

# FY2023 Report of Activities

Radiation Effects Research Foundation

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### I. Report of Major Activities

Epidemiologic data on mortality and cancer incidence from the A-bomb survivors (the Life Span Study [LSS], *In utero* study, Adult Health Study [AHS]) and their children (the F1 generation studies) have long been a primary basis for national and international estimates of the risks of cancer and other diseases from exposure to ionizing radiation. The unique importance of the LSS study stems from the combination of its large size, wide range of exposure levels, inclusion of all ages at exposure, and long-standing, high-quality follow-up of mortality and cancer incidence. The periodic follow-up and report of cohort data is only one facet of RERF's research activities. Clinical examinations and longitudinal serial collection of biosamples provide more detailed information on health conditions of interest, including the pathogenesis of conditions in relation to radiation exposure. RERF's Department of Molecular Biosciences collaborates with the Departments of Clinical Studies, Epidemiology, and Statistics, to further address the nature and extent of genetic and epigenetic effects associated with health risks. The opportunity to integrate these high-quality, long-standing epidemiologic, dose, and clinical data with serial collections of biospecimens over time is unique to RERF and demands that the best possible science be conducted for the benefit of survivors and their children, the radiation research community, and global radiation protection.

RERF's strategic plan focuses on continued excellence, using cutting edge methods to answer key questions in radiation science, emphasizing collaboration and communication. As we move forward, RERF will place a high priority on integrated research programs, leveraging expertise through collaboration with Japanese and international institutions.

### 1. Research Projects Examining A-bomb Survivors Health

#### 1) Radiation and Cancer:

- [*Life Span Study (LSS)/In-utero/ F<sub>1</sub> Update (RP 1-75 Sakata, RP 2-61 Sugiyama, RP 4-75 Sakata)*]: The Dept. of Epidemiology maintains three major cohort studies for: 1) atomic bomb survivors (LSS), 2) *in utero* survivors, and 3) offspring of survivors (F<sub>1</sub>). Around 22% of LSS cohort members were still alive at the end of 2019, including 69% of those who were less than 10 years old at the time of bombing. Moreover, 74% of the *in utero* and 87% of the F<sub>1</sub> cohorts were still alive as of 2019. These cohorts are the basis of RERF's major analyses of radiation-related risk in humans. Individual radiation doses have been estimated and continuously revised as newer techniques become available. In the past year, we showed that the solid cancer mortality dose-response in A-bomb survivors exhibited a borderline significant upward curvature among males and significant upward curvature among females (Brenner AV et al., *Radiat Res*, 2022); that atomic bomb radiation exposure did not substantially affect survival after first solid cancer diagnosis in A-bomb survivors (Spoto R et al. *Cancer Epidemiol*, 2023), and that radiation increased the risk of prostate cancer, even after accounting for effect of prostate-specific antigen (PSA) screening tests (Utada M et al, *Radiat Res*, 2023). Analysis of the F<sub>1</sub> cohort study is ongoing, with the first stage analysis to be completed in 2024, pending update of the exposure information for calculation of DS02R1 dose for a remaining subset of F<sub>1</sub> subjects.
- [*Radiation and Hematological Malignancies: Myelodysplastic Syndrome (MDS), RP 1-17, Imaizumi*]: Atomic bomb survivors have a higher risk of hematological malignancies even

50 years post radiation exposure. Recent genome analyses showed that blood samples contain several gene mutations that might be observable before clinical diagnosis. Using next-generation genome analysis technology, we are searching for mutations in serially stored blood samples of AHS participants who developed MDS to uncover the mutational process of expanding and diminishing clones observed before diagnosis of MDS. In an analysis of whole genome single nucleotide variants, we identified distinct mutational signatures between expanding and diminishing clones, indicating different mutational process in the development of these two distinct clone types.

- [*Radiation and Hematological Malignancies: Leukemia, RP-P1-23, Yoshida N*] A-bomb survivors had a high risk of hematological malignancies shortly after exposure. Little is known about the genomic alterations in these leukemia cases, but the alterations could play critical roles in radiation-induced leukemogenesis. To reveal the genomic landscape of the leukemia cases, we started a pilot study of targeted-sequencing analysis using DNA and RNA extracted from a small number of stored AHS formalin-fixed paraffin embedded (FFPE) samples. If the pilot study is successful, we will launch a full-scale study.
- [*AHS Genome Wide Association Study, RP-P2-22, Hayashi T*]: Genome-wide association studies (GWAS) on A-bomb survivors can lead to a better understanding of individual radiation-related risk of carcinogenesis risk and other health outcomes. In preparation for the planned AHS-GWAS, feasibility studies to evaluate genomic DNA extraction and genotyping were conducted using old blood smears and chromosome preparations obtained from A-bomb survivors. While DNA was successfully extracted from recent smear samples, the quality of the extracted DNA was much lower for samples older than 10 years. However, use of the REPL-g multi-combination system led to improved results, resulting in acceptable power even in a single nucleotide polymorphism (SNP) array testing conducted with 720,000 probes. Further testing will be conducted of older samples, and if results are acceptable, a full-scale study will be launched.

## 2) Radiation and Non-Cancer Effects:

- [*Adult Health Study (AHS) updates RP 2-75, Ohishi*]: In the past year, we found that radiation dose is potentially associated with risk of diabetes, especially amongst those exposed at younger ages in atomic bomb survivors, 1969-2015 (Tatsukawa et al., J Clin Endocrinol Metab, 2022), and that there was a suggestion of excess risk of multiple myeloma for definite/probable cases with an ERR/Gy = 0.43; 95% CI, <-0.01 to 2.1 (Yoshida N. Blood Adv, 2023). There was no clear effect of radiation dose on late-life neurocognitive function in atomic bomb survivors exposed as children (Ishihara K et al., Radiat Res, 2022), and no significant effect of radiation was observed on scores of metacognition, emotional regulation, motivation/organization, and processing speed on survivors exposed *in utero* (Kitamura H et al., Radiat Res, 2023).
- [*Cataract Study RP 5-15, Hida*]: Previous ophthalmological studies at RERF used non-standardized cataract evaluation methods, resulting in potential misclassification of outcomes. We completed a primary re-analysis of cataract prevalence using data from modern assessments of cataracts in AHS subjects. The reanalysis used generalized estimating equations (GEE) to account for cataract outcome in both eyes, and incorporated information on informative censoring due to individuals who had undergone eye surgery and could not be evaluated for cataracts. Preliminary results indicate an increased risk of

posterior subcapsular cataracts (PSC) with radiation dose. No significant dose-related associations were observed for cortical opacities or nuclear cataracts (RP 5-15).

- *[Radiation and Atherosclerosis, RPs 2-11 and 1-23-2, Nakamizo]*: Associations between radiation and atherosclerosis or circulating inflammatory markers have been observed in A-bomb survivors. To evaluate the potential mechanisms of radiation-induced atherosclerosis, we are focusing on possible mediation by 1) clonal hematopoiesis / T-cell aging / inflammation and 2) abnormal vascular repair. Quality assessment of cytokine measurements was completed, and a manuscript was submitted to an international journal. Statistical analysis of AHS data has been initiated.
- *[Radiation and Clonal Hematopoiesis (CH), RP 1-23-1 and RP 1-23-3, Yoshida K & Kusunoki Y]*: MBS Department's clonal hematopoiesis (CH) study was initiated using stored blood samples obtained from AHS participants to examine the occurrence of CH in the survivors and its possible relevance to various diseases. We have already obtained informed consent (IC) and are analyzing data of somatic mutations detected by whole exome sequencing (WES). A further study using stored blood samples collected over time is planned to clarify the dynamics of hematopoietic cell proliferation and expansion during the process of health recovery after the atomic bombing (RP 1-23-1). Methods to characterize and track clonal hematopoiesis following radiation exposure have been established in collaboration with outside universities (RP 1-23-3).

*[RP 1-23-1, Yoshida K]*: A related clonal hematopoiesis program to clarify the relationships between clonal hematopoiesis and the healing process, as well as the relationship between clonal hematopoiesis and inflammatory diseases during that process, is underway in concert with Nagasaki University, Kyoto University, and the University of Tokyo. Preliminary work using stored pathological tissues to search for biomarkers of radiation exposure has begun in collaboration with the private-sector Shimadzu Corporation and Kyoto University.

## **2. Research Projects on the Health of A-bomb Survivors Children (F<sub>1</sub>)**

- *[Trio Study of Hereditary Effects, RP 3-23, Uchimura A]*: Elucidating the potential hereditary genetic effects of A-bomb radiation has been a key question since the establishment of RERF, and we have long planned to analyze the whole genome of exposed parents and children to answer this question. In 2023, the research protocol was approved by the Executive Committee; a meeting was held with the study's External Advisory Committee, and suggestions from the committee were incorporated into a revised RP. Following a briefing session with the media and IRB approval, we started to obtain re-consent for participating trios and initiated a pilot study of a small number of families to establish a pipeline for whole-genome sequencing (WGS) and analysis in collaboration with NCI and RIKEN. Analyses will be performed using a secure external cloud server (RP 3-23).
- *[Platform Protocol: F<sub>1</sub> Offspring Clinical Study (FOCS), RP 4-10, Ohishi]* Heritable effects of exposure to ionizing radiation are a public health concern, but very little human data exist on the potential risk of common adult-onset multifactorial diseases (hypertension, hypercholesterolaemia, diabetes mellitus, angina pectoris, myocardial infarction or stroke) in the offspring of exposed persons. Initial examination of the FOCS from 2002 to 2006 provided no evidence for an increased prevalence of adult-onset multifactorial diseases due to parental radiation exposure. However, incidence data will have less potential for bias than

prevalence data, indicating the need for a high-quality clinical study continued until the subjects become elderly, when many multifactorial diseases develop. The analysis plan of the longitudinal study data (2002–2020) has been developed within the interdepartmental FOCS Analysis Working Group. Data have been thoroughly checked, and we have completed the first stage of the multi-state modelling longitudinal analysis to investigate the association between parental A-bomb radiation dose and occurrence of multifactorial disease in the study cohort. The first stage of analysis included modelling of transitions between healthy, ill, death, and lost-to-follow-up states (RP 4-10).

### 3. Research to Elucidate Individual Doses and Effects from the A-bomb

- *Radiation Dosimetry [RP 18-59, PI: Sposto]*: Department of Statistics members have continued work with the international Organ Dosimetry Working Group (ODWG) which is developing revised organ doses for RERF's epidemiological studies based on modern, sophisticated J45 computational phantoms. We have almost completed revision and quality control of the software necessary for the computations and are awaiting completion of the extensive simulations by means of which the necessary response functions for new organ dosimetry will be determined.

A simulation study based on 20 generalized survivor scenarios reported that the updated phantom series is expected to provide dose improvements to several important organs, including active marrow, colon, and stomach wall (15-20% impact on total dose). The new dosimetry system is expected to particularly improve neutron dose estimates (up to 2-fold difference) and organs unavailable in the previous phantom series (Griffen et al Rad Envi Biophys 2022).

As a further investigation of the issue of RBE, recently studied in the context of all solid cancer incidence by Cordova, Cullings, et al., we are collaborating with Dr. Sato at JAEA and Dr. Kai at Nippon Bunri University to utilize the J45 computational phantoms in conjunction with PHITS simulation software, currently used to compute the new organ dosimetry, to assess theoretically the RBE of neutrons in each organ for representative shielding categories for typical Life Span Study (LSS) subjects. A manuscript is currently in development.

Using biodosimetry data, we showed a strong relationship between stable chromosome aberration rate measured by fluorescent in situ hybridization (FISH) and the DS02R1 radiation dose estimates in 1,868 atomic bomb survivors. However, persistent differences of the dose-response relationship by shielding category suggests that further improvement is needed in the physical dosimetry (Sposto et al. Rad Res, 2023).

- *Spatial analysis [No RP, PI: Yamamura]*: Geographical variation in incidence and mortality rates might remain even after controlling for known background, shielding, and effect modifying variables. Controlling for these effects could improve radiation risk estimates in A-bomb survivors. In collaboration with investigators at Hiroshima University, we are developing methods for spatio-temporal analysis of rates from count data using generalized fused-Lasso Poisson models (Yamamura, Ohishi, and Yanagihara 2023, Yamamura, Ohishi, and Yanagihara 2023).

#### **4. Projects to Release Research Results and to Collaborate with Other Scientific Organizations**

Crucial to the mission of RERF is the dissemination of results of our studies to survivors and their children, and to the international community. Toward that end we interact with local liaison councils representing the communities of Hiroshima and Nagasaki and provide information via public lectures and other activities. These will be described later in another section of this report. With respect to the international community there are several activities including seminars, workshops, participation at international scientific conferences, and international publication of results. In FY2023 RERF hosted six seminars presented by national and international visitors, and published more than 60 scientific papers.

##### **Collaborative Research Projects**

- Ongoing international collaborative research projects  
In addition to the above activities the development of national and international collaborations is essential to help disseminate results and to enhance RERF research programs. A list of current collaborations is provided below:
  - a. Partnerships with the Universities of Hiroshima, Nagasaki, Tokyo, Kyoto, Kurume
  - b. Collaboration with the U.S. National Cancer Institute
  - c. Collaboration with the University of Florida
  - d. Collaboration with the University of Washington
  - e. Collaboration with Outside Investigators:
    - 47 Japanese Institutions
    - 9 North American Institutions
    - 10 European Institutions
    - 1 Asian Institution

#### **5. Training Programs for Domestic and Overseas Specialists**

- 1) RERF held a hybrid online and face-to-face epidemiological training course for radiation biologists. RERF aimed to deepen their understanding of the foundation's epidemiological research and to promote interaction among investigators working in radiation research institutes (August 21–22, 2023; 82 participants consisting of 40 and 42 from inside and outside RERF, respectively).
- 2) Due to the effects of COVID-19, the International Council for Health Care of Radiation-exposed (HICARE) provided training online. However, the Nagasaki Association for Hibakushas' Medical Care (NASHIM) delivered training lectures face-to-face.  
  
Two persons were dispatched as lecturers to the IAEA (International Atomic Energy Agency)/HICARE International Training Course on Medical Responses to Radiation Accidents and Disasters held on January 15-18, 2024.
- 3) There was no invitation for the MHLW-sponsored International Exchange and Research Program in FY2023 either, so RERF did not recruit trainees from abroad.
- 4) The Department of Statistics used RERF's official website to recruit investigators to participate in the International Fellowships for Research in Japan program sponsored by the Japan Society for the Promotion of Science (JSPS). As a result, the department made one fellowship application.

## **6. Public Information Programs**

### **i) RERF Open House event**

The Hiroshima and Nagasaki RERF laboratories held their 28th and 26th Open House events, respectively. Although the new coronavirus was downgraded to category 5 under the infectious disease law in May 2023, RERF continued to consider the impact of the disease. It held the events on a hybrid basis, combining face-to-face events with limited numbers of participants and website events. Specifically, the 2023 Open House was held with a focus on an exclusive online portal site featuring new content such as a VR introduction of the examination area (12,609 views). There also were videos posted, five live-streamed events (about 300 participants in total), and limited in-person activities (about 50 participants out of 260 applications).

### **ii) Public outreach related to genome sequencing analysis study**

RERF has to obtain understanding from the A-bomb survivors, their children, and the local communities to initiate this study. RERF is preparing for public lectures (symposiums) focusing on this study to be held in Hiroshima and Nagasaki in April 2024. As part of its efforts, a guidance session for the mass media was held in Hiroshima and Nagasaki (October 2023, 24 participants). Aside from this, RERF is preparing for an explanatory session targeting only study participants.

### **iii) Promotion of public relations activities targeting media**

RERF strove to respond to media requests for information in an effort to ensure that its coverage was fair and unbiased. As part of PR activities for the genome sequencing analysis study, RERF held a guidance session for the media this year. This helped the foundation maintain contact with the media efficiently. In addition to this, RERF reported on the first meeting of the External Advisory Committee on Biosample Usage (6/1), the 13th regular meeting of the Board of Councilors (6/22), and the introduction of the new Directors (6/23). It also held a press conference, sent out a press release, and fielded media requests for the second meeting of the External Advisory Committee on Biosample Usage (8/23). The number of published articles featuring RERF in FY2023 totaled 103 as of March 31, 2024.

### **iv) Enhancement of social media-related activities**

RERF has opened social media accounts, including Facebook and X (formerly Twitter). Using social media requires thorough risk management, and RERF is advancing its measures to consistently develop follower support for the foundation and not merely increase follower numbers. As of March 31, 2024, RERF had 889 followers on its Facebook page and 707 followers on its English and Japanese accounts on X (formerly Twitter).

### **v) Vitalization of video-production system**

RERF is preparing to produce video content to obtain the understandings of the A-bomb survivors, their children, and local communities for its planned genome sequencing analysis study. RERF is also preparing for video production, including interviews with scientists about the specific research projects in which they are engaged, as well as other related stories, as an enhancement of synopses introducing RERF research papers.

vi) Enhancement of the RERF website

- For the FY2023 Open House, RERF effectively attracted viewers to its official website by utilizing targeted banners and Facebook advertising for the first time. Owing to these successful approaches, the bounce rate (the percentage of visitors that leave a webpage without moving to pages other than the top page) of the Open House website considerably improved from 86.55% in FY2022 to 71.55% in FY2023.
- Starting in FY2018, new easy-to-follow synopses of published papers have been posted on the public website (six synopses posted in FY2023).
- RERF continued its website's regular updates. In FY2023, 16 articles were added to the What's New section, and 41 posts of bid-related information were made. RERF also updated the pages of executive and research staff according to structural changes and posted the report of the previous year's activities and other materials on work and finance.
- As of March 31, 2024, the event counts (views) of the RERF website were 1,080,000, with the daily average being about 2,958, and the website visitors totaled 170,000, with the daily average being about 466.

vii) Facility tour program

Considering the continued concerns about the new coronavirus, RERF held facility tours but limited the dates to May 26 and August 6 in the first half of the fiscal year. There were a total of 23 participants. As requested by the City of Hiroshima, RERF also held a tour for a group of 20 ambassadors to Japan who had attended the peace memorial ceremony. RERF also cooperated with the activity being carried out by Hirosaki University Institute of Radiation Emergency Medicine as part of a human-resource training program run by the Secretariat of the Nuclear Regulation Authority. It accepted five students and graduate students learning risk analysis and others and shared the foundation's history and research findings with them. On this tour, the Department of Molecular Biosciences also joined and offered a tour of laboratories that were not made open to the public on a normal facility tour. In FY2023, there were thirteen facility tours (about 122 visitors) as of March 31, 2024.

viii) Other PR activities

- Press releases were sent out regarding two studies of high-impact factors. RERF accepted a media request for an interview, but it did not appear as an article.
- The RERF School Visit Program was held—which is an attempt to teach radiation health effects to school children using readily understandable language. As of March 31, 2024, there were nine school visits (about 480 participants).
- The online version of the RERF School Visit Program was held (two visits, 570 participants). By holding the program online, RERF could resolve problems such as the conflict of schedule between RERF and schools and the unavailability of a venue due to an excessive number of participants.
- RERF held a guidance session with peace volunteer guides and volunteer memory keepers of A-bomb experiences from external organizations of the Hiroshima Peace Memorial Museum (nine participants). Since some participants had expressed concern about their knowledge of radiation in their guiding activities, RERF solicited the research staff's support and provided the participants with a session more detailed than a normal school visit, which was received favorably. A similar guidance session is scheduled for May 2024.
- As requested by the Department of Clinical Studies, RERF held a tour of Hijiyama



Hall for some AHS and FOCS participants. The foundation introduced the building as an architectural heritage to the participants and provided them with explanations of the significance of RERF's research findings (three total number of days and 36 total participants).

**FY2023 RERF International Collaborative Activities**

I. Participation in international collaborative activities by RERF directors and staff members		II. Acceptance of visitors from overseas for briefing and training	
WHO-related activity	3 people	(Hiroshima)	
UNSCEAR-related activity	2 people	Visitors related to HICARE	9 people
ICRP-related activity	3 people	Visitors related to RERF (International Exchange Research Program)	None
IAEA-related activity	None	Visitors related to MEXT	None
Medical checkup for A-bomb survivors residing in South Korea-related activity	1 person	Visitors related to JICA	None
NASHIM-related activity	1 person	(Nagasaki)	
Others	15 people	Visitors related to NASHIM	24 people
<b>Total: 25 people</b>		<b>Total: 33 people (Hiroshima: 9 people, Nagasaki: 24 people)</b>	

**I. Participation in international collaborative activities by RERF directors and staff members (excluding participation in international scientific meetings)**

*In italics: Funding Organization*

1. World Health Organization (WHO)-related activity (3 people)

*RERF* (hereinafter, all titles represent those at time of participation)

Kenji Kamiya, Chair, Kazunori Kodama, Executive Director, and Misa Imaizumi, Assistant Department Chief of Clinical Studies (Nagasaki), attended the 17th Radiation Emergency Medical Preparedness and Assistance Network (WHO REMPAN) (September 13-15, 2023, Korea).

2. United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR)-related collaborative activity (2 people)

1) *National Institute of Radiological Sciences*

Ritsu Sakata, Acting Department Chief of Epidemiology, attended the UNSCEAR domestic committee meetings (September 26, 2023, Online, and March 6, 2024, Online).

2) *RERF*

Alina Brenner, Senior Scientist, Department of Epidemiology, attended meetings as a lead writer for UNSCEAR Epidemiological studies of Radiation and Cancer (June 19, July 10, August 22, September 13-15, October 30, and December 8, 2023, Online, February 6, and March 6, 2024, Online).

3. *ICRP (International Commission on Radiological Protection)*-related activity (3 people)

- (1) Alina Brenner, Senior Scientist, Department of Epidemiology, attended meetings as a member of the ICRP Task Group 122 (Update of Detriment Calculation for Cancer)

(April 13 and October 3, 2023, Online, February 29, 2024, Online).

- (2) Preetha Rajaraman, Vice Chair, attended the 7th International Symposium on the System of Radiological Protection and Committee Meetings at ICRP 2023 as Committee Member and a Member of the ICRP Task Group 111 (Factors Governing the Individual Response of Humans to Ionizing Radiation). (November 5-12, 2023, Tokyo).
- (3) Tomoki Nakamizo, Division Chief of Radiology of the Department of Clinical Studies, Nagasaki, attended meetings as a member of the ICRP Task Group 119 (Radiation Effects on Diseases of the Circulatory System) (April 25 and June 9, 2023, Online, January 15, 2024, Online).

4. IAEA (*International Atomic Energy Agency*)-related activity (0 person)

This activity was not done in FY2023.

5. Medical checkup for A-bomb survivors residing in South Korea-related activity (1 person)

*Nagasaki Prefecture*

Ayumi Hida, Department Chief, Department of Clinical Studies, Nagasaki, participated in 33rd A-bomb survivors medical checkup in Korea (July 9-13, 2023, Seoul, Korea).

6. Nagasaki Association for Hibakusha Medical and International Cooperation (NASHIM) related (1 person)

*Nagasaki Prefecture*

Dr. Imaizumi, Assistant Department Chief of Clinical Studies, Nagasaki, participated in the exchange of opinions on the NASHIM expert dispatch project (September 11-12, 2023, Korea)

7. Others (15 people)

- (1) Alina Brenner, Senior Scientist, Department of Epidemiology, gave an invited presentation at the ISORED meeting (May 16, 2023, Sitges, Spain)
- (2) Kenji Kamiya, RERF Chair, attended the reception of the 20th anniversary of the Hiroshima Office of the United Nations Institute for Training and Research (June 30, 2023, Hiroshima).
- (3) Osamu Tanabe, Chief Scientist, attended the 17th International Congress for Radiation Research (August 27-30, 2023, Montreal, Canada)
- (4) Richard Sposto, Department Chief, Department of Statistics, gave a lecture at the 2023 United Nations Disarmament Fellowship Program (October 2, 2023, Hiroshima)
- (5) Kenji Kamiya, RERF Chair, gave a lecturer at HICARE's seminar on the medical care for A-bomb survivors in Hawaii, USA (October 11-12, 2023, Hawaii, USA).
- (6) Hiromi Sugiyama, Assistant Department Chief, Department of Epidemiology, attended a board meeting of International Association of Cancer Registries (IACR) (October 14, 2023, Online, November 13, Spain, 2023, February 6, and March 7, 2024, Online).
- (7) Hiromi Sugiyama, Assistant Department Chief, Department of Epidemiology, attended Asia Cohort Consortium (ACC) (October 25-26, 2023, Nagoya).
- (8) Ritsu Sakata, Acting Department Chief and Alina Brenner, Senior Scientist, Department of Epidemiology, gave an invited presentation at the 7th International Symposium On The System of Radiological Protection ICRP 2023 (November 9, 2023, Tokyo)

- (9) Ayumi Hida, Department Chief, Department of Clinical Studies, Nagasaki, made a presented at the Satellite Session (Cataracts) of the 7th ICRP International Symposium (November 11, 2023, Tokyo)
- (10) Kenji Kamiya, RERF Chair, attended as a chair and Richard Sposto, Department Chief, Department of Statistics, gave a lecture at the 25th International Charles Heidelberger Symposium on Cancer Research. (November 16-17, 2023, Hiroshima).
- (11) Kenji Kamiya, RERF Chair, and Kazunori Kodama, Executive Director, gave a lecture at the IAEA-HICARE International Training Course on Medical Responses to Radiation Accidents and Disasters (January 18, 2024, Hiroshima).
- (12) Kenji Kamiya, RERF Chair, attended the 2024 Fukushima Medical University International Symposium on the Fukushima Health Management Survey (March 2, 2024, Fukushima).

## II. Acceptance of visitors from overseas for briefing and training (33 people)

### 【Hiroshima 9 people (Online training)】

Visitors related to *Hiroshima International Council for Health Care of the Radiation Exposed (HICARE)*: 9 people

- 1) United States (3 people)  
August 29, 2023: 3 trainees
- 2) South Korea (6 people)  
Short-term training group of medical treatment for A-bomb survivors living in South Korea  
December 5, 2023: 6 trainees

### 【Nagasaki 24 people】

Visitors related to *the Nagasaki Association for Hibakushas' Medical Care (NASHIM)*: 24 people

- 1) Kazakhstan:  
July 28, 2023: 5 trainees
- 2) Korea  
(1) October 18, 2024: 6 trainees  
(2) January 24, 2024: 11 trainees
- 3) Brazil  
January 24, 2024: 2 trainees

**FY2023**

**Joint programs between RERF and overseas researchers/research organizations**

*In italics: Funding Organization*

1. Collaborative studies between *RERF and US National Cancer Institute (NCI)*

- (1) Under the research contract entered into by and between RERF and the US National Cancer Institute (NCI), in which Kotaro Ozasa, Former Department Chief of Epidemiology, served as a responsible person of the RERF side, analysis of solid cancer incidence risks in the LSS cohort, site-specific cancer studies based on histopathological diagnoses were conducted based on this contract.

The following papers have been published (RERF authors underlined):

Yoshida N, Fujihara M, Preston DL, Ozasa K, Hida A, Ohishi W, Sakata R, Mabuchi K. Further analysis of incidence of multiple myeloma among atomic bomb survivors, 1950-1994. *Blood Advances* 2023 (June); 7(12):2807-10 [RP-3-94]

Utada M, Brenner AV, Preston DL, Yamada M, Grant EJ, Sugiyama H, Sakata R, Cahoon EK, Ozasa K, Mabuchi K. The effect of prostate-specific antigen (PSA) test on radiation risk estimate for prostate cancer incidence among atomic-bomb survivors. *Radiat Res* 2023 (July); 200(1):96-101[RP-S5-19]

Note: The contract research agreement between RERF and NCI, dated May 20, 2019, expired on July 31, 2021.

- (2) Ritsu Sakata, Acting Department Chief, and Alina Brenner, Senior Scientist, Department of Epidemiology, are joining with the data of tumor of the central nervous system from RERF as a part of the pooled analysis conducted by the scientists of Radiation Epidemiology Branch, NCI.
- (3) Ritsu Sakata, Acting Department Chief of Epidemiology, is joining with the data of radiation-associated thyroid cancers from RERF as a part of the pooled analysis conducted by the scientists of Radiation Epidemiology Branch, NCI.

2. Collaboration between *RERF and the/Asia Cohort Consortium (ACC)*

Ritsu Sakata, Acting Department Chief of Epidemiology, is joining the collaborative project with the ACC entitled: Tobacco smoking, alcohol drinking, body mass index and risk of rare cancers.

3. Collaboration between *RERF and Institute of Cancer Research, UK and US National Institute of Environmental*

Alina Brenner, Senior Scientist, Department of Epidemiology, is joining with premenopausal breast cancer data from RERF as a part of the pooled analysis conducted by Dr. Anthony Swerdlow of Institute of Cancer Research, UK, and Dr. Hazel Nichols of US National Institute of Environmental.

4. Collaboration between *RERF and The Federal Office for Radiation Protection, Oberschleißheim, Germany.*

Munehika Misumi is collaborating with Dr. Jan Christian Kaiser of the Federal Office for Radiation Protection, Oberschleißheim, Germany, on the issue of mechanistic modelling of the radiation risk for colon cancer in Japanese A-bomb survivors.

5. Collaboration between *RERF and Columbia University, New York, USA*

Zhenqiu Liu is collaborating with Drs. Sally Amundson, Igor Shuryak, and David Brenner, of Columbia University, on the issue of candidate biomarker discovery, with focus on accurate

radiation risk estimation using deep learning, double/debiased machine learning, and causal gradient boosting.

6. Collaboration between *RERF* and *Kyungpook National University, Korea*

John Cologne is collaboration with Dr. Young Min Kim of Kyungpook National University, Korea, on the issue of inference for the mediation proportion in causal models.

7. *RERF* international collaborative studies on radiation dosimetry.

Harry Cullings, Consultant, and Sachiyo Funamoto, Section Chief, Department of Statistics, collaborated with an international group of dosimetry experts in work to update RERF radiation dosimetry.

8. *University of Bern* international multi-institutional collaborative studies on thyroid

Misa Imaizumi, Assistant Department Chief of Clinical Studies (Nagasaki), Waka Ohishi, Department Chief of Clinical studies and Michiko Yamada, Division Chief of Radiology of Department of Clinical Studies are joining with Adult Health Study data from RERF as a part of the pooled analysis of thyroid conducted by Dr. Rodondi of University of Bern, Switzerland (Thyroid Studies Collaboration).

9. *RERF* international collaborative studies on cancer registries

- (1) Hiromi Sugiyama, Assistant Department Chief, Department of Epidemiology, submitted data to the International Association of Cancer Registries (IACR)/International Agency for Research on Cancer (IARC) Cancer Incidence on Five Continents using cancer registry data from Hiroshima and Nagasaki, which was published in Volume 12.
- (2) Hiromi Sugiyama, Assistant Department Chief, Department of Epidemiology, is participating in the CONCORD program at the London School of Tropical Hygiene and Tropical Medicine, using data from the Hiroshima and Nagasaki cancer registries.
- (3) Hiromi Sugiyama, Assistant Department Chief, Department of Epidemiology, is participating in the Rare Cancer Epidemiology Study in Asia (Rarecarenet Asia) using data from the National Cancer Registry.

令和5年度 外部資金研究一覧表  
FY2023 External Research Funds

外部機関名称 Name of Outside Organization	件数 Number of Grants	研究資金 (資金拠出機関からの入金額) Research funds (amount of funds from funding)
厚生労働省 Ministry of Health, Labour and Welfare (MHLW)	3	¥1,850,000
独立行政法人 日本学術振興会 (文部科学省所管の独立行政法人) Japan Society for the Promotion of Science (JSPS) [Independent administrative entity under the jurisdiction of the Ministry of Education, Culture, Sports, Science and Technology (MEXT)]	9	¥14,950,000
一般財団法人 土谷記念医学振興基金 Tsuchiya Memorial Medical Foundation	1	¥0 *
国立研究開発法人 国立がんセンター National Cancer Center	1	¥0 **
総合計 Grand total	14	¥16,800,000

注)

- ・ 間接費を含む。
- ・ 研究分担者の配分額を含む。

\* 研究期間延長のため、今年度資金の配分なし。

\*\* 研究協力者として研究参画のため、資金の配分なし。

Notes)

- ・ These amounts include indirect cost.
- ・ These amounts include subsidies allocated to collaborators.

\* No research funds are allocated in FY2023, because the research term has been extended.

\*\* No research funds are allocated, because the RERF researcher takes part in the research as a cooperative investigator.

令和5年度 外部資金研究一覧表  
FY2023 External Research Funds

研究のタイトル Title of Research	委託組織の名前と場所及び研究 グループのチーフ又は担当の主任研究者 Name and location of entrusting outside organization Chief of research group or principal investigator in charge	放影研における研究者の名前 Investigator(s) at RERF	研究資金(資金拠出 機関からの入金額) Research funds (amount of funds from funding organizations)	令和5年度 開始日 First project date in FY2023	令和5年度 終了日 Last project date in FY2023	関連RP Related RPs	関連性 Relationship to RERF's mission
疫学部 Department of Epidemiology							
1 社会経済的格差に着目したがん対策に資する空間疫学的ビッグデータ解析研究 Spatial epidemiological big data analysis research that contributes to cancer control focusing on socio-economic disparities	日本学術振興会・科学研究費助成事業 「基盤研究(B)」 研究代表者 伊藤 秀美 愛知県がんセンター JSPS Grant-in-Aid for Scientific Research Scientific Research (B) Hidemi Ito Chief, Division of Cancer Information and Control, Aichi Cancer Center Research Institute	研究分担者 (Collaborator) 杉山 裕美 Hiromi Sugiyama	直接経費 (Direct cost) ¥150,000  間接経費 (Indirect cost) ¥45,000	April 1, 2023	March 31, 2024	RP-S2-17	日本人のがんの疫学研究 Epidemiological study of cancer in Japanese population
2 がん統計を活用した、諸外国とのデータ比較に基づく日本のがん対策の評価のための研究 Research on the evaluation of cancer control in Japan based on data comparison with overseas countries using cancer statistics	厚生労働省・厚生労働科学研究費補助金 「がん対策推進総合研究事業」 研究代表者 松田 智大 国立研究開発法人国立がん研究センター がん対策研究所 国際政策研究部 部長 Health and Labour Sciences Research Grants (MHLW) Promotion of Comprehensive Research Project for Cancer Control Tomohiro Matsuda Chief, Division of International Health Policy Research, National Cancer Center, Institute for Cancer Control	研究分担者 (Collaborator) 杉山 裕美 Hiromi Sugiyama	¥650,000	April 1, 2023	March 31, 2024	RP-S2-17	日本人のがんの疫学研究 Epidemiological study of cancer in Japanese population
3 診断・治療が特に困難ながんの実態把握と治療成績の向上に資する研究 Research that contributes to understanding the actual status of cancers that are particularly difficult to diagnose and treat and to improving treatment outcomes	厚生労働省・厚生労働科学研究費補助金 「がん対策推進総合研究事業」 研究代表者 井上 真奈美 国立研究開発法人国立がん研究センター がん対策研究所 予防研究部 部長 Health and Labour Sciences Research Grants (MHLW) Promotion of Comprehensive Research Project for Cancer Control Manami Inoue Chief, Division of Prevention, National Cancer Center, Institute for Cancer Control	研究分担者 (Collaborator) 杉山 裕美 Hiromi Sugiyama	¥400,000	November 8, 2023	March 31, 2024	RP-S2-17	日本人のがんの疫学研究 Epidemiological study of cancer in Japanese population



令和5年度 外部資金研究一覧表  
FY2023 External Research Funds

研究のタイトル Title of Research	委託組織の名前と場所及び研究 グループのチーフ又は担当の主任研究者 Name and location of entrusting outside organization Chief of research group or principal investigator in charge	放影研における研究者の名前 Investigator(s) at RERF	研究資金(資金拠出 機関からの入金額) Research funds (amount of funds from funding organizations)	令和5年度 開始日 First project date in FY2023	令和5年度 終了日 Last project date in FY2023	関連RP Related RPs	関連性 Relationship to RERF's mission
疫学部 Department of Epidemiology							
4 科学的根拠に基づくがんリスク評価とがん予防ガイドライン提言に関する研究 Study for evaluation of cancer risk and proposal of cancer prevention guidelines on the basis of scientific evidence	国立がん研究センター・国立がん研究センター研究開発費 研究代表者 井上 真奈美 国立研究開発法人国立がん研究センター がん対策研究所 予防研究部 部長 National Cancer Center Funds for Cancer Research and Related Technology Development Manami Inoue Chief, Division of Prevention, National Cancer Center, Institute for Cancer Control	研究協力者 (Cooperative Investigator) 歌田 真依 Mai Utada	研究協力者のため、 研究資金の配分なし Since this person is a cooperative investigator, research funds were not allocated to her.	April 1, 2023	March 31, 2024	RP-A2-15	日本人のがんの疫学研究 Epidemiological study of cancer in Japanese population

令和5年度 外部資金研究一覧表  
FY2023 External Research Funds

研究のタイトル Title of Research	委託組織の名前と場所及び研究 グループのチーフ又は担当の主任研究者 Name and location of entrusting outside organization Chief of research group or principal investigator in charge	放影研における研究者の名前 Investigator(s) at RERF	研究資金(資金拠出 機関からの入金額) Research funds (amount of funds from funding organizations)	令和5年度 開始日 First project date in FY2023	令和5年度 終了日 Last project date in FY2023	関連RP Related RPs	関連性 Relationship to RERF's mission
臨床研究部 Department of Clinical Studies							
1 循環器疾患及び糖尿病、COPD等の生活習慣病の 個人リスク及び集団リスクの評価ツールの開発と応 用のための研究 Research on the development and application of individual and population risk assessment tools for lifestyle-related diseases, including cardiovascular disease, diabetes and COPD	厚生労働省・厚生労働科学研究費補助金 「循環器疾患・糖尿病等生活習慣病対策総合研究事業」 研究代表者 村上 義孝 東邦大学医学部 教授 Health and Labour Sciences Research Grants (MHLW) Comprehensive Research on Life-Style Related Diseases including Cardiovascular Diseases and Diabetes Mellitus Yoshitaka Murakami Professor, Graduate School of Medicine, Toho University	研究分担者 (Collaborator) 立川 佳美 Yoshimi Tatsukawa  研究協力者 (Cooperative Investigator) 山田 美智子 Michiko Yamada	¥800,000	April 1, 2023	March 31, 2024	RP 2-75 RP 6-08 RP 1-15 RP-S1-23	広範囲な医学的調査 (生活習慣病) Broad-based medical research (Lifestyle disease)
2 造血器腫瘍における放射線被ばくに伴うゲノム異常 と間質リモデリングの同定 Identification of radiation-related genomic alterations and stromal remodeling in hematological malignancies	日本学術振興会・科学研究費助成事業 「基盤研究(C)」 研究代表者 吉田 稚明 JSPS Grant-in-Aid for Scientific Research Scientific Research (C) Noriaki Yoshida	研究代表者 (P.I.) 吉田 稚明 Noriaki Yoshida  研究分担者 (Collaborator) 濱崎 幹也 (分子生物科学部) Kanya Hamasaki (Dept. Molecular Biosciences)	直接経費 (Direct cost) ¥1,900,000  間接経費 (Indirect cost) ¥570,000  久留米大学の研究分担者への配分額は、上記の研究 資金に含まれている。 The above amount includes funds allocated to the collaborators at Kurume University.	April 1, 2023	March 31, 2024	RP 6-70 RP 5-90 RP 3-94 RP-S2-15 RP 5-02 RP-P2-19	がん研究 (被爆者ががん研究への応用) Cancer research (Application to cancer research among A-bomb survivors)
3 被爆後早期に発症した白血病症例の分子病理学 的解析 Pathological and molecular characterization of leukemia developed shortly after A-bomb radiation exposure	一般財団法人 土谷記念医学振興基金 研究代表者 吉田 稚明 Tsuchiya Memorial Medical Foundation Noriaki Yoshida	研究代表者 (P.I.) 吉田 稚明 Noriaki Yoshida	¥0  研究期間延長により、令和4年度の未執行額(846,431円) を使用。令和5年度に新たな助成金の交付はなし。 With extension of the research term, the unexecuted amount for FY2022 (846,431yen) has been used. No grant was provided for FY2023.	April 1, 2023	March 31, 2024	RP 6-70 RP 5-90 RP-S2-15 RP 5-02	がん研究 (被爆者ががん研究への応用) Cancer research (Application to cancer research among A-bomb survivors)

令和5年度 外部資金研究一覧表  
FY2023 External Research Funds

研究のタイトル Title of Research	委託組織の名前と場所及び研究 グループのチーフ又は担当の主任研究者 Name and location of entrusting outside organization Chief of research group or principal investigator in charge	放影研における研究者の名前 Investigator(s) at RERF	研究資金(資金拠出 機関からの入金額) Research funds (amount of funds from funding organizations)	令和5年度 開始日 First project date in FY2023	令和5年度 終了日 Last project date in FY2023	関連RP Related RPs	関連性 Relationship to RERF's mission
統計部 Department of Statistics  1 Fused-lassoによる広島・長崎の被爆に関する時空間リスク推定モデルの開発 Development of a spatio-temporal risk estimation model for Hiroshima and Nagasaki exposures by Fused-lasso	日本学術振興会・科学研究費助成事業 「基盤研究(B)」 研究代表者 山村 麻理子 JSPS Grant-in-Aid for Scientific Research Scientific Research (B) Mariko Yamamura	研究代表者 (P.I.) 山村 麻理子 Mariko Yamamura	直接経費 (Direct cost) ¥2,400,000  間接経費 (Indirect cost) ¥720,000  広島大学、東北大学及び関西大学の研究分担者への配分額は、上記の研究資金に含まれている。 The above amount includes funds allocated to the collaborators at Hiroshima University, Tohoku University and Kansai University.	April 1, 2023	March 31, 2024	RP 1-75	LSS
2 疫学データに基づく大腸がんの放射線発がん機序モデリングとその妥当性の検討 Biology-based mechanistic modelling of colorectal cancer based on epidemiological data and investigations of its validity	日本学術振興会・科学研究費助成事業 「基盤研究(C)」 研究代表者 三角 宗近 JSPS Grant-in-Aid for Scientific Research Scientific Research (C) Munehika Misumi	研究代表者 (P.I.) 三角 宗近 Munehika Misumi	直接経費 (Direct cost) ¥1,000,000  間接経費 (Indirect cost) ¥300,000	April 1, 2023	March 31, 2024	RP-S4-18 RP18-61	LSS LSS

令和5年度 外部資金研究一覧表  
FY2023 External Research Funds

研究のタイトル Title of Research	委託組織の名前と場所及び研究 グループのチーフ又は担当の主任研究者 Name and location of entrusting outside organization Chief of research group or principal investigator in charge	放影研における研究者の名前 Investigator(s) at RERF	研究資金(資金拠出 機関からの入金額) Research funds (amount of funds from funding organizations)	令和5年度 開始日 First project date in FY2023	令和5年度 終了日 Last project date in FY2023	関連RP Related RPs	関連性 Relationship to RERF's mission
分子生物科学部 Department of Molecular Biosciences							
1 原爆被爆者のクローン造血と体細胞変異に基づく時間 分解バイオシメトリ Time-resolved biosimetry based on clonal hematopoiesis and somatic mutations in atomic-bomb survivors	日本学術振興会・科学研究費助成事業 「基盤研究(B)」 研究代表者 吉田 健吾 JSPS Grant-in-Aid for Scientific Research Scientific Research (B) Kengo Yoshida	研究代表者 (P.I.) 吉田 健吾 Kengo Yoshida  研究分担者 (Collaborator) 楠 洋一郎 Yoichiro Kusunoki 内村 有邦 Arikuni Uchimura 田邊 修 Osamu Tanabe 濱崎 幹也 Kanya Hamasaki  研究協力者 (Cooperative Investigator) John B. Cologne (統計部) (Dept. Statistics)	直接経費 (Direct cost) ¥4,000,000  間接経費 (Indirect cost) ¥1,200,000	April 1, 2023	March 31, 2024	RP1-23-1	被ばくに関連した変異クローンの 生成時期の推定を目指し、新規バ イオシメトリ法の開発に貢献 This study contributes to the development of a novel biosimetry method aimed at estimating the timing of generation of mutant clones associated with exposure.
2 プタモデルを用いたFOLFOX誘導性のSOSの予防 法の確立 Establishment of a preventive method of FOLFOX- induced SOS using a porcine model	日本学術振興会・科学研究費助成事業 「基盤研究(C)」 研究代表者 瀬尾 智 高知大学 医学部 教授 JSPS Grant-in-Aid for Scientific Research Scientific Research (C) Satoru Seo Professor, School of Medicine, Kochi University	研究分担者 (Collaborator) 鶴山 竜昭 Tatsuaki Turuyama	直接経費 (Direct cost) ¥50,000  間接経費 (Indirect cost) ¥15,000	April 1, 2023	March 31, 2024	No.RP	放射線被ばくにおける肝疾患発症 のメカニズム研究 Mechanistic analysis of radiation- associated development of liver diseases

令和5年度 外部資金研究一覧表  
FY2023 External Research Funds

研究のタイトル Title of Research	委託組織の名前と場所及び研究 グループのチーフ又は担当の主任研究者 Name and location of entrusting outside organization Chief of research group or principal investigator in charge	放影研における研究者の名前 Investigator(s) at RERF	研究資金(資金拠出 機関からの入金額) Research funds (amount of funds from funding organizations)	令和5年度 開始日 First project date in FY2023	令和5年度 終了日 Last project date in FY2023	関連RP Related RPs	関連性 Relationship to RERF's mission
分子生物科学部 Department of Molecular Biosciences							
3 デング熱感染回復期の細胞障害性T細胞抗原受容 体レパトアのシングルセル解析 Single cell analysis of TCR genotypes of CTL at recovery phase of acute Dengue infection	日本学術振興会・科学研究費助成事業 「基盤研究(B)」 研究代表者 平山 謙二 長崎大学 熱帯医学・グローバルヘルス研究科 教授 JSPS Grant-in-Aid for Scientific Research Scientific Research (B) Kenji Hirayama Professor, School of Tropical Medicine and Global Health, Nagasaki University	研究分担者 (Collaborator) 谷本 幸介 Kousuke Tanimoto	直接経費 (Direct cost) ¥0  間接経費 (Indirect cost) ¥0  長崎大学の研究員(非常勤)の立場で研究分担者とし て当研究所の就業時間外に行われる。当該科研費の 管理および係る交付申請、実績報告書等の提出事務 はすべて長崎大学が行う。 As the part-time researcher of Nagasaki University, this project is performed outside working hours. All management of this funds and submission of reprots, etc. are done by Nagasaki University.	April 1, 2023	March 31, 2024	No.RP	該当なし None

令和5年度 外部資金研究一覧表  
FY2023 External Research Funds

研究のタイトル Title of Research	委託組織の名前と場所及び研究 グループのチーフ又は担当の主任研究者 Name and location of entrusting outside organization Chief of research group or principal investigator in charge	放影研における研究者の名前 Investigator(s) at RERF	研究資金(資金拠出 機関からの入金額) Research funds (amount of funds from funding organizations)	令和5年度 開始日 First project date in FY2023	令和5年度 終了日 Last project date in FY2023	関連RP Related RPs	関連性 Relationship to RERF's mission
<p>情報技術部 Department of Information Technology</p> <p>1 ワイヤレスセンシングと機械学習による猟師向けリアルタイム獣流推定に関する研究 Study concerning the use of wireless sensing and machine learning by hunters to estimate the movements of wildlife real-time</p>	<p>日本学術振興会・科学研究費助成事業 「若手研究」 研究代表者 小野 悟 JSPS Grant-in-Aid for Scientific Research Early-Career Scientists Satoru Ono</p>	<p>研究代表者 (P.I.) 小野 悟 Satoru Ono</p>	<p>直接経費 (Direct cost) ¥600,000</p> <p>間接経費 (Indirect cost) ¥180,000</p>	April 1, 2023	March 31, 2024	No RP	<p>診療録を始めとする紙媒体のスクリーンデータを分類するための手法の構築には、本研究で用いる機械学習を用いた行動情報の分類に関する研究が有用に機能すると思われる。 This research which will examine machine-learning-based dog's movement data classification, will expect to contribute to the creation of a best-fit classification method for medical charts and other paper documents.</p>

令和5年度 外部資金研究一覧表  
FY2023 External Research Funds

研究のタイトル Title of Research	委託組織の名前と場所及び研究 グループのチーフ又は担当の主任研究者 Name and location of entrusting outside organization Chief of research group or principal investigator in charge	放影研における研究者の名前 Investigator(s) at RERF	研究資金(資金拠出 機関からの入金額) Research funds (amount of funds from funding organizations)	令和5年度 開始日 First project date in FY2023	令和5年度 終了日 Last project date in FY2023	関連RP Related RPs	関連性 Relationship to RERF's mission
バイオサンプル研究センター Biosample Research Center  1 ヒト造血幹細胞における放射線誘発変異の全ゲノム シーケンスによる解析 Whole-genome sequence analysis of radiation-induced somatic mutations in human hematopoietic stem cells	日本学術振興会・科学研究費助成事業 「基盤研究(C)」 研究代表者 田邊 修 JSPS Grant-in-Aid for Scientific Research Scientific Research (C) Osamu Tanabe	研究代表者 (P.I.) 田邊 修 Osamu Tanabe  研究分担者 (Collaborator) 松田 由喜子 (分子生物科学部) Yukiko Matsuda (Dept. Molecular Biosciences) 吉田 健吾 (分子生物科学部) Kengo Yoshida (Dept. Molecular Biosciences) 内村 有邦 (分子生物科学部) Arikuni Uchimura (Dept. Molecular Biosciences)	直接経費 (Direct cost) ¥1,400,000  間接経費 (Indirect cost) ¥420,000	April 1, 2023	March 31, 2024	No RP	放射線被曝による晩発障害である 白血病、固形腫瘍、循環器疾患な どの分子メカニズムの解明と、それ ら疾患の予防法、治療法の開発に 貢献 This study contributes to the elucidation of molecular mechanisms of the late-onset diseases by radiation exposure, including leukemia, solid tumors, and cardiovascular diseases, and contributes to the development of preventive and therapeutic measures for those diseases.

令和5年度 特別会計一覧表  
FY2023 Special Funds

資金拠出機関名称 Name of Funding Agency	件数 Number of Funds	資金合計 Amount of Funding Total
厚生労働省 Ministry of Health, Labour and Welfare (MHLW)	2	¥8,461,000
広島県 Hiroshima Prefecture	1	¥12,243,141
長崎県 Nagasaki Prefecture	1	¥8,700,000
総合計    Grand total	4	¥29,404,141

注)

- ・ 間接費を含む。
- ・ 研究分担者の配分額を含む。

Notes)

- ・ These amounts include indirect cost.
- ・ These amounts may include subsidies allocated to collaborators.



令和5年度 特別会計一覧表  
FY2023 Special Funds

	研究のタイトル Title of Research	委託組織の名前と場所及び研究 グループのチーフ又は担当の主任研究者 Name and location of entrusting outside organization/Chief of research group or principal investigator in charge	放影研における契約者/ 研究者の名前 Investigator(s) at RERF	資金拠出機関か らの入金額 Amount of Funds from Funding Agencies	開始日 Initiation Date	終了日 Termination Date	関連RP Related RPs	関連性 Relationship to RERF's mission
1	放射線業務従事者の健康影響に関する疫学研究 Epidemiological study of health effects in radiation workers	厚生労働省・労災疾病臨床研究事業費補助金 研究代表者 大久保 利晃 独立行政法人労働者健康安全機構 労働安全衛生総合研究所 労働者放射線障害防止研究センター センター長 Research Grant for Clinical Studies of Work-Related Illness (MHLW) Toshiteru Okubo Director, Research Center for Prevention from Radiation Hazards of Workers, National Institute of Occupational Safety and Health, Japan Organization of Occupational Health and Safety	研究分担者 (Collaborative Investigator) 大石 和佳 Waka Ohishi	¥6,587,000	April 1, 2023	March 31, 2024	RP 6-15	東電福島第一原発事故処理緊急作業従事者の長期疫学調査 Long term follow-up epidemiological study on emergency workers of TEPCO, Fukushima Daiichi Nuclear Power Plant accident.
2	原爆被爆者の生物試料の保管及び活用に関する研究事業 Research Program on preservation and use of the A-bomb survivors' biosamples	厚生労働省・委託事業 神谷 研二 MHLW Entrustment Kenji Kamiya	受託者 (Contractor) 神谷 研二 Kenji Kamiya	¥1,874,000	January 25, 2024	March 31, 2024		原爆被爆者の生物試料の保管 及び活用 Preservation and use of the A- bomb survivors' biosamples
3	がん登録推進事業 Cancer Registry Promotional Project	広島県・委託事業 神谷 研二 Hiroshima Prefecture Kenji Kamiya	受託者 (Contractor) 神谷 研二 Kenji Kamiya	¥12,243,141	April 1, 2023	March 31, 2024	RP18-61 RP29-60 RPs18-61& 29-60附属書	がんの疫学研究、 LSS、胎内被爆者、 F1集団 Epidemiological study of cancer, LSS, in utero, and F1 populations
4	長崎県がん登録・評価事業 Nagasaki Prefecture Cancer Registry Program	長崎県・委託事業 神谷 研二 Nagasaki Prefecture Kenji Kamiya	受託者 (Contractor) 神谷 研二 Kenji Kamiya	¥8,700,000	April 1, 2023	March 31, 2024	RP18-61 RP29-60 RPs18-61& 29-60附属書	がんの疫学研究、 LSS、胎内被爆者、 F1集団 Epidemiological study of cancer, LSS, in utero, and F1 populations

## **II. Operation and management of RERF**

### **1. Research Resource Center**

In order to accomplish the "Strategic Plan" of RERF, it is planned that the Research Resource Center (RRC) will be established with the aims to modernize the research infrastructure of RERF and to facilitate collaborative studies by streamlining research management system. More specifically, the mission of the RRC is 3-fold as follows:

- (1) Preserve RERF's research assets and historical materials, which include various paper materials for research, photographs, films, paper manuscripts, and datasets.
- (2) Integrate all research data and biosample inventories to enhance the availability of those research resources, and for this aim, provide tools and systems for data visualization and data assembly.
- (3) Create an Office of Research Support to provide an efficient administrative framework to advance collaborative projects inside and outside RERF and facilitate applications for contracts and grants.

As the endeavor of the Research Resource Section to preserve RERF's research assets and historical materials according to the mission (1) above, microfilms kept by the Department of Clinical Studies in Nagasaki were digitized. The degraded old microfilms needed to be dealt with urgently. This work completed the digitization of all microfilms stored in RERF. In addition, specifications were prepared to outsource digitization of the negative films of chromosome images and their ledgers held by the Department of Molecular Biosciences. Furthermore, a policy was developed for prioritizing the digitization and integration of research resources stored in each department at RERF. The prioritization was to be decided by the RERF Board of Directors after discussion at the Research Resource Center Operating Committee (RRCOC), based on RERF's "Strategic Plan" with reference to research scenarios developed by each department, and taking into consideration the future use probability and frequency of the research resources, as well as the budget and time frame required for digitization. Regarding (2), a plan was approved to link the research database currently in operation with the biosample database created by the Laboratory Information Management System (LIMS) that manages biosamples, and with the consent information database being created by the Departments of Clinical Studies, to construct an integrated research data source. In addition, it was decided to share information within RERF using Tableau® software, which extracts data from electronic information within the Foundation and visualizes it for at-a-glance viewing. Since Tableau Server® software for sharing digital dashboards has already been implemented in RERF, we plan to use this environment to share the visualized information. For the establishment of the Office of Research Support as described in (3), the Departments of Epidemiology and Information Technology are working together to select practical staff.

### **2. Relocation of the Hiroshima Laboratory**

RERF concluded an entrustment contract for design and supervision with Naito Architects Co., Ltd., as of June 7, 2023, and the process of detailed design for the new building was initiated. The design process was originally scheduled to be completed by the end of January 2024 but was extended due to changes in design and rising construction-material prices.

### 3. Full audit

The audit report on the voluntary audit (full audit), which is a new process taken from FY2022, was submitted to the Auditors by the auditing firm on May 31, 2023. At the annual BOC meeting in FY2023, the Directors reported on the progress made in establishing audit system, and the Auditors presented their audit report.

An audit contract for FY2023 was signed with Deloitte Touche Tohmatsu LLC on November 1, 2023, and a voluntary audit was initiated. The audit has been being conducted since the contract date and will continue through June 30, 2024.

The specifics of the audit performed, as of the end of March 2024, are as follows:

- First-round audit at RERF, December 19, 21, 25–26, 2023  
Assessment of preparation and implementation of internal control: Processes for subsidy revenues, purchase, fixed assets management, inventory management, salaries, and financial management.
- Second-round, Briefing on audit plans and discussion with management, January 12, 2024
  1. Briefing on audit plans
  2. Discussion with the Chair: Environmental analysis, major managerial issues, understanding of general situation of RERF in the current fiscal year.
- Third-round audit, March 29, 2024  
Substantive procedures taken during the fiscal year: witnessing for stocktaking, physical inspection of cash, confirmation of bank balances, confirmation with a lawyer.

Upon completion of the audit, the final report will be submitted to the Auditors by the regular meeting of the Board of Directors in June 2024.

### 4. Revision of the rules and regulations

RERF in FY2023 continued to review its regulations to enhance the foundation's operational framework as a public interest incorporated foundation. The following are main regulations revised or established.

- Supplementary Regulations Concerning Organization of the Laboratory (Research Departments) [Effected on April 1, 2023]  
The supplementary regulations were updated to reflect the establishment of the Research Resource Section in the Information Technology Department as part of the Research Resource Center (RRC) plan.
- Regulatory amendments due to the increase in mandatory retirement age [Effected on April 1, 2023]  
Due to the foundation's adoption of the national government's system to raise the retirement age in steps, the Rules of Employment, Wage-related Regulations, and other relevant standards were revised.
- Supplementary Regulations Concerning Handling of Specific Assets [Effected on April 1, 2023 (applicability date: April 1, 2022)]

Due to the Accounting Standards for Nonprofit Organizations' requirement that those not deemed basic assets be recorded as specific assets, the supplementary regulations on such assets' handling were established.

- Regulations on Prevention of Harassment and Others [Effectuated on April 1, 2023]  
As it was made obligatory for employers to take measures required for personnel management to prevent power harassment at workplace, RERF also established its regulations to enhance the foundation's measures to prevent the harassment.
- Procedures for Characterizing Autopsy Samples and Database management [Applied from May 30, 2023]  
Written procedures for characterizing autopsy samples were established to facilitate molecular pathology research in the future.
- Regulations on Management Authority of Directors [Applied from August 4, 2023]  
With the new Directors' arrival at RERF, their duties were re-evaluated to revise the appended table related to Article 7: Duties of Directors.
- Payment of Expenses for Activities of Outside Experts, Including Consultants and Visiting Research Associates [Applied from October 1, 2023]  
The amount of honorarium for industrial physicians and consultants were revised.

## Appended documents to FY2023 report of activities

There were no items considered to be important matters for supplementing the contents of the FY2023 report of activities.