

www.biotechcenter.org

Better future for all

POSTECH Biotech Center



POSTECH Biotech Center

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The POSTECH Biotech Center

a ray of light brightening up the future.

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I. About PBC

POSTECH BIOTECH CENTER (PBC) - The research center for life sciences and technology

POSTECH Biotech Center (PBC) was founded in 2000 with a generous funding from POSCO to promote the bio-industry and welfare of the human kind utilizing the competitive infrastructure of POSTECH and new information and technologies generated and/or adapted by POSTECH.

The primary goal of PBC is incubating disruptive technologies in biology, chemistry and material science areas including immunology, pharmaceuticals, and nanobiotechnology. PBC has contributed to explore molecular level understandings of lives and to translational researches based on the knowledge. Moreover, PBC participates in the education of students and researchers and in nurturing venture companies trying to create new values using POSTECH's technologies.

Currently, the PBC plays a leading role in the development of a new platform of drug development. PBC, POSTECH and the government are trying to establish 'a structure-based drug design platform' which facilitates the development of drug candidates targeting membrane proteins. For this purpose, we are building up a new group determining three-dimensional structures of membranes proteins and designing drug candidates based on the structure. The PAL-XFEL facility built in POSTECH in 2016 will be actively used in this project.

■ Mission and Strategy

Mission

- To conduct high impact researches in biotechnology
- To transfer research results to industries for creating high value addition
- To direct POSCO's future diversification into bio-industry
- To contribute to the nation's biotech R&D by establishing a world class biotech center
- To develop a key technology which can bridge the POSCO Bio Health Care business
- To Contribute to the POSTECH & CATHOLIC university
 - By creating profits by developing new drugs and high-tech biomedical devices
 - By training future leaders in biotechnology and bio-industry

Strategy

- By Materializing short-term success from mature projects;
- By focusing on core areas of research for efficient resource planning;
- By creating major impacts on science and social benefit from innovative projects;
- and
- By developing continuous pipelines of major technologies through platform research support programs



■ Chronology

Nov. 20, 2000	POSTECH Biotech Center established in cooperation between POSTECH and POSCO and Professor Chi-Bom Chae appointed as the first Director of PBC on Nov. 21, 2000
Oct. 16, 2003	PBC Building completed and Opened
Jul. 23, 2004	Cooperation agreement entered with National Cancer Center
Feb. 22, 2005	POSTECH-CATHOLIC Biomedical Institute established
Sep. 01, 2005	Professor Sung Ho Ryu appointed as the second Director
Feb. 06, 2006	Bio diagnosis Initiative (Aptamer) group formed
Feb. 16, 2006	Hosted 'Pohang Bio festival 2006'
Apr. 24, 2006	NSB POSTECH founded (Biochip Initiative) as the 1st University Venture business
Dec. 22, 2006	Collaboration agreement with Agricultural Technology Institute of Gyeongbuk Province
Mar. 18, 2008	NSB POSTECH entered with cooperation with Fred Hutchinson Cancer Research center of USA
Mar. 01, 2009	Professor Young Chul Sung appointed as the third Director
Sep. 30, 2009	Workshop organized by POSTECH and National Cancer Center
May 10, 2010	Research achievement report to the POSTECH foundation for 10 years of PBC establishment
Aug. 01, 2011	Establishment of PBV BIO company
Nov. 22, 2011	Report of the PBV fund status to the president of POSCO
Mar. 01, 2013	Professor Yoon Keun Kim appointed as the fourth Director
Nov. 08, 2013	Held the POSTECH-AMC R&D Partnering Symposium
Mar. 01, 2014	Professor Sung Key Jang appointed as the fifth Director
May 16, 2015	Remodeling construction of the 5th floor Animal Facility completed and facility operation started
Jan. 2016	KGMP (Korea Good Manufacturing Practice) facility established in the POSTECH Biotech Center, Room #283
Jan. 2016	Starting ANITI Germ Free experimental animal breeding (Prof. Charles D. Surh / IBS campus research team)

■ Resources & Infrastructures

Human Resources (243)

Professor	Post-Doc.	Graduate Student	Undergraduate Student	Research Staff	Etc.	Total
27	19	119	1	33	47	243

Building & space (14,154 m²)

Conventional Animal Room (462m²)

POSTECH Biotech Center (14,154 m²) including

- SPF & P3 Animal Room (2,100 m²)
- Radioisotope Room, Clean Room, Green House

Life Sciences Building (7,500 m²) including

- SPF Animal Room (980m²)

II. Core Research Fields

POSTECH Biotech Center, having selected three core areas: Molecular Medicine, Plant Biotechnology, and Nano Biotechnology, is focusing its major resources on them with a goal in mind to grow into a world class research institute in biotech field.

Members of the Center are not only identifying new drug candidates by unveiling relevant proteins and genes, but developing new plants of high immunity for enhanced food supply and eco-friendly energy. Also, application of nanotechnology for the early diagnosis of various diseases has been studied.

Core Research Fields

Molecular Medicine

Research to develop medicine by identifying protein or gene valuable to our body.

Molecular medicine are engaged in developing new technologies and materials useful for the prevention, diagnosis and treatment of 'hard to cure' diseases by integrating new discoveries made on a molecular and cellular level in life phenomena and diseases. Representative projects currently in progress include the developments of immuno-therapeutic vaccines against hepatitis B and C virus, HIV/AIDS, immune modulators with new functions, diabetes and obesity controllers of new concept, and therapeutics for brain diseases such as Alzheimer's disease.

Especially, immunotherapeutic technology, in which the killer T-cells of humans are used to eradicate germs or virus, is a next generation technology that can be applied in the treatment of chronic diseases complementing the existing chemotherapies.

In case of the immuno therapeutic vaccines against hepatitis B virus, the project is entering the initial stage of clinical trial and preparing the commercialization in cooperation with a leading pharmaceutical company.

Successful commercialization of such therapeutic vaccine will relieve about 300 million people around the world from sufferings from type B chronic hepatitis.

Plant Biotechnology

Development of plants having high immunity for new food and eco-friendly energy.

The filed of plant biotechnology aims to establish techniques that aid biomass production and enhanced crop productivity. For that, we are focused on the signaling networks of various phytohormones such as cytokinin, auxin, brassinosteroid, abscisic acid, and salicylic acid. As well, we are also investigating epigenetic regulations of the induced resistance (e.g. priming) against various pathogen attacks in genome level. In addition, we are prompting to understand how legume plants develop the nodules for nitrogen fixation. The integrative analysis of these complex interactions among signaling cascades are comprehensively analyzed in our own interactome databse (PDNA) to understand the network of life.

Nano Biotechnology

Development of fast and accurate diagnostic technology for various diseases.

Research objective of the Nano-Biotechnology field is to understand the biological events in depth and to create tools needed for the studies of biology and medicine, and medical diagnosis and therapy, using the technology of nano science.

The bio-AFM research team has been keen on detecting of DNA, RNA, and protein biomarkers of subfemtomolar concentration and analyzing behaviors of single biomolecule, while the bio-analysis technology team is concentrat ing on developing microchips and bio-sensors used for the analysis of biological specimens and on analyzing single cells and single molecules. The nano bio-catalysis team is mainly interested in developing new synthetic catalysts and applying them to the synthesis of new bioactive materials.

Platform Technology

NanoCone Surface Coating Technology

NanoCones™ technology is an innovative surface coating technology for diagnostics and bioanalysis. Its most advantageous feature is its ability to precisely control regular spacing between biomolecules.

Immune Modulating Technology

Biological activity of common γ -chain cytokines such as IL-2 can be significantly enhanced by the complex with antibodies. Through this technology, T cells can be manipulated for the treatment of transplantation cancer and autoimmunity. Gem-Free (Axenic) animal facility.

Aptamer Platform Technology

Aptamer is an oligonucleotides of three-dimensional structure. Unlike commonly used Antibodies, Aptamer is a novel class of protein binders that offer unique benefits over Antibodies.

DNA Vaccination Technology

DNA vaccine is an engineered plasmid DNA designed to be delivered into muscles or skins of animals in order to induce (humoral and/or cellular) immune responses against encoded (viral or bacterial) antigens in the host.

Hybrid Fc Platform Technology

Hybrid Fc technology allows the generation of a long-acting agonistic protein by hybridizing with IgD (hinge-CH2) and IgG4 (CH2-CH3). This enables a fusion protein to have no cytolytic function, enhanced hinge fold flexibility, and elongated half-life.

NanoCone Enabled Atomic Force Microscopy

NanoCone Enabled Atomic Force Microscopy



NanoCone surface

- Rational approach for surface control
- Low nonspecific binding
- Enhanced accuracy and reproducibility

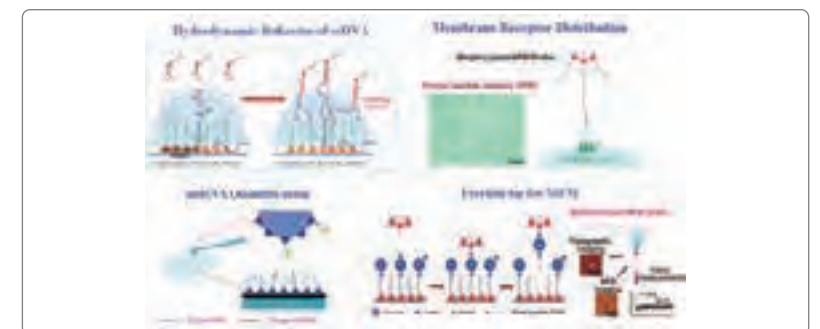
Atomic Force microscopy (AFM)

AFM is a powerful tool enabling the single molecule analysis with the superb lateral resolution and the accuracy.



Applications

- Interactions and Behaviors of Biomolecules
- Distribution of Biomolecules at the Nanoscale
- Single-molecule Attached AFM Probes
- Ultra-sensitive Detection of Biomarkers




● Immune modulating Technology

Immune Modulating Technology

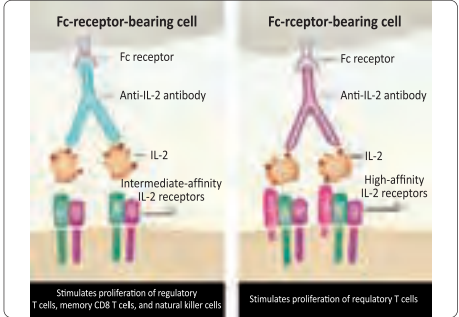
Basic Research

- Development & Homeostasis of naive & memory T cells
- Homeostasis between the immune systems and commensal bacteria
- Core Facilities
 - Germ-Free (Axenic) animal facility



Discovery of novel immune modulating targets

- Modulating T cell populations for treatment of cancer, autoimmune disease and transplantation
- Modulating biological activity of IL-2 differentially by IL-2/Ab complex

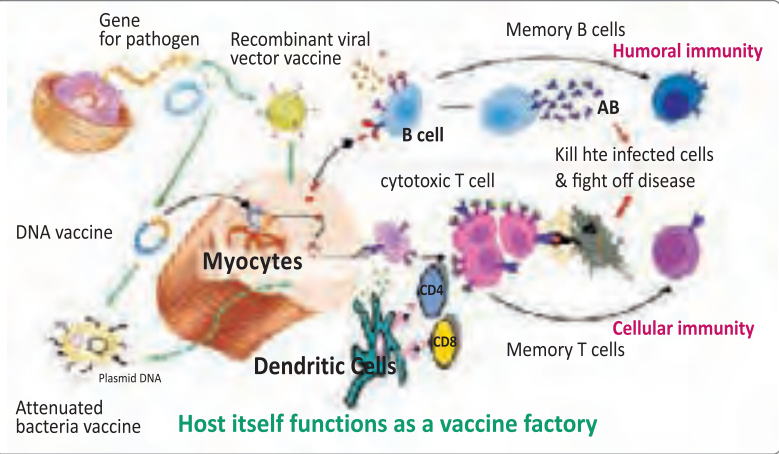


● DNA Vaccination Technology

DNA Vaccination Technology

Strength

- Safety
- Easy manufacturing
- Easy formulation of multivalent vaccines
- Induction of immune responses



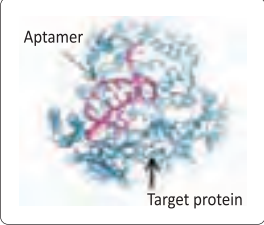
Additional technologies for improving the potency

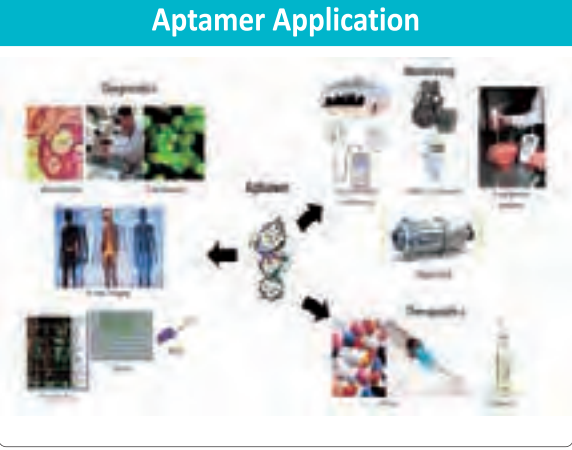
- Delivery: mucosal injection, electroporation
- Plasmid alteration: high expression vector, codon optimization
- Stability: encapsulation, formulation

● Aptamer Platform Technology

Aptamer Platform Technology

Aptamer is the next-generation bio-material which is stable, capable of binding to its target molecule with high affinity and specificity.





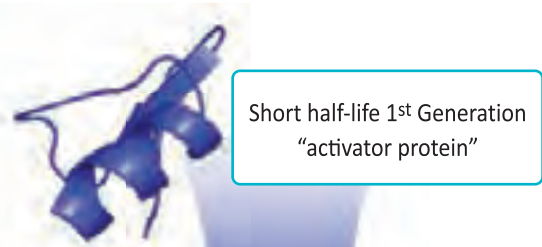
Aptamer Platform Technology

- Established proprietary aptamer-discovery platform/Advanced SELEX technology using modified nucleosides
- Quality controlled nucleotides synthesis, labeling and conjugation
- Unique functional assay solutions for drug discovery
- 200+ aptamers bank with strong focus on cellular membrane proteins/receptors
- Strong research & clinical networks


● Hybrid Fc Platform Technology

Hybrid Fc Platform Technology

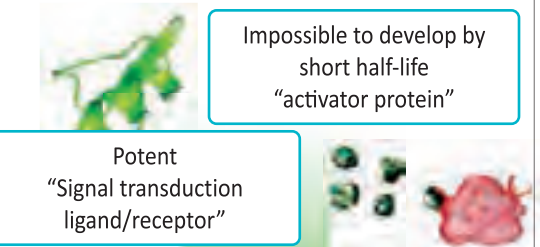
What is Hybrid Fc?
The next generation of long-acting Fc-region fusion technology by using natural form of hybrid Fc with high hinge flexibility and inhibiting the apoptosis of target cells by ADCC or CDC.



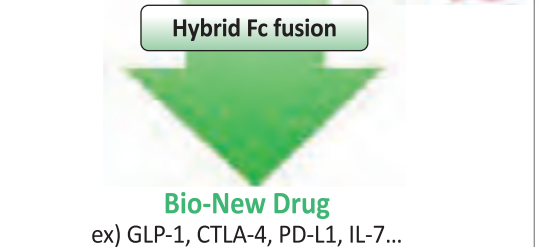
Short half-life 1st Generation "activator protein"



2nd generation Long-acting Bio-better
ex) EPO, G-CSF, hGH...



Impossible to develop by short half-life "activator protein"









Potent "Signal transduction ligand/receptor"

Hybrid Fc fusion

Bio-New Drug
ex) GLP-1, CTLA-4, PD-L1, IL-7...

III. Core Facilities

No.	Name of Facility	Model/Usages	Photo
1	In Vivo Microscope Combined confocal and multi-photon microscope	Model: TCS SP5 microscope Usage: Measurement of internal structures and morphology of cells	
2	NMR & LC-MS NMR: Nuclear Magnetic Resonance Spectroscopy LC-MS: Liquid Chromatography-Mass Spectrometer	Model: JMS-T100L(AccuTOF)	
3	T.E.M Transmission Electron Microscope	Model: JEM-1011 Usage: - Measurement of protein position and nano-structure - Observation of structure of macro proteins - Determination of protein localization inside a cell	
4	S.P.M Scanning probe Microscope	S.P.M UHV-VT SPM, BIO-AFM UHV-VT SPM (Model: Multiprobe S, VT AFM & STM 25 DRH) BIO-AFM (Model: Nanowizard Scanning Force Microscope in Life Science Version)	
5	MALDI TOF-TOF Bio-Molecular Diversity	MALDI TOF-TOF (Model: 4700 Proteomics Analyzer) ESI-MS (ESI-Mass Spectrometer), Model: Q-TRAP 2000 Usage: - Protein, peptide identification - MW determination	
6	Flow Cytometry FACS Calibur, Sorter	FACS Cytometry (Model: FACS Calibur) High Speed Cell sorter (Moflo-XDP)	

No.	Name of Facility	Model/Usages	Photo
7	DNA Sequencing	DNA Sequencer, Model: AB3730 DNA analyzer	
8	Cell Imaging TIRF Microscope, Confocal Microscope In Cell Analyzer	TIRM Microscope (Model: IMA 101010B0S004) Confocal Microscope (Model: LSM 510 Meta) In Cell Analyzer (Model: In Cell Analyzer 1000)	
9	Protein Analysis FT-IR spectrometer, Spectropolarimeter, DSC	FT-IR spectrometer (Model: Equinox 55) Spectropolarimeter Differential Scanning Calorimeter (Model: VP-DSC)	
10	Histopathology Tissue processor, Rotary microtome, Cryotome	Tissue processor (Model: shandon histocentre 3) Rotary microtome (Model: Finess ME) Cryotome (Model: CM1850)	
11	Bio-Chip Biochip fluorescent scanner, Microarrayer	Biochip fluorescent scanner (Model: GenePix 4000B), Microarrayer (Model: Q-array mini)	
12	Bio-MEMS Spinner system, Mask aligner, Laser micro machining, Wafer bonder	Spinner system (Model: Delta 50 T2/150) Mask aligner (CA-40TS), Laser micro machining (IX-100 193 nm Excimer laser for micro machining) Wafer bonder (TPS-1000M-AF)	

IV. Animal Room

Recently, research in the field of animal experiments has been expanding rapidly both in quantity and quality. Especially in the 21st century, a post-genomics era will begin with a breakthrough in the treatment of human diseases by understanding useful genetic information.

To this end, it is required to perform a variety of animal experiments in the preclinical stage.

In the post-genomics era, needs for animal experiments instead of humans will be more diversified.

Also in Korea, the importance of animal experiments is emerging and the demand for international level experiments is increasing.

PBC has established an up-to-date animal experiment system and can provide facilities and equipment for those who want to perform high level animal experiments.

Remodeling of the animal experiment lab. was started in November, 2014 and May 16, 2015, the lab(475m²) was completed.

And IBS campus research team bought and has been operating the animal breeding facility(IVC rack) and the special equipment (ANTI Germ free facility)

Overview of the research

In the animal experiment laboratory, researches now in progress include the signal transduction, mouse molecular genetics, T cell biology and the development of curing agent for chronic hepatitis B. Recently, germ free incubation facilities were built for advanced animal experiments.

Cultivation Capacities

Division		PBC			
		1st Floor	2nd Floor	5th Floor	Total
S	Total volume /cage(Heads)	2,086 (8,000)	2,520 (10,080)	1,636 (6,544)	6,242 (24,624)
	Working volume / cage(%)	1,400 (67%)	1,800 (71%)	1250 (76%)	4,450 (71%)
F	IVC Rack / set	19	24	21	64
Germ Free	Isolator for breeding/set	15	4	34	53
	Man Power / man	6	7	7	20

V. PBC Bio Ventures

PBC supported 5 Bio Venture companies by offering Labs, Facilities and Core Technologies

PBC Bio Ventures

Company	Foundation	Joint Prof.	Technology	Business Stage	Infra-Support	PBC Support
NB POSTECH	Feb. 2008	Park, Joon Won	NanoCone Surface Coating	Sales in the International Market, Collaboration with Major Hospitals and Dx Companies	HQ/Research Center	Technology Transfer / Research Support
Aptamer Sciences Inc.	Apr. 2011	Ryu, Sung Ho Jang, Sung Key	Modified DNA aptamers	Aptamer service revenue, IVD in clinical trial	HQ/Research Center	
Novacell Technology	Jun. 2000	Ryu, Sung Ho	Proteomics	Protein Analysis for Biosimilar	Research Center	
PanBioNet	Dec. 2001	Jang, Sung Key	HCV Activation Detecting	anti-HCV agent	HQ/Research Center	
AEON Medix	Sep. 2009	Gho, yong Song	Endoplasmic Reticulum Expression Tech.	On Developing	HQ/Research Center	



NB POSTECH

Address POSTECH Biotech Center 55 Jigok-ro, Nam-gu, Gyeongbuk, Korea
 Tel +82-54-279-8415 Fax +82-54-279-8419
 Homepage www.nbpostech.com CEO name Joon Won Park

NB POSTECH plans to develop, manufacture and market an advanced molecular diagnostics platform, the NanoCones System, that enables simple, low cost and highly sensitive genomic and protein testing on a single platform. Our proprietary nano-surface technology simplifies molecular diagnostic testing, achieves ultra-sensitive genomic and proteomic detection at limits beyond current diagnostic technologies, provides the ability to multiplex, or run multiple tests at the same time on the same sample, and enables the development of a broad menu of test assays to be performed on a single platform.

Core Technology

Proper lateral spacing for the biomolecules of **YOUR** interest

- DNA, RNA, PNA, LNA
- Protein
- Aptamer
- Carbohydrate
- etc...

• The spacing can be adjusted based on your needs.



Aptamer Sciences Inc.

Address #282, POSTECH Biotech Center, 77 Cheongam-ro, Pohang, Gyeongbuk, 37673, Korea
Tel +82-54-279-8691 **Fax** +82-54-279-8245
Homepage www.aptsci.com **CEO name** Ryu Sung Ho, Han Dongil



Aptamer Sciences is a biotech company focused on developing cutting-edge solutions for analysis of proteins. Aptamer Sciences is dedicated to commercialize broad applications of research, diagnosis and therapeutics, based on its proprietary aptamer technology platform.



Core Technology

- Advanced SELEX technology using modified nucleosides to generate aptamers more efficiently with superior binding affinity
- Post-SELEX optimization from truncation to functional ligand identification
- Various labelling/conjugation chemistry
- More than 1,500 clones library with strong focus in cellular membrane proteins/receptors
- Multi-variate index assay for diagnostic products

Products in development/service

- In vitro diagnostics for lung cancer (to be commercialized in early 2017)
- In vitro diagnostics for pancreatic cancer
- Insulin receptor agonists for diabetes therapeutics
- Cell/protein pull down kits
- Aptamer development/manufacturing services

Proprietary Aptamer Technology	Research Service provides short return	Diagnostics provides attractive biz model mid term	Therapeutics provides big opportunities long term
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PanBioNet

Address POSTECH Biotech Center 55Bun-gil, Jigok-ro, Nam-gu, Gyeongbuk, Korea
Tel +82-54-279-5992 **Fax** +82-54-279-8009
Homepage www.panbionet.com **CEO name** Ok Kyu Song

Panbionet provides two-hybrid analysis service and hepatitis c virus (HCV)-related technical services. The founders of Panbionet are famous for their scientific achievements in HCV-related researches and in yeast two-hybrid (Y2H) technology. Through the technical expertise of the Panbionet members, Panbionet provides yeast two-hybrid screening services and anti-viral drug screening systems for HCV-related diseases. Let Panbionet lead your research into the future with proteomics solution services.

Yeast two-hybrid technology

- Panbionet offers customized yeast two hybrid screening service to researchers who prefer to concentrate on their researches rather than engaging themselves in tedious, labor-intensive, experience-demanding Y2H screening.
- Panbionet also provides pair-wise Y2H test and protein interaction domain mapping by using Y2H technique.

Antiviral drug screening technology

- Panbionet uses a cell culture-based anti-HCV drug screening system for the detection of HCV replication inhibitor in vivo. Original HCV replicon technology of ReBLikon GmbH was licensed in, and improved HCV replicons are used for the chemical library screening and validation of candidate compounds.



Novacell Technology

Address POSTECH Biotech Center 55Bun-gil, Jigok-ro, Nam-gu, Gyeongbuk, Korea
Tel +82-54-223-2475 **Fax** +82-54-223-2474
Homepage www.novacelltech.com **CEO name** Taehoon Lee

NOVACELL Technology is POSTECH-based peptide R&D company and growing into global biotechnology company by developing biomedicines and functional biomaterials, based on peptide library and comparative proteomics technology.



Peptide Library technology

- Efficient method for discovering useful functional sequences of peptides from 206 diversity through around 150 screenings that play diverse roles in biological processes.
- Effective method to establish functional motif peptide library from cumulative comparative proteomics study



Core Technology

Proteomics Technology

- Establishment of leading-edge proteomics technology in global standard
- Identification of valuable drug targets/biomarkers and analysis of Biologics/Biosimilar products



AEON Medix

Address POSTECH Biotech Center 55Bun-gil, Jigok-ro, Nam-gu, Gyeongbuk, Korea
Tel +82-54-223-2130 **Fax** +82-54-223-2134
Homepage www.aeonmedix.com **CEO name** Jeon seong gyu



Create well being for all ages through jumping together(consilience) based on R&D focused on extracellular vesicles in nature.

Core Technology

- Antibacterial vaccines, Antiviral, anti-inflammatory, & anticancer vaccines
- Drug delivery system (DDS) using nucleated cell-derived artificial BNS (Bionanosome)
- Diagnostics using EV proteins or genome, EV antibody
- Therapeutics using lactic acid bacteria-, yeast- derived EV
- Pathogenic EV filtering system
- Disease models & drug screening system using pathogenic EV

