plan aimed at the development of national biotechnology, was prepared to provide the policy direction and guidelines.

Bio-Vision 2016, which established the direction of the development of Korea's biotechnology over a 10-year period up until 2016 and it was published to achieve a goal of making Korea a biotechnology leader, according to a vision of realizing a sound "Health life" and creating an "Prosperous Bioeconomy".

Vision

"Health life" and "Prosperous Bioeconomy"

- Joining the Group of Global Top 7 Biotechnology Nations -

Objectives

Category		2005	2010	2016
No. of science-technology papers published (National ranking)		13th	11th	7th
Competitiveness in patented technology (National ranking)		14th	15th	13th
Industrialized market value	Bioindustry*	KRW 2.7 trillion	KRW 6.1 trillion	KRW 23 trillion
	Pharmaceutical Industry**	KRW 12.5 trillion	KRW 19 trillion	KRW 26 trillion

* The bioindustry is estimated to grow 22.5% every year for 3 years (2007~2009).

** The pharmaceutical market (production + import - export) is estimated to grow 5.5% every year for 3 years (2008~2010).

Major Issue

1983 Genetic Engineering Promotion Law established (Genetic Engineering Promotion Law changed to Biotechnology Support Act)

1985 Korea Research Institute of Bioscience & Biotechnology (KRIBB) was established

1994 The 1st National Framework Plan for Promotion of Biotechnology (Biotech 2000 : 1994~2007) was established

1998 Brain Research Promotion Law was implemented and National Framework Plan for Promotion of Brain Research established (Braintech 21 : 1998~2007)

2004 Novel Biomedicine and Organs industry designated as one of the next-generation growth engines

2006 The 2nd National Framework Plan for Promotion of Biotechnology (Bio-Vision 2016 : 2007~2016) was published

2007 The 2nd National Framework Plan for Promotion of Brain Research (2008~2017) was announced and The Master Plan for National Life Resources was established

2008 Science and Technology Basic plan "577 initiative" was established and "BT Committee" under the National Science and Technology Council was formed

2009 Selection of 17 new growth engines in 3 areas of the 'Visions and developmental strategies for a new growth engine'

2010 NBIC, construction of National Fusion Technology Map

2011 Launching of the National Science & Technology Commission (NSTC), the Basic Plan for Bioresearch Resources was established

2012 The second stage plan of Bio-Vision 2016 was established

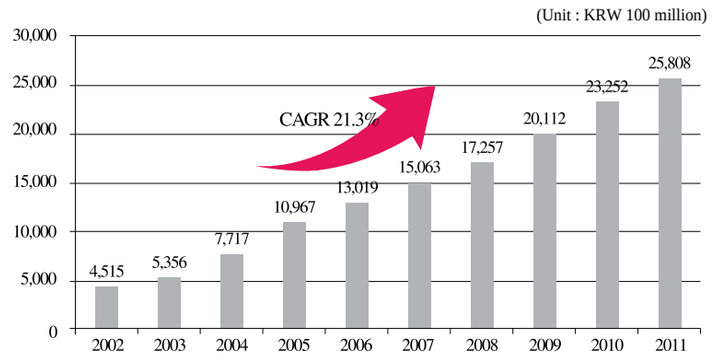
Governmental Investment

Korea has been strategically promoting the biotechnology sector emerged as a solution to the problems of aging, environment and energy, by strengthening investments for securing the original technologies and industrial infrastructure.

In biotechnology R&D, the Korean government's investment began to increase conspicuously from the 1990s and has rapidly increased so far since 1994 when the 1st National Framework Plan for Promotion of Biotechnology was established.

The investment exceeded 2 trillion won in 2009 and reached 2.58 trillion won in 2011. The investment increased by 21% per year between 2002 (451.5 billion won) and 2011 (2.58 trillion won).

Government Investment in Biotechnology (2002~2011)



The investment in biotechnology is made by 6 ministries including Ministry of Science, ICT and Future Planning (MSIP), Ministry of Health & Welfare (MW), Ministry of Agriculture, Food and Rural Affairs (MAFRA) and Ministry of Trade, Industry & Energy (MOTIE) and relevant agencies to lead technical development.

In 2011, MSIP accounted for the highest percentage (37%) of the investment, followed by MAFRA (includes Rural Development Administration, and Korea Forest Service ; 26.9%), MOTIE (includes Small and Medium Business Administration ; 19.2%) and MW (11.9%).

Bioindustry

The biotech market in Korea has been continuously growing, with the increase in production. In particular, the biopharmaceuticals industry has the highest market share.

In 2011, the bioindustry in Korea has made up a market of 7,542 billion won (production + import). It has grown roughly 15.4% every year, when considering 2008 when it recorded 5,658.9 billion won.

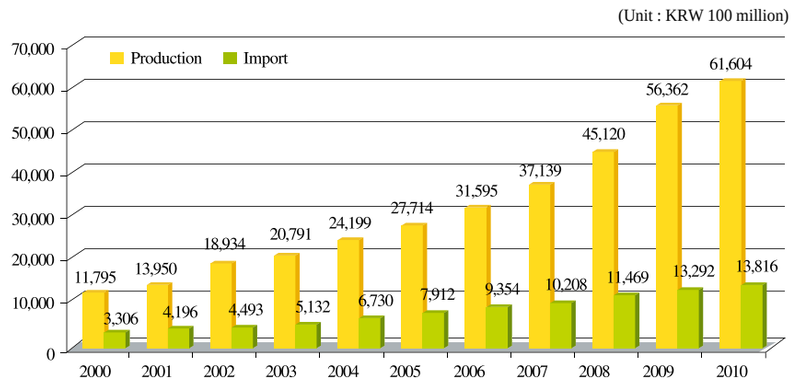
The output of the bioindustry in Korea reached 3,159 billion won in 2006 and 6,160 billion won in 2010, and so it increased twice in 5 years. At the same time, import is on a decreasing trend.

In recent 3 years (2008~2010) its output has increased by 16.8%, which is remarkably higher than that of the manufacturing industry (4.8%).

In 2010 the bioindustry in Korea made 2,744.5 billion won in exports, and the increase in exports is expected to continue with state support.

The exports increased by 12.1% from 2009 (2,447.4 billion won) ; especially, the biofood industry showed an increase of 25.8% from last year.

Domestic bioindustry scales (1994~2010)



* Source : Ministry of Trade, Industry and Energy (2012)

The number of biotech companies in Korea is 913, including 221 venture companies and 158 technically innovative companies in Korea.

As of October 2012, a total of 57 companies have been listed on KOSDAQ, most of which have gone public since 2000. It well shows that the biotech industry in Korea has rapidly prospered in recent times.

Biotech companies in Korea

(Unit : KRW 100 million)

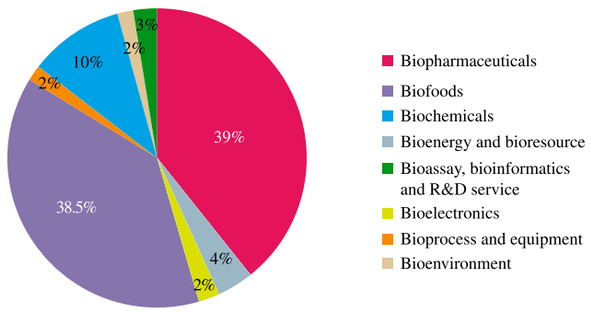
Year	No. of Companies	Employees	Export	Import
2006	794	17,316	13,502	9,354
2007	834	20,236	14,715	10,208
2008	851	20,520	19,038	11,469
2009	853	22,817	27,287	13,292
2010	913	32,004	27,445	13,816

* Source : Ministry of Trade, Industry and Energy (2012)

Biotech companies in Korea are mostly focusing on the development and production of biopharmaceuticals and biofoods.

In 2010, biopharmaceuticals and biofoods accounted for 78% (39.3% and 38.5% respectively) of the total output of the bioindustry, followed by biochemicals (10.2%), bioenergy and bioresources (4.1%) and bioassay, bioinformatics and R&D service (2.6%).

Manufacturing by areas of domestic bioindustry (2010)



Source : Ministry of Trade, Industry and Energy (2012)

Going Together!

When walking hand in hand, the street may be the most beautiful in the world. Korea has gone on a journey to biotechnological advancement, being helped by outstanding research professionals, infrastructure for world-class clinical trials, government's full support and promising biotech companies.

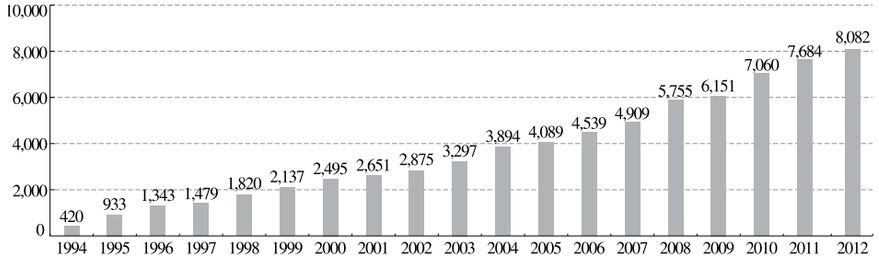
Competitiveness in Science and Technology

Publication capacity of papers from Korea in biotechnology is rapidly growing every year, and quality of papers is also increased upon publishing in highly prestigeous international journals.

The technology competitiveness of Korea in biotechnology ranked 10th in the world (as of 2012) in terms of publications of scientific papers, and has been rapidly and quantitatively increased since national biotech promotion was started in 1994.

In particular, the number of publications as of SCI Expanded have continuously increased in number; 420 cases in 1994 (ranked 29th), 2,875 cases in 2002 (ranked 15th) and 8,082 cases in 2012 (ranked 10th).

Publications from Korea in biotechnology by year



* Analysis : Biotech Policy Research Center, 2013

The remarkable growth of paper publications in terms of quantity as well as quality.

Papers from Korea, published in world-renowned scientific journals such as Nature, Science and Cell (NSC), have been increasing in number, more than 60% of which refer to biotechnology. During last five years (2008~2012), 222 papers have been published on NSC (18th in the world).

Domestic publications in NSC (2001~2012)

Year	'01	'02	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12
NSC publications total	14	19	13	18	29	28	26	28	38	47	44	43
BT- related NSC publications total	11	11	11	10	23	18	19	15	21	28	25	22
BT ratio (%)	78.6	57.9	84.6	55.6	79.3	64.3	73.1	53.5	55.2	59.5	56.8	51.2

* Analysis : Biotech Policy Research Center, 2013

The remarkable growth of patents in biotechnology in terms of quantity as well as quality.

Patents from Korea in biotechnology registered in US have been continuously increased in number ; a total of 453 registrations between 2011 and 2012.

Korea has been ranked 14th in the world in technology strength (TS) that shows the quantitative and qualitative levels of patents.

No. of patents published by Korea in the US

Year	1994~1997	1998~2001	2002~2005	2006~2010	2011~2012
No. of Patents	48	178	208	523	453
TS Index Ranking	17th	15th	16th	16th	14th

* Analysis : Korea Institute of Patent Information, 2013

Patents in the area of antibody, biomedicine and transgenic animals and plants have been relatively increasing in terms of quantity and quality.

Technology strength based on patents has recently been growing by 10.9, 6.5 and 4.9 times in the area of antibody, biomedicine and transgenic animals and plants, respectively.

Technology strength in biomedicine, bioprocess and biometric diagnosis scored 59.66, 15.04 and 11.10, respectively, and showed high levels of performances.

The current status of technology strength of Korea based on US patents

Technology Classification	2002 ~ 2005		2011 ~ 2012		Increase (b/a)
	TS(a)	Ranking	TS(b)	Ranking	
Bioprocess	10.71	12	15.04	10	1.4 Times
Sensors / Diagnostics	10.97	17	11.10	17	1.0 Times
Proteomics	1.64	17	1.93	15	1.2 Times
Animal & Plant Cell Culture	1.26	17	2.58	14	2.0 Times
Biological Resources / Bioprospection	1.51	14	3.01	8	2.0 Times
Genomics	3.78	15	4.01	19	1.1 Times
Antibody	0.38	13	4.15	8	10.9 Times
Enzyme Engineering	1.76	16	2.36	12	1.3 Times
Bio-Pesticide Development	2.52	13	0.43	20	0.2 Times
Transgenic Animals & Plants	0.25	19	1.22	13	4.9 Times
Biomedicines	9.20	22	59.66	10	6.5 Times
Environmental Biotechnology	8.07	6	1.86	11	0.2 Times

* Analysis : Korea Institute of Patent Information, 2013

Large Pool of R&D Experts

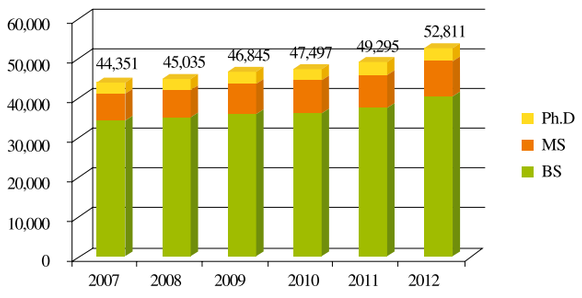
With the governmental strong supporting policy, high-quality human resources in biotechnology have highly been promoted.

Biotechology requires high-quality experts. The number of human resources in Biotechnology in Korea 2013 (based on the number of graduates from biotechnology-related departments at the college level and over) was 52,811 in 2012.

Human resources in biotechnology have continuously been increasing, as the bioindustry has been growing. Among graduates in Korea, the percentage of biotechnology majors increased from 7.01% in 2007 to 8.33% in 2012.

In particular, Master's or Ph.D. degrees make up more than 20% of the whole group.

Current status of human resources in biotechnology (2007~2012)



* Analysis : Biotech Policy Research Center, 2013

The number of industrial human resources in domestic biotech companies was 32,004 in 2010, which was 30% higher compared to the previous year. Among these human resources in bioindustry, 11,329 were for manufacturing, 11,091 were for research and 9,584 were for sales or management.

Meanwhile, the distribution of human resources in domestic bioindustry has shown more research people than manufacturing people, but the number of manufacturing people exceeded research people in 2009. It might be considered that demand for human resources in manufacturing has greatly increased compared to that in research as bioindustry in Korea is moving to commercialization from research.

High-Quality Infrastructure for Clinical Trials

Korea has succeeded in meeting the international standard of clinical trials on new drugs, and made an achievement of being the world top 10 in clinical trials, which came from its 10 years of effort.

In 2000 when multinational clinical trials have been allowed, only 5 cases of multinational clinical trials were conducted in Korea. In 2012, however, 303 cases were conducted. During last 10 years, Korea marked a 60 times increase in multinational clinical trials.

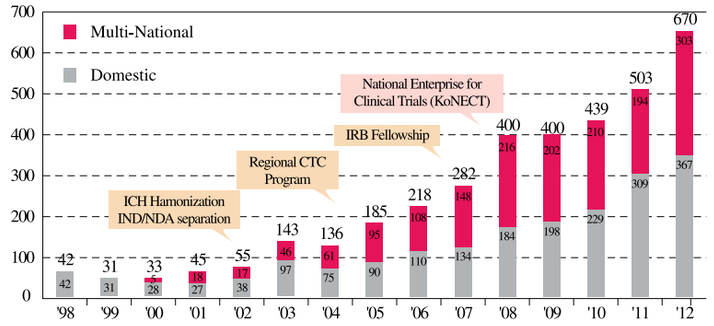
The website of global clinical trials (http://clinicaltrials.gov/) shows that Korea has been ranked 6th overall in clinical trials, 4th in single-country trials, and 15th in multinational trials (by total protocols). Now Seoul is recognized as the world's best city in clinical trials and has been the mecca of clinical trials in Asia (by sites).

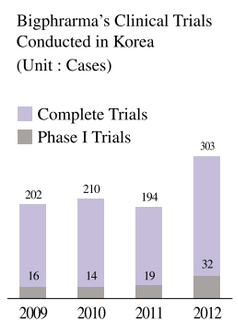
Phase I clinical trials, a national competitiveness indicator, have considerably increased from 19 cases in 2011 to 32 cases in 2012.

The Korea Food & Drug Administration (KFDA) approved 670 cases of clinical trials in 2012, which is a 33.2% increase from 2011 (503 cases).

Such results might come from multinational and domestic pharmaceutical companies expanding investment and from expanded infrastructure for clinical trials in Korea. The biggest reason why Korea has recently been emerged as the hub of multinational clinical trials is in that it satisfies fast progression, high quality and high efficiency.

Clinical Trials Approved by KFDA





* Source : KFDA, 2013

Noticing the importance of global clinical trials, the Korean government began to pave the way early in 2000.

Investigational New Drug (IND) Application and Good Clinical Practice (GCP) were introduced in 2002 to strengthen the global competitiveness in clinical trials and to secure subjects safety.

In addition, KoNECT was established in December 2007 with wholehearted support from the Korean government, academics and related industries in order to meet the increasing demands for clinical trials and to raise national competitiveness by fostering necessary human resources, developing core technologies, and building a solid infrastructure to become a global clinical trial hub.

The CRO industry in Korea has evolved since 2000. In 2007, however, the industry advanced into a growth phase. The 2014 sales estimates for CROs in Korea are projected at 440.7 billion KRW.

Contract research organizations (CROs) in Korea increased in number between 2001 and 2004. There are currently 18 domestic CROs and 15 foreign-owned ones in Korea.

Considering population, infrastructures, legal environments, government control and cost, FierceCRO appointed 7 countries including Korea, Singapore, Taiwan, Philippines, Argentina, Colombia and Poland, as emerging CRO markets

South Korea (FierceCRO, an article dated of September 10, 2012)

The world's eyes have been on fast-growing BRIC markets for several years now. In the CRO sphere, however, BRIC might be rebranded as BRICK: Brazil, Russia, India, China — and Korea. One only has to look at statistics to realize how big a player South Korea has become in the outsourcing game. The number of new clinical trials there increased to 513 in 2009 from 206 in 2006, making for a 150% spike over four years, according to CROAsia.

"That's usually not an accident," Lewis said of the dramatic increase. "It's a conscious decision from a government to do that." One government initiative is KoNECT, a collaboration between the South Korean government and global CRO Quintiles to provide life sciences groups with clinical research resources, training and support.

South Korea boasts short lead times for new trials; startups there are among the quickest in Asia, Icon says. The country's well-tuned regulations and Institutional Review Board codes offer a firm legal foundation. And its healthcare infrastructure is solid, too. Goh says Icon works with Korean and non-Korean clients there on all aspects of drug development, from regulatory consulting work to Phase III trial management.

"Korean clients tend to be well-informed and very clear on their drug development strategies," Goh says. "They have ambitious targets that are focused on the European and U.S. markets".

Intensification of Industrial Competitiveness

Korea has been producing copy drugs (the 1980s) and generic drugs (the 1990s) on the strength of the government's positive supports and pharmaceutical companies' efforts. Entering the 21st century, Korea succeeded in developing new drugs with new substances and has been competitive in new drug development in a relatively short space of time.

19 new drugs have been developed so far. In addition, 8 generic drugs, 30 vaccines and 6 drugs based on natural products (plant extracts) have been approved.

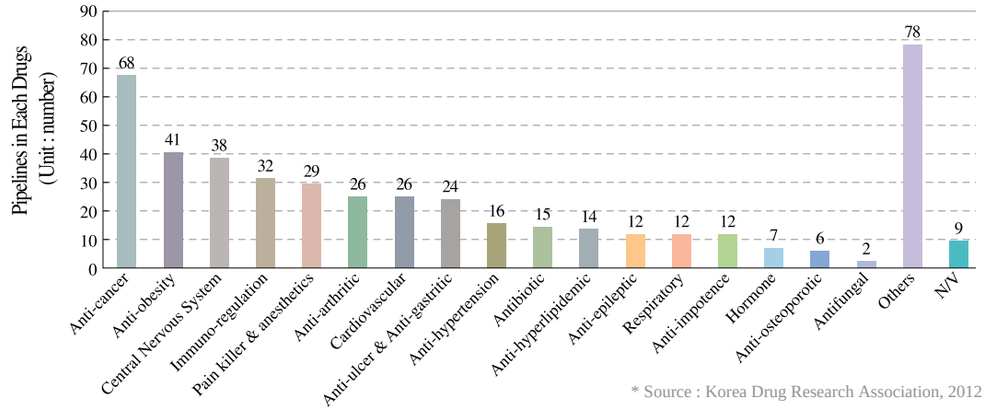
The recent success and performance in biotechnology made Korea the 8th country to develop the H1N1 vaccine (Green Cross, 2009) and first to develop stem cell therapy products (FCB Pharmicell, 2011).

In 2009 when H1N1 is spreading throughout the world, all the countries in the world keenly competed for the vaccine. However, Korea could overcome the crisis by using self-developed vaccine.

In Korea, 37 pharmaceutical companies, which have been concentrating on R&D activities, have 467 pipelines regarding new drugs, generic drugs, biobetters and biosimilars. New drugs account for the highest percentage (51%, 238) of research activities, followed by generic drugs (43%, 200) and biosimilars (5.4%, 25).

They can be classified into 18 as to target diseases, inclusive of anticancer drugs, anti-obesity drugs, central nervous system (CNC) drugs, immuno-regulatory drugs, etc.

The Pipelines of Drugs Classified by Target Diseases (2012)



* Source : Korea Drug Research Association, 2012

Annual growth of approved clinical trials on biotherapeutics was 21% between 2007 and 2011.

Recombinant therapeutics accounted for 63% of the clinical trials, and cell therapy or gene therapy products are continuously increasing.

In case of biosimilars, 7 domestic pharmaceutical companies carry out clinical trials for 8 products.

Biomedicines-Related Clinical Trials Approved by KFDA

	Plasma Derivatives	Vaccines	Anti-toxins	Recombinant Therapeutics	Cell Therapy	Gene Therapy	Total
Domestic (Single-Country)	3	33	12	81	77	14	220
Multinational	0	16	2	198	1	4	221
Total	3	49	12	279	78	18	441

* Source : KFDA, 2012

Korea has continuously worked on the development of stem cell therapy to lead the future medicines such as talor-made preventive medicines, and as a result succeeded in developing stem cell therapy products and stepping out into world markets.

Currently, 3 products from domestic companies are on the market. In addition, 25 clinical trials are underway.

In July 2011, PARMICELL's Hearticellgram-AMI was licensed as the world' s first stem cell therapy product.

MEDIPOST's self-developed Cartistem went through phase-I and II-a clinical trials approved by US FDA and has been exposed in November 2012, which was the first time in the history of domestic pharmaceutical companies.

Stem Cell Therapy Products Approved in Korea

Company	Products	Cell Types	Target Diseases	Date of Approval
FCB PHARMICELL	Hearticellgram -AMI	Autologous bone marrow-derived mesenchymal stem cells	Improvement of LVEF in acute myocardial infraction patients	2011.7.1
MEDIPOST	CARTISTEM	Umbilical cord blood-derived mesenchymal stem cells	Treatment of knee cartilage defects	2012.1.18
ANTEROGEN	CUPISTEM	Autologous adipose-derived mesenchymal stem cells	Treatment of Crohn's fistula	2012.1.18

Emerging of Successful Biotech Companies

Biotech companies in Korea have have invested in research and development over 10 years since their foundation, and now they are expanding their capability into commercialization.

As biotech companies like CELLTRION have achieved commercial successes, bioindustry in Korea is expected to take a leap forward.

Biotech companies such as CELLTRION, MEDYTOX, MEDIPOST, SEEGENE, BIONEER and TOOLGEN have successfully established in Korean market, based on their own know-hows and platform technologies. Now they are more likely to enter the global market.

CELLTRION has core technologies to develop antibodies and to combine therapeutic antibodies and synthetic drugs. MEDYTOX succeeded in turning botulinum toxin into cosmetic and therapeutic products and has the technologies to preserve and transplant stem cells and cord blood.

Only 7 biotech companies were listed in the Korean stock market (KOSDAQ) before the year 2000, but since then, more than 50 companies have listed on it, showing that their strong growth.

In 2012, 57 biotech companies were listed in KOSDAQ. As of March 2013, there are 13 companies having one-trillion-won market value in KOSDAQ, compared to only 4 companies as of March, 2012. 2 of them are biotech companies.

Companies Having One-Trillion-Won Market Value in KOSDAQ

Ranking	Company	Total Market Value	Ranking	Company	Total Market Value
1	CELLTRION	4.6933-trillion won	8	DAUM	1.2616-trillion won
2	PARADISE	1.9098-trillion won	9	GS Home Shopping	1.2410-trillion won
3	CJ O Shopping	1.9014-trillion won	10	POSCO ICT	1.0963-trillion won
4	Seoul Semiconductor	1.7987-trillion won	11	SFA	1.0539-trillion won
5	CJ E&M	1.4150-trillion won	12	SEEGENE	1.0357-trillion won
6	SK Broadband	1.3614-trillion won	13	PARTRON	1.0097-trillion won
7	DONGSUH	1.3078-trillion won			

* Source : Korea Technology Transfer Center (as of Mar. 8, 2013)

Governmental Strong Promotion Policy

The Korean government selected "Bioindustry" as a new economic growth engine, and has improved systems and promotion policies (Bio-Vision 2016). The government is focusing on the efficient management of national R&D programs, supporting systems for bioindustry, establishment of cutting-edge medical clusters and training of experts.

Investment of total R&D in biotechnology sectors in Korea is continuously growing

As mentioned above, the biotechnology sector comprised 19% (2.5808-trillion won) of the national R&D budget in 2012.

Direction of R&D investment in biotechnology

According to a report titled 'Investment Direction of the 2014 Government R&D Investment,' released by the National Science and Technology Commission, the government has the plan to expand investment in R&D related to innovative technologies for people's wealthy and happy life, safety and security, and future mega-trends & needs. R&D for improving industrial structure is also one of strategic area of governmental investments.

To cope with chronic diseases and social/economic issues caused by urbanization and aging, investment will be made in public welfare enough to make people feel wealthier and happier.

With infrastructure for ICT, the way will be paved for advancement of researches on life science and healthcare.

Strong investment will be made for platform technologies of biotechnology and healthcare industry to make them as a economic growth engine for global market.

Supporting Policy for Pharmaceutical Industry

The Ministry of Health and Welfare will streamline the pricing system and the approval procedures for new medical technology and medicine, expand government R&D supports, improve R&D support system, increase tax incentives and develop new financing method for R&D related to exports.

Biofund to Nurture Bioindustry

In 2011, Seoul City and the Ministry of Trade, Industry and Energy created a 75 billion won fund titled 'Korea Seoul Life Science Fund' through a public-private joint investment. It invests more than 60% of the entire fund in midium-sized companies with sales revenue of more than 30 billion won or unlisted small or medium ventures in the biologics or medical equipment industries.

Beneficiaries of Korea Seoul Life Science Fund : Kang Stem Holdings, EARLOGIC Korea, Crystal Genomics, PCL, Pathway Genomics, PHARMABCINE and CORESTEM

Bio-
Clusters
in Korea

Balancing Power!

'Balance' comes from the establishment of the same goal and the division of powers. Korea has been strengthening competitiveness in bioindustry, creating bio-clusters such as R&D complexes and industrial complexes in key areas.

Major Bio-Clusters

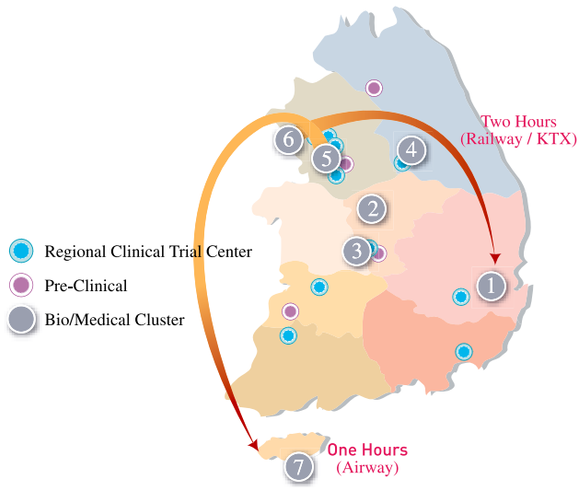
The Korean government has been forstering the "Bio-cluster System" and creating specialized hubs and R&D complexes in each district with the aim of strengthening its competitiveness in biotechnology, which is expected to enable the setup of inter-regional human, technical and industrial networks, local innovation and the balanced development of biotech industries.

A total of 25 bio-clusters (9 Bio Venture Centers and 16 Regional Technology Innovation Centers) have been formed in 15 cities or provinces in Korea. They support 3 specialized hubs, biomedicine, marine biotechnology and life care material. Korea Bio-Hub Center, founded in 2004, takes the initiative in networking with bio-clusters and activating academic-industrial joint researches.

For more information, refer to the website of Korea Bio-Hub Center (www.koreabiohub.org)

Specialized Biomedical Clusters in Korea

Korea's Bio-Clusters are established in major cities and are all connected, forming one national cluster within one hour's distance by air



Cluster	Value chain
① Daegu Hi-Tech Medical Cluster (Medivalley)	Pharma / BT/ Medical device ⇨ R&D /Production
② Osong BioValley	Bio-Pharma/Medical device ⇨ R&D
③ Innopolis Daedeok	Bio-Pharma ⇨ R&D
④ Wonju Medical device Cluster	Medical device ⇨ R&D / Production
⑤ Gyeonggi-do Techno valley	BT, Pharma / Healthcare ⇨ R&D / Production
⑥ IFEZ Bio-Complex	Bio-Healthcare ⇨ R&D / Production
⑦ Jeju Healthcare Town	Healthcare ⇨ R&D /Leisure

* Source : Invest Korea (http://www.investkorea.org/)

1. Daegu-Gyeongbuk High-Tech Medical Cluster

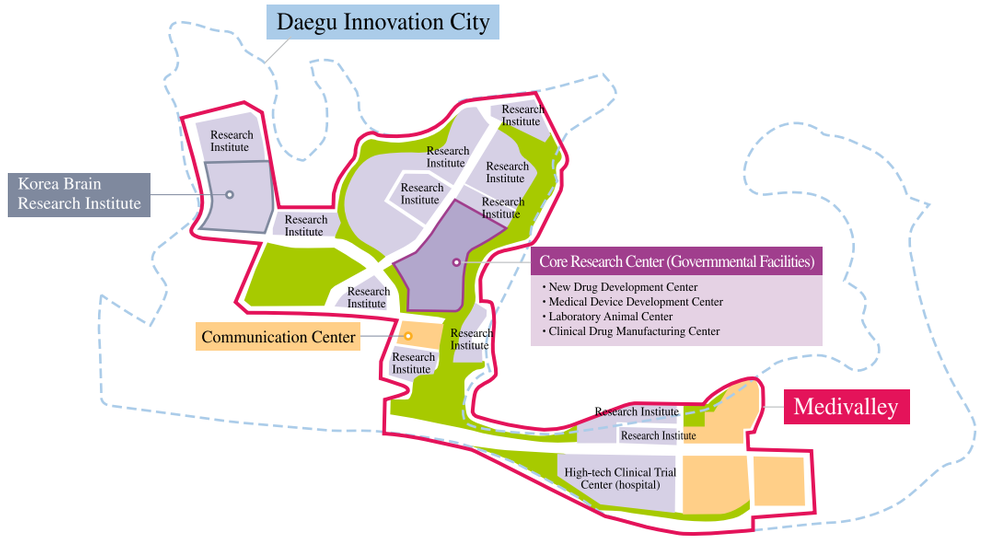
Korea makes a hi-tech medical complex, in line with the huge-scale national project to develop medical industry as a national strategic industry. It will be a global hub of medical industry to develop it as a next-generation economic growth engine. They will be constructed in Daegu and Osong, respectively, and these constructions are scheduled to be completed by 2013.

Daegu-Gyeongbuk Hi-Tech Medical Cluster, planned to be created in Daegu, will be 1.03 square kilometers in area, in which a total of 4.6-trillion won will be invested. The construction is underway.

The complex is composed of 4 core research centers including, new drug development center, medical device development center, laboratory animal center, and clinical drug manufacturing center, and will translate basic research into clinical trial stages to develop first-in-class (innovative) new drugs and medical devices.

The cluster will focus on synthetic chemical drugs and IT-based high-tech medical devices, unlike the Osong complex, in order to differentiate them from others. It is enabled by 12 hospitals equipped with outstanding clinical trial infrastructure and by the synchrotron radiation (Pohang).

Map of Daegu-Gyeongbuk High-Tech Medical Cluster



* Source : Daegu-Gyeongbuk Medical Innovation Foundation (http://www.medivalley.re.kr)

2. Osong BioValley

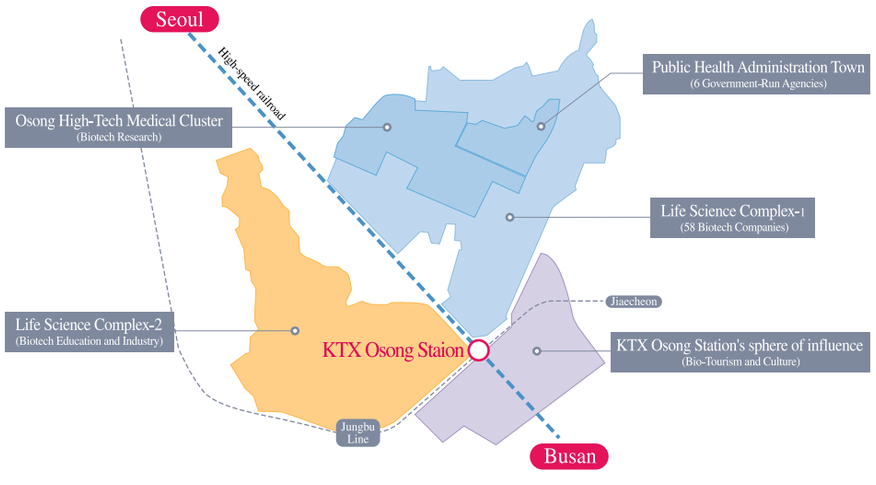
Osong (North Chungcheong Province) has 'Osong BioValley' equipped with world-class biotech R&D infrastructure to make Korea the hub of the integrated biotech industry. Osong BioValley provides world-class medical R&D innovation, medical services, bio-tourism, culture and education, in which 'Osong Life Science Complex' and 'Medical Innovation Cluster' were created in 2008 and 2009 respectively. It has been occupied by a variety of biotech companies since six government-run healthcare agencies moved to there in 2010, and now it is emerging as the center of Korean biotechnology.

The complex is 9,545 square kilometer in area. It is equipped with biomedical facilities and composed of 'Life Science Complex-1', 'Medical Innovation Cluster', 'Life Science Complex-2' and 'Public Health Administration Town'. In particular, it has the merits of being adjacent to KTX Osong Station. Functionally, it supports not only R&D for new drugs or a medical devices but the commercialization of them, in addition to administrative affairs.

Considering that the complex has 6 government-run healthcare institutions including KFDA and is adjacent to Daedeok R&D Complex having many research institutes including Korea Research Institute of Bioscience and Biotechnology (KRIBB), it specializes in biotherapeutics and BT-based high-tech medical devices.

Recently, an agreement with Germany's Berlin-Brandenburg Center for Regenerative Therapies (BCRT) was made for foundation of a research institute for stem cell and regenerative medicine (May 2012).

An Overview Map of Osong Biovalley



3. Innopolis Daedeok

The Innopolis Daedeok (yuseong-gu and daedeok-gu of daejeon metropolitan city) refers to 'Daedeok Research Complex', 'Daedeok Techno Valley' and 'Daejeon Industrial Complex.' It is the Korea's biggest R&D complex having an area of 67.8 square kilometers.

The master plan of the Innopolis Daedeok was established in 1973 to advance basic and special sciences, and research institutions began to go up in the site from 1978. As of 2011, the complex has been occupied by about 60,000 workers at 30 government-run agencies, 11 public institutions, 14 national institutions, 30 non-profit institutions, 5 universities and 1,306 companies (1,399 in all).

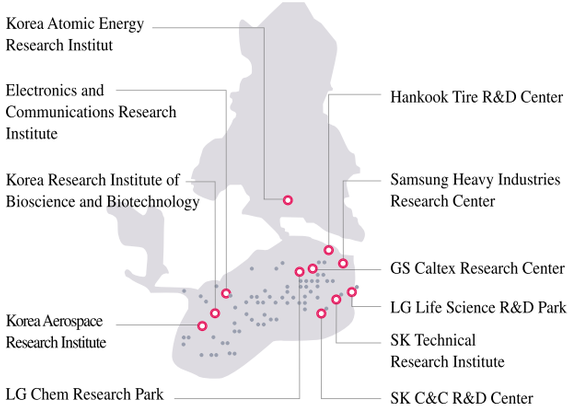
Strengths of Innopolis Daedeok

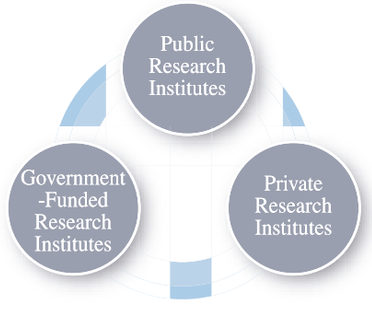
In Innopolis Daedeok, there are many government-funded institutes related to innovative industries such as biotechnology, information technology, nanotechnology, robotic and aerospace.

Its R&D capability is highest in Korea, and its workers are equivalent to 10% of those having doctoral degrees in sciences and engineering in Korea. The KAIST, called 'Korean MIT', produces world-class scientists and researchers, and the complex functions as a reservoir of professional human resources necessary for industries and technical development in Korea.

The Innopolis, based on integrated research techniques, is advantageous to technology-intensive companies and startups. Its occupants, Korea's best ventures and other various companies, are in possession of commercialized technologies such as DRAM and SRAM chips, LCD modules, cell phone technologies and wireless wide area network technologies.

Research Institutes in Innopolis Daedeok





* Source : INNOPOLIS Foundation (http://ddi.or.kr)

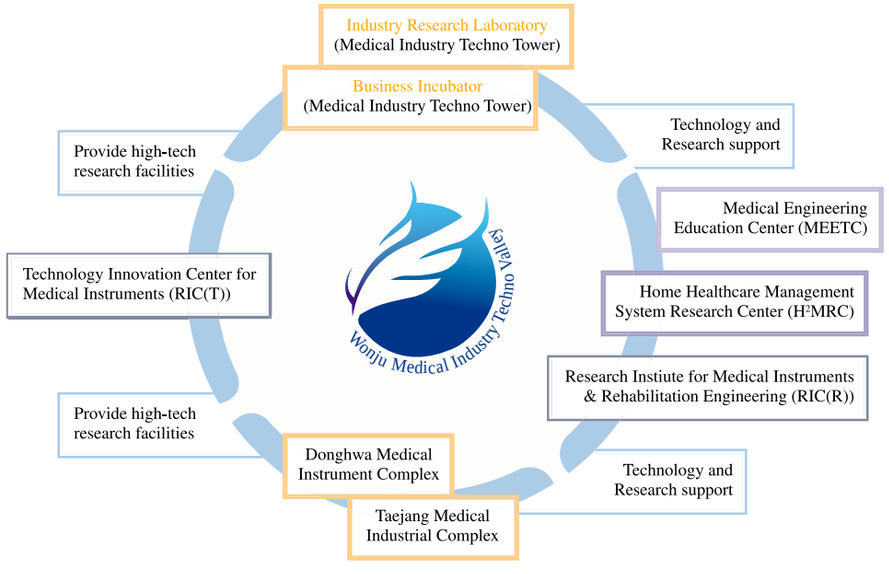
4. Wonju Medical Device cluster

Wonju Medical Equipment Techno Valley development project has been pushing ahead for bringing Wonju as a city of global medical equipment industry since 1998. It was founded for supporting the industries, specialized in medical equipment, for vitalization of regional economy and improving international competitiveness of domestic medical equipment industry by supporting things such as training man power and technology cooperation, establishment support, production function and marketing through organic cooperation with industry, university and institute.

With a close academic-industrial cooperation, it boosts the medical equipment industry and invigorates local economy by backing up researches, developments, technologies, product licensing, test product making, domestic and overseas marketing, preclinical and clinical trials and startups. In addition, it provides research facilities, leases flatted factory buildings, and sells factory sites in lots.

It is largely composed of Medical Industry Techno Tower, Venture Center, Wonju Medical Technology Techno-park and Donghwa Medical Instrument Complex, and has been tenanted by more than 90 companies.

Technical Support Center, located there, has been designated as the first Underwriter Laboratories Witness Test Data Program (UL-WTDP) in Korea in March 2013, and it has been possible for medical device exporters to get safety certificates from the cencer.



* Source: Wonju Medical Industry Techno Valley (http://www.wmit.or.kr/)

5. Gyeonggi-do Techno Valley

Gyeonggi Province in Korea has been leading technical innovation together with Seoul and Incheon. Being easy to recruit highly skilled workers in virtue of geographical proximity to the capital city of Seoul, it maintains active partnership with the Institute Pasteur Korea and other large global clinical trial centers. It is also adjacent to foreign-invested companies, such as GE Healthcare and Siemens, and large local pharmaceutical corporations. Pangyo Techno Valley and Gwanggyo Techno Valley, conducting R&D activities regarding the convergence among BT, IT and NT, underlie the infrastructure.

PAN-GYO TECHNO VALLEY

The Pangyo Techno Valley (Pangyo, Seongam City) is a hi-tech innovation cluster having an area of 661,925 square meters. It aims to establish a specialized global cluster covering reseaech (R), information (T), and trade (T) for IT and other IT R&D-related convergence technologies and implement a ubiquitous trial model.

At present, it has 41 companies in addition to R&D Center, Indusy-Academia Research institute R&D Center and Public Support Center and offers optimal business environment. It is expected to be an important foothold for the hi-tech industry in gyeonggi province, together with gwanggyo, ansan and gwacheon.

* Source : Pangyo techno valley (http://www.pangyotechnovalley.org/)

Gwanggyo Technovalley

Gwanggyo Techno Valley (Gwanggyo, Suwaon) is a hi-tech R&D complex having an area of about 11.3 square kilometers. It is based on hi-tech industries such as BT, IT and NT. It was created for the purpose of reviving local economy, cultivating outstanding human resources and strengthening national competitiveness.

Five facilities, including Gyeonggi Bio Center, Gyeonggi R&DB Center and Advanced Institutes of Convergence Technology, underlie its R&D infrastructure. Gyeonggi Bio Center, specializing in the promotion of pharmaceutical and biotech industries, provides occupants with the most advanced laboratory devices.

* Source : Gwanggyo Techno Valley (http://www.ggtv.or.kr/)

6. Incheon Free Economic Zone (IFEZ) Bio-Complex

The Korean government appointed Incheon Free Economic Zone (IFEZ) as a forward base for global business and has guaranteed to actively support its economic activities. The site of 169.5Km^2, including Incheon International Airport, Incheon Harbor, Songdo, Yeongjong and Cheongna International City, was appointed as the Korea's first economic free zone in August 2003.

IFEZ is suitable for business, logistics, advanced industry, biomedical, education and tourist & culture. In the case of the biomedical industry, a customized and regenerative medicine complex was created for the purpose of being ranked 3rd in the world for technological strength.

The biomedical industry is boosted with the creation of a 'Medi Park' and a medical city 'Yeongjong Medi City', the attraction of foreign hospitals and the development of 'International BIT-Port'.

IEFZ has been occupied by CELLTRION, Samsung Bio Logics, I-SENS (a glucometer producer), KD Corporation (a silica gel manufacturer), BINEX and BERNA Biotech Korea, and a large foreign hospital is scheduled to be founded there.

Enterprise Promotion Plan

Enterprise Project	Enterprise Outline	Target Investment Industry
Construction of Songdo Biomedipark	· Enterprise period 2010. 1 ~ 2014. 12(1st Phase) 2015. 1 ~ 2020. 12(2nd Phase)	Biomedical production / manufacturing facilities and research centers
Construction of Bio-Research Complex	· Enterprise period 2009. 1 ~ 2013. 12 · Primary facilities Yeongu-dong, Imsang-dong, apartment factories, business facilities, administrative buildings	Enterprises closely involved in bio-industries and BT, NT, and IT research
Construction of Yeongjong Medicity	· Enterprise period 2009. 1 ~ 2015 · Primary facilities International hospital, schools, research centers, residences, service facilities	National and international treatment and pharmaceutical development organizations
Construction of Cheongna International BIT-Port	· Enterprise period 2006. 9 ~ 2014. 12 · Primary facilities Education and management facilities, research facilities, academic-industrial cooperation facilities	BIT-related fused technology education, research, and industrialization facilities
Songdo International Hospital	· Enterprise period 2005. ~ 2013	Managing organizations · Johns Hopkins Hospital and Seoul University Hospital

* Source : Incheon Free Economic Zone (http://www.ifez.go.kr)

7. JDC, Jeju Healthcare Town

Recently, the construction of 'Jeju Healthcare Town' has begun for the purpose of inviting local and foreign companies and creating a global medical environment to vitalize medical business. It is expected to enable visitors not only to take recreation but to get medical services in Jeju Island famous for picturesqueness. It is planned to be created in a site of about 1.5 square kilometers with an investment of 784.5-billion won. The site began to be renovated in 2011, and the town is scheduled to be opened in 2015.

Jeju Healthcare Town will be largely composed of Wellness Park, Medical Park and R&D Park.

Wellness Park will be a medical and recreational complex, in which a condominium, a water park and 'Wellness Mall' will go up.

Medical Park will be a medical complex to provide the most advanced medical services, which will be equipped with hospitals, specializing in plastic surgery, dentistry and cancer treatment, and recreational facilities for the elderly and retirees.

R&D Park is to research biotechnology and medicine, in which 'Medical R&D Center', 'AntiAging Center' and 'Rehabilitation Center' will be founded.

Present State

In October 2012, China's Greenland Group signed an investment contract of 1-trillion won. Currently, the phase-I construction is underway.

In February 2013, a Korea-China consortium was formed and two companies (SEOWOO in Korea and ZHONGDA DICHAN in China) singed a MOU.

Business Purpose

Vision

"Construct and operate Global Medical Complex"

Goal

"One of Jeju Free International City's key businesses, inviting local and foreign companies and creating a global medical environment to vitalize medical business"

Strategy

Medical resort complex based on theme of health	Medical complex providing latest medical services	Medical research complex researching medical specialized fields

* Source : JEJU Free International City Development Center (http://www.jdcenter.com)

Biotech-Leading Entities in Korea

Coming Tomorrow!

If you look forward to tomorrow, you will feel happy today.

Korea maps out the future of the bioindustry in closer cooperations among large-sized companies to launch bio-healthcare businesses, a number of biotech companies listed in stock market, research institutions & related organizations, and associations & clinical trial centers.

Status of Biotech & Healthcare Business of Large-sized Companies

An industrial ecosystem has been formed by active participations of the large-sized companies in Korea, expecting biotech and healthcare sectors to be the key to the next growth industry.

As the aging population is quickly increasing throughout the world, especially in Korea, leading electronic, chemical and telecommunications companies in Korea have been making inroads into biotech and healthcare markets in recent 3 or 4 years.

In particular, the fact that Samsung going into the biotech business makes the biotech industry in Korea highly anticipated. Its subsidiaries, Biologics and Bioepis, went into the biosimilar business, and moreover Samsung Electronics has gotten stuck into the medical device industry.

Company	Major issues
SAMSUNG	- Selected the Bio-Health area as a new business (2010) - Established a joint venture with Quintiles (USA) for a bio similar business (2011) - Takeover of the medical instrument company Medison (2011) · Develops medical devices such as blood analyzers, digital x-ray units and others · Conducts M&A activities to win domestic and overseas medical device companies such as GES, NEXUS, NEUROLOGICA, etc - Launches Samsung Biologics, a joint biomedicine company (Apr. 2011) - Launches Biogen Idec and a joint company Samsung Bioepis to develop and commercialize biosimilars (Feb. 2012) - Sets up the bioinformatic business (Samsung SDS) and began to provide gene analysis services (SamsungGenome.com) from 2011 - Starts the bioindustry with biochemical and biofuel sectors (Samsung Petrochemical) (2011)
HYUNDAI HEAVY INDUSTRIES CO., LTD	- Begins to develop a next-generation medical robot jointly with Asan Medical Center (Mar. 2012)
LG	- LG Life Science promotes bio business, invests in biosimilar - Approved growth hormone 'Valtropin (generic)' licensed by U.S. FDA and EMEA - Enbrel's biosimilar, clinical trial in progress - Construction of a biosimilar plant in the Osong high-tech Medical Complex is underway - Concludes a contract with Mochida(Japan) for the joint development and sale of biosimilars (Nov. 2011) - Develops Korea's 19th new drug, 'Zemiglo (anti-diabetic)' (2012) - Conducts a demonstration project 'Smart Care Service (ubiquitous healthcare service)' jointly with Daegu City (LG Electronics) (2010)
SK	- Founds 'SK Biopharmaceuticals' a subsidiary to specialize in new drug development as part of the healthcare business (Apr. 2011) - Founds a new department to carry out ubiquitous healthcare business (SK Telecom) ; acquires shares in 'NanoEnTek', an in vitro diagnostic (IVD) unit manufacturer ; carries out healthcare business with a venture, 'Healthcare Connect', founded jointly with Seoul National University Hospital in January 2012 ; enters the healthcare market in China by acquiring a 49 percent stake in 'Tian Long', a diagnostic unit manufacturer in China - Regards sunlight, biofuels and secondary batteries as the future green energy, and plans an investment of 4.5-trillion won until 2020 (SK Energy) - Focuses on the development of vaccines, biomedicines and botanical drugs, and conducts the Korea's first phase I clinical trial on a cell culture influenza vaccine (SK Chemical) (Sep. 2012)
Hanwha	- Selected as a future growth engine business such as bio and solar energy (2009) - KFDA approval for HD203, an Enbrel's biosimilar (Sep. 2012) - Biosimilar plant construction plan in Osong BioValley - Focuses on the medicine, anti-obesity drug and aesthetic businesses (Dream Pharma)
KT&G	- Selects biotech and pharmaceutical sectors as new promising businesses, and promotes them. · Lays foundation for the pharmaceutical industry, taking over Youngjin Pharm, and takes over Mazence, a biotech venture specializing in new drug development (2012) - Founds a subsidiary, KT&G Life Science, and focuses on the development of new drugs (Mar. 2012)
kt	- Founds a medical-ICT convergence company 'Who Health Care' jointly with Severance Hospital (Jul. 2012) · Builds up 'a smart medical ecosystem', developing and providing a hospital information system
posco	- Starts the biotech industry, founding a biotech venture in USA (2002) · Invests its own found into the development of stem cell therapy products, a new promising business (Sep. 2011)

Biotech Companies

(as of October 2012)

Biotech Companies Listed on KOSPI (7)

Companies	Fields	Websites
LG Life Sciences	Biopharmaceutical	www.lgls.co.kr
SK Chemicals	Biopharmaceutical	www.skchemicals.com
VGX International	Biopharmaceutical	www.vgxi.com
SEWON CELLONTECH	Biopharmaceutical	www.sewoncellontech.com
RNL BIO	Biopharmaceutical	www.rnl.co.kr
Orient Bio	Biopharmaceutical	www.orient.co.kr
CKDBIO	Biopharmaceutical	www.ckdbio.com

Biotech Companies Listed on KOSDAQ (50)

Companies	Fields	Websites
NeoPharm	Biopharmaceutical	www.neopharm.co.kr
Neurotech	Biopharmaceutical	www.neurotech.co.kr
Deasung Microbiological Labs.	Biopharmaceutical	www.dsmbio.com
Daehan New Pharm	Biopharmaceutical	www.dhnp.co.kr
Lifecord	Biopharmaceutical	www.lifecord.co.kr
Rexgene Biotech	Biofood	www.rexgenebio.co.kr
Macrogen	Bioassay	www.macrogen.co.kr
Medytox	Biopharmaceutical	www.medytox.com
Medipost	Biopharmaceutical	www.medi-post.co.kr
Medifron	Biopharmaceutical	www.medifron.com
Binex	Biopharmaceutical	www.bi-nex.com
ViroMed	Biopharmaceutical	www.viromed.co.kr
Bioneer	Bio-equipment	www.bioneer.co.kr
Bioland	Biochemical	www.biolandkorea.com
Biotoxtech	Bioassay	www.biotoxtech.com
Sansung L&S	Biochemical	www.sansung.co.kr
Seoulin Bioscience	Bio-equipment	www.seoulin.co.kr
Celltrion	Biopharmaceutical	www.celltrion.com
Suprema	Bio-equipment	www.suprema.co.kr
Skynewpharm	Biopharmaceutical	www.skynewpharm.com
Cellbiotech	Biofood	www.cellbiotech.com
Seegene	Biopharmaceutical	www.seegene.co.kr
CTCBIO	Agriculture	www.ctcbio.com
Estech Pharma	Biopharmaceutical	www.estechpharma.com
Oscotech	Biopharmaceutical	www.oscotech.com
EagleVet	Agriculture	www.eaglevet.com
InnoCell	Biopharmaceutical	www.greencrosscell.com
ISUAbxis	Biopharmaceutical	www.abxis.com
Easy Bio System	Biofood	www.easybio.co.kr
Equis & Zaroo	Biopharmaceutical	www.equispharm.com
Infopia	Bio-equipment	www.infopia21.com
Ilshin Lab.	Bioprocess and equipment	www.1sbb.com
Genexine	Biopharmaceutical	www.genexine.com
Genic	Bio-cosmetic	www.genic21.com
Cheil Bio	Agriculture	www.cheilbio.com
CAVAC	Biopharmaceutical	www.cavac.co.kr
JW-Shinyak	Biopharmaceutical	www.jw-shinayk.co.kr
Gene Matrix	Biopharmaceutical	www.genematrix.net
Gene Biotech	Biopharmaceutical	www.genebiotech.co.kr
Cha Bio & Diostech	Biopharmaceutical	www.chabio.co.kr
K-Mac	Bioprocess and equipment	www.kmac.com
Komi Pharm	Biopharmaceutical	www.komipharm.com
KOLON Life Science	Biopharmaceutical	www.kolons.co.kr
Crystal Genomix	Biopharmaceutical	www.crystalgenomix.com
PharmswellBio	Bio-equipment	www.pharmswell.com
Kolmar Korea	Biopharmaceutical	www.kolmar.co.kr
Hans Biomed	Bioprocess and equipment	www.hansbiomed.com
Hwail Pharmaceutical	Biopharmaceutical	www.hwail.com
Dong-A Pharmtech	Biopharmaceutical	www.dapt.co.kr
DNA Link	Bioassay	www.dnalink.com

* Source: The Korea Biotechnology Industry Organization

Research Institutes

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

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 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

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

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

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

Organizations & Associations

Korea Biotechnology Industry Organization (KOREA BIo)	Founded in 2008, As the organization representing the biotechnology industry as per Article 38 of the Industry Development Act of the Korean Ministry of Trade, Industry and Energy, the Korea Biotechnology Industry Organization strives to enhance links between the many businesses that constitute the biotechnology industry and while acting as a catalyst for further technological development and industrialization For more information, visit http://www.koreabio.org
Korea Drug Research Association (KDRA)	Founded by law in 1986 as a non profit organization, the KDRA represents Korea's R&D-oriented, innovative companies. The major purpose of establishment is to promote pharmaceutical research & development activities especially through promoting activation of research & development activities and raising the efficiency of R&D activities by furthering joint projects between industrial, academic and research fields For more information, visit http://www.kdra.or.kr
Korea Pharmaceutical Manufacturers Association (KPMA)	KPMA, since its foundation in 1945, along with pharmaceutical companies has been committed to improve healthcare for all mankind and develop pharmaceutical industry. KPMA aims to strengthen collaboration of Korean companies with pharmaceutical companies already having experience in product launches in the overseas markets For more information, visit http://www.kpma.or.kr
Korea National Enterprise for Clinical Trials (KoNECT)	KoNECT was established in December 2007 with wholehearted support from the Korean government, academics and related business industries in order to meet the increasing demands for clinical trials and to raise national competitiveness by fostering necessary human resources, developing core technology, and building a solid infrastructure to become a global clinical trial hub For more information, visit http://www.konect.or.kr
Korea Health Industry Development Institute (KHIDI)	Korea Health Industry Development Institute (KHIDI) is a public organization that consists of a group of experts dealing with various programs on promoting and developing health industry in Korea, while helping improve the national healthcare services For more information, visit http://www.khidi.or.kr
Korea Biomedicine Industry Association (KoBIA)	Established for conducting to the global competitiveness of Korean biomedicine industry and for this propose we make the utmost effort to improve the authorization policy of biomedicine. we seek to arrange timely distribution of industry news and our training programs of high-level biomedicines for this propose as well For more information, visit http://www.kobia.kr

Clinical Trial Centers (CTC) and Contract Research Organization (CRO)

Clinical Trial Centers (CTC)

No	Company	Websites
1	Clinical Trials Center, Seoul National University Hospital	http://ctc.bri.snuh.org
2	Clinical Trials Center, Inje University Pusan Paik Hospital	http://www.paikctc.ac.kr
3	Clinical Trials Center, Kyungpook National University Hospital	http://ctc.knu.ac.kr
4	Clinical Trials Center, Ajou University Medical Center	http://rctc.ajoumc.or.kr
5	Clinical Trials Center, Yonsei University Health System	http://sev.iseverance.com/ctc
6	Clinical Trials Center, Chonnam National University Hospital	http://www.cnuhctc.com
7	Clinical Research Coordinating Center, Catholic Medical Center of the Catholic University of Korea	http://cmccrcc.catholic.ac.kr
8	Clinical Research Center, Asan Medical Center	http://crc.amc.seoul.kr
9	Clinical Trials Center, Chonbuk National University Hospital	https://www.jbctc.co.kr
10	Clinical Trials Center, Samsung Medical Center	http://ctc.samsunghospital.com
11	Clinical Trials Center, Inha University Hospital	http://www.inha.com
12	Clinical Trials Center, Chungnam National University Hospital	http://www.cnuh.co.kr
13	Clinical Trials Center, Korea University Anam Hospital	http://ctc.kumc.or.kr
14	Clinical Researchi Center, Dong-A University Hospital	http://ctc.damc.or.kr
15	Clinical Trials Center, Pusan National University Hospital	http://www.pnuhmri.org

Contract Research Organization (CRO)

No	Company	Websites
1	Global Health Care	http://globalhealthcare.co.kr
2	DreamCIS	http://www.dreamcis.com
3	MedicalExcellence	http://www.mediex.co.kr
4	Apple Tree laboratory	http://www.applelab.co.kr
5	Synex	http://www.synex.co.kr
6	Seoul CRO	http://www.seoulcro.co.kr
7	Seoul Clinical laboratory (SCL)	http://www.scllab.co.kr
8	Seoul Pharma laboratory (SPL)	http://www.splab.co.kr
9	Sejong CRO	http://www.sjcro.com
10	Solomon Medical Research	http://www.solomonmed.com
11	C&R Research	http://www.cnrres.com
12	ACROVAN	http://www.acrovan.com
13	ADM Korea	http://www.admkorea.co.kr
14	LSK Global PS	http://www.lskglobal.com
15	GDFI	http://www.gdfi.co.kr
16	Pharma CRO	http://www.pharmacro.co.kr
17	Korea Medicine Research Institute (KMRI)	http://www.kmri.co.kr

Think
tomorrow
for
earth

KRIBB
Korea Research Institute of Bioscience & Biotechnology

BPRC
BIOTECH POLICY RESEARCH CENTER

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