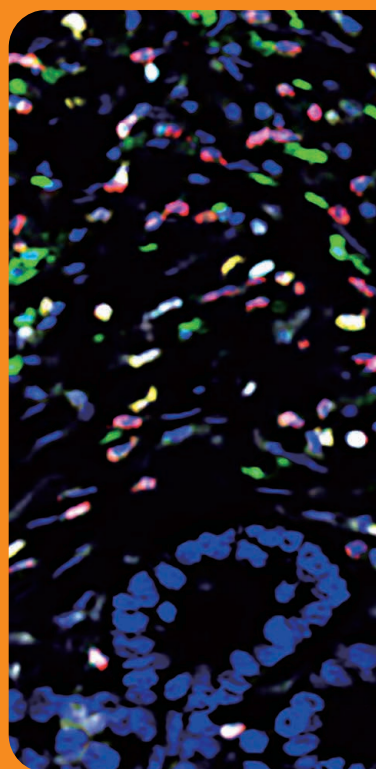
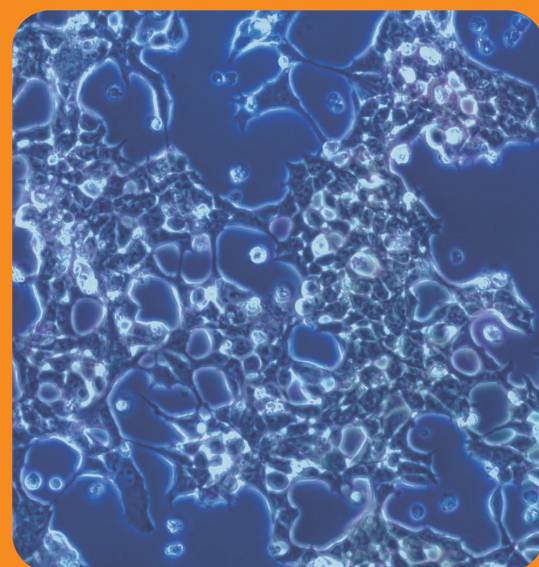


Team FIOC : From Bench to Bedside and Back again!



FIOC

Fundamental
Innovative
Oncology Core



国立がん研究センター
研究所

National Cancer Center Research Institute

Team FIOC: From Bench to Bedside and Back again!

Message from the FIOC Director

Drug development is a lengthy process, making the bridge between preclinical and clinical research essential. Innovative, first-in-class drug discovery ideas often emerge from the unique insights of individual researchers in basic science. However, achieving the ultimate goal of clinical application—transforming these research seeds into viable therapies—requires a collaborative team of researchers, each contributing specialized expertise. For this reason, effective team-based research, carried out with creativity and practicality, is vital.

At FIOC, we promote translational research to bridge basic and clinical research, embodying the spirit of "From Bench to Bedside and Back Again!" Our team-based approach fosters innovative and practical research and supports this journey from concept to clinical application.

Our center provides comprehensive support, including consultation services through the Office of Research Coordination, foundational research support in the Central Animal Division and Central Radioisotope Division, and technical assistance across the Department of Biobank and Tissue Resource, Department of Clinical Genomics, Department of Immunogenomic Medicine, Department of Bioinformatics, Department of Proteomics, Department of Translational Oncology, Department of Pharmacology and Therapeutics, Department of Cancer Model Development, Department of Analytical Pathology, and Department of Immune Medicine, all organized to facilitate effective team operations.

Our notable achievements include the development of Japan's first gene panel test for genomic medicine, the "NCC Oncopanel," and the pioneering "Rainbow Cloud Project," which allows rapid responses to clinical needs. Additionally, the Japanese patient-derived xenograft (J-PDX) Library Project—a tumor xenograft model derived from Japanese patients with cancer—and the NCC Biobank's management of patient blood and tissue resources are invaluable assets for cancer research. FIOC integrates cutting-edge methodologies, including WES/RNA sequencing, bioinformatics, immune profiling, tumor microenvironment analysis, proteomics, and pharmacokinetics.

Moving forward, the FIOC will continue to expand bioresources and leverage advanced analytical techniques, striving to provide novel treatments and diagnostic methods for patients with cancer. We deeply appreciate your continued support for Team FIOC.

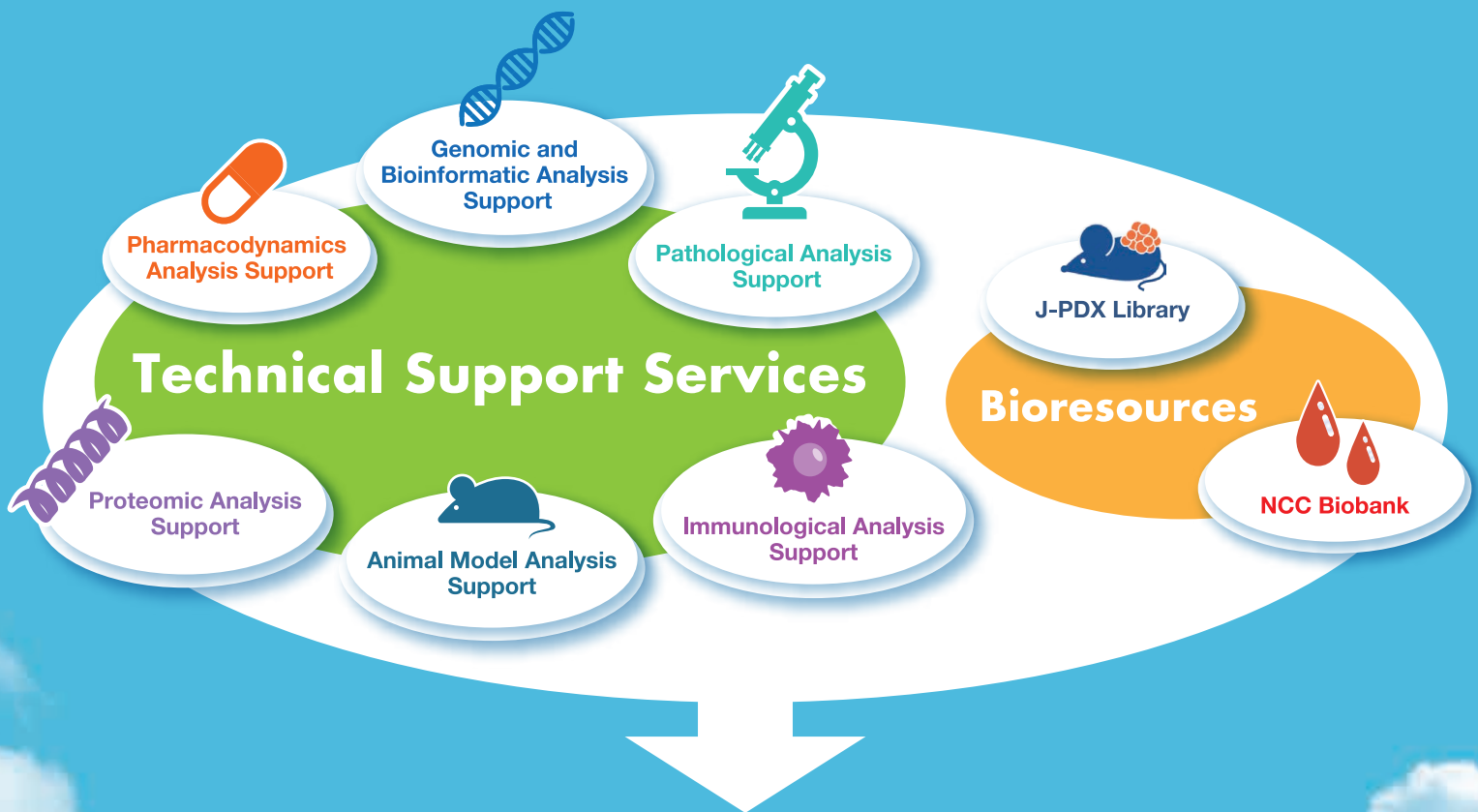


Akinobu Hamada

National Cancer Center Research Institute
Fundamental Innovative Oncology Core
Director

FIOC Research Supports:

Our support integrates six technical services with NCC's bioresource



Research Support and Collaboration

We offer comprehensive research support and collaborative research opportunities for both corporate and academic partners.

Research Support and Collaboration Workflow

Our standard workflow begins with consultation and proceeds through contract signing, initiation of research support, and finally, return of analytical results.



Six Technical Support Services

01

Department of Clinical Genomics

Department of Bioinformatics

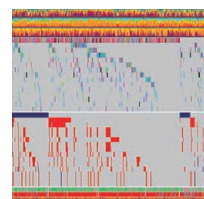
Genomic and Bioinformatic Analysis Support

Genomic analysis (wet and dry analysis)

- Whole-exome and whole-genome sequencing
- Transcriptome analysis ■ Methylation analysis

Secondary genomic data analysis

- Mutation signature analysis ■ GSEA ■ Survival analysis
- TMB, MSI, and HRD analysis ■ Pathway and gene ontology analysis
- Clustering and dimensionality reduction analysis



02

Department of Pharmacology and Therapeutics

Pharmacological Analysis Support

Pharmacokinetic and pharmacodynamic analyses

- Drug concentration analysis using mass spectrometry
- Analysis of drug distribution in tumor tissues using fluorescent immunostaining techniques (antibody-based therapeutics)
- Drug imaging analysis for small molecules via mass spectrometry imaging
- Biomarker discovery through metabolomics analysis and multiplexed tissue immunostaining

Drug screening using patient-derived xenograft (PDX) models



Department of Pathological Analysis

Central Radioisotope Division

Pathological Analysis Support

Histopathological and morphological evaluations, as well as specimen selection and provision

- Customized sample suggestions based on pathological and morphological evaluations (frozen or paraffin-embedded samples from the biobank)

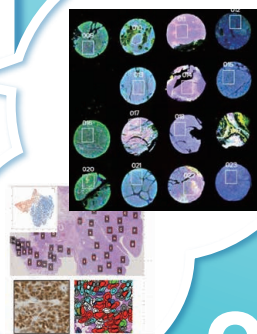
Tissue microarray preparation

- Evaluation across numerous specimens or multiple organs on a single slide

IHC and FISH

Spatial transcriptomics analysis (Xenium, GeoMx)

Confocal microscopy analysis



03

Bioresource

<https://www.ncc.go.jp/en/ri/jimu/020/020/020/>

FIOC collaborates with NCC Hospital and Hospital East to establish high-quality bioresources, a variety of cancer PDX models, as well as bio-banked blood and tissue samples. These resources are available to support research across both academia and industry.



J-PDX Library

<https://j-pdx.ncc.go.jp/en/>

The J-PDX Library, built from patient-derived tumors from NCC Hospital and Hospital East, includes over 600 cross-cancer PDX models as of September 2024, accompanied by clinical data and genomic analysis results.

04

Department of Immune Medicine

Department of Immunogenomic Medicine

Immunological Analysis Support

Immune cell analysis

- Flow cytometry analysis
- Protein expression analysis via multiplexed immunohistochemistry

Immune functional analysis

- *In vitro* T-cell proliferation analysis
- *Ex vivo* immune function assessment
- Tumor immune microenvironment analysis

Immunogenomic analysis

- Immune-related gene expression profiling
- Single-cell gene expression analysis



05

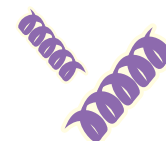
Department of Proteomics

Proteomics Analysis Support

Advanced proteomics analysis using mass spectrometry

- Protein quantification
- Analysis of protein modifications (e.g. phosphorylation, methylation, and acetylation)
- Analysis of protein complex (e.g. immunoprecipitation, proximity labeling, and crosslinking)

Reverse-phase protein array analysis



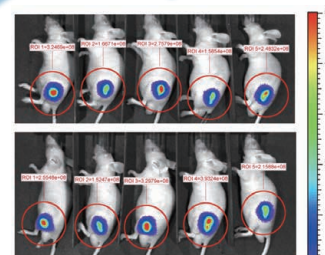
Department of Translational Oncology

Department of Cancer Model Development

Animal Model Analysis Support

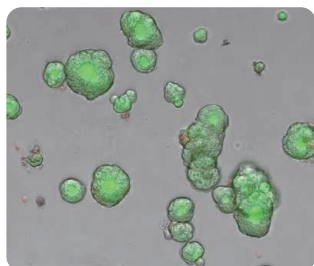
Cancer research through animal model development and analysis

- *In vivo* imaging (bioluminescence, fluorescence, X-ray)
- Cancer cell line-derived xenograft model development
- Gene-edited mouse model creation
- Developmental engineering techniques (e.g. *in vitro* fertilization, strain preservation)
- Patient-derived cancer cell line creation
- Organoid models derived from mouse tissue



06

Patient-derived cell lines and organoids



The FIOC has established numerous cancer cell lines and peritoneal metastasis cell lines from gastric, pancreatic, and ovarian cancers linked to clinical data and organoids from cancer patients.

NCC Biobank



Samples provided by the patients, including blood and tumor tissues, along with associated clinical information, were available through our collaborative NCC Hospitals and Hospital East.



Department of Clinical Genomics

Genome and transcriptome analysis in collaboration with the NCC Biobank

The Department of Clinical Genomics provides technical support for genome analysis using clinical samples collected by clinicians and basic researchers (both within and outside our center, including hospitals and research institutions). In collaboration with the Department of Biobank and Tissue Resources, we performed genome and transcriptome analyses (both wet and dry) using available clinical samples as a one-stop service. Our contributions include research on the transmission of cervical cancer from mother to child (Arakawa et al., NEJM 2021). Our department supports a wide range of projects ranging from clinical research to collaborative research with companies. Please feel free to contact us if you have any requests or interest in support.



Department Head
Kouya Shiraishi



https://www.ncc.go.jp/en/ri/department/clinical_genomics/

Department of Bioinformatics

Bioinformatics from basic to applied research

The Department of Bioinformatics covers a wide range of fields, from basic to applied research. "Bioinformatics" is an emerging interdisciplinary field that combines biology and informatics, primarily conducting biological research through computational data analysis. In the Department of Bioinformatics, we conducted a bioinformatics analysis of the data produced by experimental laboratories in collaborative research. Focusing on cancer, our research spans the application of bioinformatics, with continuous consideration of clinical applicability. Our past collaborative research achievements include a comprehensive whole-genome analysis of liver and bile duct cancers (International Cancer Genome Consortium). For those interested in collaborative research, please contact the Office of Research Coordination.



Department Head
Mamoru Kato



<https://www.ncc.go.jp/en/ri/department/bioinformatics/>

Department of Proteomics

Daily analysis of 50 clinical samples and 10,000 types of proteins

The Department of Proteomics provides support for protein analysis to researchers both within and outside our center, including protein analysis using mass spectrometry and reverse-phase protein array analysis using antibodies. With the ASTRAL system, we can identify and quantify approximately 10,000 proteins in 50 samples per day. In addition to quantification, we also study protein complexes and modifications. Even analyses not routinely conducted by our department can be considered as part of collaborative research. We welcome researchers interested in proteomic analysis to consult with us, even if they have no prior experience.



Department Head
Shungo Adachi



<https://www.ncc.go.jp/en/ri/division/proteomics/>

Department of Immunogenomic Medicine

Detection of immunological changes in the tumor microenvironment

The Department of Immunogenomic Medicine performs comprehensive immunogenomic and data analyses using clinical samples gathered through collaborations with our center's departments and research laboratories, as well as various external medical institutions and academia. We investigate the effects of different treatments on immunological changes in the tumor microenvironment and systemic immune cells. Additionally, we conduct *in vivo* functional analysis of immune-related molecules identified from clinical samples using mouse models. We are responsible for supporting the above activities.



Department Head
Shohei Koyama



https://www.ncc.go.jp/en/ri/department_of_Immuno_genomic_medicine/



Drug Discovery and Disease Model Core

Department of Translational Oncology

Testing the novel cancer therapies in mouse models using *in vivo* imaging

The translational oncology department is involved in the development of nucleic acid drugs. In particular, we are focused on creating a drug delivery system to deliver nucleic acid drugs to cancer cells and are building an evaluation system using *in vivo* imaging to create various cancer model mice. Additionally, we develop various therapeutic modalities, such as new molecular-targeted cancer drugs, antibody drugs, and extracellular vesicles. Our department supports experimental infrastructure, including the development of cancer model mice using *in vivo* imaging, and cell line establishment.



Department Head
Fumitaka Takeshita



https://www.ncc.go.jp/en/ri/department/translational_oncology/

Department of Pharmacology and Therapeutics

Supporting cancer drug development with PDX Models

The Department of Pharmacology and Therapeutics bridges preclinical and clinical research using PDX models derived from tumor tissues of Japanese patients with cancer to conduct drug sensitivity testing across cancer types. Through pharmacokinetic, drug imaging, and genomic, pathological, and proteomic analyses, we conduct efficacy evaluation and biomarker exploration for patient stratification and translational research. To address clinical questions, we promote collaborative research among physicians. In translational research supporting clinical studies, we create standard operating procedures for specimen handling, analysis, and management to ensure reproducibility and reliability.



Department Head
Akinobu Hamada



https://www.ncc.go.jp/en/ri/department/pharmacology_therapeutics/

Department of Cancer Model Development

Accelerating research through rapid production of gene-mutated mice

The Department of Cancer Model Development conducts essential animal-based experiments and analyses in cancer research and drug development. The Cancer Model Development Division maintains and manages animal experimental facilities considering animal welfare while supporting model animal production. Specifically, we created genetically mutated mice using genome editing and supported research both within and outside of our center based on these developments. We also offer essential techniques for cancer research, such as *in vitro* fertilization, strain preservation in genetically mutated mice, and tissue sample preparation. We look forward to consultations and requests.



Department Head

Hidetoshi Kassai



https://www.ncc.go.jp/en/ri/department/cancer_model_development/



Research Support Core

Central Radioisotope Division

Contributing to cancer development research using radiation

The Central Radioisotope Division conducts research on cancer risk related to radiation, focusing on DNA repair proteins closely associated with cancer and studying DNA repair mechanisms. In collaboration with the NCC Hospital Department of Radiation Oncology and other companies, we conduct research on biological evaluation methods for neutron irradiation and boron neutron capture therapy, as well as basic research on the biological utilization of alpha-emitting radionuclides at the Advanced Medical Development Center. We provide technical support for radiation exposure, radioisotope experiments, and live cell imaging using confocal microscopy.



Chief

Masamichi Ishiai



<https://www.ncc.go.jp/en/ri/division/radioisotope/>



Department of Analytical Pathology

Planning cancer research based on pathological morphology

The Department of Analytical Pathology collaborates with the Biobank, offering joint research for morphological evaluation of all types of tumors and proposing samples according to search content (frozen samples or paraffin blocks from the Biobank). Based on pathological morphology, we provide guidance on the positioning, diagnosis, and spatial distribution of tumor cells within the tissue. We also provide technical support for molecular pathology, such as tissue arrays, and examine the expression of markers and molecular targets identified in basic research.



Department Head
Yasushi Yatabe



https://www.ncc.go.jp/en/ri/department/analytical_pathology/

Department of Immune Medicine

Connecting immunological analysis with therapeutic development in patients with cancer

The Department of Immune Medicine, in collaboration with pharmaceutical companies and academia, both inside and outside our center, provides technical support for immunological analysis in translational research. Specifically, we conduct analyses of peripheral blood and cancer tissues as ancillary studies for clinical trials led by pharmaceutical companies and academia, engaging in collaborative research on biomarker discovery and elucidation of the immune mechanisms of new drugs. We also support academia in the development of novel immunotherapies using animal models and clinical specimens, contributing as an immune profile analysis team for AMED Practical Research for Innovative Cancer Control projects. Our division supports the development of new drugs through immunological analyses.



Department Head
Kazunori Aoki



https://www.ncc.go.jp/en/ri/department/immune_medicine/



Office of Research Coordination

Connecting FIOC technical support and bioresources with researchers

The Office of Research Coordination serves as a gateway connecting FIOC with companies and academia to support development research by utilizing technical support and bioresources from FIOC. In cooperation with FIOC researchers, we strive to provide analytical technology and bioresources that match current needs by investigating the latest technologies, development trends, and tracking support achievements. FIOC has made numerous achievements in technical support and collaborative research, and we can provide research support by integrating multiple technical support services and bioresources. Direct consultations from companies and academia have led to successful collaborative research; therefore, please feel free to consult the Office of Research Coordination.



Chief

Yoshinori Ikarashi



https://www.ncc.go.jp/en/ri/division/research_coordination/

Examples

Utilization examples for corporate and academic research support

- Annual support for approximately 90 cases of genomic analysis using clinical samples, with over 1,000 samples processed to date.
- Ongoing analytical research supports the bioinformatics analysis of two academic projects following non-disclosure agreements, in addition to consulting and contracts established through direct inquiries from university researchers.
- The identification of stratification markers for anticancer drugs using proteomic analysis supports approximately 20 academic requests annually.
- Biomarker discovery and drug screening using the PDX Library; ongoing joint research with 10 pharmaceutical companies and over 10 academic institutions.
- Collaborative research and technical guidance for startups without in-house animal experimental facilities, including evaluation of drug efficacy.
- Immunological analyses supporting first-in-human trials for corporate-led studies on new immunotherapies.

Utilized examples of Practical Research for Innovative Cancer Control Management Office (PRIMO) technical support scheme

Through the PRIMO support scheme, FIOC collaborates with AMED Practical Research for Innovative Cancer Control Projects. Since 2021, FIOC has engaged in 10 collaborative projects.

- Immune profiling analysis of clinical specimens to elucidate antitumor mechanisms in collaboration with young researchers.
- Screening of new anti-cancer drugs and cross-cancer drugs using the J-PDX Library.



Contact Information

National Cancer Center Research Institute

Fundamental Innovative Oncology Core (FIOC)

Office of Research Coordination

Please ensure that all inquiries are addressed to both email contacts provided below.

Tel: 03-3547-5201 (Ext:3435)

E-mail: fioc-renkei@ml.res.ncc.go.jp, yikarash@ncc.go.jp

URL: <https://www.ncc.go.jp/en/ri/fioc/about/020/>

