KOBE Biomedical Innovation Cluster

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Biomedical Innovation and New Industry Headquarters
KOBE CITY GOVERNMENT

November 2017
Location and Surrounding Environment

- **2h 50min**
  - By bullet train
  - Shin Kobe <-> Tokyo

- **Approx. 30min**
  - By fast boat
  - Kobe Airport <-> KIX

- **Approx. 1h 10min**
  - By air
  - Kobe <-> Tokyo Haneda
    - (10 round-trip flights/day)
Background

Launched as one of the disaster reconstruction projects

Death toll in Kobe City: approx. 4,600
Economic loss: 6.9 trillion yen (equivalent to city’s one-year GRP)
Mission

Dr. Hiroo Imura
President Emeritus
Foundation for Biomedical Research and Innovation

To create Japan’s first biomedical cluster

Establishing an R&D hub for highly advanced medical technology on Kobe’s Port Island

To construct a medical innovation system

Promoting translational research which bridges basic research and clinical application / commercialization

Research focus

- Creation of employment and revitalization of Kobe’s economy
- Provision of advanced medical treatment to the city residents
- Contribution to the improvement of medical standards in Asian countries
Kobe City Government and the Foundation for Biomedical Research and Innovation work together to lay the foundation for and promote cluster development.

Foundation for Biomedical Research and Innovation (FBRI)
- The Institute of Biomedical Research and Innovation (IBRI)
- Translational Research Informatics Center (TRI)
- R&D Center for Cell Therapy (RDC)
- Pro-Cluster Kobe (PCK)

President Tasuku Honjo M.D., Ph.D.
Progress

1998 (0 company)

2001 (18 companies)

2007 (125 companies)

2015 (316 companies)
Transition of Number of Companies and Employees

Companies: 344 (as of Sep. 30, 2017)
Employees: 9,200 (as of Jun. 30, 2017)

Estimate of economic impact
- Economic impact (bn yen) 40.9 104.1 125.1 153.2
- Tax revenue (bn yen) 1.3 3.5 4.5 5.3
Companies in KBIC

344 Companies (as of Sep. 2017)

Pharma

Boehringer Ingelheim
Oncolyx BioPharma
Carna Biosciences
SUCAMPO
Senju Pharmaceutical Co., Ltd.
Japan Blood Products Organization

Meiji Seika Pharma
Takeda Pharmaceutical
Mitsubishi Tanabe Pharma Corp.
Subio Pharma Co., Ltd.

Medical Device

Minato Medical Science Co., Ltd.
Asics
‘ToraY’ Innovation by Chemistry

Regenerative Medicine

Sumitomo Dainippon Pharma
Santen
Rohto
Kaneka
Kyocera
Organ Technologies Inc.

Takeda Pharmaceutical
Mitsubishi Tanabe Pharma Corp.
Senju Pharmaceutical Co., Ltd.
Otsuka Pharmaceutical Co., Ltd.
Meiji Seika Pharma

Yamato System Development Co., Ltd.
Sumitomo Bakelite Co., Ltd.
Kawasaki

Tei
Systmex
Advantages

Take the next leap forward in the Kobe Biomedical Innovation Cluster

**Commercialize your technologies and ideas in medical field**

**Kobe Support Platform for Promoting Medical Device Commercialization and Marketing**
Match needs from clinical site and seeds companies own, coordinate meeting with advisers

**KBIC networking event/workshop**
Great opportunities for business matching among healthcare-related companies and researchers
- Study Group for Regenerative Medicine
- Port Island Forum for Drug Development

**Accelerate R&D**

**Further opening up of new market**

**Joint participation in trade fairs in Japan and overseas**
Bio Japan, BIO tech (Tokyo)
BIO International Convention (U.S.)
MEDICA (Germany), Medical Japan (Osaka), etc.

**Designated as National Strategic Special Zone  May 2014**
Relaxation of regulations, Preferential tax/financial treatment

**Respond to various needs**
Rental labs/offices, facilities for temporary use (RI experiments, animal testing) are available. This makes it possible to conduct research or business by holding down initial investment.
Overview Map of the Cluster

- Kobe Minimally Invasive Cancer Center
- Hyogo Prefectural Kobe Children’s Hospital
- Kobe City Medical Center General Hospital
- Institute of Biomedical Research and Innovation (IBRI)
- RIKEN Center for Developmental Biology (CDB)
- RIKEN Center for Life Science Technologies (CLST)
- Foundation for Computational Science (FOCUS)
- Kobe Minimally Invasive Cancer Center (will open in 2017)
- Hyogo Prefectural Kobe Children’s Hospital
- Kobe City Medical Center General Hospital
- Institute of Biomedical Research and Innovation (IBRI)
- RIKEN Center for Developmental Biology (CDB)
- RIKEN Center for Life Science Technologies (CLST)
- Foundation for Computational Science (FOCUS)
- Kobe Eye Center (will open in 2017)
- International Clinical Cancer Research Center of Kobe University (will open in 2017)
- Kobe Center for Medical Innovation (KCMI)
Bio-tech R&D Area

Institute of Biomedical Research and Innovation (IBRI)

International Medical Device Alliance (IMDA)

Translational Research Informatics Center (TRI)

RIKEN Center for Developmental Biology (CDB)

RIKEN Integrated Innovation Building (IIB)

RIKEN Center for Life Science Technologies (CLST)
Regenerative Medicine Research (Dr. Taguchi)
Image-based Medicine (Dr. Senda)
Molecular Life Science (Dr. Nabeshima),
R&D of Preemptive and Preventive Medicine (Dr. Nabeshima)
Immunoregulation for the Treatment of Inflammation-related Disorders (Dr. Ohta)

Research and clinical trials currently conducted

1. **Regenerative Medicine**: Neuro-regeneration for stroke, vascular regeneration for limb ischemia and refractory fractures, and cornea regeneration, etc.

2. **Therapeutic immune regulation** of inflammation-related disorders including cancers

3. **Pathologic clarification of aging-related diseases** such as arteriosclerosis, osteoporosis, emphysema, Alzheimer’s type dementia

4. **A cohort study called the Kobe Study** for early diagnosis and intervention before the onset of diseases
Medical Area

Provision of optimum medical care through collaboration within the cluster

Institute of Biomedical Research and Innovation (IBRI)
Kobe City Medical Center General Hospital
Kobe Eye Center (will open in Dec. 2017)
Nishi Memorial Port Island Rehabilitation Hospital
Hyogo Prefectural Kobe Children’s Hospital
Proton Therapy Center (tentative name) (will open in Dec. 2017)
Kobe Minimally Invasive Cancer Center
Child Chemo House
International Clinical Cancer Research Center of Kobe University

Hospital integration in Nov. 2017

**Total number of beds: Approx. 1,500**
**Total number of patients in 2015**
Inpatient approx. 350,000
Outpatient approx. 550,000

Medical Cluster Promotion Committee was established to discuss the cooperation and responsibilities.
K computer

- General-purpose supercomputer for research and industrial use (installed in RIKEN AICS)

As of June 2017
- **HPCG** 1st place (application processing performance for industrial use)
- **Graph500** 1st place (big data processing performance)
- **Top500** 8th place (peak performance solving systems of linear equations)

Development of post K supercomputer (the FLAGSHIP 2020 Project)

- Aiming to develop another general-purpose supercomputer with the world highest standards by 2020
- In March 2014: Decided to install the post K supercomputer in the RIKEN AICS

**[Expected research projects]**

- Development of groundwork for innovative drug discovery
- Personalized/preemptive medicine
- Neo-futuristic manufacturing
- Sophistication of meteorological and global environment prediction

*Courtesy of RIKEN*
Major Projects
Promotion of “Open Innovation”

Process for drug discovery and development

Basic Research → Preclinical Study → Clinical Study → Application/Approval → Manufacturing

- Seeds from venture business
- Seeds from research institutions (RIKEN; Kobe U; IBRI; other related universities)
- RIKEN CDB
- RIKEN CLST
- “Medical Cluster” • Kobe City Hosp. • IBRI Hosp. • Kobe Children’s Hosp. etc.
- Supporting Businesses (CROs)
- PMDA-FBRI Cooperation Center for Pharmaceutical Affairs Consultation
- GMP facilities of Biologics

Core Facilities in KBIC

“Open Innovation Program”

Supporting drug discovery and development by coordinating researchers, businesses, facilities, and clinical sites

FBRI

Coordinators

Research Institutions → Companies in KBIC → Hospitals

Pharmaceutical companies → Proposals

Coordination
Support Platform for medical device commercialization

R&D process

Seeds & needs
- Matching
- Prototype test
- Production planning
- Pharmaceutical consultation
- Preclinical studies
- Pharmaceutical application
- Training support

Support process

Consult (companies, etc.)
1) consult
2) seek opinions
3) advise
4) support

Coordinators

Advisors (commercialization, regulations, etc.)

Specialists (lawyers, etc.)

PMDA-WEST

Clinical sites (Kobe City Medical Center General Hospital, etc.)

Medical Device Development Center (MEDDEC)

Examples

Sales & marketing

Consultation

Regenerative Medicine Using iPS Cells

Toward clinical research on allogeneic transplantation of retinal pigment epithelial cells

Center for iPS Cell Research and Application (CiRA), Kyoto Univ.

- Subjects: patients with wet type age-related macular degeneration (AMD)
- The world’s first retinal sheet transplantation using iPS cells in Sep. 2014
- The protocol of clinical research on allogeneic transplantation was approved by the Minister of Health, Labour and Welfare in Feb. 2017
- First allogeneic transplant surgery was performed in Mar. 2017

RIKEN Center for Developmental Biology (CDB)

- Autologous iPS cells
- Allogeneic iPS cells
- Retinal pigment epithelium (RPE)
- RPE sheet
- RPE suspension

Kobe City Medical Center General Hospital
Osaka Univ. Hospital

Transplant surgery of RPE in patients with wet-type AMD

Press conference at Kobe City Medical Center General Hospital on June 6, 2016
Establishment of Kobe Eye Center

- Integrated ophthalmic institution from basic research to clinical practice including rehabilitation
- Accelerate clinical application of regenerative medicine technology

*Designated as a national strategic special zone project in September 2014

- Cell culture
  - Foundation for Biomedical Research and Innovation

- Basic research
  - RIKEN

- Clinical practice (hospital)
  - Kobe City Medical Center General Hospital

- Rehabilitation (low vision care)
  - NEXT VISION

Completion of construction is scheduled in October 2017
Opening of the center is scheduled in December 2017

Site area: 2,000㎡
Total floor space: approx. 8,800㎡
Bldg. structure: 7 stories above the ground
An incubation facility consisting of wet laboratories for pharmaceutical companies, CPC space suitable for regenerative medicine, and space for R&D of post K supercomputer.

- Rendering of the Center

- 2F Image of common-use space

- Facility scheme
  - 1F 53 - 81m² 14 rooms
  - Space for R&D of post K supercomputer
  - Wet Lab. (CPC available)
  - Interaction space
  - Shared mtg room
  - Conveniences store, etc.
  - To K computer mae sta.
  - 3 - 5F 180 – 250m² 6 rooms/floor

- New Incubation Facility - Kobe Center for Medical Innovation (KCMI)
Development of Medical Robots

Medicareoid Corporation

Joint establishment by Kawasaki Heavy Industries and Sysmex
- President: Yasuhiko Hashimoto (Kawasaki)
- Vice President: Kaori Asano (Sysmex)
- 26 board members and employees
- Business: design, development, manufacture, sales, marketing, of medical robots, and its after-sales service
- Office location: IMDA

2016 Launch of applied robots
2019 Aiming to launch operation-assisting robots
2030 Aiming to achieve sales amount of 100bn yen
“Compass to Healthy Life” Research Complex

MEXT’s Project: program for promoting world-class research complex
Kobe’s proposal was chosen to be the first program nationwide

Core institution: RIKEN
Local governments: Kobe City, Hyogo Pref.
Universities/Research institutions: Kyoto Univ., Kobe Univ., Univ. of Hyogo, etc.
Companies: Hankyu Hanshin Holdings, Inc., etc. (Total of 88 organizations/institutions)

Accumulation of health information
- Dietary life
- Health condition
- Exercise log
- Treatment history, etc.

Maximization of individual health
Playing a meaningful role over a lifetime

Provision of a compass for individuals to achieve health and longevity

Evidence-based predictions

Various types of businesses × Multidisciplinary research

Creation of various industries based on health science
Establishment of KOBE Monowasure (Memory) Network

Establishing the Network consisting of 20 medical institutions and patients who want to participate in the clinical trials, toward the development of drugs for diagnosis and treatment on dementia.

Organizer: Foundation for Biomedical Research and Innovation

Registered medical institutions: 20 (as of Aug. 2017)

Patients participating in clinical trials

Launch of joint research among WHO Kobe Center, Kobe Univ., FBRI and Kobe Gakuin Univ.

Aiming to establish “Kobe Model,” an integrated system for early detection, diagnosis and intervention on dementia, in the city of Kobe with the population of 1.5 million people. Providing evidence worldwide to tackle dementia issues.

(3-year project starting in Sep. 2016)
Aiming to be Asia’s No.1 Cluster

Kobe Biomedical Innovation Cluster Department
Biomedical Innovation & New Industry Headquarters
City of Kobe

URL : http://www.city.kobe.lg.jp/information/project/iryo/english/index.html
Facebook : https://www.facebook.com/kobeiryosangyotoshi