



National Center Biobank Network

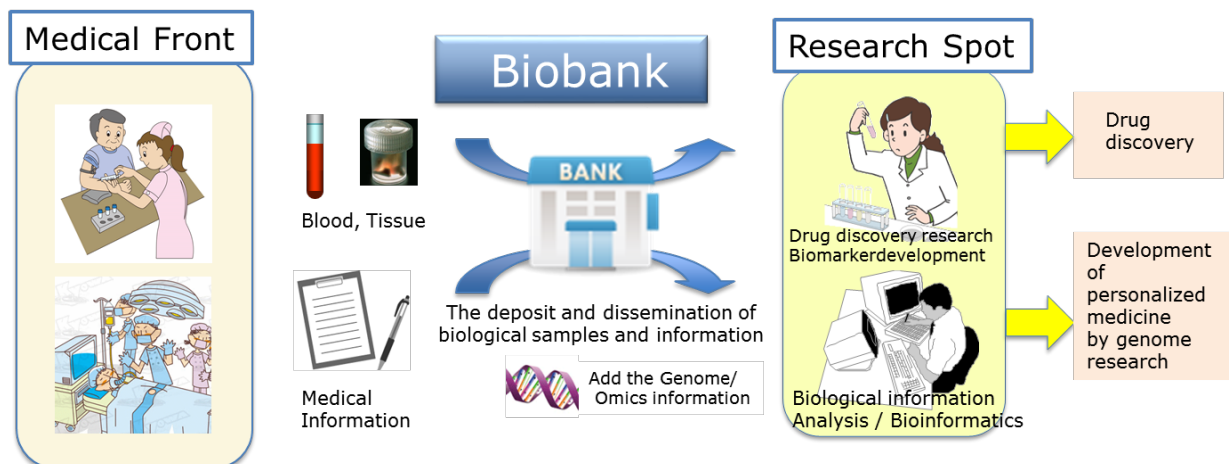
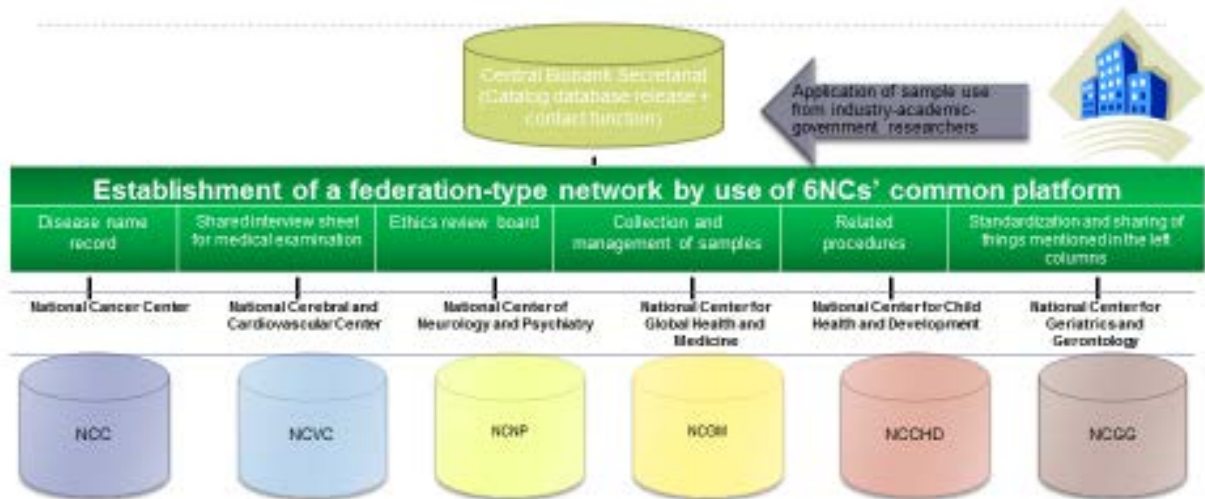
# National Center Biobank Network

— Introduction to 6NC —

Oct. 11–13, 2017 @BioJapan 2017

# What is National Center Biobank Network?

The National Center Biobank Network is a collaborative project by 6 National Centers in Japan, aim to create a research basis for the “new medical care”.





# National Cancer Center (NCC) - Biobank



## Features of Biobank

- **22,192 cases** of pathological frozen tissue, 54,571 cases of withdrawn blood for analysis (as of end-August, 2015) = **the nation's largest cancer tissue bank**
- **Pathologist removes** tissues based on an accurate diagnosis and maintains high quality through rapid freezing
- Collect all possible samples to **meet the needs of a variety of studies**
- Generate a high-quality **database for clinicopathological information**, which can interface with in-hospital cancer registry information, etc.
- **More convenient** samples, obtained with informed consent for sample transfer to outside researchers, including companies, for genome-wide analysis and to establish cell lines

## Historical performance and achievements

- Published **420 studies** in English (the total impact factor is **2148.254 points**, the total number of citations is **8,804**).
- 67% of sample utilization studies are joint research carried out by providing detailed **clinicopathological information to an external institution** (21% is joint research with **private companies**).
- Used for nationwide clinical research derivations and many patent filings, such as The International Cancer Genome Consortium and The International Human Epigenome Consortium (ICGC, IHEC), Integrative Disease Omics Database construction, SCRUM-Japan, etc.
- Knowledge on how to manage high quality maintenance, as described in "Pathology organization sample handling rules and regulations for genome studies" by the Japanese Society of Pathology and meets **Japan standards**.

## Future prospects

- To further improve the coefficient of utilization of completely collected samples and to pursue possible contributions to the All-Japan One Stop Service concept
- To consider the formulation of pipelines for sample transfer to companies, etc., without joint research with NCC
- To establish a "next-generation biobank", which **collects samples on demand from companies**; to improve the **connectivity** between biobanks as disorder cohorts and **molecular information databases obtained by clinical sequencing, etc.**; to promote industry-academia-government cooperation within all of Japan; and to contribute to the realization of genomic medicine



# National Cerebral and Cardiovascular Center (NCVC) - Biobank



## Features of Biobank

- 《**Collected samples**》
- Blood samples from patients who visited NCVC
  - Clinical residual samples
  - Surgical pathology samples
  - Autopsy tissue samples
  - Deposited samples from researchers inside and outside NCVC, research institutes, etc.

### 《Numbers of samples collected》

Serum	9,155
Plasma	8,986
Living cells	9,150
DNA	8,942

\*As of Sep. 2017

### 《Accompanying information》

- National Center Biobank Network (NCBN) shared interviews sheet
- Health-related quality of life (QOL) survey
- Clinical data collected through the Data Warehouse (DWH) from electronic medical records and various section systems

## Historical performance and achievements

- Analysis of pathogenic mechanisms of myocardial infarction, brain infarction, etc., using surgical pathology samples or autopsy tissues
  - Analysis of causative genes or prognosis using genome and clinical information for genetic disorders (particularly cardiac dysrhythmia or hypercholesterinemia)
- 《Specific example》
- 1) Archiving of carotid endarterectomy specimens and comparison with MRI
  - 2) Identification of a genetic mutation in CALMODULIN 2 as the cause of long QT syndrome and catechol-aminergic polymorphic ventricular tachycardia
  - 3) Clarification of the risk of coronary artery disease in families with hypercholesterolemia by using genomic and clinical information

## Future prospects

Securing of sample resources and promotion

Obtaining biobank consent from all of inpatients principle

Centralized administrative control over research materials

For management of "Human rights protection of subjects" or "Accelerating medical research", all research materials held by NCVC should be managed by the biobank.

Omics Research Center Cooperation and Support for Personalized medicine

- Prophylactic treatment
- Genetic diagnosis and treatment
  - Counseling and therapeutic development
- Preemptive medicine
- Development of medicines
  - Development of diagnostic drugs



## National Center of Neurology and Psychiatry (NCNP) - Bioresource

High-value-added bioresources available for use in studies of psychiatric, neurological, and muscular diseases

### Features of Biobank

- Collection of "hard to get" samples
  - Frozen skeletal muscle samples: approx. 16000
  - Fibroblasts: more than 1700
  - Spinal fluid: more than 2500
  - Brain tissues: more than 550
- Samples to meet various research needs
  - Frozen tissues (including muscles and brain tissues)
  - Cultured cells (lymphoblasts, Fibroblasts, iPSCs, etc.)
- High-quality clinical information, including accurate diagnosis by specialists and PET/MRI images
- Ethical procedures for cooperation with industry, government, and academia

### Historical performance and achievements

- In muscle diseases, more than 400 papers in leading journals, including Nature and Science, have been published, including identification of the intracellular location of dystrophin (Nature, 1988) and identification of the etiology of MELAS (Nature, 1990)
  - ⇒ Led to novel treatments or clinical trials, including exon skipping and taurine treatment
- Identification of biomarkers for subtypes of psychiatric disorders
  - Fibrinogen, ethanolamine, etc.
- Identification of new causal genes for developmental disorders and neurological disorders
- Establishment of Biobank Utilization Committee

### Future prospects

- Function as a core institution for large research projects focused on development of genomic medicine, intractable disease, undiagnosed diagnosis, etc.
  - ⇒ Implementation and cooperation to provide effective control of genomic information (genomic medicine)
- Develop new medical treatments and preventive measures by actively providing samples and information for research studies
- Delivery of specific bioresources according to the needs of researchers at the researcher's request
- For neurological disorders, samples, such as DNA, plasma, and spinal fluid, will be available for researchers

## National Center for Global Health and Medicine (NCGM) - Biobank



National Center focused on internationally important diseases, such as infectious diseases and lifestyle diseases

### Features of Biobank

- Collect biological samples and precise medical information from diabetic patients.
- Collect biological samples and medical information of liver disease, child psychiatry, etc.
- Collect blood samples of HIV infection (ACC)
- Collect blood samples from patients with attack of fever after returning to Japan, dengue fever, etc. (DCC).

### Historical performance and achievements

- Search and identify new serum and urinary biomarkers reflecting clinical conditions of lifestyle diseases, such as diabetes.
- Develop test drugs and diagnostic products for infectious diseases (e.g., viruses).
  - Provide samples for standardization of HBs antigen or *IL28B* gene testing.
  - Establish a drug-resistant variant for genetic testing against anti-HIV drugs.
  - Development of and clinical trials for a novel influenza rapid diagnostic kit
- Identify drug susceptibility and disease susceptibility loci by genome-wide association analysis in a major joint study.

### Future prospects

- Promote partnerships and network maintenance with domestic and international biobank.
- Support the clinical use of a biomarker.
- Promote integrated projects on complex clinical conditions such as complications of diabetes and cancer.
- Promote the cross-cutting project 6NC for investigation of the microbiome (intestinal flora).



# National Center for Child Health and Development (NCCHD) - Biobank

The largest National Center for pediatric and obstetric research in Japan

## Features of Biobank

- Various types of samples from pediatric patients with rare intractable diseases
- Samples from patients with obstetric complications (including cord blood and placenta)
- Eutocia samples from pregnant women
- Samples with a high degree of clinical information and examination findings
- The Japanese study group for comprehensive and accurate diagnosis of intractable diseases
- Cooperation with Initiative on Rare and Undiagnosed diseases in Pediatrics (IRUD-P)
- Semipermanent storage of materials, such as ES cells, based on regenerative medicine law

## Historical performance and achievements

- Published a database of gene polymorphisms in Japanese individuals (multicenter joint research).
- Published data on gene polymorphisms associated with eutocia in a pregnant Japanese woman.
- Identify the causal genetic elements of rare diseases and intractable diseases.
- Discovery of a new disease concept - Kagami-Ogata syndrome.
- Development of a genetic diagnosis panel optimized to Japanese patients.

Cooperate with next-generation gene analysis

## Future prospects

- Cooperate with cohort studies and epidemiological studies.
- Maintain and publish standard data essential for the analysis of perinatal medicine and pediatrics.
- Facilitate research on microbiomes, such as the intestinal flora.
- Search for biomarkers in samples from pediatric patients, which are hard to collect.
- Identify new causal genetic elements of rare diseases and intractable diseases. (Kawasaki disease, inflammatory bowel disease, obstetric complications, etc.)

Infrastructure development for research on life diseases

- Identification of the causes of intractable diseases
- Therapeutic development
- Provision of drug development seeds



# National Center for Geriatrics and Gerontology (NCGG) – Biobank

Biobank

The largest Biobank for bioresources of dementia in Japan

## Features of Biobank

- ◆ Collect biological samples and clinical records focusing on the geriatric diseases including dementia.
- ◆ Unified management of samples and clinical data in the Biobank building.
- ◆ Collect and store CSF, inflamed joint tissue in addition to DNA, plasma, serum.
  - No. of samples: >85,000
- ◆ Work in respect of SOPs.
- ◆ Technical support of the research groups using biobank samples (gene analysis and PATHWAY analysis and so on).

## Historical performance and achievements

- ◆ Biobank registered performance
  - Approx. 7,000 participants from NCGG hospital (disclosed)
  - Approx. 13,000 participants from regional cohort study (undisclosed)
  - samples have been distributed to scientists and numerous outcomes have been generated as below.
- ◆ Sample transfer record
  - 96 researches incl. universities and companies since establishment
  - Contribute samples and information more than 10,000
- ◆ Numerous outcomes generated by samples transfer (since establishment)
  - 52 studies (as of end-Sept., 2017)

## Future prospects

- ◆ Promote of genomic analysis for Japanese patients with dementia.
- ◆ Construction of sequence data base to which researchers can access.
- ◆ Cooperation with Tohoku Medical Megabank Organization.
- ◆ Collection of omics data of biobank samples and linkage to clinical records.