KRIBB
Korea Research Institute
of Bioscience
and Biotechnology

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2007 KOREA RESEARCH INSTITUTE of BIOSCIENCE & BIOTECHNOLOGY ANNUAL REPORT

KRIBB
Korea Research Institute
of Bioscience
and Biotechnology

KRIBB

is leading us into a prosperous future
in the 21st century

Contents

Message
from the President

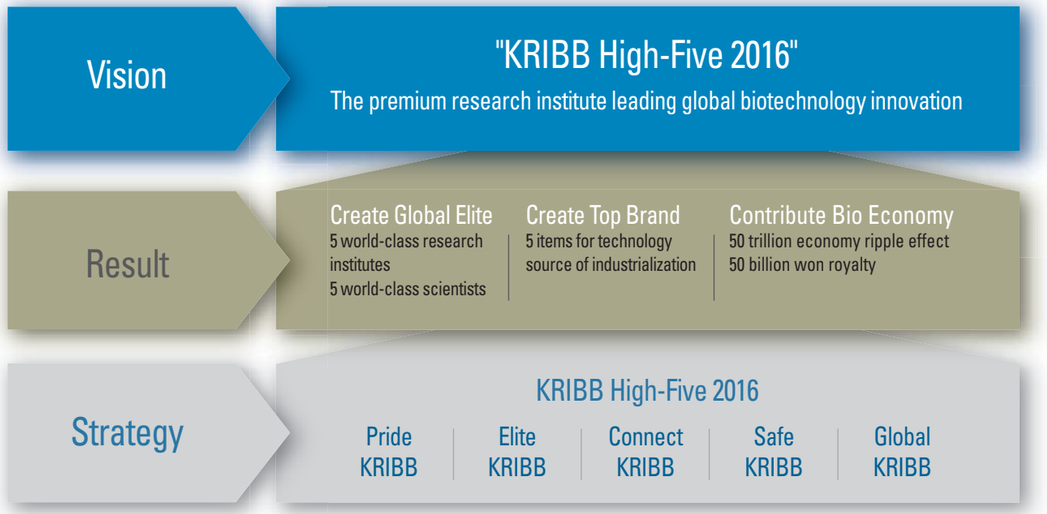
The Korea Research Institute of Bioscience and Biotechnology(KRIBB) is the government-funded research institute dedicated to state-of-the-art bioscience and biotechnology. The Korean government has been systematically promoting biotechnology through the national plan [Biotech 2000] (1994~2006), which has made a remarkable progress to date. [Bio-Vision 2016] envisions designed to make Korea one of the world's top seven biotechnology powerhouses by 2016.

KRIBB achieved great results in 2007. We have built up a strategic partnership with the global pharmaceutical company, Pfizer(2007.06) and also established the International Biological Material Research Center. Furthermore, the approval of a research-based clinical trial of NK cell therapy, the development of a diagnostic tool for gastric cancer using protein biomarkers(*International J. of Cancer*, 2007.02), and the discovery of a hyper sensitive cancer biomarker have qualitatively altered during cancer progression(*Molecular & Cellular Proteomics*, 2007.12). Our latest achievements have proven excellence both from the qualitative and quantitative perspectives compared with the previous year's publications and patents.

Now, KRIBB, which is undergoing a remarkable period of growth, is living up to its new motto 'KRIBB High-Five' seeking rebirth as 'a premium technical research institute capable of leading the world into a new era of biotechnology innovation'. Every researcher at KRIBB is fully committed to ensuring better public health and pursuing the development of the bio industry.

Sang Ki Rhee, Ph.D.
President & CEO

Mission & Vision



Key R&D Areas

Bio-Pharmaceuticals	To develop next generation bio-pharmaceuticals by using genome and proteome information, and stem cell and bio-organs by regenerating cells
Bio-Materials	To develop new functional materials by using genome information, and clean and environmental biomaterials
Bio-Nanotechnology	To develop cutting-edge fusion bioscience and technology (biochip, biosensor)
Bio-Informatics	To discover bio information related to diseases, to collect bio information, and to interpret bio structures and functions

Management Objectives

Quality Management for a superb performance

We have implemented 'quality management' in order to ensure great results in our four main Research Areas - bio-pharmaceuticals, bio-materials, bio-nanotechnology, and bio-informatics. In order to manage the organization's objectives and facilitate our rebirth as an organization focused on policies, we have reformed the research organization and made a commitment to promote the national economy and public welfare by pursuing significant research achievements.

Innovation Management to strengthen our innovative ability

We, as a government-funded research institute, have established and promoted five innovation policies, the 'KRIBB High-Five', with the goal of improving research and management efficiency.

Pride KRIBB Establishing an organization culture based on unity and faith
Elite KRIBB Seeking out and cultivating the bio-stars of the next generation
Connect KRIBB Creating new, up-to-date business
Safe KRIBB Creating a safe environment for researchers on the front burner
Global KRIBB Raising the research institute's status and profile throughout the world

Open Management - laying the foundations for another leap forward

For our second leap forward, we have been promoting the business of the Ochang campus and the Jeonbuk Branch Institute, and performing our role as the primary agent of domestic bio-clusters. We have also been working on raising public awareness of the organization and buiding a global cooperation network through an ongoing process of exchange with foreign organizations.

General Information

Foundation Basis

Article 8, Act on the Establishment, Management and Promotion of Government-funded Research Institutions

Objectives

Research and development in bioscience and biotechnology and support for research projects

Domestic and overseas cooperation among industry, academia and research institutes and distribution of the results

Mission

Research institute for realizing a bio-society in the 21st century

Function

Research on bioengineering and the distribution of technology
(bio-pharmaceuticals, bio-materials, bio-nanotechnology, bio-informatics)
Public infrastructure support for industry, academia, research institutes, and the government
(public infrastructure, cooperation among industry, academia and research institutes,
think-tank for national policy)

History

1985. 02	The Genetic Research Center(GRC) established as a spin-off institute of the Korea Advanced Institute of Science and Technology(KIST)
1989. 06	GRC transferred to the Korea Institute of Science and Technology(KAIST)
1990. 07	GRC moved to Daedeok Science Town
1990. 12	GRC changed its name to the Genetic Engineering Research Institute(GERI)
1995. 03	GERI changed to the Korea Research Institute of Bioscience and Biotechnology(KRIBB)
1999. 05	KRIBB became an independent entity
2001. 01	KRIBB became an independent legal entity under the umbrella of the Korea Research Council of Fundamental Science and Technology(KRCF)

Human Resources

Descriptions	Executives	Researchers	Engineers	Administrators	Technicians	Total
Regular employees	1	176	46	26	46	295

Budget (Unit: Millions of Won)

Revenue

Descriptions	Budget
Government funds	50,832
Ministry of Commerce, Industry and Energy funds	2,291
Institute revenues	52,183
Government-funded projects	48,533
Privately-funded projects	1,850
Royalties	500
Miscellaneous	1,300
Total	105,306

Expenditure

Descriptions	Budget
Personal expenses	21,881
Direct expenses	65,021
Institute projects	18,176
Specific research projects	22,411
Research for other organizations	14,949
Privately-funded projects	1,437
General purpose projects	8,048
Indirect expenses	17,112
Working expenses	5,450
Installation expenses	11,662
Others	1,292
Loans	792
Miscellaneous	500
Total	105,306

Facilities (Area: m²)

Daejeon Main Campus

Site	100,978
Building	51,552
Research and support	44,673
Main building	11,871
Research building	17,008
Resource building	6,554
Venture building	3,044
Native plant building(1)	1,134
Native plant building(2)	1,077
Cafeteria building	2,646
Greenhouse research building, etc.	1,339
Residence	6,879
Single	909
Superintendence APT	991
Dormitory	4,979

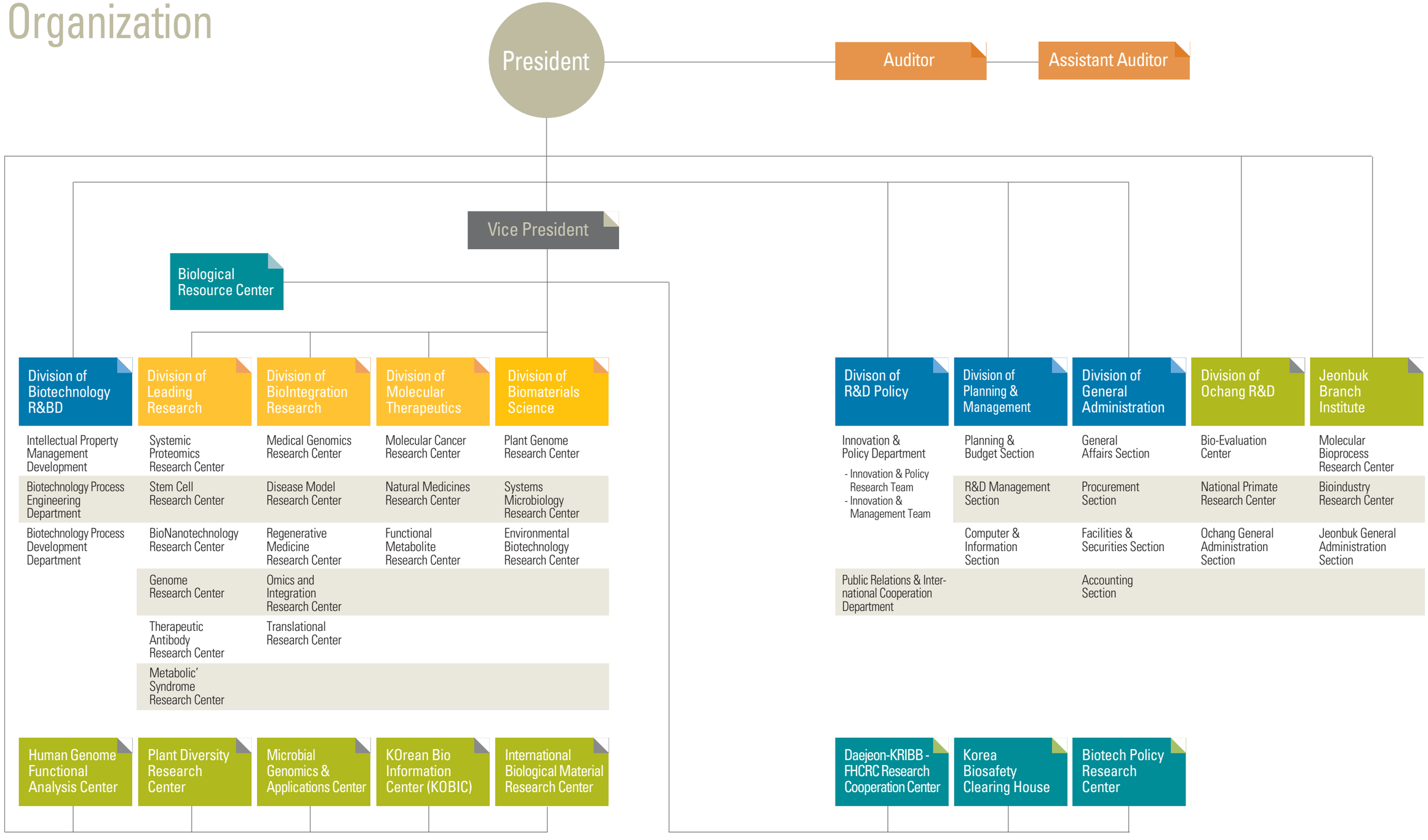
Ochang Campus

Site	212,258
Building	14,235
Research	14,235
National Primate Research Center	4,774
Bio-Evaluation Center	9,461

Jeonbuk Branch Institute

Site	18,098
Building	8,551
Research	8,551
Research building	5,740
Administration building and dormitory	2,811

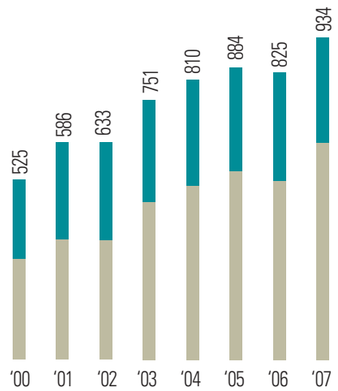
Organization



Yearly Progress

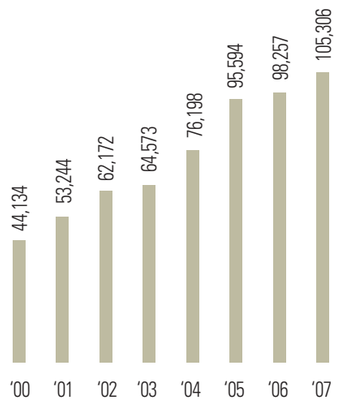
1. Personnel

	'00	'01	'02	'03	'04	'05	'06	'07
Regular Employees	228	243	280	290	300	297	295	295
Special Service Interns	297	343	353	461	510	547	530	639
Total	525	586	633	751	810	884	825	934



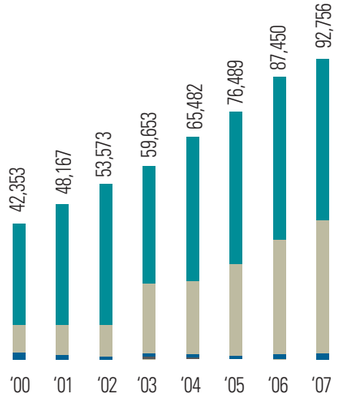
2. Budget Unit : Millions of won

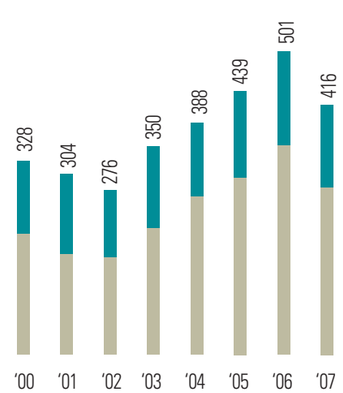
	'00	'01	'02	'03	'04	'05	'06	'07
Total	44,134	53,244	62,172	64,573	76,198	95,594	98,257	105,306



3. Research Expenses Unit : Millions of won

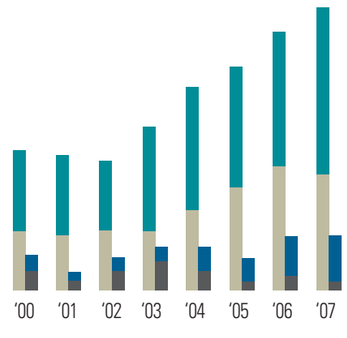
	'00	'01	'02	'03	'04	'05	'06	'07
Government	31,657	37,525	43,085	37,888	44,008	47,041	50,941	50,686
Institutes	9,025	9,580	10,044	20,268	22,860	28,546	35,210	40,699
Private	1,626	1,023	444	757	709	702	1,299	1,401
Others	45	39	-	740	905	200	-	-
Total	42,353	48,167	53,573	59,653	65,482	76,489	87,450	92,756





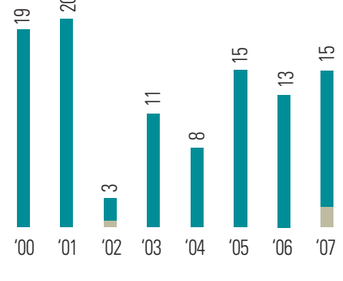
4. Publication Unit : Items

	'00	'01	'02	'03	'04	'05	'06	'07
Domestic	120	116	106	121	117	136	141	129
Overseas	208	188	170	229	271	303	360	287
Total	328	204	276	350	388	439	501	416



5. Patents Unit : Items

	'00	'01	'02	'03	'04	'05	'06	'07
Domestic Application	86	79	73	113	135	127	147	184
Registration	67	65	64	64	88	116	139	126
Overseas Application	17	8	12	19	25	23	46	47
Registration	14	9	17	28	20	10	13	11



6. Technology Transfer Unit : Items

	'00	'01	'02	'03	'04	'05	'06	'07
Domestic	19	20	2	11	8	15	13	13
Overseas	-	-	1	-	-	-	-	2
Total	19	20	3	11	8	15	13	15

Inspired by Life

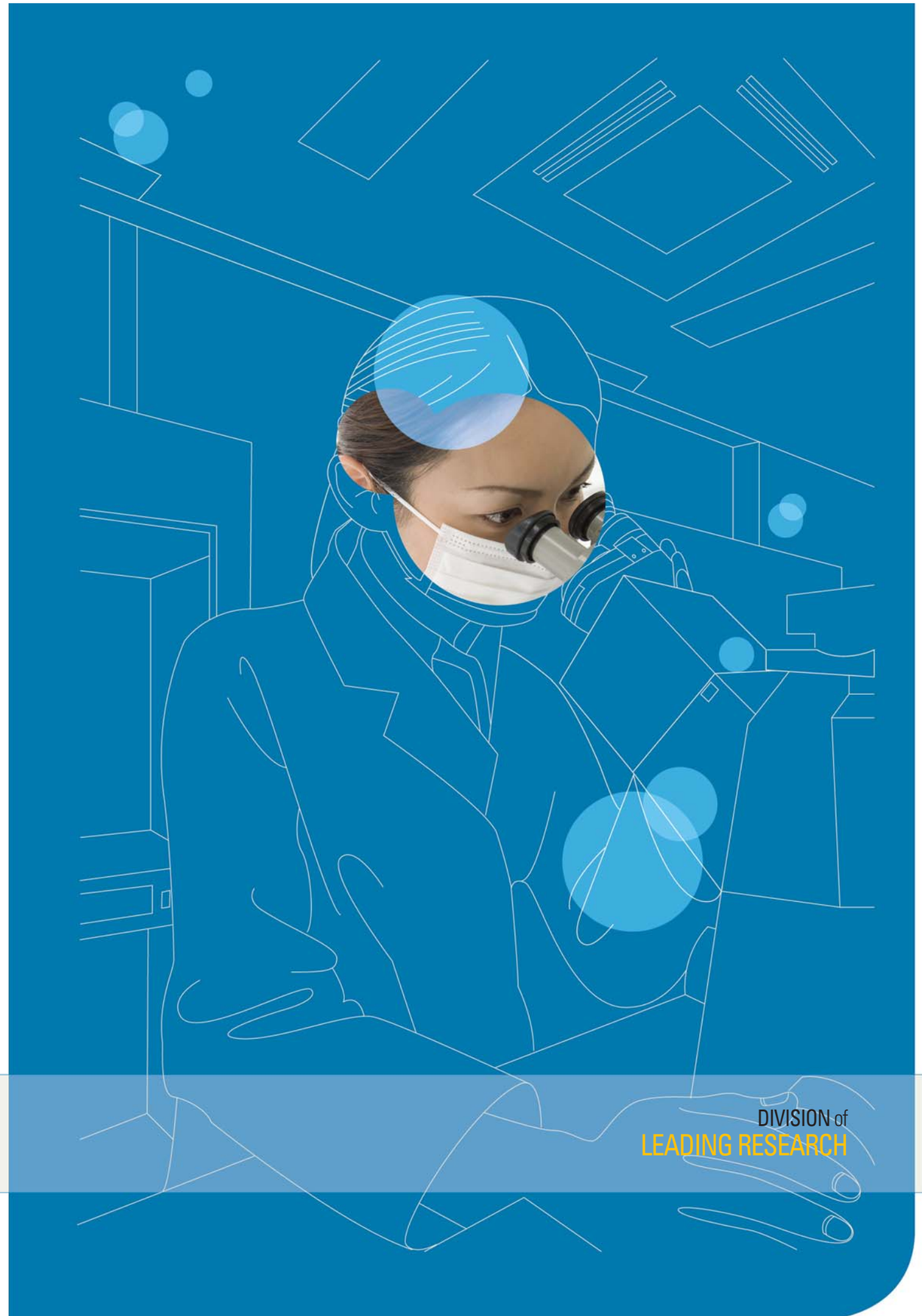
2007 KRIBB Annual Report

DIVISION of
LEADING RESEARCH

Principle Functions and Duties

Systemic studies of protein structure and function
Development of NK cell therapy based on stem cell differentiation
Integrative research of BINT(bio/info/nano-technology) for healthcare
Comparative genome structure & genome network research
Discovery of target and development of therapeutic antibodies for cancer therapy
Platform technology for metabolic syndrome

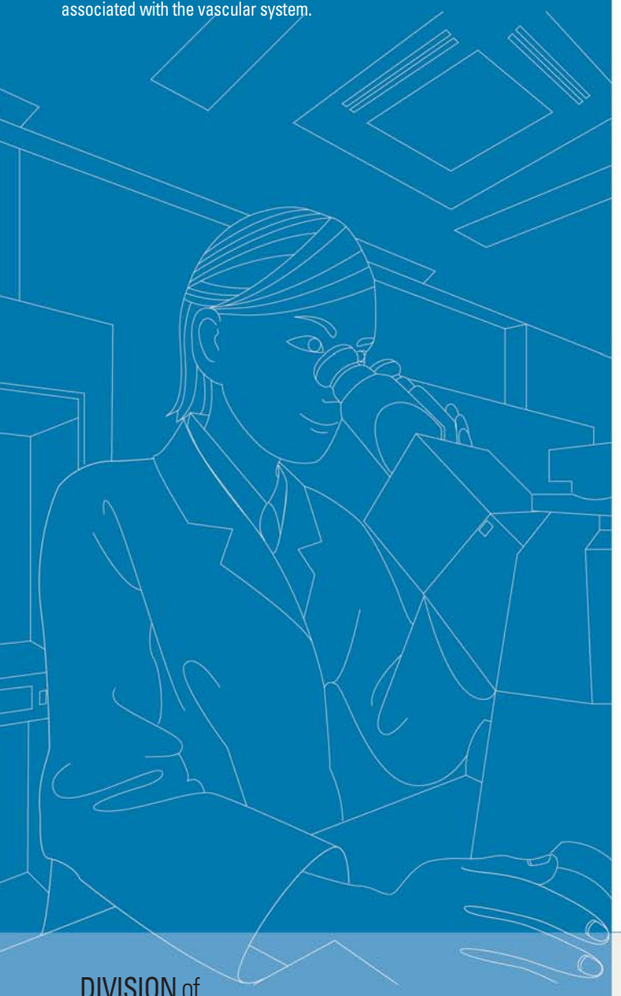
Systemic Proteomics Research Center <
Stem Cell Research Center <
Bio-Nanotechnology Research Center <
Genome Research Center <
Therapeutic Antibody Research Center <
Metabolic Syndrome Research Center <



01

Systemic Proteomics Research Center

Our goal is to develop platform technologies for disease treatment and diagnosis through systemic proteomics studies of cellular functional switches. The major research area encompasses the structural/functional analysis of disease related proteins and the high-throughput discovery of drug target proteins. Particular emphasis is placed on the holistic and quantitative analysis of disease model cells associated with the vascular system.



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Researchers

Seong Eon Ryu ryuse@kribb.re.kr
- Analysis of cellular switches

Hyun Jun Lee hjlee7@kribb.re.kr
- Functional validation of drug targets

Jeong Hee Moon jhdal@kribb.re.kr
- Discovery of analytical techniques

Dae Gwin Jeong dgjeong@kribb.re.kr
- Structure and function of PTPs

Tae Seong Yoon yoonts@kribb.re.kr
- Structure-based drug design

Research Areas

Analysis and applications of cellular switching
- Analyzing the change in the proteome during the cellular damage process caused by an ischemic stroke
- Constructing a proteome signaling network for cellular switching
- Uncovering disease target proteins

Research of protein structures and functions
- Examining novel structures of protein tyrosine phosphatases (PTPs) which are crucial to cell function
- Researching the role of PTP proteins in a variety of organic environments and discovering prospective disease targets, etc.

Development of analytical techniques and discovering biomarkers
- Analyzing low amount proteins through mass-spectrometric technologies
- Discovering and verifying biomarkers

Achievements

High-throughput discovery and validation of disease target proteins
Through subcellular fractionation and multi-dimensional mass analysis methods the proteome involved in brain cell death was analyzed, leading to the discovery of target proteins for brain damage treatment and the establishment of an activity analysis system for new target proteins. Regulatory substances were also identified.

Construction of a systemic research infrastructure for a protein family
The overexpression and purification of the PTP protein family was successful. This result was used to clarify the tertiary structure of the protein family, produce monoclonal antibodies and analyze systematic functions, all with a view to laying the foundations for a world-class center of excellence dedicated to researching PTP structures and functions.

Selected Publications

Seong Eon Ryu(Corresponding) Crystal structure of the major diabetes autoantigen, IA-2 reveals distinctive immune epitopes *Diabetes* 56: 41-48 (2007)

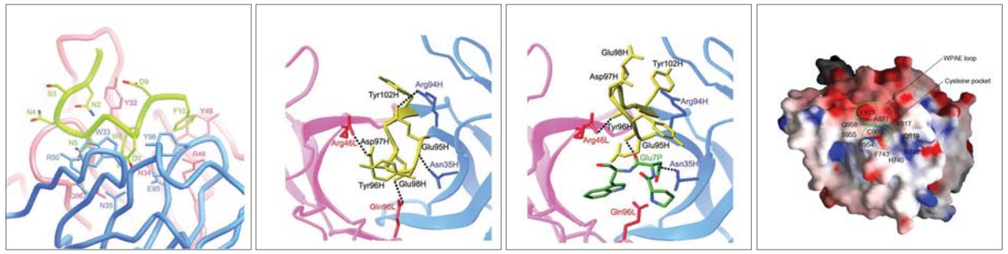
Seong Eon Ryu(Corresponding) Broadly neutralizing anti-hepatitis B virus antibody reveals a complementarity determining region H3 lid-opening mechanism *Proc Natl Acad Sci U S A.* 104: 9230-9235 (2007)

Seong Eon Ryu(Corresponding) Phosphoproteomic analysis of neuronal cell death by glutamate induced oxidative stress *Proteomics* 7: 2624-2635 (2007)

Seong Eon Ryu(Corresponding) Structural insight into the constitutive repression function of the nuclear receptor Rev-erb β *J. Mol. Biol.* 373: 735-744 (2007)

Dae Gwin Jeong(First) Crystal structure of the catalytic domain of human DUSP5, a dual specificity MAP kinase protein phosphatase *Proteins* 66: 253-258 (2007)

Jeong Hee Moon(First) Photodissociation at 193nm of some singly protonated peptides and proteins with m/z 2000-9000 using a tandem time-of-flight mass spectrometry using glycerol: enhancement with a disperse laser beam *Rapid Comm in Mass Spec.* 21: 1468-1474 (2007)



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02

Stem Cell Research Center

Our goal is to identify the differentiation factors involved in the differentiation of adult stem cells to immune cells, and by reserching their functions, to develop the core platform technology for immune cell therapies for targeting cancer.

DIVISION of
LEADING RESEARCH

Researchers

Inpyo Choi ipchoi@kribb.re.kr
- Differentiation of NK cells from hematopoietic stem cells
- Anti-tumor NK cell therapy based on NK differentiation

In Seong Choe ischoe@kribb.re.kr
- Functional analysis of novel genes related to hepatoadenocarcinoma

Hee Gu Lee hglee@kribb.re.kr
- Development of diagnostic techniques using cancer specific biomarkers

Jaewha Kim wjkim@kribb.re.kr
- Evaluation of NK cell effects on tumor suppression in animal models

Eun Young Song eysong@kribb.re.kr
- Development of a cellular immunology-based diagnostic assay system

Kee Nyung Lee knlee@kribb.re.kr
- Functional studies of VDUP-1 on tumorigenesis

Suk Ran Yoon sryoon@kribb.re.kr
- Regulation of NK differentiation from hematopoietic stem cells

Jin Woong Chung wchung@kribb.re.kr
- Functional studies of the genes involved in NK differentiation

Research Areas

Cell differentiation
- Developing platform technology for the differentiation of stem cells
- Developing platform technology for the regulation of immune cell activity

Cell therapy
- Developing cell therapy for cancer treatment
- Developing customized cell therapy through preclinical study

Achievements

Molecular profiling for NK cell differentiation from stem cells

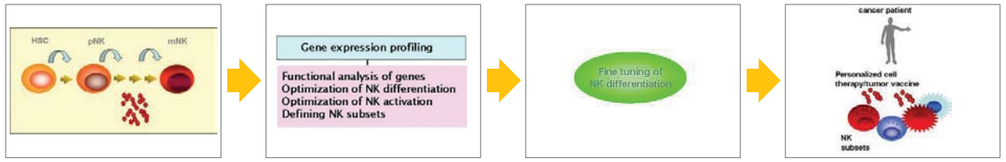
NK cells develop from hematopoietic stem cells (HSCs) in the bone marrow. To understand the molecular regulation of NK cell development, serial analysis of gene expression (SAGE) was applied to HSCs, pNK, mature NK cells cultured without (-OP9) or with (+OP9) stromal cells, OP9. From 170,464 total individual tags from four SAGE libraries, 35,385 unique genes were identified. The identification of genome-wide profiles of gene expression in different stages of NK cell development affords us a fundamental basis for defining the molecular network during NK cell development.

Molecular mechanism of VDUP1 during NK cell differentiation from stem cells

In order to observe the mechanism of VDUP1, the differentiation gene of NK cells, knock-out mice for this gene were developed. Observation of their small intestines revealed abnormal proliferation and a 70% decrease in the number and activity of NK cells, leading to depressed anticancer activity, and thus proving that this gene does in fact play a critical role in NK cell differentiation.

Development of immune therapy techniques utilizing NK cells

Based on the observations made during NK differentiation, an immunotherapy for cancer has been designed. Platform technology for drug development for a cancer immune therapy was established and will be used in the treatment of incurable diseases involving immune cells.



Selected Publications

Inpyo Choi(Corresponding) VDUP1 mediates nuclear export of HIF1- α via CRM1-dependent pathway *BBA-MCR* (in press)

Inpyo Choi (Corresponding) Hypoxia-induced IL-18 increases hypoxia-inducible factor-1 expression through a Rac1-dependent NF- κB pathway *Mol. Biol. Cell* (in press)

Suk Ran Yoon, Jin woong Chung(First) and Inpyo Choi (corresponding) Development of Natural Killer Cells from Hematopoietic Stem Cells *Mol. Cells* 24(1): 1-8 (2007)

Hee Gu Lee (Corresponding) Up-regulation of Mac-2 binding protein by hTERT in gastric cancer *Int. J. Cancer* 120(4): 813-20 (2007)

Eun Young Song(Corresponding) Development of a rapid, immunochromatographic strip test for porcine rotavirus in stool *J. Virological methods* (in press)

Jae Wha Kim(Corresponding) S100A6 (Calcyclin) enhances the sensitivity to apoptosis via the up regulation of caspase-3 activity in Hep3B cells *J. Cellular Biochem.* (in press)

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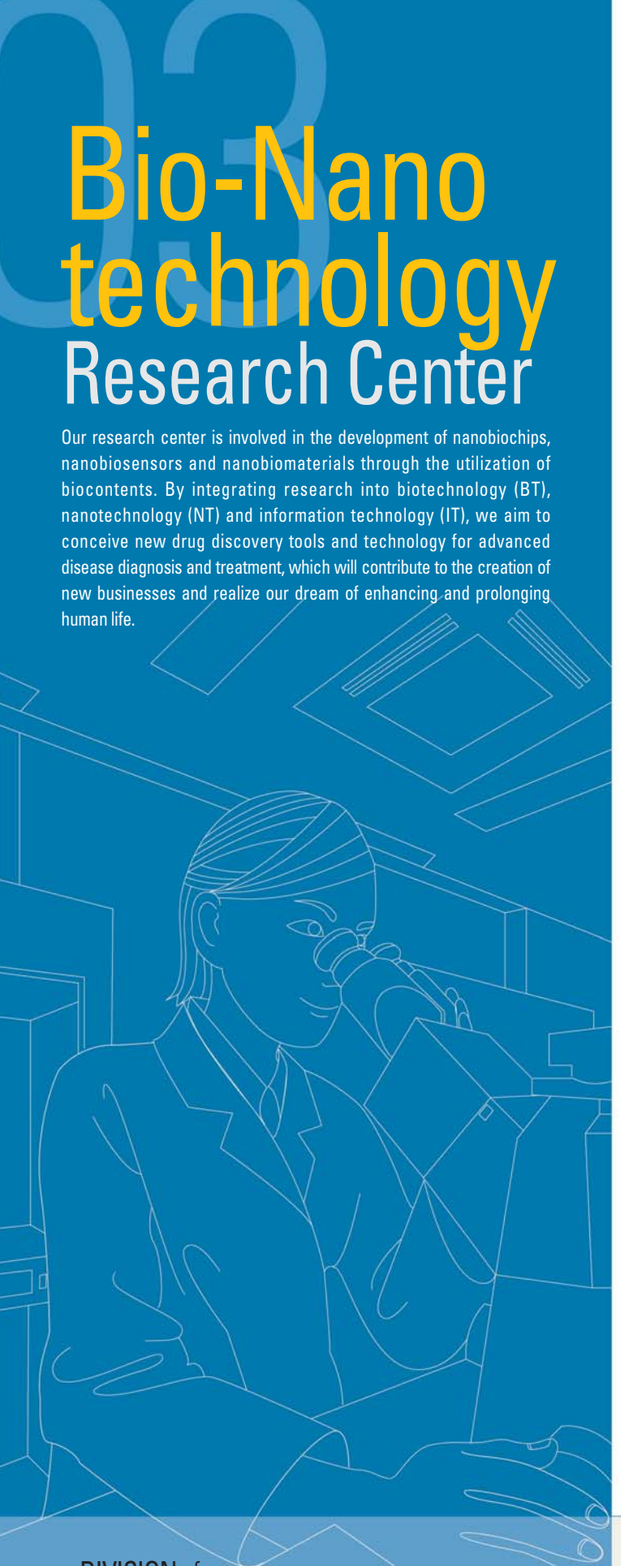
Bio-Nano technology Research Center

Our research center is involved in the development of nanobiochips, nanobiosensors and nanobiomaterials through the utilization of biocontents. By integrating research into biotechnology (BT), nanotechnology (NT) and information technology (IT), we aim to conceive new drug discovery tools and technology for advanced disease diagnosis and treatment, which will contribute to the creation of new businesses and realize our dream of enhancing and prolonging human life.



DIVISION of
LEADING RESEARCH

Researchers

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- Biochips and biosensors
- Bionanomaterials

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- Cellular immunology

Min-Gon Kim mgkim@kribb.re.kr
- Biosensors and biochips
- Biochemical engineering

Yong-Beom Shin ybshin@kribb.re.kr
-Optical material engineering for biosensors and biochips
-BioMEMS

Sang Jeon Chung sjchung@kribb.re.kr
- Bioorganic and medicinal chemistry
- Chemical biology

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- Bioimaging
- Nanoparticles-based biophotonics

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-Molecular biology
-Biochips and biosensors

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- Biocompatible nanoparticles
- Surface chemistry

Tae Hwan Ha taihwan@kribb.re.kr
- Nano-materials

Yongwon Jung ywjung@kribb.re.kr
- Biochemistry
- Cancer biology

Chang-Soo Lee cslee@kribb.re.kr
- Molecular self-assembly
- Nanotechnology

Research Areas

Protein chips
- Developing platform technologies to construct new generation protein chips, whose detection system is free of fluorescence and radioisotope labeling.
- Creating protein chips with biocontents that are employed in disease diagnosis and high throughput screening of potential drug candidates.

Nanobiomaterials
Conjugating various biomolecular inorganic materials, such as metal or magnetic nanoparticles, in order to investigate protein-protein interactions and treat cancers.

Nanobiosensors
Developing platform technology to establish and practically use biosensors for the early diagnosis of diseases:
- Label-free ultrasensitive nanobiosensing.
- Interfacing biocontents with sensor substrates
- Design and production of disease-specific biomarkers

Mobile lifecare system
Developing the necessary technology for the Mobile Lifecare System, incorporating IT with biochip and biosensor technology to enable portable health care.

Achievements

Development of novel nanobiomaterials and technology transfer
The technology to produce metal nanoparticles capable of accommodating the visible spectrum of light and multicolor colloids was developed and used in the incorporation of gold and silver nanoparticles for pigment composition in cosmetics. This technology was transferred to Natural F&P Ltd. in January 2006.

Development of a mobile diagnostic sensor for liver disease
A miniaturized strip sensor, which can measure the level of specific enzymes in the blood and thereby indicate the status of several liver diseases, was developed and incorporated into a mobile cell-phone system. A prototype of this Mobile Lifecare System with developed strip sensors is shown in the Figure.

Selected Publications

Bong Hyun Chung(Corresponding) Wavelength and intensity multiplexing of metal nanoparticles for the fabrication of multicolored micro- and nanospheres *Advanced Functional Materials* 16(8): 1015-102 (2007)

Bong Hyun Chung(Corresponding) Surface plasmon resonance imaging-based protein arrays for the high-throughput screening of protein-protein interaction inhibitors *Proteomics* 5(17): 4427-4431 (2007)

Bong Hyun Chung(Corresponding) Surface plasmon resonance imaging protein arrays for the analysis of triple protein interactions of HPV, E6, E6AP, and p53 *Proteomics* 6 (7): 2108-2111 (2007)

Bong Hyun Chung(Corresponding) Oriented immobilization of antibodies with GST-fused multiple Fc-specific B-domains on a gold surface *Analytical Chemistry* 79(2): 546-556 (2007)

Bong Hyun Chung(Corresponding) Direct immobilization of protein g variants with various numbers of cysteine residues on a gold surface *Analytical Chemistry* 79(7): 2680-2687 (2007)

Bong Hyun Chung(Corresponding) Self-directed and self-oriented immobilization of antibody by protein G-DNA conjugate *Analytical Chemistry* 79(17): 6534-6541 (2007)

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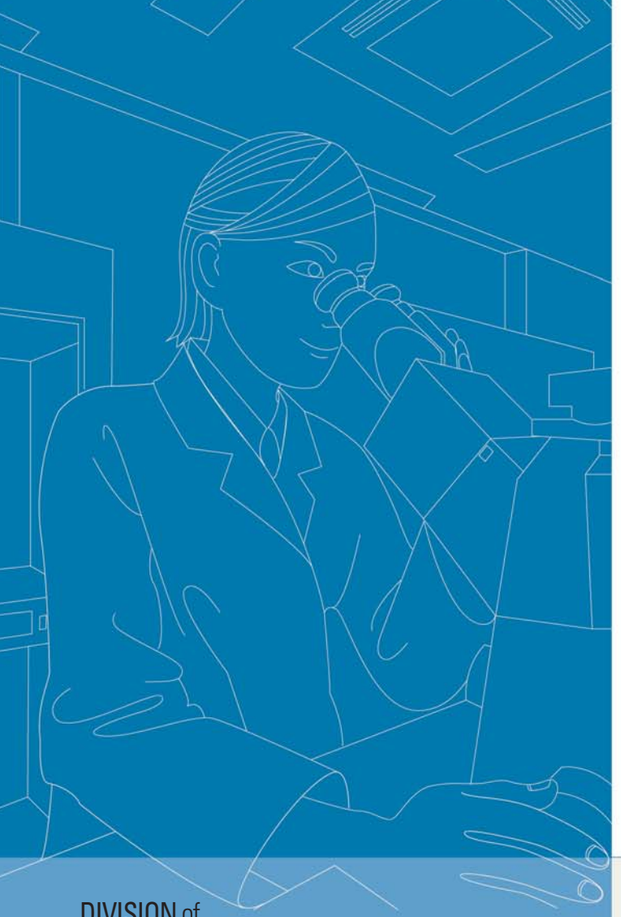
04

Genome Research Center

Our primary goal is to acquire an understanding of the biological phenomena of life through genomic science, which is a systematic and comprehensive technology based on the genome information of various organisms. The Genome Research Center(GRC) has established a solid platform for genomic sciences, and archived many world-leading research products through international cooperation. Furthermore, we are actively collaborating with many academic and industry research groups in order to contribute to the advancement of Korea's genome technology industry.



DIVISION of
LEADING RESEARCH

Researchers

Hong-Seog Park hspark@kribb.re.kr
- Comparative analysis of gene structure between human and chimpanzee brains
- System development for the application of genomic sequence information
- Unveiling the origins and migration of Koreans

Haeyoung Jeong hyjeong@kribb.re.kr
- Analysis of microbial genome structure

Sang-Haeng Choi shchoi@kribb.re.kr
- Comparative analysis of gene structures between human and chimpanzee brains
- Genetic marker development in Korean cattle (Hanwoo)
- Metagenome library construction from ancient DNA

Hyung-Cheol Kim hykim@kribb.re.kr
- Molecular evolution of the non-coding region in mammals
- Functional analysis of chimpanzee specific genes

Jungmin Seo jmseo@kribb.re.kr
- Development of an automated EST data analysis pipeline and system

Taeha Woo thwoo@kribb.re.kr
- Development of a database and web application for bioinformatics

Dae-Won Kim todaewon@kribb.re.kr
- Comparative analysis of gene structures between human and chimpanzee brains
- System development for the application of genomic sequence information

Research Areas

Animal genome
- Comparative genome structure research into chimpanzees, whales, cattle, and pigs.

Plant genome
- High-throughput DNA sequencing of the Solanaceae sp. family of plants
- Mass gene collection of industrially used plants, especially medicinal plants grown domestically

Microbial genome
- Meta-genome research of environmental organisms
- Genome structure analysis based on massive genome sequencing of various bacteria

Research support
- Based on projects: governments and companies

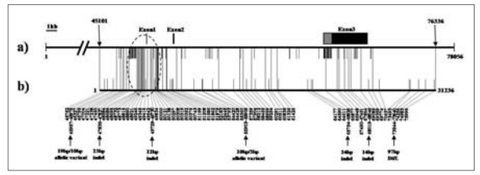
Achievements

Comparative analysis of the gene structures of chimpanzee and human brains

Out of all the animals on earth, the chimpanzee most closely resembles man. We constructed cDNA libraries of the chimpanzee brain (Cerebrum and Cerebellum), and sequenced 26,880 reads. We discovered 14,673 unique genes in the cerebrum and 16,477 unique genes in the cerebellum.

Construction of comparative physical map between whales and humans

We clearly explained that most parts of the OR cluster regions were removed from the false killer whale genome. Most of the remaining OR genes turned out to be pseudogenes apart from some intact OR genes, which will provide a clue to understanding the evolutional mechanism of olfactory functions.



Genomic sequence variability of the prion gene (PRNP) in Korean cattle

We investigated sequence variants in the PRNP gene of 20 specimens belonging to the Korean cattle breed, and have analyzed and compared genetic features between other varieties of cattle breeds. We discovered a 2.6 kb SNP hot spot region localized in the putative promoter region of the PRNP gene. We also characterized a new 19 bp/10 bp allele located in the putative promoter region.

Selected Publications

Hong-Seog Park(Co-author) Chromosomal localization of Korean cattle (Hanwoo) BAC clones via BAC end sequence analysis *Asian Australasian Journal of Animal Sciences* 20(3): 316-327 (2007)

Sang-Haeng Choi(First) & Hong-Seog Park(Corresponding) Genomic sequence variability of the prion gene (PRNP) in Korean cattle *Asian-Australasian Journal of Animal Sciences* 20(5): 653-660 (2007)

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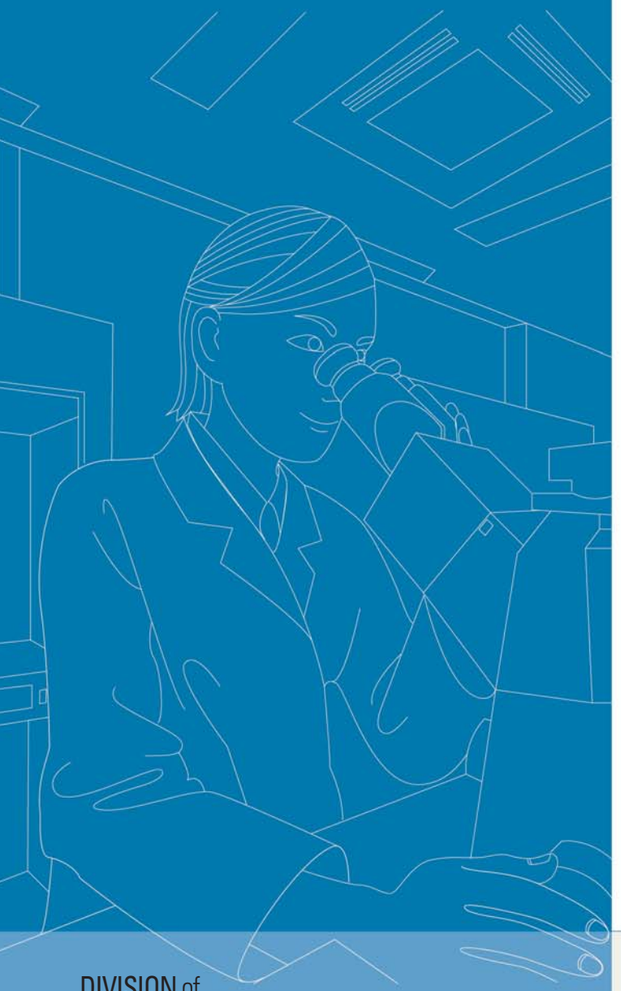
Therapeutic Antibody Research Center

Our goal is to discover new drug targets for antibody-based cancer therapy and to develop therapeutic antibodies and proteins. We also study the molecular mechanism of cancer progression and validate the anti-cancer drug targets.



DIVISION of
LEADING RESEARCH

Researchers

Hyo Jeong Hong hjhong@kribb.re.kr
- Therapeutic antibody development
- Biomarker discovery by antibody approach
- Cancer biology

Youngwoo Park ywpark@kribb.re.kr
- Therapeutic antibody development
- Target discoveries for a therapeutic antibody and a therapeutic receptor

Sang Seok Koh sskoh@kribb.re.kr
- Studies on targeted therapeutics through cancer genomics
- Mechanistic investigation of novel metastatic factors

Jin-San Yoo hottac@kribb.re.kr
- Development of antibody-based therapeutics
- Engineering of antibody and beyond for clinical application

Semi Kim semikim@kribb.re.kr
- Identification/validation of novel therapeutic targets in cancer development and metastasis
- Development of anti-cancer biologics drugs

Jeong-ki Min jekmin@kribb.re.kr
- Vascular biology
- Biomarker discovery by antibody approach

Research Areas

Cancer cell biology
- Tumor progression and metastasis
- Apoptosis
- Intracellular signaling
- Stem cells

Discovery and validation of drug targets for antibody-based cancer therapy
- Discovery of drug targets through genomics and antibody approaches
- Studies on the role of identified targets in tumor progression
- Validation of the drug targets as anti-cancer agents

Development of therapeutic antibodies
- Development of therapeutic antibodies such as human monoclonal antibodies and humanized antibodies
- Optimization of therapeutic antibodies through affinity maturation
- Construction of a mammalian cell line producing therapeutic antibodies or proteins
- Production and purification of therapeutic antibodies or proteins
- In vitro and in vivo study of therapeutic antibodies and proteins

Achievements

Structural analysis of the interaction between HBV neutralizing humanized antibody and preS1 antigen

A humanized antibody against the preS1 antigen of hepatitis B virus was developed. The complex structure of the antigen-binding pocket was determined by crystallography and the functional mapping of the antigen-combining site was performed by alanine-scanning mutagenesis of all the CDRs. The information will be useful for a rational design regarding the maximal humanization and affinity maturation of the antibody.

Discovery of therapeutic targets for cancer therapy

A Novel type II transmembrane serine protease was identified and characterized as a cancer therapeutic target. The new protease has proven to be highly up-regulated in lung cancer tissues and is associated with the invasiveness, motility, and cell-matrix adhesion of cancer cells. The mining of a DNA microarray expression database also allowed us to identify many novel genes with therapeutic potential. For example, the development of human antibodies targeting PAUF is underway for therapeutic intervention.

Discovery of novel human embryonic stem cell (hESC) surface markers

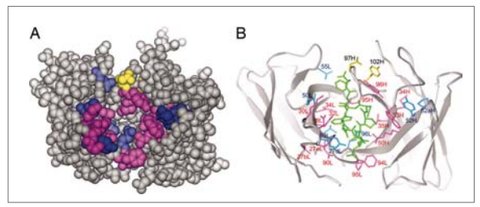
Monoclonal antibodies binding to the surface of undifferentiated hESCs were generated and selected. Their target antigens were identified and characterized. The mAbs will be useful in the identification and purification of undifferentiated hESCs for basic research and clinical application.

Selected Publications

Hyo Jeong Hong(Corresponding) Broadly neutralizing anti-hepatitis B virus antibody reveals a complementarity determining region H3 lid-opening mechanism *Pron. Natl. Acad Sci USA* 104(22): 9230-5 9.6 (2007)

Sang Seok Koh(Corresponding) Molecular cloning and functional analysis of a novel oncogene, cancer up-regulated gene 2 (CUG2) *Biochem. Biophys. Res. Commun.* 360(3): 633-9 2.9 (2007)

Youngwoo Park, Semi Kim(Corresponding) TMPRSS4 promotes the invasion, migration and metastasis of human tumor cells by facilitating an epithelial-mesenchymal transition *Oncogene* (in press)



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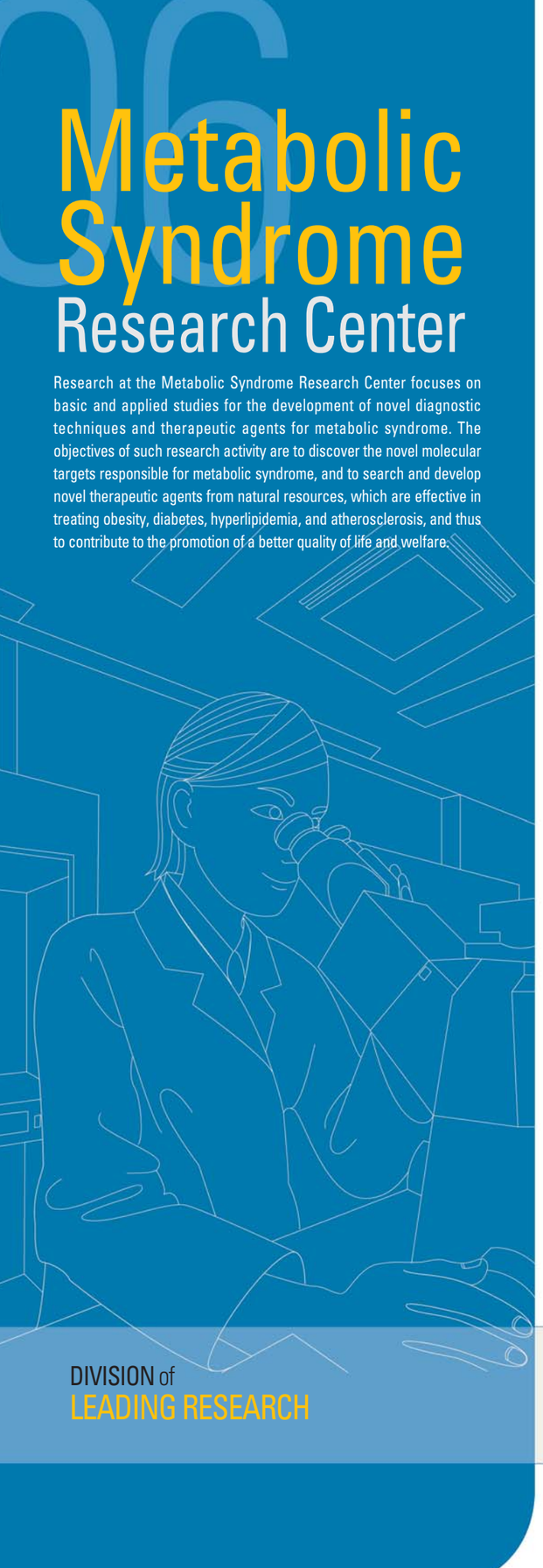
Metabolic Syndrome Research Center

Research at the Metabolic Syndrome Research Center focuses on basic and applied studies for the development of novel diagnostic techniques and therapeutic agents for metabolic syndrome. The objectives of such research activity are to discover the novel molecular targets responsible for metabolic syndrome, and to search and develop novel therapeutic agents from natural resources, which are effective in treating obesity, diabetes, hyperlipidemia, and atherosclerosis, and thus to contribute to the promotion of a better quality of life and welfare.



DIVISION of
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Researchers

Young Ik Lee yilee@kribb.re.kr
- Research and development of bioactive materials effective to NAFLD, including fatty liver and liver cirrhosis

Sung Uk Kim kimsu@kribb.re.kr
- Research and development of bioactive materials including antidiabetics and antifungal agents from natural resources

Tae-Sook Jeong tsjeong@kribb.re.kr
- Research and development of bioactive materials including anti-obesity and anti-atherosclerotic agents from natural resources and synthetic compounds

Research Areas

Development of a platform technology for metabolic syndrome
- Investigation of the causes and discovery of targets for metabolic syndrome
- Studies of the regulation mechanism
- Investigation of the genes and proteins related to metabolic syndrome and their functional analysis

Development of bio-materials inhibiting metabolic function
- Establishment of screening systems for regulators capable of controlling metabolic syndrome
- Research and development of novel therapeutic proteins and lead compounds from natural resources and their derivatives, which have biological effects on obesity, diabetes and cardiovascular diseases
- Evaluation of efficacy in animal models

Achievements

Development of anti-atherogenic agents for the prevention /treatment of cardiovascular diseases
The abietane compounds from Torreya nucifera leaves and new O-acyl oxime derivatives were developed as anti-atherogenic agents. In particular, abietane compounds were observed to reduce atherosclerotic lesions and improve the inflammatory condition in cholesterol-fed LDLr-deficient mice. These active materials can be utilized for the development of nutraceuticals and new drugs for the prevention and treatment of cardiovascular diseases.

Development of anti-fibrogenic agents for the treatment of liver cirrhosis
We have developed an anti-fibrogenic which is effective in the treatment of liver cirrhosis. We have almost finished the preclinical tests and toxicological tests that are required for clinical applications. After satisfying all the requirements we plan to carry out clinical tests at home and abroad.

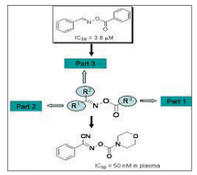
Selected Publications

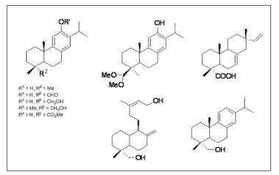
Young Ik Lee(Corresponding) Aberrant epigenetic modifications in hepatocarcinogenesis induced by hepatitis B virus X-protein *Gastroenterology* 132: 1476-1494 (2007)

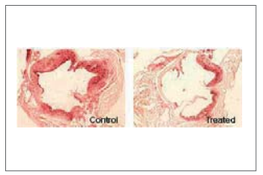
Sung Uk Kim(Corresponding) Inhibition of chitin synthase 2 and antifungal activity of lignans from the stem bark of Lindera erythrocarpa *Planta Med.* 73: 679-682 (2007)

Tae-Sook Jeong(Corresponding) Effects of diarylheptanoids on the tumor necrosis factor-a-induced expression of adhesion molecules in human umbilical vein endothelial cells *J. Agri. Food Chem.* (in press)

Tae-Sook Jeong(Corresponding) Effects of 5-O-methylhirsutanonol on nuclear factor-kB-dependent production of NO and expression of iNOS in lipopolysaccharide-induced RAW264.7 Cells *J. Agri. Food Chem.* (in press)







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DIVISION of
BIO- INTEGRATION RESEARCH

Principle Functions and Duties

Researching the function and clinical implications of the human disease genome
Researching disease model-based muromics
Researching regenerative medicine for embryonic stem cell therapy and xenotransplantation
Omics-based research for intelligent cellular engineering and molecular reconstruction
Integrated and collaborative research of clinical and basic sciences

Medical Genomics Research Center <
Disease Model Research Center <
Regenerative Medicine Research Center <
Omics and Integration Research Center <
Translational Research Center <

DIVISION of
BIO-INTEGRATION RESEARCH

01

Medical Genomics Research Center

Our goal is to establish top-quality genomics-based technology platforms and apply them to biomedical research programs in order to achieve a high-throughput identification and global function analysis of the genes associated with the diseases that are most prevalent in the Korean population such as stomach and liver cancers. We also conduct functional genomics research to discover validated targets and biomarkers for the development of effective diagnostics and therapeutics.

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- Genomic analysis of cancers and identification and functional validation of therapeutic targets
- Cancer gene therapy

Yong Sung Kim yongsung@kribb.re.kr
- Epigenomics in gastric and colon cancers
- High-throughput LOH genotyping associated with gastric cancer

Mi Sun Won misun@kribb.re.kr
- Functional validation of candidate target genes and biomarkers for therapeutics/diagnostics development
- Development of anticancer drugs by chemical screening and study of modes of action

Kwang-Lae Hoe kwanghoe@kribb.re.kr
- Developing a drug target screening technology

Nam-Soon Kim nskim37@kribb.re.kr
- Identification and functional study of target genes related to gastric and liver cancers
- Systemic screening of human novel genes using the zebrafish as an animal model

Kyung-Sook Chung kschung@kribb.re.kr
- Development of anticancer drugs by chemical screening and study of modes of action
- Functional validation of candidate target genes for therapeutics development

Young Joo Kim yjkim8@kribb.re.kr
- Bioinformatics: Disease associated network analysis
- Korean HapMap Database for Korean haplo-type mapping and SNP statistical analyses

Dong-Uk Kim kimdongu@kribb.re.kr
- Systematic parallel analysis of haploinsufficiency phenotype in *S. pombe*
- Drug target identification using drug-induced haplo insufficiency

Seon-Young Kim kimsy@kribb.re.kr
- Functional genomics approach to understanding human cancers
- Bioinformatics and computational biology

Soo Jung Kim crystal@kribb.re.kr
- Functional studies on genes involved in liver cancer

Kyung Chan Park kpark@kribb.re.kr
- Large-scale screening and identification of cancer-related genes
- Functional validation of candidate target genes for therapeutics development

Cho-Rok Jung crjung@kribb.re.kr
- Functional analysis of genes associated with cancer
- Development of anti-cancer gene therapeutic tools
- Anti-cancer drug screening and validation

In-Sun Chu chu@kribb.re.kr
- Integrative Functional Genomics using microarray gene expression profiling

Research Areas

- Establishment of a functional genomics research infrastructure and technology platforms
- Large-scale screening and identification of disease-related genes
- Functional validation of candidate target genes and biomarkers for therapeutics/diagnostics development
- Development of tools and strategies for modulating the therapeutic targets and monitoring the biomarkers

Achievements

Identification of E2 EPF UCP as a novel therapeutic target of human cancers

E2-EPF (UCP) associates with and targets pVHL for ubiquitin-mediated proteolysis in cells, thereby stabilizing HIF-1 α UCP is detected coincidently with HIF-1 αin human primary liver, colon and breast tumors, and metastatic cholangiocarcinoma and colon cancer cells. UCP promotes tumor growth and metastasis in vitro and mouse xenograft models through effects on the pVHL-HIF pathway. UCP may be a new molecular target for therapeutic intervention in human cancers.

Development of therapeutic target genes for liver cancer

About 2,500 hepatocellular carcinoma-associated genes were identified through DNA chip analysis of human liver cancer tissues. The application of cell chip technology to these genes revealed 680 genes that are functionally relevant to the regulation of major biochemical pathways whose abnormality can lead to the development of liver cancer. From this candidate gene pool we finally identified 12 target genes with high therapeutic potential. Currently, we are extensively characterizing a few of them in terms of their biological function, as well as their clinical significance in terms of cancer development and progression. Recently, we initiated a collaborative research project with Pfizer for three of these target genes in order to define a therapeutically valid target for anti-cancer drug development in HCC.

Development of multi-purpose expression systems for stomach/liver cancer candidate genes

Five hundred multi-purpose expression clones for the 100 candidate genes related to gastric or liver cancers were constructed using the Gateway system. Since these clones can be expressed as His, GST or EGFP fusion proteins in *E. coli*, insect cells or mammalian cells, they can be directly used in a large-scale cell-based assay for a functional study as well as in the large-scale preparation of antigen proteins for antibody production.

Development of a high-content screening system

A high-content screening system using automated fluorescence imaging was developed in order to identify candidate drugs for cancers including liver and stomach cancers.

Construction of whole-genome mutant system of fission yeast and application to anti-cancer drug development

We built a whole-genome deletion mutant library for the fission yeast *S. pombe*, and applied it to high-throughput gene function analysis and drug screening. We identified one lead and several candidate compounds for anti-cancer drug development as well as novel genes involved in cell cycle regulation. A high-throughput platform for the analysis of the mode of drug action is also being established, and together with the high-throughput drug screening system (HTS), collaborative researches with domestic pharmaceutical companies are currently underway.

Selected Publications

Seon-Young Kim(Corresponding), In-Sun Chu (Corresponding) GAzer: gene set analyzer *Bioinformatics* 23(13): 1696-9 (2007)

Yong Sung Kim(Corresponding) Epigenetic down-regulation and suppressive role of DCBLD2 in gastric cancer cell proliferation and invasion *Molecular Cancer Research* (in press)

Kwang-Lae Hoe(Corresponding) PPARg activation abolishes LDL-induced proliferation of human aortic smooth muscle cells via SOD-mediated down-regulation of superoxide *BBRC* 359(4): 1017-23 (2007)

Misun Won(Corresponding) Kyung-Sook Chung(First) Rapid screening of human genes for their relevance to cancer using fission yeast *J. of Biomolecular Screening* 12 (4): 568-577 (2007)

Kyung-Sook Chung(First), Misun Won (First) Yeast-based screening to identify modulators of G-protein signaling using uncontrolled cell division cycle by overexpression of Stm1 *J. of Biotechnology* 129(3): 547-554 (2007)

DIVISION of
BIO-INTEGRATION RESEARCH

02

Disease Model Research Center

Our goal is to generate animal models for human diseases by mutagenesis such as transgenic, gene targeting and natural breeding, for in vivo validation of the genes associated with human diseases. The establishment of an infrastructure for in vivo animal experimentation is also an important objective of our center.

Researchers

Dae-Yeul Yu dyyu10@kribb.re.kr
- Discovery of early detection biomarkers in cancer model mice
- Discovery of new therapeutic targets by studying phenotypes and in vivo function of disease model mice

Chul-Ho Lee chullee@kribb.re.kr
- Development of animal models for human metabolic disease
- Discovery and validation of the functional genes associated with metabolic disease

Byung-Hwa Hyun hyunbh@kribb.re.kr
- Genetic study of animal models for human neurological diseases
- Development of animal models for human diseases with non-human primates

Research Areas

- Discovery of early detection biomarkers in cancer model mice
- Discovery of new therapeutic targets by studying phenotypes and in vivo function of disease model mice
- Development of techniques for the efficient production of mutant mice, embryonic stem cells and MEF (mouse embryonic fibroblast) cells
- Research support with animal models

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Achievements

Generation of an HBx transgenic mouse inducing hepatocellular carcinoma as well as hepatic steatosis

The results suggest that HBx may have multi-functions inducing not only hepatocellular carcinoma but also hepatic steatosis, which can cause metabolic syndrome in HBV patients.

Generation of H-ras12V transgenic mice inducing hepatocellular carcinoma

Gender-related differences in molecular responses to activated Ras may have implications for the prevalence of hepatic alterations in the mice.

Generation of Peroxiredoxin II knockout mouse with various phenotypes

Peroxiredoxin II has been proven to be essential for sustaining the life span of erythrocytes, negatively regulating acute inflammation, preventing cellular senescence, regulating PDGF signaling and vascular remodeling, and regulating thymocyte maturations and proliferation.

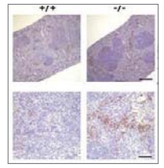
Overexpression of the membrane-type matrix metalloproteinase-1 gene induces mammary gland abnormalities and adenocarcinoma in transgenic mice

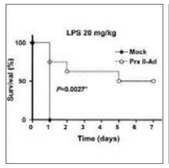
MT1-MMP may have a tumorigenic function in mice.

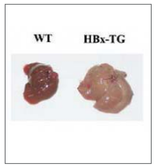
Selected Publications

Dae-Yeul Yu(Corresponding) Hepatitis B Virus X Protein Induces Hepatic Steatosis Via Transcriptional Activation of SREBP1 and PPARgamma *Gastroenterology* 132(5): 1955-1967 (2007)

Dae-Yeul Yu(Corresponding) Roles of peroxiredoxin II in the regulation of proinflammatory responses to LPS and protection against endotoxin-induced lethal shock *JEM* 204(3): 583-594 (2007)







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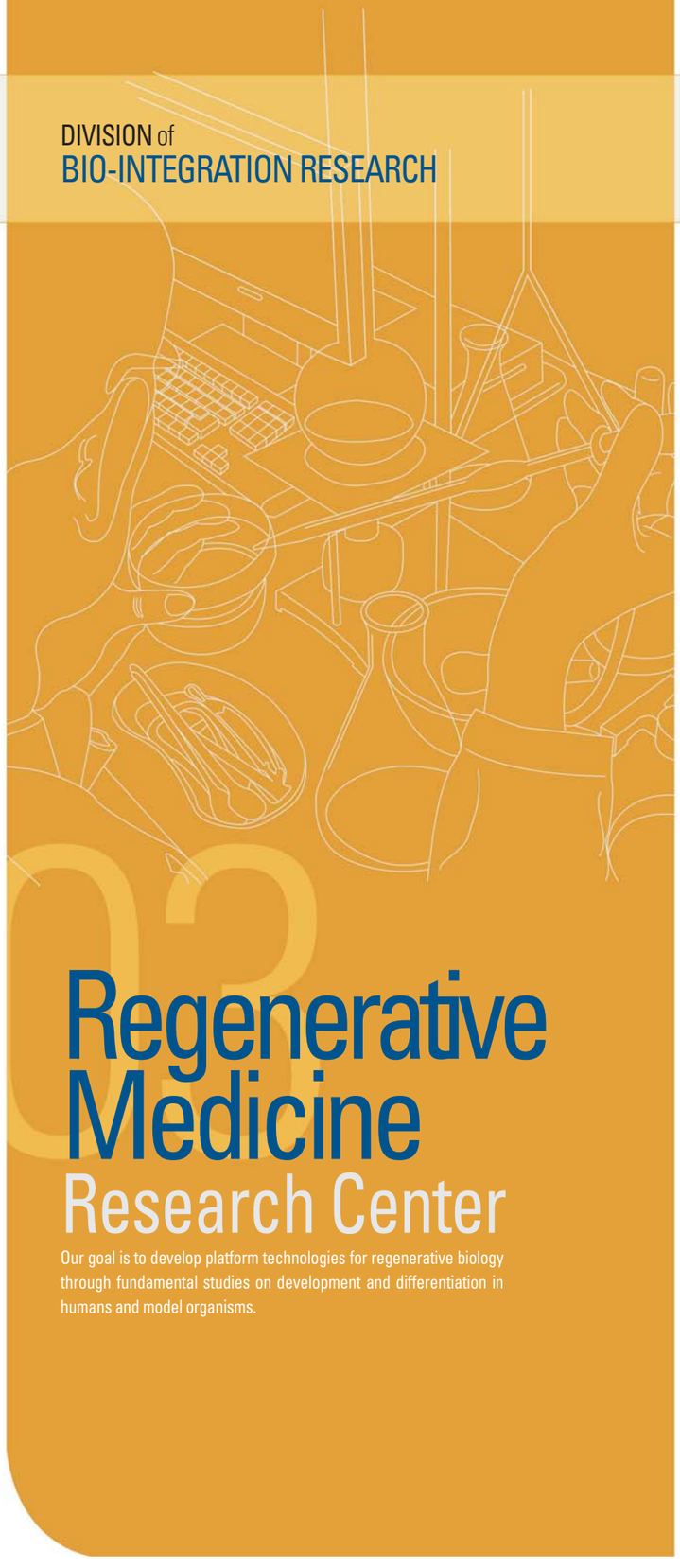

02 Regenerative Medicine Research Center

Our goal is to develop platform technologies for regenerative biology through fundamental studies on development and differentiation in humans and model organisms.

Researchers

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- Mammalian embryo development
- Interspecies somatic cell nuclear transfer

Kyung-Kwang Lee leekk@kribb.re.kr
- Xenotransplantation
- Production of knock-out clone pig

Yong-Kook Kang ykkang@kribb.re.kr
- Epigenetic control of early mammalian development
- HTS Development for drug screening in human ES cells

Kweon Yu kweonyu@kribb.re.kr
- Molecular genetics

Yee Sook Cho june@Kribb.re.kr
- Stem cell-based drug screening
- Signaling mechanisms controlling ESC self-renewal and differentiation

Janghwan Kim negapos@kribb.re.kr
- Differentiation of human ESCs toward neural stem cells.
- Stem cell-based drug screening for neural and cardiac cells.

Jung Sun Park jspark@kribb.re.kr
- Nuclear transfer for the production of cloning animals,
- Micromanipulation of mouse, porcine and bovine oocytes

Sun Mi Woo wsm1959@kribb.re.kr
- Signaling mechanisms controlling neural stem cell self-renewal and differentiation

Mi-Young Son microcandy@hanafos.com
- Cardiomyocyte differentiation from human embryonic stem cells

Research Areas

Stem cell
- Developing platform technologies for the production of therapeutic cells through mechanistic studies on stem cell self-renewal and differentiation
- Development of embryonic stem cell lines derived from interspecies somatic cell nuclear transfer (iSCNT) blastocysts

Molecular control of early embryonic development
Studying molecular and epigenetic mechanisms of early embryos development

Organogenesis
Researching the molecular development of organogenesis to gain a better understanding of organ development

Achievements

Stem cells
- Signaling pathways important for ESC self-renewal and differentiation
- Development of neural-lineage differentiation of human ESCs by using an inhibitor of SHH signaling
- Development of a large-scale culture system for hESCs using nanotechnology

Molecular control of early embryonic development
- Synchronizing meiotic resumption by dbcAMP treatment improves the developmental capacity and embryonic qualities of IVF and SCNT porcine embryos
- In bovines, the compound processes of active DNA demethylation, and de novo DNA methylation, along with de novo H3-K9 trimethylation,also take place altogether within this very narrow window of pronucleus development

Organogenesis
- The accumulation of reactive oxygen species (ROS) in the pancreas of an adult cloned pig leads to apoptosis

Selected Publications

Deog-Bon Koo(Corresponding) Exogenous dibutyryl cAMP affects meiotic maturation via protein kinase A activation; it stimulates further embryonic development including blastocyst quality in pigs *Theriogenology* 69: 290-301 (2008)

Deog-Bon Koo(First) Effects of daunorubicin on ganglioside expression and neuronal differentiation of mouse embryonic stem cells *Biochem Biophys Res Commun*. 362(2): 313-318 (2007)

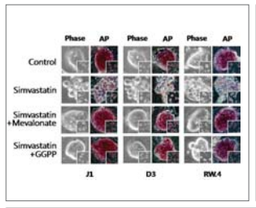
Yee Sook Cho(Corresponding) Microfabricated embryonic stem cell divider for large-scale propagation of human embryonic stem cells *Lab Chip* 7: 513-515 (2007)

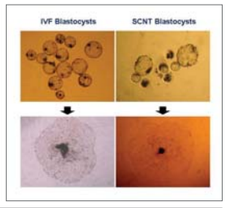
Yee Sook Cho(Corresponding) Simvastain suppresses self-renewal of mouse embryonic stem cells by inhibiting RhoA geranylgeranylation *Stem Cells* 25: 1654-1663 (2007)

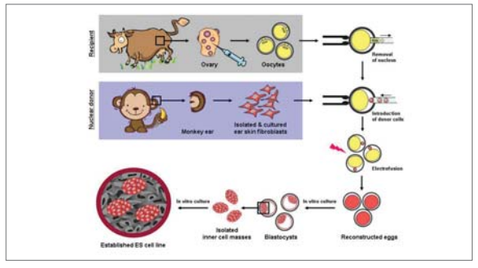
Yong-Kook Kang(Corresponding) DNA methylation state is preserved in the sperm-derived pronucleus of pig zygote *Int. J. Dev. Biol.* 51(8): 707-14 (2007)

Yong-Kook Kang(Corresponding) Dynamic DNA methylation Reprogramming - Active De-methylation and Immediate Re-methylation in the Male Pronucleus of Bovine Zygotes *Dev. Dyn.* 236: 2523.2533 (2007)

Yong-Kook Kang(Corresponding) Characterization of DNA methylation change in stem cell marker genes during the differentiation of human embryonic stem cells *Biochem. Biophy. Res. Comm.* 359(3): 536-542 (2007)







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Researchers

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- Protein secretion and glycosylation

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- Cellular kinetics of signal transduction protein
- Bio-imaging of in vivo signaling dynamics

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- Ab generation against post-translationally modified protein
- Peptide biochemistry and biology

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- Neuronal cell death mechanisms
- Apoptotic signaling in cancer cells

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- Signal transduction and molecular genetic engineering

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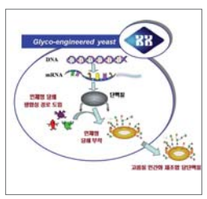
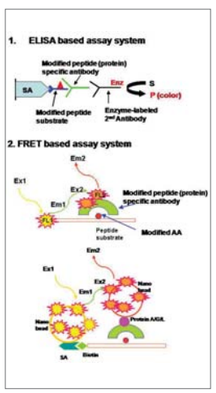
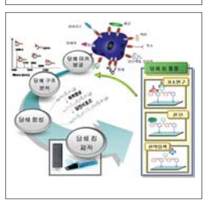
- Development of glycan remodeling technology
- Protein therapeutics and engineering







04

Omics and Integration Research Center

Our goal is to develop core platform technology that will be useful for the production of next-generation bio-therapeutics and high-value added metabolites. We focus on intelligent cellular engineering and molecular reconstruction based on the understanding of life phenomena at system level via the acquisition and integrated analysis of various "Omics" data, such as functional genomics, proteomics and glycomics.

Research Areas

Omics-based cellular modeling and reconstruction
- Integrated genomic analysis of the metabolic regulatory networks and stress response mechanisms
- Functional genomic analysis and the application of protein secretion and modification networks
- Development of synthetic regulatory circuits and signal transduction networks based on Omics information

Cellular kinetics of signal transduction proteins
- Study of genetic regulation and biochemical characterization of signal transduction proteins
- Study of spatio-temporal kinetics of signaling proteins by using bio-imaging technology
- Modeling of the signal transduction process based on the integrated analysis and reconstruction of the movement and interaction of protein complex

Glycomics-based glycan remodeling and fusion technology
Development of a glyco-engineered strain library by glycosylation pathway reconstruction
- Development of a glycan modifying enzyme library and an enzymatic glycan modification process
- Development of a high-throughput and ultra-sensitive glycan analysis system
- Development of a glycan-based bio-chip and cellular imaging technology

Achievements

Development of integrated genomics platforms for industrial yeast, *Hansenula polymorpha*
We have established platforms for proteomics and glycomics research of methylotrophic yeast, *H. polymorpha*, along with the development of whole-genome cDNA microarrays. This will facilitate an Integrated Omics approach to obtain solid knowledge about the cellular systems of *H. polymorpha* at the global level, thereby enabling the successful exploitation of the industrial potential of this yeast.

Development of glyco-engineered yeast to produce human mannose-type glycoproteins
The glycosylation pathways of non-traditional yeasts, *H. polymorpha* and *Yarrowia lipolytica*, have been elucidated and reconstructed in order to produce human-compatible mannose-type glycoproteins, which will be used as high quality and economical hosts for the mass production of high-value added therapeutic glycoproteins.

Visualization and quantification of *in vivo* signaling dynamics
We developed a protocol to detect *in vivo* interactions between protein partners. We can obtain the live cell imaging of fluorescence-probed signaling molecules after expression in a mammalian cell line.

Selected Publications

Hyun Ah Kang(Corresponding) Identification of the cadmium-inducible *Hansenula polymorpha SEO1* gene promoter by transcriptome analysis and its application to whole-cell heavy-metal detection system *Applied and Environmental Microbiology* 73 (19): 5990-6000 (2007)

Hyun Ah Kang(Corresponding) Engineering of the yeast *Yarrowia lipolytica* for the production of glycoproteins lacking the outer-chain mannose residues of N-glycans *Applied and Environmental Microbiology* 73 (14): 4446-4454 (2007)

Ki-Sun Kwon(Corresponding) Cytoplasmic localization and ubiquitination of p21(Cip1) by reactive oxygen species *Biochem Biophys Res Commun.* 358 (22): 219-225 (2007)

Ki-Sun Kwon(Corresponding) Curcumin attenuates glutamate-induced HT22 cell death by suppressing map kinase signaling *Mol Cell Biochem.* 298(1-2): 187-194 (2007)

Sung Sup Park(2nd author) In a model of immunoglobulin heavy-chain (Igh)/c-myc translocation, the Igh 3' regulatory region induces c-myc expression at the immature stage of B cell development *Gene Chromosome Canc.* 46(10): 950-959 (2007)

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Translational Research Center

We are set to establish ourselves as the R&D hub of nationwide translational research in Korea. We are establishing close collaboration with many partner groups in basic research and clinical medicine. Our major research interests include immune diseases, apoptosis, degenerative neuro-diseases, stem cell differentiation, and cell signaling.

Researchers

Byoung Chul Park parkbc@kribb.re.kr
- Target mining and validation using proteomics
- Translational research of immune diseases

Sang Chul Lee lesach@kribb.re.kr
- Elucidation of reaction mechanism of TCDD
- Proteomic analysis of neuronla cell death pathway and stem cell differentiation

Sung Goo Park sgpark@kribb.re.kr
- Mechanism and functions of apoptosis-related proteins
- Protease degradomics

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- Functions and regulation of ubiquitin-proteasome system
- Protein misfolding diseases (e.g., Huntington's disease, ALS, SCA)

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- Structural studies on anti-oxidant proteins and protein tyrosine phosphatases
- Drug development using 3-D structural information

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- Hormone nuclear receptors and their application

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- Aptamers
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- Target mining and validation using reverse genetics tools
- Proteomic analysis of neuronal cell death pathway and stem cell differentiation

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- Functional study of neuronal synapse formation by protein tyrosine phosphatases
- Regulation of synaptogenesis by microglia in the brain

Research Areas

Autoimmune disorder
Discovery and functional verification of biomarkers from patients suffering immune diseases, such as atopic dermatitis, asthma, and rheumatoid arthritis

Apoptosis
Identification and functional studies on new substrate of caspases, key regulators of apoptosis

Neuroscience and neurodegenerative diseases
Proteomic research into neuronal cell functions and neurodegenerative diseases

Differentiation of mesenchymal stem cells
Discovery and functional verification of the genes and marker proteins, that are involved in the differentiation of human mesenchymal stem cells into adipocytes and osteoblasts

Cell signaling
Research on the mechanisms of key cell signaling pathways, e.g. the MAPK pathway

Phathogenic microbes
Proteomic research into pathogenic microbes (e.g. Vibrio) and industrial microbes

Achievements

Proteomic research on pathogenic microbes, Vibrio
Proteomic research on pathogenic microbes, Vibrio, led to the discovery of proteins, which were implicated in Vibrio virulence. Functional studies of these proteins were conducted.

Proteomic research on neuronal cell death
Proteomic research led to the discovery of key protein players in the apoptosis of neuronal cells. Functional studies on these proteins were conducted.

Research on apoptosis and cell signaling
Proteomic research led to the discovery of regulators of cellular apoptosis and cell signaling. The results were published in the major scientific journals.

Selected Publications

Do Hee Lee & Byoung Chul Park(Co-corresponding) Proteomic analysis of glutamate-induced toxicity in HT22 cells *Proteomics* 7(2): 185-193 (2007)

Byoung Chul Park(Corresponding) G1 to S phase transition protein 1 induces apoptosis signal-regulating kinase 1 activation by dissociating 14-3-3 from ASK1 *Oncogene* (in press)

Kwang-Hee Bae(First) & Sang Chul Lee(Corresponding) Phosphoproteomic analysis of neuronal cell death by glutamate-induced oxidative stress *Proteomics* 7(15): 2624-2635 (2007)

Do Hee Lee & Sung Goo Park(Co-corresponding) Caspase-7 mediated cleavage of proteasome subunits during apoptosis *Biochem. Biophys. Res. Comm.* 363(2): 388-394 (2007)

Eui-Jeon Woo(Corresponding) Structural insight into the constitutive repression function of the nuclear receptor Rev-erbbeta *J. Mol. Biol.* 373(3): 735-744 (2007)

Kwang-Hee Bae & Sung Goo Park (Co-corresponding) Gpx3 of S. cerevisiae suppresses non-enzymatic degradation of glutamine synthetase in an activity-independent manner *Biochem. Biophys. Res. Comm.* 362(2): 405-409 (2007)

DIVISION of
MOLECULAR THERAPEUTICS

Principle Functions and Duties

Identification of therapeutic targets in cancer and discovery of their modulators
Development of new drug candidates from natural resources
Discovery of bioactive metabolite from microorganisms and plants

Molecular Cancer Research Center <
Natural Medicines Research Center <
Functional Metabolite Research Center <

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- Chemical genomics using cell- or phenotype-based assay, gene and protein expression profiling
- Natural product chemistry

Jung Joon Lee jjlee@kribb.re.kr
- Discovery and optimization of anti-cancer drug-lead from chemical library and natural products targeted NF-kB, HIF-1, and PPAR and evaluation of their efficacy in animal models
- Molecular pharmacology and target discovery of bioactive natural products

Kyou-Hoon Han khhan600@kribb.re.kr
- Study of natively unstructured proteins by NMR structural biology
- Development of peptide drugs using αconotoxins

Kwang-Hee Son sonkh@kribb.re.kr
- Study of microbial natural products as SMDs (small molecular drugs)
- Study of microbial enzymes as a protein drug

Young-Soo Hong hongsoo@kribb.re.kr
- Manipulation of antibiotic biosynthetic genes to make precise structural changes in a complex antibiotics molecule
- Heterologous expression of an artificial biosynthetic pathway

Dong Cho Han dchan@kribb.re.kr
- Study of cancer migration and metastasis, and development of its blocking chemicals
- Study of apoptosis induced by cell cycle arrest and stress

Seung-Wook Chi swchi@kribb.re.kr
- Structural biology of p53 in the cancer protein network
- Structure-based drug development

Kyeong Lee kaylee@kribb.re.kr
- Medicinal chemistry and chemical biology of a small molecule inhibitor of HIF (Hypoxia Inducible Factor) as a potential anticancer agent
- Development of ansamycin analogues as a potent HSP90 inhibitor

Research Areas

- Target identification and validation by chemical method and NMR technology
- Discovery of anti-tumor agents from natural sources and peptides
- Lead identification/optimization for development of novel anticancer therapeutics
- Mode of action of candidate compounds using genomic or proteomic tools

Achievements

Finding STAT3 inhibitor from natural products

Sugiol, a diterpene compound, was identified from the screening of natural products using the STAT3-dependent luciferase reporter system. We confirmed that sugiol specifically inhibits only Tyr705 of STAT3 in DU145 prostate cells and that the expression level of cyclin D1, cyclin A and survivin is down-regulated by STAT3 activity.

Development of a small molecule inhibitor of HIF-1 activity

Structural modification of a hit compound discovered during high-throughput screening using an HRE-dependent reporter assay has revealed a novel class of HIF-1 inhibitors, which potently inhibit the HIF-1a protein accumulation and its target gene expression under hypoxic conditions in human hepatocellular carcinoma Hep3B cells.

Validation of DRG9 in an animal model as an oncogene

A novel protein, DRG9, has been identified via the elucidation of a molecular mechanism of a p50 selective inhibitor, a natural diterpene compound. This protein, which is induced by a variety of kB activators, potently stimulates kB target gene expression, p65/RelA transcriptional activity, and HIF-1a accumulation. Furthermore, over-expression of DRG9 in cancer cells significantly increased its anchorage independent growth, invasiveness, and angiogenic activity, suggesting that DRG9 could be an oncogenic protein.

Determination of a structural basis for the broad neutralization of an HBV-neutralizing antibody

We have determined the crystal structures of the humanized monoclonal antibody HzKR127 Fab and its complex with preS1 epitope peptide of the hepatitis B virus. In the complex structure, the bound peptide forms a type IV βturn followed by a 310 helical turn, whose looped-out conformation provides a structural basis for broad neutralization.

DIVISION of
MOLECULAR THERAPEUTICS

01

Molecular Cancer Research Center

The goals of the molecular cancer research center are to discover novel molecular targets for anticancer drug screening and to develop anti-cancer drug candidates against the novel targets. We apply functional and chemical genomics in order to identify the gene or protein involved in tumor progression and metastasis. To find novel anti-cancer agents, we screen chemical library and natural products using cell-based assay systems.

Selected Publications

Seung-Wook Chi(First) Broadly neutralizing the anti-HBV antibody revealed a CDR H3 lid opening mechanism *Proc. Natl. Acad. Sci. USA* 104: 9230-9235 (2007)

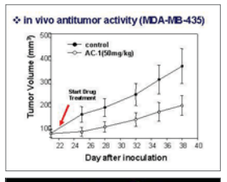
Kyeong Lee(First) & Jung Joon Lee(Corresponding) (Aryloxyacetylamino)benzoic acid analogues: A new class of hypoxia-inducible factor-1 inhibitor *J. Med. Chem.* 50: 1675-1684 (2007)

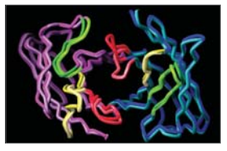
Kwon, B, M.(Corresponding) Apoptosis induction of 2'-hydroxycinnamaldehyde as a proteasome inhibitor is associated with ER stress and mitochondrial perturbation in cancer cells *Biochem. Pharm*. 74: 557-565 (2007)

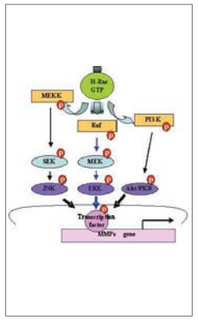
Jung Joon Lee & Young-Soo Hong(Corresponding) Mutasynthesis of geldanamycin by the disruption of a gene producing starter unit: generation of structural diversity in the benzoquinone ring *ChemBioChem* 8: 1491-1494 (2007)

Kyou-Hoon Han(Corresponding) Pre-structured motifs in the natively unstructured preS1 surface antigen of the hepatitis B virus *Protein Science* 16: 2108-2117 (2007)

Kyeong Lee & Jung Joon Lee(Corresponding) Synthesis of (aryloxyacetylamino)-isonicotinic/nicotinic acid analogues as a potent hypoxia-inducible factor (HIF)-1alpha inhibitor *Bioorganic Med. Chem. Lett.* 1997, 17(22): 6305-6310 (2007)







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Researchers

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- Identification of new molecular targets related to immune diseases, establishment of a bioassay/screening system for such compounds, and development of active compounds
- Construction of a natural product library

Kyung-Seop Ahn ksahn@kribb.re.kr
- Determination of anti-inflammatory and anti-allergic activity of natural products using a mouse asthma model and cell-based assay

Sei-Ryang Oh seiryang@kribb.re.kr
- Identification of biologically active compounds from natural sources
- Establishment of a screening system for anti-asthmatic & anti-inflammatory activity.

Ho-Jae Lee hjlee@kribb.re.kr
- Development of an assay system for the screening of TGF- βsignal modulators
- Molecular mechanisms of TGF- βsignaling during inflammation and/or airway remodeling

Sangku Lee sangku@kribb.re.kr
- Organic synthesis of natural compounds and medicinal chemistry for the development of drug candidates

Joongku Lee joongku@kribb.re.kr
- Establishment of a wild plant seed bank to ensure the ex-situ conservation of plant resources and to develop mass production for high value-added products

Hyun Sun Lee leehs@kribb.re.kr
- Development of therapeutic agents/nutraceuticals for metabolic diseases including obesity, type 2 diabetes, insulin resistance, hyperlipidemia and construction of bioactive substances from natural products

Young-Kook Kim kimyk@kribb.re.kr
- Establishing a screening system for metabolic diseases including atherosclerosis and obesity, and developing specifically bioactive compounds

Mun-Chual Rho rho-m@kribb.re.kr
- Identification of inflammation related target molecules
- Eestablishment of screening systems and development of active compounds for inflammation related diseases

Dur-Han Kwon dhkwon@kribb.re.kr
- Identification of cultures and a quantitative titration method for several viruses
- Development of new active compounds against diseases induced by viruses including the influenza virus, rotavirus, coranvirus, rhinovirus and enterovirus

Research Areas

Identification of new molecular targets related to immune and metabolic diseases
- Identifying major genes or proteins involved in the immune system and lipid metabolism, and their functional analysis
- Establishing a bioassay/screening system for such compounds, and developing specifically active compounds

Immunomodulator research
- Researching the cellular response modulator affected by the excessive activation of immune cells
- Researching the inhibition activity of respiratory viruses
- Isolating natural bioactive compounds and synthesizing them, and developing a potent compound by structure optimization

Metabolome research
- Isolating metabolomes derived from plants
- Elucidating metabolome structure and researching its metabolism

Construction of a natural product library
- Collecting plant resources domestically and abroad, and securing data
- Constructing a plant extract library and a natural compound library

Establishment of a wild plant seed bank in Korea
- Collecting native plant seeds and making voucher specimens
- Constructing a database system for seeds and the study of seed properties

Achievements

Identification of disease-oriented molecular target candidates
Through research of molecular targets for asthmatic diseases, three disease target candidates have been identified. This enabled the development of new anti-asthmatic drug candidates, which are being prepared for preclinical testing (of toxicity, PK, etc.).

Identification of leads and candidates for new drugs
Discovery research for chronic inflammatory diseases including asthma, allergies and cancer and metabolic disorders such as obesity and diabetes revealed about 20 leads and 10 therapeutic candidates, including verproside.

Development of anti-viral agents
In the search for natural anti-viral agents, a material showing exceptional activity against white-spot syndrome virus was discovered. Research for industrialization is ongoing.

DIVISION of
MOLECULAR THERAPEUTICS

02

Natural Medicines Research Center

Our aim is to develop natural therapeutics that will be effective against chronic immune diseases (e.g. asthma, arthritis, vascular diseases, metabolic diseases, etc.) which are difficult to treat with modern drugs, from the natural product library, starting with traditional medicines.

Construction of biomaterial infrastructure
With regard to natural product library construction, we are continuing to expand the number of samples in our plant extract and seed bank libraries (plant extracts: 500; natural products: 50; seed bank: 500 a year), and have launched a promotional campaign to encourage their use.

Industrial research
We developed natural anti-bronchitis agents and were able to register a patent and exchange information with several companies.

Commercialization of cholesterol-lowering drugs
We developed cholesterol-lowering agents from a natural source and transferred them to Dong-Hwa Pharm.Ind.Co. Ltd for anti-atherosclerosis drugs.

Selected Publications

Hyeong-Kyu Lee & Kyung-Seop Ahn(Corresponding) Anti-inflammatory and anti-allergic effects of kefir in a mouse asthma model *Immunobiology* 212(8): 647-654 (2007)

Hyeong-Kyu Lee & Sei-Ryang Oh(Corresponding) Suppressive effect of verproside isolated from Pseudolysimachion longifolium on airway inflammation in a mouse model of allergic asthma *Int. Immunopharmacology* 6 (6): 978-986 (2007)

Ho-Jae Lee(Corresponding) Negative regulation of Activin/Nodal signaling by SRF during Xenopus gastrulation *Development* 134: 769-777 (2007)

Ho-Jae Lee(First) SRF is a nuclear repressor of Smad3-mediated TGF- β signaling *Oncogene* 26: 173-185 (2007)

Mun-Chual Rho(Corresponding) Dimeric sesquiterpenoids isolated from Chloranthus japonicus inhibited the expression of cell adhesion molecules *J. Ethnopharmacol.* 104(1-2):270-7 (2007)

Hyun Sun Lee(Corresponding) Inhibition of diacylglycerol acyltransferase by alkamides isolated from the fruits of Piper longum and Piper nigrum *J. Agric Food Chem.* 54(26):9759-9763 (2007)

Hyun Sun Lee(Corresponding) Inhibition of diacylglycerol acyltransferase by betulinic acid from Alnus hirsuta *Planta Med.* 72 (3): 267-269 (2007)

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- Cosmeceuticals

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- Natural product chemistry
- Mushroom metabolite

Research Areas

Obesity/Diabetes
Developing anti-obesity and anti-diabetic lead compounds with regulatory roles in the insulin singnaling and ER-stress induced gene expression

Natrural product library
Isolate and deposit the bioactive secondary metabolites through microbial synthetic biotechnology and metabolomic technology

Antioxidants
Developing new bioactive antioxidant compounds from mushrooms and other natural materials

Antimicrobial agents
Discovering novel antibiotics against drug resistant pathogenic bacteria, and determining their mode of action

Epigenomic modulators
Developing bioactive compounds for regulating DNA methyltransferase-mediated gene expression and carcinogenesis

Achievements

Apoptotic death of prostate tumor by a compound isolated from plant extracts
Five compounds showing similarities in their chemical structure were isolated from a plant extract. Among them, four had a strong induction of apoptosis, inducing the activation of caspase-3 and PARP cleavage. Exploitation of the mechanism of the compounds indicated that FLIP, downstream of Fas, was down-regulated in its expression by the compounds. The malignant growth of cancer cells, including HBx-transformed liver and K-ras-transformed prostate cells, was also reduced by the compounds. Furthermore, one of the compounds significantly reduced tumor size in a mouse model injected with the K-ras-transformed cancer cells. The related patents and manuscripts are under preparation.

Isolation of ER-stress inducer and inhibitor
An endoplasmic reticulum (ER)-stress inducer was isolated from a plant extract. This compound strongly induced the expression of ER-stress-associated proteins, including GRP78 chaperone, and the splicing of XBP-1 mRNA, a hallmark of ER-stress-induced IRE-1a activation. Conversely, an inhibitor of ER-stress was also isolated for use as an inhibitor of type II diabetes mellitus. Both are expected to be effective in cancer therapeutics and anti-diabetes.

Isolation and application of extremophiles
Over twenty new species of microorganisms, including the halophilic *Halomonas kribbensis* were isolated from extreme environments such as salt fields. The metabolite analysis and study of these organisms are currently taking place.

DIVISION of
MOLECULAR THERAPEUTICS

03

Functional Metabolite Research Center

The goal of the research center is to discover the bioactive metabolites of microorganisms and plants in order to find drug candidates for metabolic and infectious diseases through screening and development. In order to accomplish this goal, we have developed a screening system based on cell biology and metabolomics and constructed a metabolite bank isolated from microorganisms and plants to develop medicinal and functional well-being compounds.

Information exchange and commercialization of obesity/diabetes therapeutics
Purified compounds from *Torreya nucifera, Salvia miltiorrhiza, Morus sp* were identified as having anti-obesity and anti-diabetic effects through the inhibition of protein dephosphorylation, leading to increased insulin sensitivity. They proved to be effective in the mouse model system. This technology has been exchanged with a corporation and research is underway for its use in pharmaceutical drugs and functional products containing insulin sensitizing compounds.

Selected Publications

Jong Seog Ahn(Corresponding) NF-kB inhibition enhances caspase-3 degradation of Akt1 and apoptosis to camptothecin *Cell Signaling* 19: 1713-1721 (2007)

Bo Yeon Kim(Corresponding) NF-kB inhibition increases chemosensitibity to trichostatin A-induced cell death of Ki-Ras-transformed human prostate epithelial cells *Carcinogenesis* 27: 2258-2268 (2007)

Won-Gon Kim(Corresponding) Fumimycin: a Peptide Deformylase Inhibitor with an Unusual Skeleton Produced by Aspergillus fumisynnematus *Org. Lett*. 9 (13): 2449-2451 (2007)

Chang-Jin Kim(Corresponding) Shimazuella kribbensis gen. nov., sp. nov., a mesophilic representative of the family Thermoactinomy-cetaceae *Int. J. Syst Evol Microbiol* 57(11): 2660-2664 (2007)

Ick-Dong Yoo(Corresponding) Glucose starved HT-29 human colon calcinoma cells are sensitive to verrusosidin as a GRP78 down-regulator *Toxicology* 229(3): 253-261 (2007)

Jong-Pyung Kim(Corresponding) Cyathusals A, B and C, New Antioxidants from the Fermented Mushroom Cyathus stercoreus *J. Nat. Prod.* 70(6): 1043-1045 (2007)

Bong-Sik Yun(Corresponding) Highly oxygenated and unsaturated metabolites providing a diversity of hispidin class antioxidants in the medicinal mushrooms Inonotus and Phellinus *Bioorg. Med. Chem*. 15: 3309-3314 (2007)

DIVISION of
BIO-MATERIALS SCIENCE

Principle Functions and Duties

Structural and functional genomics of economically important plants

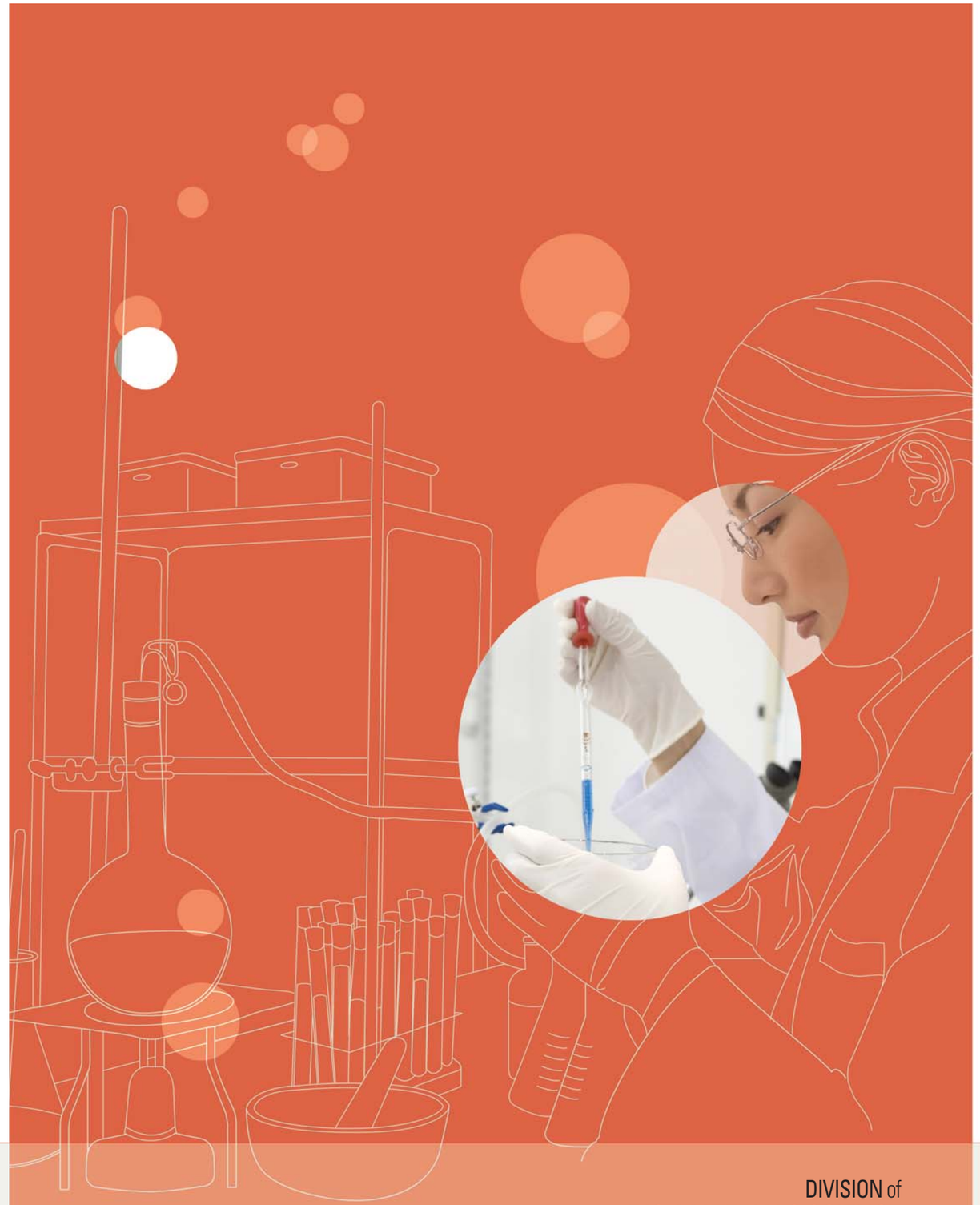
Genome-based systems microbiology

Environmental biotechnology to produce sustainable industrial materials

Plant Genome Research Center <

Systems Microbiology Research Center <

Environmental Biotechnology Research Center <



Researchers

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- Development of "CyanoCrops" by introducing cyanobacterial genes into the chloroplast genome of crops
- Cloning of salt resistance genes from marine cyanobacterias via a functional genomics approach and development of salt-tolerant crops
- Development of new cultivars of strawberry by genetic transformation

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Hyun Soon Kim hyuns@kribb.re.kr
- Development of an edible vaccine for Alzheimer's disease
- Development of transgenic crops
- Development of novel binary vectors for molecular farming

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- Solanaceae international genome project
- Development of a gene pool involving tissue-specific and alternative splicing
- Plant, microbial genome databases and annotation

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Hye Sun Cho hscho@kribb.re.kr
Jeong Mee Park jmpark@kribb.re.kr
- Molecular plant-microbe interactions
- Development of an oligo DNA chip for the diagnosis of pathogens
- Identification of the genes involved in development by virus-induced gene silencing

Research Areas

- Research of plant genome structure
- Research into the functional genomics of plant-microbe interactions
- Research into bio-informatics technology and establishment of a platform for various genomes
- Research into the development of an environmentally-friendly binary vector system
- Research into the signal transduction network of plant cell death
- Research into CyanoCrops by using cyanobacterial genes

Achievements

International collaboration for analysis of the *Solanaceae* genome

The Plant Genome Research Center supervises the international consortium-driven research for the genomic analysis of *Solanaceae*, and participates in the international tomato genome sequencing project. This ten-year project, launched in 2004, involves 20 nations. Ten countries are participating in primary operations to decode the genomic sequence. Korea is responsible for the 2nd chromosome, which consists of 12% of the entire genome; thus far we have accomplished about 60% of our designated task. We hope that this may serve as an opportunity to internationally promote our country's plant bioengineering industry. (http://sol.pdrc.re.kr)

Large-scale isolation of pepper genes and public release

We have undertaken the task of gene identification in peppers, Korea's most important vegetable product, and have finished analyzing about 120,000 expressed sequence tags. A database for this information has been developed and opened to the public. We believe that we have secured more than two-thirds of the pepper genome, which consists of 30,000 unigenes, and expect varieties information to be helpful in the development of new strains. (http://sol.pdrc.re.kr)

Development of platform technology for plant functional genomics research

Virus-induced gene silencing was developed for the large-scale screening of genes. This technology is being used in the screening of many types of *Solanaceae* plants including *Nicotiana benthamiana*, peppers, and tomatoes. The resultant data are expected to be widely used in the identification of functional genes.

Development of transplastomic technology

The need to improve transgenic technology in order to prevent the random release of artificially produced genes into the environment via the pollen of transgenic plants is gaining prominence. We developed transformation technology for foreign gene expression in plastids. These genes can only be inherited from the maternal line, which cannot be spread through pollen, thereby ensuring a low environmental risk.

Development of an edible plant-derived vaccine for Alzheimer's disease

Antigens for mutant β-amyloid proteins, which are known to be a cause of Alzheimer's disease, were overexpressed in potatoes as an edible vaccine. We have developed the transgenic potato, and have confirmed through experiments with mice that the potato vaccine does produce specific antibodies for β-amyloids. We need to conduct additional animal trials, as well as tests for toxicity, before we can use this product as a human vaccine.

Selected Publications

Min SR(First) A sepal-expressed ADP-glucose pyrophosphorylase gene (NtAGP) is required for petal expansion growth in 'Xanthi' tobacco *Plant Physiol.* 145 (1): 277-289 (2007)
Youm JW(First) & Kim HS(Corresponding) Oral immunogenicity of potato-derived HBsAg middle protein in BALB/c mice *Vaccine* 25: 577-584 (2007)
Park JM(Corresponding) The chili pepper CaATL1: an AT-hook motif-containing transcription factor implicated in defence responses against pathogens *Mol. Plant Pathol* 8(6): 761-771 (2007)
Hur CG(Corresponding) TISA: Tissue-specific alternative splicing in human and mouse genes *DNA Research* 13(5): 229-243 (2007)

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01

Plant Genome Research Center

The center has focused on the development of the platform technology required for the industrial application of functionally important genes and new transgenic plants with useful traits. We have conducted research of the structure and functional genomics of economically important plants of the Solanaceae family (e.g. peppers, tomatoes, potatoes), and have secured successful results and platform technologies for their commercial application.

DIVISION of
BIO-MATERIALS SCIENCE

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- Bacillus genetics, GRAS microbial factory

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- Yeast protein factory, yeast genetics

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- Biomolecular engineering, bioimaging, biosensors

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- Bacteria taxonomy, microbial biodiversity

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- Protein engineering, biocatalysis

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- Bacillus genetics, metabolic regulation

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- Bacteria-plant interactions, plant immunity

Myung Hee Kim mhk8n@kribb.re.kr
- Protein structure and functions

Sung Ho Yoon moncher@kribb.re.kr
- Metabolic engineering, bioinformatics

Research Areas

Microbial genome analysis
Genome sequencing and functional genomics of industrial microorganisms ; deciphering microbial diversity on a genome scale

Microbial cell factory
Developing novel expression systems with yeast and bacteria, metabolic pathway engineering, and engineered bacteria-plant interaction

Biocatalyst innovation
Custom-made enzymes, biomolecular engineering, and innovative biocatalysis processes

Achievements

Construction of a yeast protein factory for the efficient production of recombinant proteins for therapeutics and industrial enzymes
- Genome-wide screening of the TFP library
- Efficient secretion of 'difficult-to-express' proteins and enzymes

Dissecting probiotic *Paenibacillus*-plant interactions and their genome analysis
- Understanding *Paenibacillus*-elicited plant growth promotion and induced resistance
- Functional analysis of biosynthetic genes of polymyxin and fusaricidin
- Improvement of crop productivity by plant-associated *Paenibacillus* spp.

Development of biocatalytic processes
- Biodiesel production with immobilized and improved lipase
- Whole-cell biocatalysis with surface-displayed β-galactosidase

Genome analysis of *Escherichia coli* B and microbial pathogenicity islands
- Genome analysis of *E. coli* BL21(DE3), REL606, and evolved strains
- Comparative omics analysis of *E. coli* B and K-12: transcriptomes to phenomes
- Web service of a database for prokaryotic pathogenicity islands

Continued discovery of bacterial biodiversity - maintaining No 1. ranking in the field
- Isolation of 5 new genus of bacteria and more than 30 novel species
- Isolation of novel class lipase from metagenome library

Selected Publications

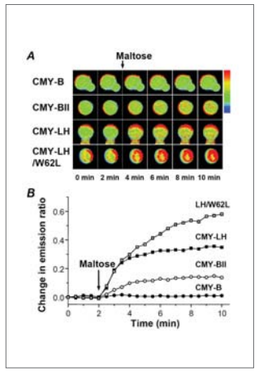
Yoon, S. H., Park, Y.-K., Lee, S., Choi, D., Oh, T. K., Hur, C.-G., and Kim. J. F. Towards pathogenomics: A web-based resource for pathogenicity islands *Nucleic Acids Res.* 35: D395-D400 (2007)

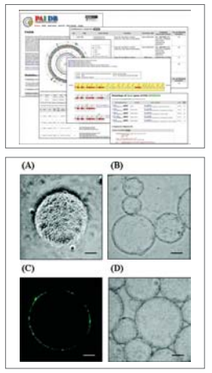
Ha, J.S., Song, J.J., Lee, Y.M., Kim, S.J., Sohn, J.H., Shin, C.S., and Lee, S.G. Design and application of highly responsive fluorescence resonance energy transfer biosensors for the detection of sugars in living *Saccharomyces cerevisiae*. *Appl. Envir. Microbiol.* 73(22): 7408-7414 (2007)

Cho, H.-S., Park, S.-Y., Ryu, C.-M., Kim. J. F., Kim, J.-G., and Park. S.-H. Interference of quorum sensing and virulence of the rice pathogen Burkholderia glumae by an engineered endophytic bacterium *FEMS Microbiol. Ecol.* 60: 1-14 (2007)

Kwon, S. J., Jung, H. C., and Pan, J.G. Transgalactosylation in a water-solvent biphasic reaction system with β-galactosidase displayed on the surfaces of *Bacillus subtilis* spores *Appl. Envir. Microbiol.* 73: 2251-2256 (2007)

Yoon, J.-H., Kang, S.-J., Jung, S.-Y., and Oh, T.-K. *Humicoccus flavidus* gen. nov., sp. nov., isolated from soil. *Int. J. Syst. Evol. Microbiol.* 57: 56-59 (2007)





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02 Systems Microbiology Research Center

Our aim is to become a national competence center specializing in microbial biotechnology by developing the platform technology required for microbial genomics and microbial cell factories.

DIVISION of
BIO-MATERIALS SCIENCE

Researchers

Sang-Soo Kwak sskwak@kribb.re.kr
- Transgenic plants with enhanced tolerance to multiple environmental stresses
- Molecular breeding of sweetpotato for sustainable development in marginal lands

Hee-Mock Oh heemock@kribb.re.kr
- Ecophysiological study of microalgae and cyanobacteria in eutrophic waters
- Production of high-value materials from microalgae and cyanobacteria

Haeng-Soon Lee hslee@kribb.re.kr
- Transgenic plants with enhanced tolerance to multiple environmental stresses
- Transgenic plants for bioenergy and functional feed materials

Hee-Sik Kim hkim@kribb.re.kr
- Biodegradation of petroleum hydrocarbons in contaminated soil by a microbial community
- Molecular analysis of microbial diversity and functions in contaminated environments (chlorinated compounds, ECDs, heavy metals)

Chi-Yong Ahn cyahn@kribb.re.kr
- Ecological modeling for freshwater quality and cyanobacterial bloom
- Ecophysiological and molecular study of cyanobacteria and their toxins

Research Areas

Plant antioxidation research
Developing industrial transgenic plants with enhanced tolerance to multiple environmental stresses for sustainable agriculture and environments in marginal lands

Microalgae research
Using cyanobacteria in carbon dioxide reduction and developing environmentally-friendly production technology for useful materials

Microbial community research
Developing functional microbial communities for bioremediation of contaminated soil and monitoring microbial diversity and functions

Achievements

Development of plants with enhanced tolerance to multiple environmental stresses
Transgenic crops (e.g. sweetpotato, potato) for sustainable agriculture and environments were developed through the gene manipulation of antioxidative mechanisms under the control of an oxidative-stress inducible SWPA2 promoter. These plants showed a strong tolerance to multiple environmental stresses, including paraquat-mediated oxidative stress, drought, extreme temperatures and air pollution. In addition, root-specific promoters are under study for the production of bioenergy and functional feed materials in transgenic sweetpotatoes.

Greenhouse gas reduction and beneficial material production
Outdoor mass bioreactor and cyanobacteria harvesting apparatus were successfully developed; they showed improved efficiency in carbon dioxide fixation. Thus, the produced cyanobacterial biomass could be used in health foods, cosmetics, and medicines. In addition, environmentally-friendly materials and apparatus were developed for bloom control.

Development of functional microbial communities for bioremediation
Several functional microbial communities (FMCs) degrading highly petroleum oil were obtained from oil-contaminated soil through sequencing enrichment techniques. Their microbial diversity was examined using DGGE and t-RFLP. We developed an effective FMC preservation technology using solid carriers and filtration. After 6 months of preservation, FMC maintained the degrading activity and microbial diversity by more than 90%.

Selected Publications

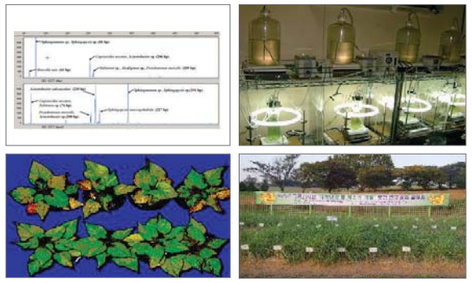
Sang-Soo Kwak(Corresponding) Enhanced tolerance of transgenic sweetpotato plants expressing both superoxide dismutase and ascorbate peroxidase in chloroplasts against methyl viologen-mediated oxidative stress *Mol. Breeding* 19: 227-239 (2007)

Hee-Mock Oh(Corresponding) Determination of cyanobacterial diversity during algal blooms in Daechung reservoir, Korea, on the basis of cpcBA intergenic spacer region analysis *App.I Environ. Microbiol.* 72: 3252-3258 (2007)

Hee-Mock Oh(Corresponding) Life cycle of the ichthyotoxic dinoflagellate Cochlodinium polykrikoides in Korean coastal waters *Harmful Algae* 6: 104-111 (2007)

Hee-Sik Kim(Corresponding) Cloning of srfA operon from Bacillus subtilis C9 and its expression in E. coli. *Appl. Microbiol Biotechnol.* 75: 567-572 (2007)

Chi-Yong Ahn(First author) Alternative alert system for cyanobacterial bloom, using phycocyanin as a level determinant *J. Microbiol.* 45: 98-104 (2007)



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03 Environmental Biotechnology Research Center

We aim to develop industrial platform technology using high-tech ecogenomics and biological resources in response to the United Nations Framework Convention on Climate Change for sustainable development. To achieve this goal, we focus on the development of integrated fusion technology combined with plant science, microbial science including microalgae, and environmentally-friendly materials science.

DIVISION of
BIO-MATERIALS SCIENCE

DIVISION of BIOTECHNOLOGY R&BD

In order to promote and commercialize our research outcomes, we are focusing on bioprocess development for the commercialization, technology transfer and licensing in/out, and the effective management of the intellectual properties of KRIBB. In particular, we are carrying out a process scale-up, optimization and industrialization through pilot plant facilities, cultivation of human resources, and academic-industrial collaboration especially for the commercialization of bio-products. Additionally, we are systematically registering and managing the intellectual properties of KRIBB, as well as engaging in technology transfer and supporting the business activities of bio-companies.

Researchers

Joon-Ki Jung jkjung@kribb.re.kr
- Genetic engineering
- Bioprocess engineering

Hong-Weon Lee hwlee@kribb.re.kr
- Fermentation physiology
- Bioprocess engineering

Eun-Gyo Lee eglee@kribb.re.kr
- Recombinant protein production and purification
- Cell culture

Jung-Oh Ahn ahnjo@kribb.re.kr
- Genetic engineering
- Metabolic engineering

Research Areas

Bioprocess development for the production of bioactive materials and biopharmaceuticals

Process development, process optimization, and scale-up of the entire bioprocess including expression system, fermentation, downstream process and chromatographic purification

Microbial fermentation and animal cell culture

High quality and high yield production of valuable metabolites and recombinant proteins by batch, fed-batch and continuous cultures

Providing pilot plant facilities

Providing diverse pilot plant facilities for the prototype production and R&D collaboration for the manufacturing process development

Patent management and technology transfer

Management of KRIBB's patents, and the promotion of technology transfer and licensing in/out

Venture promotion and innovative support

One-roof business-support system ranging from the incubation of bioventure companies to management and marketing consultation

Achievements

Production of a pronase from *Streptomyces griseus*

In order to produce a pronase (mixture of proteolytic enzymes) cost-effectively, we screened the appropriate mutant strains after considering productivity, growth rate and stability. We then optimized the fermentation conditions including culture environment and media. In a pilot-scale fermentor (2,500 liters) the pronase was stably produced up to 3,600 U/mL. We are currently preparing to license this technology to a bio company.

Development of recombinant vaccines for livestock

Leptospiral outer membrane proteins (OMPs) have been known to play an important role in the pathogenicity of *Leptospira*. New vaccine strategies using the OMPs as subunit-antigens are deemed necessary for effective protection against Leptospirosis instead of the classical vaccines based on inactivated whole cells. We developed an expression system of recombinant LipL41 to enhance the expression of their antigenic subunits effectively and evaluated the potential of recombinant LipL41 as a subunit-antigen to protect against Leptospirosis. Also, the processes for the mass-production and purification of this protein were developed, while supportive tests on the immunogenicity of the purified protein were conducted on guinea pigs.

Production of shikimic acid in metabolically-engineered *Escherichia coli*

Shikimic acid is a high-value compound that serves as a key starting material for Tamiflu, for use as an orally active antiviral compound for the prevention and treatment of influenza infections. An alternative to the extraction of shikimic acid from *Illicium* plant is fermentative production by metabolically engineered microorganisms. For the fermentative production of shikimic acid, we developed rationally designed *E. coli* strains by blocking the aromatic amino acid pathway after the production of shikimic acid. Furthermore, we developed the fermentation process for an effective production of metabolically-engineered *E. coli.*

Production of bioactive human cytokines in recombinant *Escherichia coli*

One of the major issues in the bioindustry and proteomics research area is to find a solution that will enable us to produce bioactive recombinant human proteins by using the functional fusion proteins and signal human proteins by using the functional fusion proteins and signal sequences in *E.coli.* We developed the secretion technology of human cytokines for their mass-production and were able to optimize the purification process to produce pure and high yields.

Production of therapeutic proteins in mammalian cell culture

Mammalian cell culture has become the dominant system for the production of recombinant proteins for clinical applications because of their proper protein folding and complete post-translational modification. We are developing rCHO cell culture technology for the large-scale production of therapeutic proteins in a suspension bioreactor, and the boosting technology for high-quality proteins by genetically engineered cells has also been studied. Furthermore, chromatographic purification and high-throughput analysis technology have been developed.

Selected Publications

Jung-Oh Ahn(First) & Hong-Weon Lee(Corresponding) Translation elongation factor 1-α gene from Pichia pastoris: molecular cloning, sequence, and use of its promoter *Appl. Microbiol. Biotechnol.* (2007)

Joon-Ki Jung(Corresponding) Over-production of beta-carotene from metabolically engineered Escherichia coli. *Biotechnol. Lett.* 28(12):897-904 (2007)

Joon-Ki Jung(Corresponding) Enhanced protease cleavage efficiency on the glucagon-fused interleukin-2 by the addition of synthetic oligopeptides *Protein Expr. Purif.* 55(1):159-65.d (2007)

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DIVISION of Ochang R&D
Bio-Evaluation Center

Our aim is to establish a specific and collective foundation for the techniques, facilities, and manpower required to support the effective and successful development of biotech products. For this purpose, we have not only constructed an evaluation infrastructure for optimizing, analyzing, and standardizing living modified organisms, drug candidates and lab animals, but we have also been assessing the usefulness and risks posed by biotech products and biotech R & D processes so as to help facilitate their commercialization.

Researchers

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- Risk assessment of LMOs
- Evaluation of anticancer and immunomodulating drug candidates

Stephen Beungtae Ryu sbryu@kribb.re.kr
- Human and environmental risk assessment of LMOs
- Identification of commercially valuable genes/LMOs

Won Kee Yoon wkyoon@kribb.re.kr
- Veterinary pathology
- Health safety assessment of LMOs

Soon-Chun Jeong scjeong@kribb.re.kr
- Genetics of plant disease resistance genes
- Molecular genetics characterization of LMOs

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- Environmental risk assessment of LMOs

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- Experimental animal medicine
- Mouse stem cells

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- Microbiology
- Health monitoring of laboratory animals

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- Molecular pharmacology
- Evaluation of anticancer drug candidates

Kiho Lee kiholee@kribb.re.kr
- Biopharmaceutics
- Drug metabolism and pharmacokinetics in drug discovery

Jong Soon Kang kanjon@kribb.re.kr
- Molecular pharmacology
- Efficacy evaluation of immunomodulatory and anticancer agents

Research Areas

Living modified organisms (LMOs)
Conducting a genetic analysis of LMOs as well as assessing the risks posed by LMOs to humans and the environment. Identification of commercially valuable genes and LMOs

Drug discovery
Discovery and preclinical evaluation of new drug candidates

Laboratory animals
Acting as a national center for lab animal standardization, developing transgenic animals and evaluating their usefulness

Achievements

Living modified organisms
We have established and developed infrastructures for the genetic analysis and assessment of the potential risks posed to humans and the environment by living modified organisms. Notably, we moved to newly built greenhouse and laboratory facilities at Ochang, Chungbuk, at the end of 2006. In addition, on the basis of this infrastructure, we have been assessing the potential risks of domestically developed transgenic rice, chilli peppers, potatoes, poplars and rootstocks for watermelons. We have also conducted National Environmental Monitoring on domestic soybeans, corns and oilseed rapes and inspected the extent of their genetic contamination by imported LMOs. In collaboration with academic and private institutes, we have identified commercially valuable LMOs.

Drug discovery
Drug discovery and development is a highly valuable area including target identification/validation, hit identification, lead optimization, and preclinical/clinical studies. We have developed and implemented an integrated infrastructure for drug discovery that encompasses preclinical efficacy, ADME and toxicity evaluation. Furthermore, we have applied this technology platform to the discovery and preclinical evaluation of drug candidates, such as anticancer agents, cell therapeutics, antirheumatics and antiallergics, for cancer and immunological diseases. Our infrastructure for drug discovery plays a key role in providing practical support to many drug discovery efforts in the fields of academia and industry.

Experimental laboratory animals
Laboratory animals are essential in biosciences and biotechnologies. Our role involves the collection, maintenance, standardization and development of laboratory animals to make them invaluable public resources. We have also been carrying out environmental, genetic and health monitoring to ensure the safe, reliable and reproducible scientific usages of laboratory animals. As a national laboratory animal resources center, the total number of laboratory animals we have collected amounts to 201 strains. We have distributed animal resources to 27 organizations and performed health-monitoring for 2,099 heads of 30 organizations. We are also developing an *in vivo* short/mid-term carcinogenesis assessment system using mice for new drug candidates.

Selected Publications

Soon-Chun Jeong (Corresponding) & Hwan Mook Kim (Corresponding) Molecular analysis and quantitative detection of a transgenic rice line expressing a bifunctional fusion *TPSP Food Control* 18: 1434-1442 (2007)

Hwan Mook Kim (First) & Song-Kyu Park (Corresponding) Structure-activity relationship studies of a series of novel d-lactam-based histone deacetylase inhibitors *Journal of Medicinal Chemistry* 50: 2737-2741 (2007)

Hwan Mook Kim (First) Anti-tumor activity of *ex vivo* expanded cytokine-induced killer cells against human hepatocellular carcinoma *International Immunopharmacology* 7: 1793-1801 (2007)

Jong Soon Kang (First) & Hwan Mook Kim (Corresponding) Topical application of a novel ceramide derivative, K6PC-9, inhibits dust mite extract-induced atopic dermatitis-like skin lesions in NC/Nga mice *International Immunopharmacology* 7: 1589-1597 (2007)

Young-Suk Won (First) *Helicobacter callitrichis* sp. nov., a novel *Helicobacter* species isolated from the feces of the common marmoset. (*Callithrix jacchus*) *FEMS Microbiology Letters* 271: 239-244 (2007)

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DIVISION of Ochang R&D

National Primate Research Center

The NPRC was established in the KRIBB as a major national infrastructure with the purposes of supporting industrial/academic/research institutions in their pursuit of developing xenotransplant organs, providing animal models for research into regenerative medicine and incurable diseases, and evaluating the preclinical trials of new drug candidates.

Researchers

Kyu-Tae Chang changkt@kribb.re.kr
- Developing cells and tissue resources derived from non-human primates and researching their applications
- Developing new breeder miniature pigs for the research and development of bio-organs

Ekyune Kim kimek@kribb.re.kr
- Study on the functional relationship of membrane proteins involved in mammalian fertilization
- Down-regulation of membrane proteins through the endocytosis mechanism

Sang-Hyun Kim skim@kribb.re.kr
- Development of specific detection methods for pathogen identifications from animal samples
- Structural/functional studies of lipopolysaccharides *(Salmonella, Yersinia spp.)*

Research Areas

Acquisition/propagation/distribution of specific pathogen free (SPF) primate resources
Acquiring and propagating SPF primate resources, and then distributing them to industrial/academic/research institutions

Standardization in handling and regulating lab requirements for primate research
Maintaining quality in the standard of primate resources by monitoring bacteria, viruses and general health parameters
Establishing a standard operating procedure (SOP) for providing guidelines for the breeding and management of primate resources at the international level

Xenotransplantation research
Transplanting organs (e.g. pancreatic islet, heart) from transgenic germ-free pigs into SPF primates and analyzing the efficacy and safety of the transplanted organs

Regenerative medical research and applications
Using primate disease models in cell therapy and gene therapy research, and evaluating their efficacy/safety for the treatment of incurable diseases

Preclinical efficacy assessment of newly-developed drug candidates
Applying various biodrugs and biomaterials to SPF primates in order to evaluate their efficacy

Evaluation of the immunogenicity and safety of vaccine candidates
Testing various vaccines and AIDS vaccines and assessing their immunogenicity, efficacy and safety

Development of disease models
Constructing disease models for incurable diseases from primates, which have the most similar metabolic pathways to mankind, and thus developing new drugs and applications for organ xenograft and regenerative medicine

Collaboration/support for nationwide non-institutional research involving primates
Providing specialized technology and information about primate care and facilities to other researchers, and conducting collaborative research for the development of related technologies

Transfer of primate-related resources and techniques to national partners at industrial/academic/research institutions
The NPRC shares its primate-related expertise with researchers nationwide, in fields such as neuroscience, pharmacokinetics, and so forth. We provide services for the upkeep of SPF primates, including microbiological monitoring, quarantine and maintenance workshops, and also train the personnel (e.g. veterinarians and breeders) who work with the primates.

Collaboration with national and international research teams
We have conducted collaborative studies in various fields, including xenotransplantation and the pharmacokinetic evaluation of therapeutic drugs against aplastic anemia. For the introduction of baboons, we cooperated with the Washington, Tulane, and Southwest National Primate Research Centers, and are currently collaborating with globally renowned researchers in embryo implantation and development. We are also working together with domestic companies for the development of mini-pigs, which are useful in the generation of xenotransplantational organs.

Achievements

Acquisition of primate resources
Primates give us valuable opportunities in providing the non-human physiological/anatomical data required for biomedical research and its applications. The NPRC currently houses six types of SPF primates: Rhesus monkeys, Cynomolgus monkeys, African green monkeys, Japanese monkeys, squirrel monkeys, and the common marmoset, which gives a total of 110 animals.

Selected Publications

Sang-Hyun Kim(Co-author) Secondary acylation of Klebsiella pneumoniae lipopolysaccharide contributes to sensitivity to antibacterial peptides *Journal of Biological Chemistry* 282:15569-15577 (2007)

Sang-Hyun Kim(Co-author) Contribution of AIDA-I to the pathogenicity of a porcine diarrheagenic Escherichia coli and to intestinal colonization through biofilm formation in pigs *Veterinary Microbiology* 120: 308-319 (2007)

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Jeonbuk Branch Institute
Molecular Bioprocess Research Center

Our goal is to develop biotechnologies and bioprocesses for the production of microbial metabolites, proteins, industrial enzymes and bioenergy, all of which are useful for the pharmaceutic, nutraceutic, dietetic, cosmetic, feed and fine chemical industries, etc.

Researchers

Chul Ho Kim kim3641@kribb.re.kr
- Development of the human papillomavirus vaccine
- Bioconversion of by-products generated by the palm oil industry

Hyo Kon Chun hkchun@kribb.re.kr
- Process development for the production of a flexible display substrate
- Process development for the production of a Tamiflu substrate from quinic acid

Joong Su Kim Joongsu@kribb.re.kr
- Study and genetic analysis of carbohydrate polymer producing genes in Aureobacidium species
- Development of the glycosyltransferases applicable to industries

Jae Jun Song jjsong@kribb.re.kr
- Development of platform technology for massive screening and the commercialization of industrially valuable enzymes using the HTS system
- Development of hyper-sensitive cell-based genetic circuitry for the screening of functional genes from meta-genomic DNA

Sukhoon Koh shskoh@kribb.re.kr
- Development of genetic tools for Aureobasidium sp.
- Development of enzymes for the carbohydrate industry

Woo Song Lee wslee@kribb.re.kr
- Development of atherogenic agents from various plants and microorganisms
- Development of a trans-sialidase inhibitor from various plants and microorganisms

Jeong-Woo Seo jwseo@kribb.re.kr
- Development of processes for the production of highly pure polyunsaturated fatty acids
- Development of biorefinery technologies

DIVISION of
Jeonbuk Branch Institute

Research Areas

Microbial metabolic engineering
- Production of microbial metabolites
- Metabolic engineering of industrial microorganisms

Bioconversion technology
- High throughput screening of novel biocatalysts
- Directed evolution of industrial enzymes
- Production of bio-substances by bioconversion

Molecular bioprocess engineering
- Production of therapeutic recombinant proteins
- Development of bio-refinery technologies

Development of human papillomavirus vaccine
Human papilomavirus genes coding L1 protein were isolated from Korean patients infected with various types of HPV.

Selected Publications

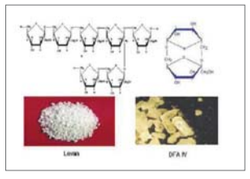
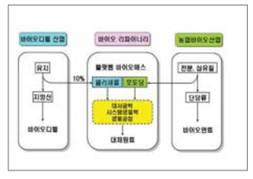
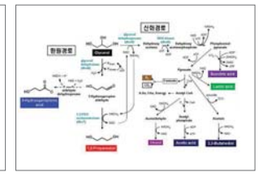
Jeong-Woo Seo(Coauthor) Thermolysis of iso-migrastatin and its congeners via [3,3]-sigmatropic rearrangement: a new route to the synthesis of migrastatin and its analogues *Organic Letters* 8(25): 5865-5868 (2007)

Woo Song Lee(Corresponding) Human ACAT inhibitory effects of shikonin derivatives from lithospermum erythrorhizon *Bioorg. Med. Chem. Lett.* 17: 1112-1116 (2007)

Achievements

Xanthones from *Cudrania tricuspidata* displaying potent α-glucosidase inhibition
We have proven that xanthone compounds isolated from the root of *C. tricuspidata* possess highly potent α-glucosidase inhibition properties.

Novel Levansucrase enzyme
Novel levansucrase was isolated from *Bacillus megaterium* and was cloned in *E. coli*.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Jeonbuk Branch Institute
Bioindustry Research Center

Our goal is to develop the technology required for the mass-production of microbial metabolites and industrial enzymes. Additional objectives of the center include the construction of a base for regional bio-industry development through technical support business for the activation of agriculture and stockbreeding, and research into mass-production with regard to the industrialization of useful bio-materials.

Researchers

Byung Dae Yoon bdyoon@kribb.re.kr
- Base construction for regional bio-industry development through research into microbial-materials for agriculture and stockbreeding
- Development of a mass-production process and analysis of immune activity of β-glucan purified from Aureobasidium sp.

Min Soo Kim ms5732@kribb.re.kr
- Development of fermentation techniques of biopolymers
- Bioconversion of a high-intensive sweetener from waste orange peel

Research Areas

Development of a mass-production technology for useful biological compounds and research into practical technology through field application
- Search for new functional biological compounds
- Development of mass-production technology for useful biological compounds using pilot plants
- Development of field application technology for the commercialization of useful compounds

Achievements

Environmentally-friendly agriculture based on biological control technology

Agriculture in the next decade will have to produce more food from less land through the more efficient and sustainable use of natural resources and inflict minimal impact on the environment in order to meet growing population demands. Promoting and adopting "environmentally-friendly agriculture by biological control technology and its management systems" could help us to reach this goal. Thus, we are focusing on conservation agriculture, defined as mineral disturbance combined with microorganisms in soils, as a more sustainable cultivation system for the future.

Application of immunostimulators for non-antibiotic pig-breeding

β-Glucan, an endogenous polysaccharide immunostimulator, exhibits high adjuvant activity in domestic breeding animals. It is one of the non-toxic, non-pyrogenic, and water-soluble immunostimulators. We have discovered that β-glucan has an immunoenhancing effect on pigs as an adjuvant and as a nonspecific immunostimulant. As such, further investigations in isolating and characterizing new biological agents as immunomodulators should continue in view of this success.

Search for industrially useful microbial resources from Korean traditional fermented foods

We have studied the functional effects of Korean-style fermented foods such as kimchi, soy sauce, etc. Traditional Korean fermented foods promote good digestion, because the consumption of a cup of clear soup containing soy sauce enhances gastric juice secretion in humans. Fermented soy sauce contains three tartaric isoflavone derivatives called soy flavones. These soy flavones were shown to have inhibitory activities against histidine decarboxylase, which produces histamine, a mediator of inflammation, allergy and gastric acid secretion. Soy sauce also exhibits antiplatelet activity. Beta-Carbolines were isolated from soy sauce as the active compounds. Soybeans and wheat, which are the main raw ingredients of soy sauce, are allergenic foods.

Development of a high-intensity sweetener using citrus peel waste

- Recently, a high-intensity sweetener(a low-calorie, full-bulk natural sugar) has just attained GRAS (Generally Recognized As Safe) status under the U.S. Food and Drug Administration (FDA) regulations, thereby permitting its use as a sweetener in foods and beverages. We have studied the development of NHDC produced from citrus peel waste, with regard to its demonstrated food and beverage applications and the potential health and medical benefits of this unique substance. NHDC has been found to be safe and efficacious for use as a low-calorie, full-bulk sweetener in a wide variety of foods, beverages, health foods, and dietary supplements. It fills broad, heretofore unmet needs for a low-calorie sweetener in products in which the bulk of sugar is important, such as chocolates, chewing gum, cakes, ice cream, and frosted cereals. Its synergism with other sweeteners also makes it useful in various foods. The various health and medical benefits of NHDC have been indicated, including the treatment of type 2 diabetes, hyperglycemia, anemia, and hemophilia, as well as the improvement of fetal development.

Selected Publications

Byung-Dae Yoon(Corresponding) Extracellular production of a glycolipid biosurfactant, mannosylerythritol lipid, by Candida sp. SY16 using fed-batch fermentation *Applied Microbiology and Biotechmology* 70(4): 391 - 396 (2007)

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BIOTECHNOLOGY R&D INFRASTRUCTURE

> Biological Resource Center
> Daejeon-KRIBB-FHCRC Resource Cooperation Center
> Korea Biosafety Clearing House
> Biotech Policy Research Center
> KOrean BioInformation Center(KOBIC)
> International Biological Material Research
> The 21st Century Frontier R&BD Program
> International Cooperation
> Technology Commercialization
> Support for Technology Information

Biological Resource Center

As a national bio-infrastructure for biological resources, we perform the role of a biotechnology think-tank and bio R&D. The main goal of the BRC, as a national infrastructure, is the collection, preservation and distribution of biological resources.

Researchers

Hee-Mock Oh heemock@kribb.re.kr
- Ecophysiological study and mass cultivation of microalgae and cyanobacteria

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- Insect pathology and microbiology for biomaterials and bioactive substances

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- Microbial taxanomy

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Doo Sang Park dspark@kribb.re.kr
- Microbiology and microbial enzymology

Research Areas

Biological resource acquisition
Collection and preservation of core biological resources, both foreign and domestic, offering public support by distributing biological resources to academia, industry, and research institutions, and organizing patent strain deposits

Development of core technologies for valuable bio resources
Developing platform technology for the identification and preservation of useful biological resources, the constant screening of new species, the screening of highly active enzymes (e.g. proteinase, xylanase, lipase) and bioactive substances derived from insects, insect-related microorganisms and various environments, and using them for the development of nutraceuticals and biomaterials

Construction of an information network and support of various services
Building local and international information networks for biological resources and providing support for workshops, conferences, and consultation, etc.

Achievements

Collection and preservation of biological resources
Over 1,300 strains, including bacteria, actinomycetes, yeasts, filamentous fungi, anaerobes, cell lines and patent strains, were acquired, and about 63,000 cases of long-term preservation were recorded.

Research activities
We published 56 papers concerning biological resources, and described 22 new species. We also generated and registered 17 patents, including one international patent. We developed a management system for biological resources using barcodes (IRIS, Information of Resource-Indexing System, v3.0) for the implementation of systematic and efficient management. We also improved industrial microbes and developed production processes for the efficient manufacture of the highly active proteinase, Arazyme, from a Korean spider. Highly active xylanase and lipase were also developed from insects. These technologies were transferred to a related corporation for industrialization.

Biological resource distribution and information-sharing
Over 4,000 strains were distributed to academia, industry, and research institutions. We held four workshops and two conferences, and offered consultation and technical support for more than 7,000 cases.

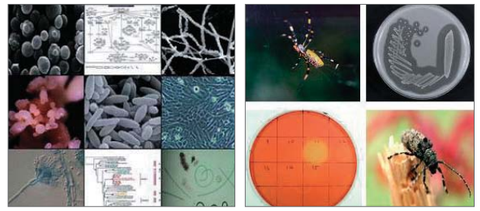
Selected Publications

Song-Gun Kim(First) A direct substrate-substrate interaction found in the kinase domain of the bifunctional enzyme, 6-phosphofructo-2-kinase/fructose-2,6-bisphosphatase *J. Mol. Biol.* 370: 14-26 (2007)

Jin Woo Bae(Corresponding) *Natronococcus jeotgali* sp. nov., a halophilic archaeon isolated from shrimp jeotgal, a traditional fermented seafood from Korea *Int. J. Syst. Evol. Microbiol.* 57: 2129-2131 (2007)

Jin Woo Bae(Corresponding) *Vibrio litoralis* sp. nov., isolated from a Yellow Sea tidal flat in Korea *Int. J. Syst. Evol. Microbiol.* 57: 562-565 (2007)

Jin Woo Bae(Corresponding) *Marinobacterium halophilum* sp. nov., a marine bacterium isolated from the Yellow Sea *Int. J. Syst. Evol. Microbiol.* 57: 77-80 (2007)



Daejeon-KRIBB-FHCRC Research Cooperation Center

Our goal is to discover cancer biomarkers of high sensitivity and specificity that are useful for the early diagnosis and prediction of cancers as well as the monitoring of drug effects. In collaboration with the teams of the 'International Cancer Biomarker Consortium' led by Dr. Lee Hartwell of the Fred Hutchinson Cancer Research Center, we are focusing on identifying biomarkers for the early detection of liver, stomach, colon and other cancers that will help to treat cancer patients more effectively and efficiently, and ultimately to raise the survival rate of cancer patients.

Researchers

Hyang-Sook Yoo yoohyang@kribb.re.kr
- Cancer genomics
- Cell cycle and signaling, yeast genetics and gene expression

Jeong-Heon Ko jhko@kribb.re.kr
- Discovery of biomarkers that show a change both in quantity and quality with a high positive prediction value.
- Functional studies that relate the candidate biomarker proteins to the biology of cancer

Eun Wie Cho ewcho@kribb.re.kr
- Discovery of autoantibody-based biomarkers that show a change in the serum of cancer patients

Sang Jick Kim sjick@kribb.re.kr
- Development of new antibodies for recognizing specific glyco-branch

Yong-Sam Kim omsys1@kribb.re.kr
- Discovery of biomarkers that show a change in terms of both quantity (amount of protein in serum level) and quality (aberrant glycosylation) with a high positive prediction value
- Biological validation of cancer biomarker candidates

Research Areas

- Discovery of biomarkers that show a change both in quantity and quality with a high positive prediction value in gastric, liver, colon and lung cancer
- Functional studies that relate candidate biomarkers to the biology of cancer
- Role of glycolipid in the apoptotic death of mammalian cells.
- Discovery of auto-antibodies produced during cancer progressions as cancer biomarkers
- Development of new glyco-recognizing antibodies using phage display

Achievements

Identification of candidate biomarkers for colon cancer

About 100 candidate proteins that are assumed to be involved in the development and malignancy of cancer were identified in the colon cancer model cell line WiDr and patients' serum. The identification method and proteins were patented.

Effect of an aberrant glycosylation of TIMP-1 on cancer metastasis

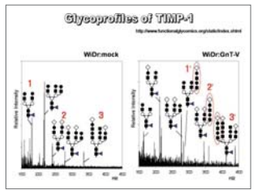
Aberrant glycosylation of TIMP-1 is responsible for the mitigated inhibition of both matrix metalloproteinase (MMP)-2 and MMP-9, and this aberrancy elevates the invasive/metastatic potential of colon cancer cells.

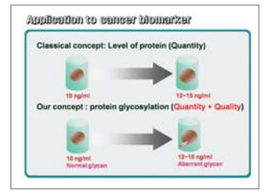
Effect of an aberrant glycosylation of PTPk on cancer cell migration

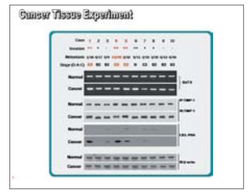
PTPk undergoes an aberrant glycosylation in GnT-V-overexpressing WiDr cells, and the aberrantly glycosylated PTPk was vulnerable to proteolytic cleavage. The enhanced cleavage of PTPk in GnT-V-overexpressing cells was responsible for the mitigation of the homophilic binding capacity, resulting in an increase in cancer cell migration.

Role of GM3 in glutamate-induced cell death

GM3 was up-regulated in the mouse hippocampal cell line HT22 death caused by glutamate. Twelve-lipoxygenase (12-LOX) was recruited to ganglioside-enriched microdomains in a GM3-dependent manner during oxidative glutamate toxicity.







Selected Publications

Yong Sam Kim, ..., and Jeong-Heon Ko(Corresponding)
"Functional proteomic study reveals that N -acetylglucosaminyltransferase V reinforces the invasive/metastatic potential of colon cancer through aberrant glycosylation on *TIMP-1*" *Mol. & Cell. Proteomics* (in press)

Yong Sam Kim, ..., and Jeong-Heon Ko(Corresponding)
Identification of target proteins of N-acetylglucosaminyltransferase V in human colon cancer and implications of protein tyrosine phosphate kappa in enhanced cancer cell migration *Proteomics* 6: 1187-1191 (2006)

Yong Sam Kim, ..., and Jeong-Heon Ko(Corresponding)
Ganglioside GM3 is involved in neuronal cell death *FASEB J.* 20: 1248-1250 (2006)

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Korea Biosafety Clearing House

Korea Biosafety Clearing House(KBCH) specializes in education and public relations, survey and research, and international cooperation as well as abiding by the legal requirements concerning the LMO information that is needed for the implementation of the "Cartagena Protocol on Biosafety" and the "Act on Trans-boundary Movements, etc. of LMOs"

Researchers

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- Biosafety information management, especially in accordance with the Biosafety Protocol and the "Act on Trans-boundary Movements, etc. of LMOs"

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- Research and analysis on R&D about LMOs and Bioindustry

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- Communication and public relations

Research Areas

Legal requirements concerning LMO information
A key priority in the effort to establish national information management and sharing systems for LMOs is to achieve synchronization and interoperability between the information systems of all organizations involved in biosafety informational activities

Communication and public relations
Promotion of public awareness and participation through online and offline communication

Survey and research
Research and analysis on law, regulations, R&D, and socio-economical issues, etc. about LMOs and biosafety

International cooperation
Collaboration with foreign organizations and participation in international meetings about LMOs and biosafety

Achievements

Information exchange through biosafety information systems
Korea ratified the Biosafety Protocol in October 2007 and will implement the "Act on Trans-boundary Movements, etc., of LMOs" on Jan. 1, 2008. The KBCH has already launched its national role of registering Korean LMO information at the BCH. A key priority in the effort to establish national information management and sharing systems for LMOs is to achieve synchronization and interoperability between the information systems of all organizations involved in biosafety informational activities.
The KBCH presented itself at the Biosafety Protocol related meetings(Conference of the Parties serving as the meeting for the Parties to the Cartagena Protocol on Biosafety, etc.), BCH operating experts' meetings, etc. It also supported six Asian countries - Thailand, Indonesia, Mongolia, Myanmar, the Philippines and Bhutan for the BCH operating experience exchange. In particular, the KBCH provided support for the improvement of biosafety capacity by dispatching biosafety experts to Pakistan in 2007.

Promotion of communication among the public, specialists and stake-holders
The Biosafety White Paper and the Biosafety Journal have been published and distributed to biosafety stake-holders. In 2007, the KBCH distributed PR booklets and leaflets by levels(beginning, intermediate, advanced), and produced LMO laws and regulations as well as PR movies. The KBCH also made efforts to promote awareness of LMOs through educational seminars for the public including 'Knowing correctly about LMOs,' and 'LMO laws and regulations.' Furthermore, it has been running a Biosafety essay competition for undergraduate and graduate students. The competition was expanded to include middle and high school students in 2007.

In-depth investigation/analysis on biosafety and LMOs
Surveys on the public perception of Biotechnology and LMOs have been carried out since 2003 to gain a better understanding of changes in consumer perceptions. Surveys of companies' perception of and attitude towards biotechnology and LMOs were also carried out in 2007. The results have been taken into consideration as an important factor for making effective programs for education and promotion. The KBCH also investigated and analyzed "Methods for implementing LMO Laws efficiently" and "The current state of LMOs for industrial use" and so on. The KBCH surveyed the worldwide LMO authorization status as well as the Korean status of LMOs and Bio imports and exports, and also analyzed the trends on policy and regulation, R&D, society and economy, public perception and risk assessment and review.

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Biotech Policy Research Center

Nominated and established by the Ministry of Science and Technology in 2004, the Biotechnology Policy Research Center aims to assist the government in establishing policies on biotechnology. To do so, the center investigates domestic and international policy information regarding biotechnology and runs a portal site (http://www.bioin.or.kr/) to enhance the public's understanding of biotechnology and biotechnology policy. The center also develops and provides biotechnology statistics, bibliometric, and market analysis. Additionally, the center organizes and supports various networks among the expert groups associated with the field of biotechnology.

Researchers

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- Policy planning and policy research, analysis of industrial trends

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- Policy planning and policy research, biotechnology white paper

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- Policy planning and policy research, statistical development: Gathering and arranging statistical data of BT from domestic and overseas countries

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- Policy planning and policy research, analysis of institutional trends related to bioethics and biosafety

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- Analysis of technological trend and patent analysis

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- UST student (University of Science & Technology), management of technology and policy

Research Areas

Policy planning
- To plan a comprehensive national policy or strategies to foster the research and development of biotechnology

Policy research
- To investigate technology, industry, institution, and policy information as well as to conduct relevant statistics, patent map, and bibliometric analysis

Information gathering/Distribution
- To run a portal site (http://www.bioin.or.kr/) in order to provide systematic information regarding biotechnology and biotechnology policy as a whole

Public relations
- To publish biotechnology white papers and to organize public workshops in order to enhance the public's understanding of biotechnology

International collaboration
- To facilitate effective international collaborations with foreign policy institutes and establish a foreign base for the center

Achievements

Monitoring BT trends and offering information
The center monitors technology, industry, policy and institutions with regard to BT, and provides the gathered information to policymakers and researchers to help with their planning of new policies and projects.
- **Technical Trend Reports (2007):** Glycomics and Carbohydrate Medicine; Human Genomics and Relevant Techniques; Brain Research and Relevant Techniques; Biological Resources; Bioremediation; New Drug Development
- **Industrial Trend Reports (2007):** A Study on the Validity Assessment of the Establishment of BT Infra and Facilities in Kyung-Gi Biocenter; An Analysis of the Trend of Bioindustries in Major Countries; 2007 Biotechnology Statistics; A Study on the Domestic and International Market and Prospects for New Bio-drugs
- **Institutional and Policy Trend Reports (2007):** Technology Assessment and Public Understanding of Biotechnology; Planning of the Promotion of R&D Related to Aging Society

Patent analysis and statistical development
- Patent map and papers analysis system has been devised to assist the government in planning R&D strategy for national projects and to set the direction for BT research projects.
- The center has gathered every item of domestic and overseas statistical data on biotechnology and categorized them by investment, human resources, industry, and technology up to the end of 2006. Released with statistical reports, the data has been used for policymaking.
- Patent Map Reports (2007): FDA-approved Drug; Core Technologies related to the Bio-Green 21 Project; Platform Technologies related to Construction of Antibody Therapeutics; Technological Trends in Therapeutics for Atopy

White paper and national guidebook for BT
- The center has published comprehensive white papers that cover national policies on BT and R&D status, and domestic and overseas trends in BT.
- The guidebook, which encompasses national policies, domestic research status, systems and laws on BT, is used for the global promotion of Korea's biotechnology industry.

Network of BT experts
Experts in BT have formed a broad community for policymaking and planning in the field of BT. The network has worked on analyzing current issues and developing future technologies.

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KOrean BioInformation Center(KOBIC)

Our goal is to develop a bioinformation infrastructure that will facilitate the efficient acquisition, analysis, and circulation of the ever-increasing corpus of bioinformation. We are developing a coherent network among the major genome research organizations, building integrated databases, and supplying an information analysis system. By providing such a shared infrastructure, we intend to raise the standard of Korean bioinformatics research facilities in order to lift Korea into the top five world ranking at the very least in terms of quality and quantity.

Researchers

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- SNP analysis

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- Proteome
- Evolution

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- Bioinformatics

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- SNP analysis

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- Sequence analysis

Chang-Bae Kim changbae@kribb.re.kr
- Comparative genomics
- Biodiversity Information

Seungwoo Hwang swhwang@kribb.re.kr
- Microarray
- SNP

Research Areas

Development of an integrated national genomics database

- Developing an integrated database of genome information for humans, animals, plants, and microorganisms and a platform for joint use
- Developing support systems for the identification /analysis of useful genes and core platform technology for bioinformatics

Development of a tight network and database transaction system for major research organizations

- Building a network among genome research institutions to serve as a center for sharing genomic information
- Cyber community (BioWiki, BioBlog, BioNew, etc.) to facilitate the sharing of researchers' interests and resources

Distribution of bioinformatics research, analytical tools, and package development

- Distribution of an EST cluster and alternative splicing analysis software
- Integrated platform (BioWorkbench) for analyzing biological data upon automated bioinformatics infrastructure
- Framework system(BioPipe) oriented by workflows and WEB 2.0 to analyze large-scale biological problems

Support of large-scale bioinformatics analysis and collaborative research

- Developing SNP information analysis, analysis systems/software
- Offering support for the Brassica genome analysis map

Development of bioinformatics technology and support

- Developing/distributing software for information analysis of gene regulation/function
- Analyzing genome function and proteomes

Development of international networks for bioinformatics and the establishment of MOUs

Exchange agreements were made with Chungbuk National University(2007.3.15) and the National Association of Biodiversity Institutes (NABI, 2007.3.6).

We have developed the following bioinformatics tools, databases, and services :

- Patome
- SNP@Ethnos, SNP@NMD, SNP analysis server(SNP@domain)
- BioPipe(biopipe.net), BioWorkbench, BioCommunity(biocommunity.org)
- Primate Genome Database(repeatome.org)
- Localizome server(localizome.org)
- Array Port(microarray data analysis system)
- Gene Set Analyzer
- BioPedia(biopedia.org, an openfree bioinformation hyper text system)
- BioPeople(biopeople.org, an openfree biological researchers' directory)
- BioSpecies(biospecies.org, an openfree biodiversity directory)
- BioCorea(biocorea.org, an openfree directory for Korean biotechnology)

Achievements

Infrastructure for information research

We operate the fifth largest genome/proteome sequence retrieval systems (SRS) in the world, which can be used as both a biological database and an analytical tool. We acquired public resources and automated analysis, built an automated analytical core system, and developed bioinfrastructures.

Domestic and international bioinformatics educational services

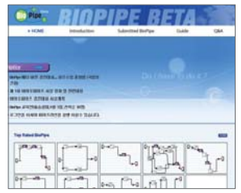
We held the 6th Korea-Japan-China Bioinformatics Training Course (Mar. 27-30, 2007). We also offer cost-free bioinformatics analysis to various research institutions, and give periodic lectures, providing basic training in bioinformatics.

Selected Publications

Jong Hwa Bhak(Corresponding) Impact of transcriptional properties on essentiality and evolutionary rate *Genetics* 175: 199-206 (2007)

Byungwook Lee(Corresponding) Patome: a database server for biological sequence annotation and analysis in issued patents and published patent applications *Nucleic Acids Research* 35: D47-D50 (2007)

Areum Han(Corresponding) SNP2NMD: A database of human SNPs (single nucleotide polymorphisms) causing NMD(nonsense-mediated mRNA decay) *Bioinformatics* 23(3): 397-399 (2007)



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BioInformation Center(KOBIC)

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International Biological Material Research Center

We aim to procure indigenous biological materials from four overseas' regional centers and their neighboring countries through legal routes within the scope of international collaborative research projects. Our mission is to provide researchers with biodiversity materials and ethnobotanical information including indigenous medicinal knowledge, and to establish the nation's core infrastructure for developing new natural drugs and nutraceutical products, along with other commercially important natural products.

Researchers

Hyeong-Kyu Lee hykylee@kribb.re.kr
-Natural product chemistry
-Immunology

Joong-Ku Lee joongku@kribb.re.kr
- Plant taxonomy
- Biodiversity

Research Areas

- Establishment of four collaborative biological material research centers for the collection and preparation of biological materials worldwide
- Establishment and operation of a comprehensive system and database in order to manage biological materials and related traditional medicinal knowledge procured from four regional centers and their neighboring countries
- Establishment and operation of a supply system for efficient provision of biological materials to leading research groups within the scope of assigned projects
- Development of new natural drugs, nutraceuticals and other commercially-important natural inventions.

Achievements

Establishment of an International Biological Material Research Center

- The center's organization has been completed. Items of quipment and facilities have been set up : highly-sensitive items of equipment (LC/MS and electric microscopes) and an expanded herbarium(storage capacity of over 100,000 voucher specimens). In addition, nearly 7,000 plant extracts have been distributed so far.
- Procurement of Foreign Biological Materials

China

Establishment of the Korea-China Biological Material Research Center
- Located in Cumming, Yunnan
- Personnel appointed(1 expert from Korea, 2 from China) and research equipment set up
- Biological materials(2,246 extracts) with ethnobotanical information

Central America

- Establishment of the Korea-Costa Rica Biological Material Research Center
- Building personnel and research equipment to be ready by January 2008
- The Korea International Cooperation Agency provides funds for buildings and most of the equipment
- Biological materials(400 dried plant species and extracts) with ethnobotanical information

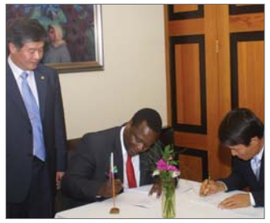
South-east Asia

- Working group meetings held for the establishment of a collaborative center (June 2007)
- Biological materials(309 dried plant species) including oceanic biological materials from Micronesia

South Africa

- Working group meetings held for the establishment of a collaborative center (June 2007)
- Biological materials(500 dried plant species) including oceanic biological materials from Micronesia



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The 21st Century Frontier R&D Program

The Center for Functional Analysis of Human Genome

The completion of the human genome sequence and the recent improvements made in chip technologies and bio-informatic approaches have provided enormous opportunities for the prevention and treatment of incurable diseases such as cancer. The R&D program for this center has been initiated i) to create knowledge, biomarkers, and molecular targets by genomic approaches for the development of diagnostics and therapeutics for stomach and liver cancer disease which are prevalent in Korea, and ii) to compete with advanced countries in the area of functional genomics of human beings. Our aims are i) to collect on a large scale and analyze functionally and clinically the novel biomarkers and molecular targets more closely associated with tumorigenesis by genomic approaches, and thereby ii) to develop diagnostics and candidates for the targeted therapy of stomach and liver cancers.

Researchers

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- Gene therapy of cancer

Young Il Yeom yeomyi@kribb.re.kr
- Genomic analysis of cancers and identification and functional validation of therapeutic targets
- Cancer gene therapy

Yong Sung Kim yongsung@kribb.re.kr
- Epigenomics in gastric and colon cancers
- High-throughput LOH genotyping associated with gastric cancer

Jeong-Heon Ko jhko@kribb.re.kr
- Discovery of bio-markers that show a change both in quantity and quality with a highly positive prediction value in gastric, hepatocellular, colon, and lung cancers
- Functional studies that relate candidate bio-markers to the biology of cancer

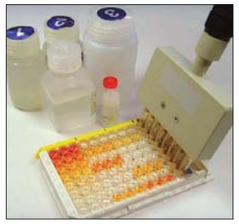
Jung-Joon Lee jjlee@kribb.re.kr
- Functional analysis and validation of a new gene to determine suitability for a molecular target in cancer therapy

Hee Gu Lee hglee@kribb.re.kr
- Preparation and production of antibodies against peptides, recombinant or fusion proteins from noble genes
- Identifying for cancer bio-markers and developing their uses in diagnostics

Sang Chul Lee lesach@kribb.re.kr
- Diffentiation of stem cell
- Discovery of cancer bio-markers by proteomic approaches

Sang Seok Koh sskoh@kribb.re.kr
- Genomic analysis of cancers
- Development of human monoclonal antibodies for cancer therapeutics

Cho-Rok Jung crjung@kribb.re.kr
- Functional analysis and validation of genes associated with tumor
- Gene therapy of cancer



Research Areas

- Development of cancer diagnostics
- Functional analysis of molecular targets for innovative cancer-therapeutics
- Development of candidates (small molecules and antibodies) for targeted cancer therapy
- Establishment of a high-throughput functional screening system of genes at genomic level

Achievements

Human gene bank

We established a human gene bank at KRIBB in 2003 that possesses 38,000 Korean unigenes and 10,000 full-length human cDNAs, and have distributed the genes to the interested parties. About 40,000 genes had been sent out domestically and to foreign countries by 2006. We will continue this service to take the lead in functional genomics.

Gene chip

We have selected a set of 250 genes that can serve as survival prediction biomarkers for liver cancer patients, and prepared a prototype gene chip containing the biomarkers that can be useful for patient treatment and tailored medicine (Patented in Korea, 2006).

Novel diagnostic and prognostic biomarker for gastric cancer

Mac-2 binding protein (Mac-2BP) is a secreted tumor antigen that is elevated in many cancers including gastric cancers and implicated in tumor metastasis. Mac-2BP protein is highly expressed in most gastric cancer cell lines and tumor tissues. Evaluation of intracellular and secreted Mac-2BP levels via ELISA indicates that Mac-2BP is expressed and secreted more abundantly in gastric cancer patients than other tumor patients and healthy donors (Patented, 2006). The elevated serum Mac-2BP level in gastric tumor patients is also significantly associated with distant metastasis and the more advanced stage of a tumor. In 2007, we licensed out the Mac-2BP biomarker to Hanrib Life-Tech Inc. in Korea, which will develop a kit for the diagnosis and prognosis of gastric cancer.

Novel target

We found that E2-EPF UCP targets the tumor suppressor VHL for degradation and is associated with tumor growth and metastasis. The UCP may be a new molecular target for the therapeutic intervention of human cancers (*Nat. Med.* 12, 809-816, 2006).

International collaboration with Pfizer

We have initiated cooperative research with Pfizer, a global pharmaceutical company, for pursing innovative biomedical research. Pfizer has sponsored a research project, in which genes associated with liver cancer will be evaluated and determined whether they are suitable targets for drugs.

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The 21st Century Frontier R&D Program
Plant Diversity Research Center

We graft plant resources and modern bioengineering technology to create high value-added products such as natural drugs and nutraceuticals. We also apply gene isolation and manipulation technology to develop new types of transgenic medicinal plants.

Researchers

Hyeong-Kyu Lee hykylee@kribb.re.kr
- Establishment of a plant extract bank of Korea
- Natural Product Chemistry
- Immunology

Joong-Ku Lee joongku@kribb.re.kr
- Establishment of a Seed Bank for wild and endangered plant species in Korea
- Plant taxonomy
- Biodiversity

Jung-Joon Lee jjlee@kribb.re.kr
- Development of nutraceuticals for improving erectile dysfunction
- Discovery of bioactive molecules
- Molecular mechanism of bioactive molecules

Byoung-Mog Kwon kwonbm@kribb.re.kr
- Development of nutraceuticals and biologically active compounds for cancer therapy
- Chemical genomics
- Natural products

Young-Kook Kim kimyk@kribb.re.kr
- Development of natural drugs for hyperlipidemia
- Cholesterol acyltransferase
- Cholesterol metabolism

Research Areas

Infra projects
- Constructing and managing the plant extract bank, plant bioinformatics system and seed bank for wild and endangered plants species

Development of plant-derived natural drugs and nutraceuticals
- Grafting plant resources and modern bioengineering technology to create natural drug materials for the treatment and prevention of diseases
- Developing high value-added nutraceuticals

Development of high value-added transgenic plants
- Analyzing useful genes in plants, and using gene isolation and manipulation technology to create new types of value-added transgenic medicinal plants

Collection, preservation and cultivation of plants species
- Collecting and classifying plant resources originating from the Korean peninsula
- Nurturing superior wild flower and tree cultivars

Achievements

Technology transfer with corporations
In the area of natural drugs and nutraceuticals research, we registered 35 patents and transferred three different technologies, resulting in 334 million won in technical fees, thus contributing to the activity of natural drugs development and its related industries. We also secured and accumulated important infra-technologies.

Preclinical/clinical trials of natural drugs and nutraceuticals
15 candidates for natural medicines and nutraceuticals were advanced and four are currently in clinical trials, and two are currently in preclinical testing. These are the results of extensive knowledge and preclinical experience of plant resources and oriental medicine. We believe that this serves as an example, showing the possibility of developing high value-added natural medicines/nutraceuticals valued at billions of won in a short period.

Continuation and reinforcement of infra project
A plant extract bank (Korean Plant Component Bank) with about 5,200 domestic/foreign samples was constructed, and it distributed 25,328 extracts to domestic academic/industrial/research institutions. We set up a center for the research of plant genome function and constructed 280,000 EST of genetic information and microarray datasets. For the seed bank for wild and endangered plant species, we collected 493 classes of seedlings of rare and endangered plants, examined their rate of germination (460 classes), studied their features (30 classes) and constructed chromosome databases (83 classes).

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The 21st Century Frontier R&D Program

Microbial Genomics & Applications Center

We aim to promote the discovery of novel genes, valuable biomolecules, engineered microbes and innovative bioprocesses. The Microbial Genomics and Applications Center focuses on developing technology platforms to utilize information about the genome function obtained from analyses of microbial genomes isolated from diverse environments.

-Elevate Korea to one of the top countries in the global microbial industry

-Create a market exceeding one billion dollars

-Construct a global knowledge infrastructure by acquiring key intellectual property rights

Researchers

Jung Hoon Yoon jhyoon@kribb.re.kr
- Biodiversity
- Metagenome

JiHyun F. Kim jfk@kribb.re.kr
- Microbial Genomics
- Bacteria-host interaction

Myung Hee Kim mhk8n@kribb.re.kr
- Protein structures and functions
- Macromolecular crystallography

Kwang-Hee Son sonkh@kribb.re.kr
- Microbial metabolome
- Small molecule drugs from natural products

Research Areas

Microbial diversity and metagenomes
- Isolation and characterization of marine microbes, extremophiles, and symbiotic microbes
- Construction of metagenomic libraries
- Screening microbes with high industrial potential

Functional genomics
- Functional genomics and proteomics
- Comparative genomics
- Analysis of metabolic pathways and networks
- Bioinformatics and a portal for microbial genome information

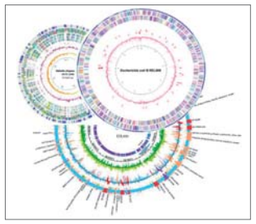
Metabolic engineering and genomic applications
- Identification of lead molecules from microbial resources
- Metabolic engineering and genome engineering
- Genome information-based enzyme evolution
- Novel molecular bioprocesses
- Novel bioconversion technologies

Achievements

Achievement of number one in the world's new bacteria discovery
We have secured more than 200 species of microbial resources and registered over 100. Over 3,000 Mbps of effective metagenomes was secured.

Analysis of microbial genome
Genome functional research was carried out for six microbial groups from *Tricholoma matsutake*, kimchi lactic acid bacteria, enteric bacteria, actinomycetes, yeasts, and *V. vulnificus*. We also secured Omics information in order to construct a data analysis system for the Omics of *E. coli* B, and were successful in completing a genome sequence database and a comparative analysis system.

Reprogrammed microbial cells and applicable technology
We developed an astaxanthin hyper-production strain through a functional genomic and pathway engineering approach(KRIBB), and analyzed the metabolic pathway of sulfur-containing amino acid using *Corynebacterium* genome information; we developed an L-methionine hyper-producing strain by genome based cell-reconstruction(CJ Co., Ltd); we developed medicinal glycosides by a bioconversion-based process using glycosyltransferases and characterization (Chonnam Univ.); we developed a production system for virus-like particles (VLP) by genome-wide control of yeast (Mogam Biotech Research Institute); we engineered a glucoamylase promoter that has been widely used for the recombinant protein in *Aspergillus niger*; and we succeeded in developing a biotransformation process for valienamine, a major intermediate for the chemical production of voglibose (Yuhan Co.)



The 21st Century Frontier R&D Program

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International Cooperation

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KRIBB has made every effort to become an internationally renowned research institute in the field of biotechnology through intensive cooperation to be achieved by building strategic global networks and carrying out joint research projects, in particular with major national and global pharmaceutical companies such as Pfizer Inc.

Global Research Activities

KRIBB was involved in 16 international research activities in 2007, working with leading scientific organizations across the globe. KRIBB works actively with our key partners to develop and support relationships best suited to achieving mutual goals.

Project Manager	Project Title	Country	Cooperating institute
Jeong-Heon Ko	International cooperation for cancer biomarker development	USA	FHCRC
Min-Gon Kim	Development of a cancer-diagnosis biosensor targeting post-modified proteins	USA	FHCRC
Jong-Seog Ahn	Bioactive Metabolite Research Center	Japan	RIKEN
Jong Hwa Bhak	Development of a Korea-China-Japan bioinformatics network	Japan, China	DNA Data Bank of Japan, National Institute of Genetics Shanghai Center for Bioinformation Technology
Dae-Yeul Yu	Generation of ENU mutant mice and studies on the *in vivo* function of the mice	Japan, China	RIKEN Nanjing University
Hyouk Joung	Establishment of a foreign biological resources center and central hub in Korea	Peru	Amazonian Biodiversity Research
Inpyo Choi	Development of platform technology for cancer immunotherapy	USA	University of Washington School of Medicine Fred Hutchinson Cancer Research Center
Sang-Soo Kwak	Understanding of the molecular mechanism of drought tolerance in plant and development of industries	China	Shanghai Institutes for Biological Sciences

Global Cooperation Networks

KRIBB has signed 15 Memorandums of understanding and agreement in 2007 and has strengthened its ties with 99 institutions in 28 countries (120 agreements) in total to prepare for the bio era and to build a world-class research environment.

Country	Institute	Country	Institute
International Cooperation Network	Asia-Pacific Molecular Biology Network (A-IMBN)	Nigeria	IAMRT
	The Consortium for the Barcode of Life(CBOL)	South Africa	CSIR
Canada	Biodiversity Institute of Ontario (BIO)	Spain	University of Valencia
Indonesia	The Agency for the Assessment and Application of Technology (BPPT)	Taiwan	Industrial Technology Research Institute (ITRI)
	IDB	USA	yet2.com
Laos	Souphanouvong University		LARTA-BANSD
Malaysia	KEDAH BioResources Corporation		Pfizer Inc.
			University of Utah

Other Major Achievements

Visit of foreign delegates

312 foreign delegates from overseas visited KRIBB in 2007 to establish international networks and discuss future research cooperation. Important visitors included Catherine BRECHIGNAC, President of CNRS, Dr. Bharat Chowrira, Vice President of Merck & Co.,Inc., and Dr. BJ Bormann, Vice President of Pfizer, etc.

International seminars and symposia

KRIBB hosted or organized a number of seminars, symposium and meetings.

Title	Topic
Foreign Scholar Seminar (Sir John Skehel, Royal Society, UK)	The Origin of Pandemic Influenza
KRIBB-Harvard Joint Symposium	Cancer/Medical Research
KRIBB- BIOTEC Joint Symposium	Biosensor and Biochip
KRIBB-Indonesia Joint Symposium	Recent Research Status of Biotech in Two Countries
KRIBB-ITRI Joint Symposium	Recent Research Status of Biotech in Two Countries
6th Osong International Biosymposium	Emerging Plant Biotechnology Trends and Industrial Implications

Appointment of foreign adjunct research fellows

KRIBB appointed 8 foreign adjunct research fellows, including Dr. Anthony Watts, Professor of Oxford University, Datin Dr. Ann Anton, Professor of Universiti Malaysia Sabah, and Dr. Hiroyuki Osada of RIKEN, asking them the favor of advice and guidance to promote research cooperation between KRIBB and other overseas institutions.

Technology Commercialization

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- Searching for excellent patent technologies, and promoting technology commercialization of research outcomes through partnerships between industry and research institutes.
- Identifying and nurturing excellent bio-ventures, such as the enterprise invested by institute and the start-up company by researcher

Main Function

Patent management team
- Intellectual property management / patent information and program management / promising technology search

Technology commercialization team
- Technology transfer / technology marketing / technology commercialization support / establishment of the enterprise invested by institute

Enterprise innovation support team
- Search and nurture of ventures / incubation and support of new ventures / industry, academia, institute networking

Major Policy Project

Technology Licensing Organization Business Support (Korea Technology Transfer Center)
- Promoting technology industrialization through the researcher's retention ability and the outcome of mutual collaboration between industry, universities, and research institutes.
- Supporting resolution for troubled technology to small and medium bio businesses and venture businesses, and also the activities between industry, university, and research institute.

Technology Business Incubator (Small and Medium Business Administration)
- Increasing the possibility of success of the launch of a new business by constructing an all-period technology business support system, ranging from technology development to production and marketing.

Technology Innovation Center (Ministry of Commerce, Industry and Energy)
- Strengthening technology competitiveness and bio medical-related technology innovation among small and medium businesses and venture businesses in the Daejeon region.

Regional Innovation System (Ministry of Commerce, Industry and Energy)
- Strengthening bio industry's technological capabilities at Daejeon and constructing a bio industry mecca.

Tenants Information of Bio Venture Center

Start-up company by KRIBB researcher

No.	Name of Company	Main Product	No.	Name of Company	Main Product
1	Anichem Inc.	Functional Bio Material (Bio Capsule)	4	Eugenteck Inc.	cDNA library construction and DNA Sequencer
2	Ace Biotech Inc.	L-Ornithine-L-Aspartate, Lipase			
3	ENZBANK, Inc.	Thermostable enzyme, new glycoside, functional carbohydrate	5	ProBionic Corp.	Microorganism probiotics

Start-up company by non-KRIBB researcher

No.	Name of Company	Main Product	No.	Name of Company	Main Product
1	NeoPharm Co., Ltd.	Ceramide-contained cosmeceuticals (Atopalm, Zeroid)	9	en2t Inc.	Recycling and treating the foodwaste using edible mushroom spawn
2	Dae Sung Microbiological Labs. Co., Ltd.	Animal pharmaceuticals (vaccine, AVILAK ABS/probiotics)	10	H-Plus Eco Ltd.	Contaminated soil restoration service, microorganism used in natural detergent
3	Lee's Biotech., Ltd.	Liver function improving product (Hep-Clean MH Plus)	11	Oiteck Co., Ltd.	Bio Informatics (protein interaction predicting System)
4	Bionutregen Co., Ltd.	Anti-obesity functional food (slim&slim diet coffee)			
5	Bio-dreams Co., Ltd.	Continus pesticide formulation, elicitor	12	HEALTHKEEPER	Functional food material, cosmetic ingredients business
6	VaccTech Corp.	Human vaccine and biomedicine, whitening cosmeceuticals	13	Moghu Research Laboratory	Herbicide for Landscape Architecture
7	Enbioengineering. Co., Ltd.	Microorganism absorbing filter , water waste treatment, Bioreactor	14	Dr. PREVENT Co., Ltd.	Dental instruments, fluoric ion introducing instrument
8	Enzychem Co., Ltd.	Antibiotics, tuberculosis drug	15	EXST Co., Ltd.	Bio diesel, Glycerin

Support for Technology Information

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Information Collection and Current Status

The KRIBB Digital Library(http://library.kribb.re.kr) has made it a priority to collect electronic materials such as electronic journals, electronic books, and web databases for providing information more rapidly and improving users' convenience. The library has been subscribing to electronic journals since 1998 and participating in the KESLI consortium. At the moment, the number of electronic journals to which the library subscribes is 5,770 titles, which is much higher than that of 62 printed journals. More than 360,000 articles are downloaded in the PDF and HTML formats each year.

Information		No. of Material	Major Sources
Journals	Printed journals Electronic journals	469 5,770	Currently 62 journals are subscribed and 16,412 volumes are bound 16 publishers including ACS, Blackwell, Elsevier, Nature, Springer, Wiley
Books	Printed books Electronic books	2,100 14,240	Research books or reference materials ebrary, Elsevier, Humana, netLibrary, Springer, Wiley
Research reports Market trend reports Video materials Web databases		5,950 650 200 12	KRIBB and other institutes Datamonitor, Frost & Sullivan KBS Media Discoverygate: Beilstein, Delphion, JCR, SciFinder, Scopus

Research Results and Information Databases

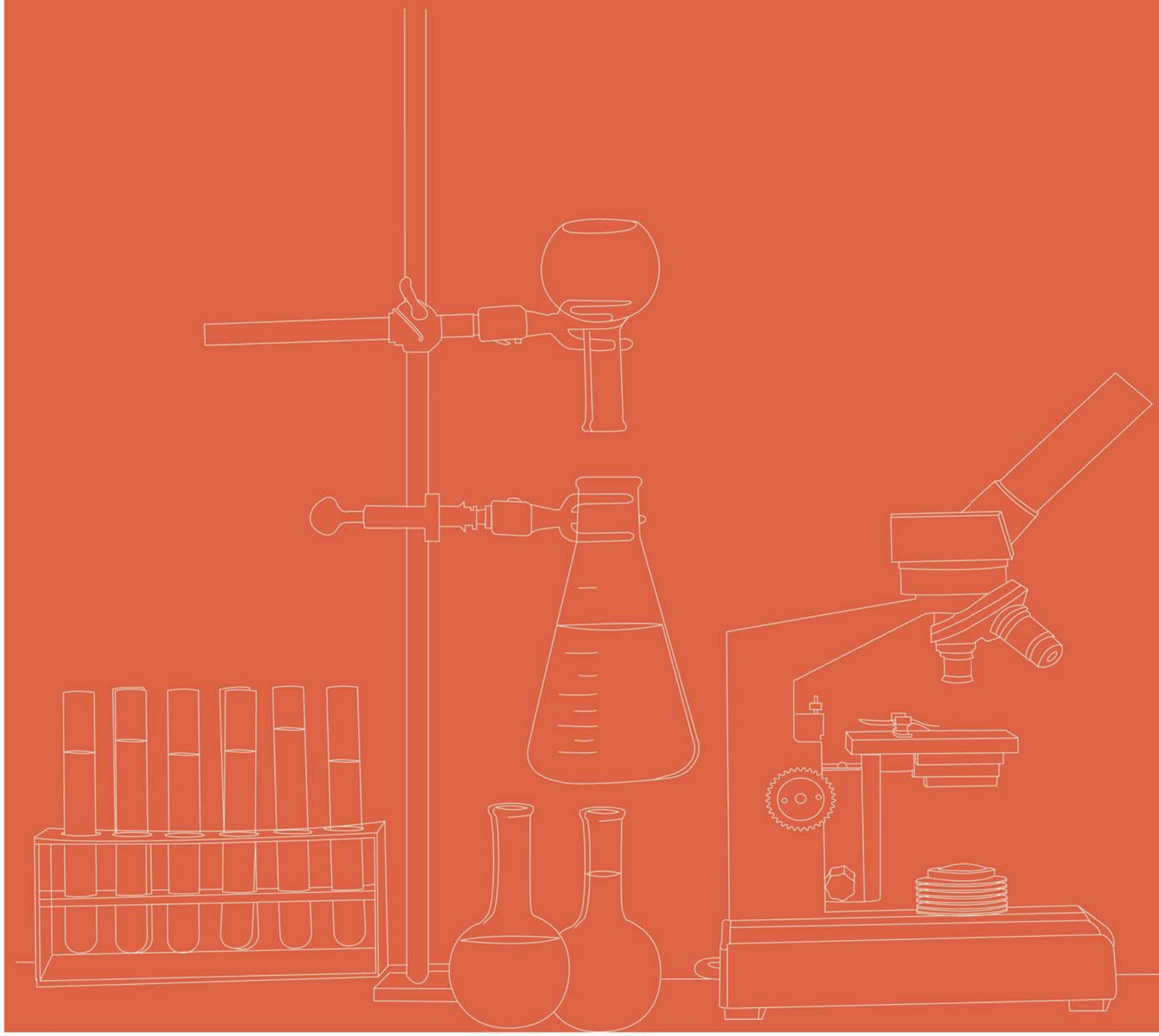
The library has databased KRIBB's research results on the web with 6,532 papers, 1,140 patents, and 1,340 research reports (Total: 9,012) for web users. By using the iLIPS program, users can search and gain access to all data including printed books, electronic journals, and electronic books within the library.

Document Delivery Service (DDS)

To solve the problems of the increasing amount of information and the lack of collections in the library, the library has made agreements with the Korean Medical Library Association (KMLA), National Digital Science Library (NDSL), Korea Institute of Science and Technology Information (KISTI), and Korea Education and Research Information Service (KERIS) so that researchers can obtain copies of original materials. The library has provided more materials (1,745 items) rather than received requests for original copies (1,104 items), which means that it has contributed to promoting document delivery among domestic libraries. In particular, users can receive materials within two or four days.

Management of Papers and Computerized Work

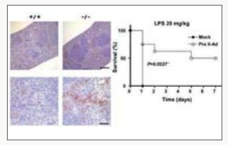
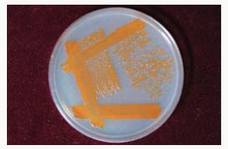
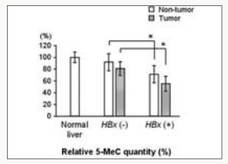
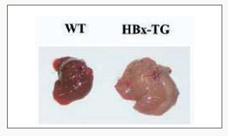
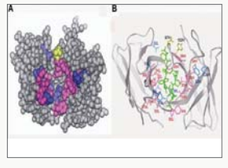
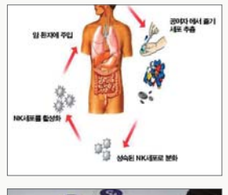
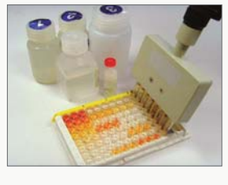
In deciding promotion and assessing personal performance, every paper published by researchers has been managed with a special program (MIS) according to the criteria for paper assessment. The program is used for registering and inputting papers, building a full-text database, checking SCI and IF, issuing statistical data, reporting the results in and out of the KRIBB, providing a service for web users, and publishing references(SCI reference materials, vol. 5, in Aug.). Every process has been through the computer for managing papers and books, requesting for copies DDS, and paying copying fees.

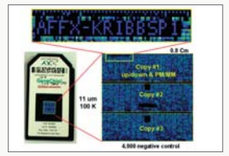
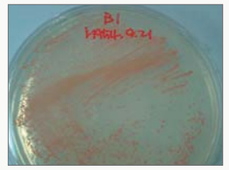
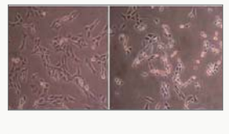
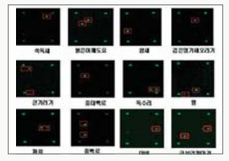
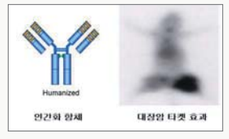
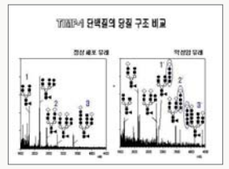
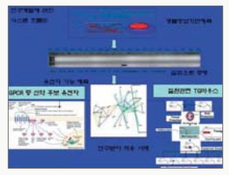
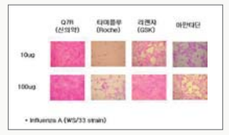


APPENDICES

> Outstanding Research Achievements
> List of Patents Registered Overseas
> List of Technology Transfer
> List of Research Projects
> Events
> Researcher Index
> Location

Outstanding Research Achievements

Date	Substance	Researcher	Note	Images
2007-01-12	Mobile liver diagnosis system	Bong Hyun Chung	- A new technology for diagnosing the liver by connecting a biosensor to the mobile phone for real-time monitoring of liver patients, and a representative model of the ubiquitous healthcare system of the future.	
2007-03-05	Verification of the function of host antioxidant enzyme effective against endotoxin	Dae-Yeul Yu	- Verification of the role of host antioxidant enzyme resistant against inflammation response to LPS. - Published in *Journal of Experimental Medicine* (2007. 03)	
2007-03-13	The top in the world for the last three years in the publication of novel bacterial species	Jung-Hoon Yoon	- Korean scientists published twenty percent of novel bacterial species described in 2006. - Published in *Int. J. Syst. Evol. Microbiol.* (2006. 01)	
2007-05-03	Identification of a new molecular mechanism in the development of liver cancer by the hepatitis B virus	Young Ik Lee	- We verified that the hepatitis B virus-X protein deregulates DNA methyltransferase and promotes both specific regional hypermethylation and global hypomethylation involved in the formation of hepatocellular carcinoma. - Published in *Gastroenterology* (2007. 04)	
2007-05-14	Verification of the mechanism of hepatic steatosis by hepatitis B virus	Dae-Yeul Yu	- Verification that the molecular mechanism hepatitis B virus induces hepatic steatosis - Published in *Gastroenterology*(2007. 05)	
2007-05-16	Elucidation of the mechanism for hepatitis virus neutralization	Seong Eon Ryu Hyo Jeong Hong	- Explaining the type B hepatitis virus neutralization mechanism through three dimensional structure determination. - Published in *PNAS*(*Proc. Natl. Acad. Sci. USA*)(2007. 05)	
2007-06-08	Approval for a research-based clinical trial of NK cell therapy	Inpyo Choi	- Clinical trial for leukemia/tumors using NK cells differentiated from HSC. It will be applied to haploidentical family patients to prevent recurrence of leukemia/tumor after bone marrow transfer. - USA patent (pending, 2007)	
2007-08-07	Development of a diagnostic tool for gastric cancer using a protein biomarker	Hee Gu Lee	- Development of a diagnostic and prognostic technology for stomach cancer using a small blood sample. - Published in *International J. of Cancer* (2007. 02)	

Date	Substance	Researcher	Note	Images
2007-08-15	Construction of systematic deletion mutants of Schizosaccharomyces pombe and its applications to a drug-target screening system	Kwang-Lae Hoe	- A *S. pombe* deletion project has been completed, and a drug-target screening system has been setup using the deletion library.	
2007-08-29	Worldwide first isolation of archaebacteria from food	Jin-Woo Bae	- Worldwide first isolation of archaebacteria from food (Korean shrimp jeotgal). - The first case of novel archaeabacterial species in Korea. - Published in *IJSEM* (2007. 09)	
2007-08-30	Mining of drug targets by phosphoproteomic analysis during neuronal cell death	Sang Chul Lee Kwang-Hee Bae	- Mining of drug targets toward neurodegenerative diseases by phosphoproteme profiling during neuronal cell death. - Published in *Proteomics*(2007. 08)	
2007-11-08	Development of the DNA chip for the identification of bird species	Chang-Bae Kim	- Development of an oligonucleotide chip based on the DNA barcode records for the identification of bird species including migratory birds.	
2007-11-26	Development of a humanized antibody to TAG-72	Hyo Jeong Hong	- Humanized antibody to TAG-72 was constructed and its tumor targeting efficacy and biodistribution were studied.	
2007-11-28	Discovery of a highly sensitive cancer biomarker qualita-tively altered during cancer progression	Jeong-Heon Ko	- GnT-V directs cancer malignancy by inducing an aberration of TIMP-1 glycan, and accordingly the aberrant TIMP-1 can be a prominent cancer biomarker. - Published in *Molecular & Cellular Proteomics* (2007. 12)	
2007-12-13	Programs and databases for tissue-specific alternative splicing gene, novel GPCR classification	Cheol-Goo Hur	- The tissue specific genes expressed in human and mouse tissues are predicted using bioinformatics and proved by experiment. This method is a fusion technology of BT and IT and enables us to find out the candidate target genes of new drugs. - Published in *Computational Biology and Chemistry*	
2007-12-26	New anti-influenza compound	Dur-Han Kwon	- New anti-influenza compound (Q7R) isolated from natural plant shows broad protection against several type of viruses including influenza viruses.	

List of Patents Registered Overseas

Title of patent	Date	Inventors	Country
Transformant of yeast producing recombinant human parathyroid hormone and method for producing said hormone	2007-02-01	Hyun Ah Kang et al.	Germany
Insecticidal compositions comprising compound having inhibitory activity versus CoA: cholesterol acyltransferase	2007-02-09	Young Kook Kim et al.	Russia
Composition containing cinnamic acid derivatives for preventing or treating elevated blood lipid level-related diseases	2007-04-03	Song Hae Bok et al.	Canada
Transformant of yeast producing recombinant human parathyroid hormone and method for producing said hormone	2007-04-15	Hyun Ah Kang et al.	Spain
Transformant of yeast producing recombinant human parathyroid hormone and method for producing said hormone	2007-05-18	Hyun Ah Kang et al.	Japan
Esterase, its DNA overexpression and production of optically active aryl propionic acids using the same	2007-05-29	Bong Hyun Chung et al.	U.S.A.
A peroxidase genomic gene derived from *Ipomoea batatas* and a promoter thereof	2007-07-04	Sang Soo Kwak et al.	Europe
Poly-gamma-glutamate having ultra high molecular weight and method for using the same	2007-07-04	Jae Jun Song et al.	China
Transformant of yeast producing recombinant human parathyroid hormone and method for producing said hormone	2007-07-17	Hyun Ah Kang et al.	U.S.A.
Method for the diagnosis of cancers by measuring the changes of Glycosylation of proteins related to tumorigenesis and metastasis and kit for diagnosis of cancers using the same	2007-07-19	Jeong Heon Ko et al.	Australia
Pharmaceutical compositions of diaryl-isoxazole derivatives for the prevention and treatment of cancers	2007-07-31	Byoung-Mog Kwon et al.	U.S.A.
Hansenula polymorpha yapsin deficient mutant strain and process for the preparation of recombinant proteins using the same	2007-08-28	Hyun Ah Kang et al.	U.S.A.

List of Technology Transfers

Name of Technology	Date	Director	Company
High expression vector(pcDCM-dhfr)	2007-01-25	Hyo Jeong Hong	Celldex Therapeutics,Inc.
Microbial consortia for the treatment of industrial wastewater containing chlorinated organic compounds	2007-04-02	Hee-Mock Oh	Korea Organic Farming Development Corp.
Production of biosurfactant for the treatment of waste-petroleum	2007-04-02	Byung Dae Yoon	Korea Organic Farming Development Corp.
Method for cloning and expressing target genes by homologous recombination	2007-04-26	Seung Goo Lee	SolGent Co., Ltd.
Hybridomas producing mouse monoclonal antibidy HBV pre S1	2007-07-16	Hyo Jeong Hong	Santa Cruz Biotechnology Inc.
Development of a diagnostic tool for gastric cancer using protein biomarkers	2007-08-07	Hee Gu Lee	Hanrib Lifetech Inc.
The high expression vector system in mammalian cells	2007-10-02	Youngwoo Park	Hanswha Chemical Corp.
Humanized antibody to TAG-72	2007-11-15	Hyo Jeong Hong	Viromed Co., Ltd.
Screening method of agents inducing apoptosis and development of RhoY as an anti-cancer drug	2007-11-15	Mi Sun Won Hwan Mook Kim	Seoulpharma Co., Ltd.
Phaffia rhodozyma mutant strains with improved astaxanthin-extractability and the method of astaxanthin extraction therefrom	2007-11-16	Eui Sung Choi	Seohae E&T Co., Ltd.
Novel bifunctional P450 hydroxylase isolated from the metagenome library	2007-11-23	Jong-Seog Ahn	Genotech Co., Ltd.
Enzymatic production of biodiesel	2007-11-27	Jung Hoon Sohn	Daekyung Esco Co., Ltd
Production strain & scale-up process development of B-glucosidase using recombinant DNA technology	2007-11-27	Joon-Ki Jung	EnzBank Co., Ltd
Application of MIG12 and OIP5 as novel targets in cancer therapeutics	2007-12-03	Mi Sun Won	Samchully Pharm. Co., Ltd
Programs and databases for tissue-specific alternative splicing gene, novel GPCR classification	2007-12-05	Cheol-Goo Hur	WithUSTech. Co., Ltd. SC&T Inc.
Technologies for the production of geldanamycin derivatives by biosynthetical modification	2007-12-18	Young-Soo Hong	Pharmaceutical Co., Ltd.
Natural compound having an antiviral effect	2007-12-18	Dur-Han Kwon	Kolon Life Science Inc.
Cellular signaling detection technology	2007-12-18	Seong Eon Ryu	Abfrontier

List of Research Projects

Projects funded with over 0.1million(USD) are listed

<Fund Source>

- KFDA : Korea Food & Drug Administration
- KRCF : Korea Research Council of Fundamental Science & Technology
- MAF : Ministry of Agriculture and Forestry
- MOE : Ministry of Environment
- MOHW : Ministry of Health & Welfare
- MOICE : Ministry of Commerce Industry and Energy
- MOMAF : Ministry of Maritime Affairs & Fisheries
- MOST : Ministry of Science & Technology

Project Title	Project Manager	Fund	Period
A project to establish of a biosafety information infrastructure as a focal point of BCH	Ho-Min Jang	MOICE	07.01 - 07.12
Development of salt tolerant bioenergy crops by utilizing salt-inducible genes from marine cyanobacteria	Jang Ryol Liu	MOMAF	07.01 - 07.12
Purification and characterization of recombinant proteins from transgenic pig milk	Bong Hyun Chung	MAF	07.01 - 07.12
The development of an oligo chip for the diagnosis of viruses	Jae Sun Moon	MAF	07.01 - 07.12
Study of the action mechanism of anti-diabetic drugs by transcriptome profiling	Young Il Yeom	KFDA	07.02 - 07.11
Development of short/medium term models for garcinogenicity testing	Hyoung-Chin Kim	KFDA	07.03 - 07.11
DNA microarray-based identification of target genes for the drug action of evodia officinalis and curcuma longa	Young Il Yeom	KFDA	07.03 - 07.11
Development of biomaterials for cosemeceuticals from the bio-resources of Jeju Island	Jong-Pyung Kim	MOICE	07.03 - 08.02
NMR and statistical physics approach to characterize the structural state and functional motifs of unstructured proteins	Kyou-Hoon Han	MOST	07.03 - 08.02
A study on the characterization and quality control of nanomaterials	Bong Hyun Chung	KFDA	07.04 - 07.11
Detection of developmental abnormalities in cloned gnotobiotic pig fetus during gestation	Deog-Bon Koo	MAF	07.04 - 07.12
Development of bioinformatics tools for isolation of a useful promoter from *Solanaceae* genome information	Jung Mee Park	MAF	07.04 - 07.12
Practical use of induced resistance compounds derived from endophytic and soil microorganisms	Choong-Min Ryu	MAF	07.04 - 07.12
A study on the mode of action for a RhoB-modulating anti-cancer drug candidate	Mi Sun Won	MOST	07.04 - 08.03
An integrated information bank for microbial genome research	Jihyun F. Kim	MOST	07.04 - 08.03
CO2 fixation by cyanobacteria and production of high-value biomaterials from their biomass	Hee-Mock Oh	MOST	07.04 - 08.03
Complex natural plants therapeutics for the treatment of hepatitis	Young Ik Lee	MOST	07.04 - 08.03
Construction and utilization of plant EST DB	Cheol Goo Hur	MOST	07.04 - 08.03
Construction of polyketide biosynthesis diversity and development of pharmaceutical microbila metabolit	Jong-Seog Ahn	MOST	07.04 - 08.03
Construction of polyketide biosynthesis diversity and development of pharmaceutical microbila metabolit	Jae Gu Pan	MOST	07.04 - 08.03
Construction of a seed bank of wild and endangered species in Korea	Joong-Ku Lee	MOST	07.04 - 08.03
Development of a diagnostic tool for gastric cancer using protein biomarker	Hee Gu Lee	MOST	07.04 - 08.03
Development of environmental risk assessment technologies of living modified organisms	Sung-Uk Kim	MOST	07.04 - 08.03
Development of an HTS drug-target screening system using haploinsufficiency	Kwang-Lae Hoe	MOST	07.04 - 08.03
Development of active compounds for lipid lowering	Young Kook Kim	MOST	07.04 - 08.03
Development of analytical methods for LMOs	Hwan Mook Kim	MOST	07.04 - 08.03
Development of anticancer drug candidates by rational biosynthesis of geldanamycin	Young-Soo Hong	MOST	07.04 - 08.03
Development of astaxanthin hyperproduction strain by a functional genomic and pathway engineering approach	Eui Sung Choi	MOST	07.04 - 08.03
Development of biological products for monitoring bio-medical functions using highly sensitive biosystems	Hee Gu Lee	MOST	07.04 - 08.03
Development of cyanocrops by utilizing photosynthetic syanobacterial genes	Jang Ryol Liu	MOST	07.04 - 08.03
Development of a deposit and application systems for biological data	Bo Kyeng Hou	MOST	07.04 - 08.03
Development of detection system for HCC markers	Eun Young Song	MOST	07.04 - 08.03
Development of fully human monoclonal antibodies against a novel target for cancer therapeutics	Sang Seok Koh	MOST	07.04 - 08.03
Development of functional genome resources for gastric and liver cancers and construction of their database combined with function information	Nam-Soon Kim	MOST	07.04 - 08.03
Development of a Korean hapMap database	Young Joo Kim	MOST	07.04 - 08.03
Development of LMO risk assessment systems on human health	Hyoung-Chin Kim	MOST	07.04 - 08.03
Development of molecular biological tools for the strain improvement of succinic acid producing Mannheimia succiniciproducens	Ohsuk Kwon	MOST	07.04 - 08.03
Development of multi-conditional sylanase from insect microbial genomes	Ho-Yong Park	MOST	07.04 - 08.03

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Project Title	Project Manager	Fund	Period
Development of new antibacterial compounds against novel targets derived from microbial genomics	Won-Gon Kim	MOST	07.04 - 08.03
Development of nutraceuticals and biologically active compounds for cancer therapy	Byoung-Mog Kwon	MOST	07.04 - 08.03
Development of nutraceuticals to improve erectile dysfunction, to protect liver function, and to potentiate tumor immunotherapy from indigenous acanthopanx sp.	Jung Joon Lee	MOST	07.04 - 08.03
Development of platform technology for natural killer cells differentiation from hematopoietic stem cells	Inpyo Choi	MOST	07.04 - 08.03
Development of a protein production system and protein design for bio-electrical devices	Moonil Kim	MOST	07.04 - 08.03
Development of a somatic cell clone monkey	Kyu-Tae Chang	MOST	07.04 - 08.03
Development of technologies for mass production and in vitro plant regeneration of useful aquatic plant resources by tissue culture	Suk Weon Kim	MOST	07.04 - 08.03
Development of a transgenic plant capable of producing an edible vaccine against Alzheimer's disease	Hyun Soon Kim	MOST	07.04 - 08.03
Diagnostic target identification for gastric cancer using nucleic acid biomarkers	Yong Sung Kim	MOST	07.04 - 08.03
Discovery and development of functional microorganisms	Jung Hoon Yoon	MOST	07.04 - 08.03
Disease specific biomarker discovery by using serum	Seong Eon Ryu	MOST	07.04 - 08.03
DNA barcode system for the conservation and management of major organisms from Korea	Chang-Bae Kim	MOE	07.04 - 08.03
DNA chip-based analysis of the dynamics of the genetic network controlling the calcium metabolism in mammalian systems	Young Il Yeom	MOST	07.04 - 08.03
Enhancement of plant comoplex resistance and growth rate by manipulating membrane signal transduction	Stephen Beungtae Ryu	MOST	07.04 - 08.03
Establishment of a centralized bank for animal cells including frozen embryos	Ki-Hoan Nam	MOST	07.04 - 08.03
Establishment of a plant extract bank	Hyeong Kyu Lee	MOST	07.04 - 08.03
Evaluation of anticancer activity, pharmacokinetics, and preliminary toxicity of anticancer drug candidates targeting RhoB	Song-Kyu Park	MOST	07.04 - 08.03
Exploitation of extremophiles and metagenomes	Chang Jin Kim	MOST	07.04 - 08.03
Functional analysis of the pathogen-associated molecular patterns and effectors of Burkholderia glumae causing bacterial grain rot in rice, and the development of disease control methods by the surveillance mechanism of rice against pathogen	Jae Sun Moon	MOST	07.04 - 08.03

Project Title	Project Manager	Fund	Period
Identification and validation of biomarkers for the HCC	Jeong Heon Ko	MOST	07.04 - 08.03
Identification of molecular targets for the targeted therapy of hepatocellular carcinoma and their application to therapeutics development	Young Il Yeom	MOST	07.04 - 08.03
Integrated functional genomics on the regulatory network of protein secretion and modification in yeast: functional and genomic analysis of the protein quality-control network	Hyun Ah Kang	MOST	07.04 - 08.03
Integrated system of national biological resources and genome information	Jong Hwa Bhak	MOST	07.04 - 08.03
KRIBB technology transfer office project	Joon-Ki Jung	MOICE	07.04 - 08.03
Live imaging technology for interaction network in living cells	Seung-Goo Lee	MOST	07.04 - 08.03
Management of the application of bio R&D products	Jung-Sook Lee	MOST	07.04 - 08.03
Management fund for the Center for Functional Analysis of Human Genome	Dong Soo Im	MOST	07.04 - 08.03
Microbial resources bank	Jung-Hoon Yoon	MOST	07.04 - 08.03
Molecular function of DRG9 in cancers and its validation as a molecular target for drug development	Jung Joon Lee	MOST	07.04 - 08.03
National Cosmeceutical Research Center	Ick-Dong Yoo	MOHW	07.04 - 08.03
Project for the management of the PDRC program	Hyouk Joung	MOST	07.04 - 08.03
Project for the management of the MGAC program	Tae Kwang Oh	MOST	07.04 - 08.03
Spatio-temporal bio-imaging of the calcium signaling system	Ki Sun Kwon	MOST	07.04 - 08.03
Study of the co-regulation of a disease specific metabolome with proteome and genome	Sung Goo Park	MOST	07.04 - 08.03
System development of biological markers for the diagnosis and cure of cerebrovascular diseases	Young Joo Kim	MOST	07.04 - 08.03
Target discovery of hepatocarcinoma using hepatitis virus transgenic mouse and clinical validation	Sang Chul Lee	MOST	07.04 - 08.03
Target identification by genome and proteome analysis	Dong Cho Han	MOST	07.04 - 08.03
Target validation and therapeutic antibody development using the cancer genomic databases	Youngwoo Park	MOHW	07.04 - 08.03
The application of a novel gene associated with tumor growth and metastasis for the treatment of liver cancer	Cho-Rok Jung	MOST	07.04 - 08.03
The international tomato chromasome 2 sequencing project and functional analysis for solanaceae genomes	Cheol Goo Hur	MOST	07.04 - 08.03

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Project Title	Project Manager	Fund	Period
Therapeutic Antibody Center	Hyo Jeong Hong	MOHW	07.04 - 08.03
Analysis of microbial genome function of a plant-probiotic bacillus and its application	Seung Hwan Park	MOST	07.04 - 08.04
Management of plant diseases by induced systemic resistance	Choong-Min Ryu	MAF	07.04 - 08.04
Development of nutraceuticals improving dyslipidemia and respiratory inflammation using old platycodi radix	Hyun Sun Lee	MAF	07.05 - 07.12
Enzyme platform for the production of cellulosic bioethanol	Jung-Hoon Sohn	MAF	07.05 - 08.05
Human and environmental risk assessment of transgenic crops	Stephen Beungtae Ryu	MOST	07.06 - 08.03
Development of insecticide and antimicrobial agent using microbes	Chang-Jin Kim	MAF	07.06 - 08.06
Genomics and proteomics approaches to drug candidates for the mode of action	Byoung-Mog Kwon	MOST	07.07 - 08.03
Biocatalyst technology innovation: development of in silico based integrative directed evolution technology	Jae Gu Pan	KRCF	07.07 - 08.06
Development and application of glycan chips for diagnostics and high-throughput screening	Hyun Ah Kang	KRCF	07.07 - 08.06
Development of next-generation glycan control systems for glycan remodeling	Hyun Ah Kang	MOICE	07.07 - 08.06
Glycomic approach for the search of cancer biomarkers	Jeong Heon Ko	KRCF	07.07 - 08.06
Interfacing of nanostructure/biomolecule and its applications	Bong Hyun Chung	MOICE	07.07 - 08.06
Regional innovation system for Deajeon biotechnology	Joon-Ki Jung	MOICE	07.07 - 08.06
Support program for policy & information of biotechnology	Byung Hwan Hyun	MOST	07.07 - 08.06
Anti-metastasis therapeutic antibody development	Hyo Jeong Hong	MOST	07.07 - 08.07
Construction of fully human monoclonal antibody for the treatment of lung cancer	Youngwoo Park	MOST	07.07 - 08.07
Developing protein biosensor by engineering of hormone nuclear receptors	Eui-Jeon Woo	MOST	07.07 - 08.07
Development of protein chip-based bioassay system and biological contents for protein chip applicaion	Bong Hyun Chung	MOST	07.07 - 08.07
Development of targets and preclinical drugs for the tailored therapy of gastric cancer	Nam-Soon Kim	MOST	07.07 - 08.07
Development of transgenic cloned pigs for xenotransplantation	Kyung-Kwang Lee	MOST	07.07 - 08.07
Discovery and functional analysis of new anti-cancer target genes using DNA methyltransferase inhibitors	Bo-Yeon Kim	MOST	07.07 - 08.07
Establishment of lung cancer model mice vulnerable to oxidative stress and elucidation of the related mechanisms	Dae-Yeul Yu	MOST	07.07 - 08.07
Mechanistic studies and therapeutic applications of a new apoptosis-inducing biofactor	Sangseok Koh	MOST	07.07 - 08.07
System development for single-cell assay and molecular evolution of functional biocatalysts	Seung Goo Lee	MOST	07.07 - 08.07
Development of cancer targeting biomolecules and their immobilization methods on nanoparticles	Bong Hyun Chung	KRCF	07.08 - 08.06
Development of a point-of-care testing platform using FRET-based nanosensors	Seung Goo Lee	MOST	07.08 - 08.07
Development of a portable instrument to assess safety of water and agricultural products based on single cellular bio-sensors	Jang Ryol Liu	MOST	07.08 - 08.07
Platform engineering center for industrial utilization of protein resources	Jae Gu Pan	MOICE	07.08 - 08.07
Designer's synthetic biotechnology cluster	Jae Gu Pan	MOST	07.08 - 08.08
Development of asthma-related biomarkers based on functional genomics and proteomics	Hyeong Kyu Lee	KRCF	07.09 - 08.06
Proteome analysis of metabolism related proteins for new secondary metabolite synthesis	Byoung Chul Park	MOICE	07.09 - 08.08
Development of nano-probes for gastric cancer cell surface markers and their application to a cell microchip	Min-Gon Kim	MOST	07.10 - 08.09
Genome-wide epigenomic profiling of human embryonic stem cells	Yong Sung Kim	MOST	07.10 - 08.09
System development for application of genomic sequence information	Hong-Seog Park	MOST	07.10 - 08.09
Development of a bio-system for the optimization of label free molecular imaging technology	Sang Jeon Chung	MOST	07.11 - 08.07
Development of a non-human primate embryonic stem cell using interspecies nuclear transfer	Deog-Bon Koo	MOST	07.11 - 08.07
Identification of a genetic marker associated with Korean medicine by genome-wide SNP genotyping	Yong Sung Kim	MOST	07.11 - 08.07
Study of the redox-mediated cell signaling network	Ki Sun Kwon	MOST	07.11 - 08.07

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Events

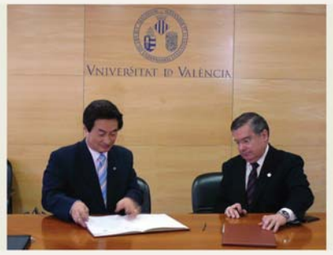
2007
KOREA RESEARCH INSTITUTE of BIOSCIENCE & BIOTECHNOLOGY

2007-06-15
Visit by the Vice Chancellor of the University of Western Australia

2007-07-03
Visit by the President of the Arab Science & Technology Foundation (ASTF)

2007-07-09
Visiting of INBio delegation, Costa Rica

2007-01-23
Signing of an MOU with the Consortium for the Barcode of Life (CBOL)



2007-02-12
Signing of an MOU with the University of Valencia, Spain

2007-03-09
Visit by the President of CNRS, France

2007-09-10
Visit by Merck representatives

2007-10-04
Daejeon-KRIBB-FHCRC Joint Symposium

2007-10-05
KRIBB-ITRI (Taiwan) Joint Symposium

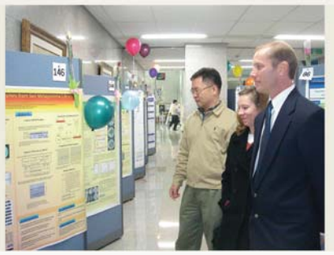
2007-05-07
Participating in 'BIO 2007' (Boston), the world's greatest Bio exposition

2007-05-31
KRIBB-BIOTEC (Thailand) Joint Symposium

2007-06-14
Signing of an MOU with Pfizer Inc.

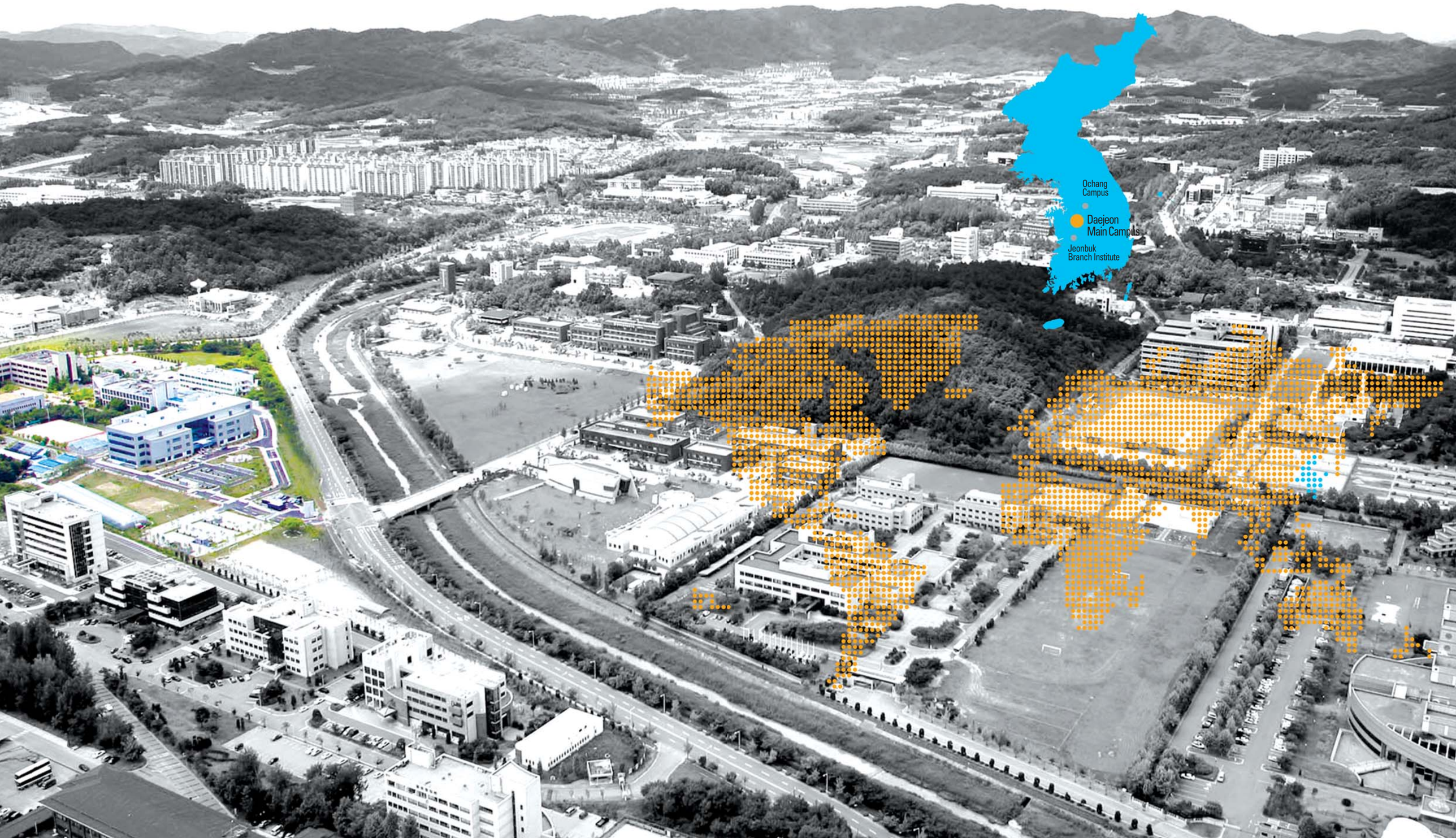
2007-10-08
Participating in the HUPO 6th Annual World Congress (Seoul, Korea)

2007-11-01
The 6th Osong International Bio-Symposium (Osong, Korea)



2007-11-07
The 1st KRIBB Poster Festival

Location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