FY2024 Report of Activities

Radiation Effects Research Foundation

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I. Report of Major Activities

Evaluation of long-term radiation-related health effects on atomic bomb survivors, and assessment of potential transgenerational effects of radiation on their children, continue to drive the Mission of RERF today: to help improve the health and well-being of the survivors, their children, and radiation-exposed populations around the world. Research at RERF would not be possible without the dedicated support and cooperation of the atomic bomb survivors and their children.

Data from RERF's cohorts of atomic bomb survivors and their children provide risk estimates of radiation-related mortality from all causes, and incidence from cancer and various non-cancer diseases, that have long been the primary basis for national and international radiation protection standards worldwide. These data are used to inform the recommendations of organizations such as the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), International Commission on Radiological Protection (ICRP), International Atomic Energy Agency (IAEA), World Health Organization (WHO) and other authorities, such as the Committee on Biological Effects of Ionizing Radiation (BEIR) of U.S. National Research Council of the National Academies.

The unique importance of RERF's cohorts stems from the combination of their large size, wide range of exposure levels, inclusion of all ages at exposure, and long-standing, high-quality follow-up of disease outcomes. Individual radiation doses for survivors are calculated through a robust dosimetry program. The periodic follow-up and report of cohort data is only one facet of RERF's research activities. Clinical examinations and longitudinal collection of biosamples allow detailed evaluation of health conditions and the biological basis of diseases related to radiation exposure. 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 in cohort follow-up, using cutting edge methods to answer key questions in radiation science, leveraging national and international expertise through collaboration, and communication of these results to relevant stakeholders.

1. Research Projects Examining A-bomb Survivors Health

1.1 Radiation and Cancer

- *Life Span Study Report on Cancer and Non-cancer Diseases (LSS, RP 1-75, RP 2-61, RP 4-75)*: The Department of Epidemiology maintains three major cohort studies of: 1) atomic bomb survivors (LSS), 2) *in utero* survivors, and 3) offspring of survivors (F_1). Around 21% of the LSS cohort members were still alive at the end of 2020 (the most recent date for which we have complete information on vital status), including 67% of those who were less than 10 years old at the time of the bombings. Moreover, 72% of the *in utero* and 86% of the F_1 cohorts were still alive as of 2020. These cohorts are the basis of the major RERF analyses of radiation-related risk in humans. Individual radiation doses have been estimated and continuously revised as newer techniques become available; the latest revision is expected to be complete by the end of FY2025.

  In the past year, analyses summarizing radiation-related risks of solid cancer incidence in the follow up period 1958-2009 were completed, and a manuscript has been submitted. Previous suggestions of elevated radiation-related risk for cancers of the prostate, uterine

corpus, pancreas (in females), and brain/CNS tumors became statistically significant in the 1958-2009 follow up analyses. Novel age-at-exposure patterns were identified, with highest radiation risks for a given dose observed around menarche (for breast cancer) and early puberty (for uterine corpus cancer). Joint endpoint analyses of site-specific risks according to families of physiologically related cancers may provide a promising alternative to modeling all solid cancers as a single outcome applying a common model. Work is also nearing completion for manuscripts comparing radiation-related risk for subtypes of breast cancer and uterine corpus cancer. Radiation ERR per unit dose was elevated for each of the subtypes of breast cancer (luminal A, luminal B, HER2+, triple negative, unknown), and uterine corpus cancer (type-1, type 2, other epithelial, sarcoma), with little indication of difference by subtype for either cancer type. In addition, a manuscript is in preparation describing hematological malignancies followed up 1950-2009; radiation-related risk was significantly increased for all hematological malignancies combined, and for the major subtypes of acute myeloid leukemia, acute lymphoblastic leukemia, and chronic myeloid leukemia.

In parallel with completion of these analyses, data and analytical sets are being prepared for an updated series evaluating risks of cancer mortality (1950-2019), and cancer incidence (1958-2019).

- *Pathogenesis of Myelodysplastic Syndrome (MDS) (RP 1-17)*: Atomic bomb survivors have a higher risk of hematological malignancies even 50 years post radiation exposure. Recent genome analyses indicate that blood samples contain several gene mutations potentially observable before clinical diagnosis. We are searching for mutations in serially stored blood samples of AHS participants who developed MDS using next-generation genome analysis technology. Phylogenetic analysis of whole exome sequencing (WES) of pre-diagnostic blood samples revealed the presence of several MDS clones of different origins at the time of diagnosis. Clones with onset closer to MDS diagnosis (2-5 years prior) occurred predominantly in the high-dose group (≥ 1 Gy). Furthermore, these clones of different origin showed different mutational signatures in whole genome sequencing (WGS) analysis, suggesting a unique process of MDS development in the high-dose group. A manuscript describing these results is in preparation.

- *Leukemia among A-bomb Survivors (RP P1-23)*: 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 such alterations could play a critical role in radiation-induced leukemogenesis. To understand the genomic landscape of such leukemia cases, we initiated a pilot study of targeted-sequencing analysis using DNA and RNA extracted from formalin-fixed paraffin embedded (FFPE) samples collected in the 1960's from three cases participating in the LSS. The amplicon size was smaller than expected, indicating that modifications to the protocol are needed, especially for DNA sequencing. However, we found that RNA sequencing analysis for the screening of fusion genes, as well as DNA sequencing for hot-spot mutations, are feasible using current techniques.

- *Radiation and Liver Cancer (RP 9-92)*: The established association between radiation exposure and chronic hepatitis B virus (HBV) infection, together with the known roles of both radiation and HBV in risk of hepatocellular carcinoma (HCC) imply that HBV is a mediator, but the extent of mediation has not previously been established. We estimated mediation proportions for HBV and hepatitis C virus (HCV) infection for radiation-associated risk of HCC in a prospective clinical cohort study of 4,345 atomic bomb survivors. A total of 111 HCC cases were identified between 1993 and 2011 through local

cancer registries in Hiroshima and Nagasaki, Japan. Adjusted for age, sex, city, proximal-distal location at the time of exposure, and hepatitis virus infection status, the hazard ratio (HR) of HCC for 1 Gy radiation was 1.22 (95% confidence interval [CI]: 0.91-1.64). HRs for HBV and HCV infection directly were 8.3 (3.2-21) and 34 (23-51), respectively. The estimated mediation proportions were 11% for HBV infection and 33% for HCV infection, subject to uncertainty that was difficult to quantify due to methodological limitations. A manuscript reporting the results has been submitted to an international journal.

1.2 Radiation and Non-Cancer Effects:

- *Adult Health Study (AHS) Report on Non-cancer Disease (RP 2-75)*: One of our main mission goals is to identify non-cancer diseases associated with radiation exposure. Updating the AHS report on the incidence of non-cancer diseases not only helps to identify new radiation-associated diseases, but also to re-evaluate and strengthen previous findings. Preliminary analyses for the incidence of non-cancer disease (Report 9, 1958–2020, 29 disease outcomes) have been conducted using organ dosimetry based on the DS86 phantoms to assess any dose response while assessing the sensitivity of the results to background modeling. Analyses using organ dosimetry based on the J45 phantoms will continue in 2025.

- *Radiation and Diabetes (RP 1-15)*: A recent AHS study suggested a statistically significant association between radiation dose and diabetes incidence, although the results were inconsistent by city and age at exposure. To investigate whether radiation-related diabetes is associated with either impaired pancreatic β-cell insulin secretion or insulin resistance and whether the associations are modified by city of exposure, we have conducted a cross-sectional study of AHS participants. This study investigated 3,152 survivors who were younger than 15 years at exposure. Homeostasis model assessment of β-cell function (HOMA-β) and HOMA of insulin resistance (HOMA-IR) were used as surrogate indices of pancreatic insulin secretion function and insulin resistance, respectively. Radiation dose was significantly and positively associated with the levels of HOMA-β and HOMA-IR in both Hiroshima and Nagasaki. In addition, in the analysis of factors related to visceral fat and insulin resistance other than HOMA-IR, radiation dose was found to be significantly positively associated with triglycerides and significantly negatively associated with adiponectin and HDL cholesterol levels. City was not a dose modifier of the radiation response on these markers of visceral fat and insulin resistance including HOMA-IR. Although it is possible that insulin resistance was one of the factors contributing to the increased incidence of diabetes associated with radiation in A-bomb survivors, the cause of the difference in the dose response in the incidence of diabetes between cities remained unclear. A manuscript was published in 2024 (Tatsukawa et al. *J Clin Endocrinol Metab,* 2024).

- *Radiation and Cataracts (RP 5-15)*: Radiation effects on posterior subcapsular cataracts (PSC) have been documented among A-bomb survivors and other exposed populations. However, past reports of radiation effects on cortical (COR) and nuclear (NUC) cataracts have been inconsistent, possibly due to inaccurate diagnosis of the outcomes and population characteristics. The present study used appropriate devices and diagnostic criteria to obtain more precise diagnosis. Associations were observed between radiation and PSC, as well as the precursor lesion vacuole center lens (VCC), but no radiation effects were observed for COR or NUC. No significant association was observed between radiation and additional subtypes (retrodots and waterclefts). Differences from the results of the previous study could be due to increased precision of diagnostic methods for the

current study and/or potential selection bias or biological differences due to the older age of participants in the current study. A manuscript of these results has been prepared.

- *Radiation and Atherosclerosis (RPs 2-11 and 1-23-2)*: 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 (Nakamizo et al. *Eur J Med Res*, 2024) revealed that VEGF-A, osteoprotegerin, and osteopontin have acceptable variations. Statistical analysis of AHS data is ongoing.

- *Radiation and Thyroid Conditions (RP 4-23)*: A previous AHS study conducted in 2007–2011 (1st cycle) reported increased radiation-related risk of thyroid nodules, but not of thyroid dysfunction and autoimmunity. In 2024, diagnosis of thyroid disorders at the 2nd examination cycle (2018–2022) was nearly complete, and the 3rd examination cycle is in progress.

1.3 Underlying Biological Mechanisms of Radiation Health Effects

- *Preparation for AHS Genome Wide Association Study (RP-P2-22)*: In preparation for planning genome-wide association studies (GWAS) in A-bomb survivors to better understand individual susceptibility to radiation risks, this feasibility study evaluates the suitability of using DNA extracted from aged blood smears, Giemsa-stained chromosome preparations, and blood infiltrated paper discs of A-bomb survivors for SNP-array genotyping with 720,000 probes. DNA extracted from 20-year-old paper discs and amplified with REPLI-g was successfully genotyped using the SNP array. Using standard methods, the quality of DNA extracted from smears stored for over 10 years was too poor to produce acceptable genotyping data even after REPLI-g amplification. However, we developed a novel multicombination system to successfully amplify DNA from 10- to 50-year-old blood smears to produce acceptable call rates and precision in SNP array typing. DNA extracted from 30-year-old Giemsa-stained samples, on the other hand, could not be analyzed even after amplification using the multicombination system.

- *Radiation and Clonal Hematopoiesis – Human Studies* (*RP 1-23-1)*: To investigate the occurrence of clonal hematopoiesis (CH) in A-bomb survivors and its possible relevance to disease, a study of CH was initiated using stored blood samples obtained from AHS participants. Deep whole-exome sequencing (WES) and T-cell receptor (TCR) sequencing have been completed, and the data are currently being validated at RERF to identify CH somatic mutations and T-cell clonal expansion. 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 following the atomic bombing.

- *Radiation and Clonal Hematopoiesis - Animal Studies (RP 1-23-3)*: In the mouse, radiation induces CH with high-frequency somatic mutations in blood cells, but the effects of radiation on the clonal expansion of hematopoietic progenitors and lymphocytes have remained elusive. We examined CH mutations and TCR and B cell receptor (BCR) sequences in mice 18 months after 3-Gy irradiation and found that radiation preferentially induces clonal expansion of hematopoietic progenitors over mature lymphocytes in the bone marrow (Yoshida K, et al. Stem Cell Reports, in press).

- *Oxidative Stress Response in Radiation-induced Effects – Animal Studies (RP P3-19)*: To identify genetic and environmental factors that might modulate radiation-induced somatic mutagenesis, the potential effects of the oxidative stress response on mutations in long-term hematopoietic stem cells (LT-HSCs) were investigated using mutant mice with loss or constitutive activation of NRF2. In wild-type control mice, whole genome sequence analysis of clonal cell populations grown ex vivo from LT-HSCs isolated from bone marrow showed that SNVs and small indels were the most common types of somatic mutations and were increased up to 2- to 3-fold by whole-body 3.8- to 7.7-Gy X-irradiation at 8 weeks of age (Matsuda Y, et al. Proc Natl Acad Sci USA, 2023). The same experiments have been performed with mutant mice in which WGS analysis of somatic mutations is ongoing. A manuscript is in preparation

2. Research Projects on the Health of A-bomb Survivors Children (F_1)

- *F1 Offspring Clinical Study (FOCS), (RP 4-10)*: 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 diseases in the offspring of exposed persons. Initial examination of the FOCS from 2002 to 2006 provided no evidence for increased prevalence of adult-onset multifactorial diseases (hypertension, hypercholesterolemia, diabetes mellitus, angina pectoris, myocardial infarction and stroke) due to parental radiation exposure. However, longitudinal incidence data obtained from a high-quality clinical study continued until the subjects become elderly (when many multifactorial diseases develop), will have less potential for bias than prevalence data. The analysis plan of the longitudinal study data (2002–2020) has been developed within the interdepartmental FOCS Analysis Working Group and initial risk analysis has been conducted. The not-in-city (NIC) status for many of the F1 parents whose DS02R1 dose was unknown has been confirmed. The parental dose data has been updated by changing doses from missing to zero for all FOCS parents whose status has been newly confirmed to be NIC. Following update of the illness-death risk data, re-analysis has started.

- *Trio Genome Study of Hereditary Effects (RP 3-23)*: The Trio Genome Study evaluates potential hereditary genetic effects of A-bomb radiation by comparing whole genome data from exposed parents and their children. From January 2024 to the end of December 2024, informed consent was obtained from 314 trios participating in the Trio Genome Study, representing about 55% of the total target samples. In February 2024, a pilot study was launched to determine DNA quality and establish an analysis pipeline using samples from three trios for which consent had been obtained early. WGS with 60x coverage was performed using short-read next-generation sequencing (NGS). Data analysis using the supercomputer SHIROKANE proceeded smoothly, and *de novo* germline mutations were successfully identified. Mutation detection analyses performed independently using the RERF pipeline and a pipeline developed by research collaborators at the U.S. National Cancer Institute yielded almost identical results, confirming the technical feasibility of the Trio Genome Study.

  Given the particularly sensitive nature of research on biospecimens of A-bomb survivors and their offspring, ongoing communication with research participants, local communities, and other stakeholders is considered essential to the success of the Trio Genome Study. In FY2024, a series of information sessions and public lectures were held to inform research participants and the public at large about the study. The majority of people who attended the information sessions and public lectures expressed their desire for this study to be carried out. These activities were also widely covered in newspapers and on television.

The issue of returning secondary genetic findings to research participants has also been carefully considered, and RERF plans to return any information from the genome analysis that could be beneficial to an individual's health. To address this issue, a close partnership has been established with Hiroshima University Hospital, and is in process for Nagasaki University Hospital also. These partnerships will allow us to implement specific procedures for the return of genetic results. In December 2024, we invited several national and international experts, including the co-chair of the American College of Medical Genetics and Genomics (ACMG) working group on secondary findings, to an RERF-hosted international symposium to discuss the ELSI (Ethical, Legal, Social Issues) related to return of results. Based on advice from the expert participants, we are finalizing guidelines for the return of findings.

- *Transgenerational Effects: Animal Studies (RP 2-13, RP S3-11)*: The main objectives of the animal model experiments are (1) to create a high-precision pipeline for capturing genome (epigenome) DNA changes that occur at the whole-genome level, (2) to understand the frequency and characteristics of naturally occurring mutations, and (3) to clarify the characteristics of radiation-induced mutations. We have developed new technology to detect large-scale chromosomal reorganization possibly related to human diseases. Combining short-read and long-read sequencing technologies in exposed mouse families as a model experiment has allowed the capture of structural variants (SVs) with unprecedented precision, enabling the estimation of SV frequency in successive mouse generations and the effects of parental exposure. We are currently preparing the first paper in the world to clarify the frequency and characteristics of spontaneous *de novo* structural variants in the mouse germline. In addition, through joint research with Osaka University, we used our high-precision mutation detection system to analyze mutations occurring in a single fetal neuron, and we elucidated that abnormal demethylation causes specific *de novo* mutations in neurons. The results of this work will inform our program addressing hereditary effects in humans.

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

- *Shielding Survey and Radiation Dosimetry (RP 18-59)*: RERF has continued work with the international Organ Dosimetry Working Group to develop 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.

  RERF is also collaborating with Dr. Sato at JAEA and Dr. Kai at Nippon Bunri University to utilize J45 computational phantoms in conjunction with PHITS simulation software, to assess theoretically the relative biological effectiveness (RBE) of neutrons in each organ for representative shielding categories for typical Life Span Study (LSS) subjects. A manuscript describing this work has been published. (Shimizu, S., T. Sato, S. Funamoto, et. al., Radiat Res, 2025)

- *Radiation Biodosimetry (RP8-93)*: Biological dosimetry using the frequencies of chromosomal aberrations (mainly stable translocations) in A-bomb survivors as markers of radiation exposure could support and improve individual physical dose calculations. The project, which began in 1966 and incorporated fluorescent in situ hybridization (FISH) technology in 1989, has resulted in measurements from a total of 1,868 A-bomb survivors (1,179 in Hiroshima and 689 in Nagasaki). In the most recent analysis using the dosimetry DS02R1, over 95% of the individual cytogenetic gamma-ray doses were found to be within

the expected range of plus/minus approximately 1 Gy from the DS02R1 dose, and the mean slope for linear regression was 0.98, reassuring us of the validity of the DS02R1 study, and the results were published as a summary report (Kodama Y, et al., Int J Radiat Biol, 2024).

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

The dissemination of RERF's study results to survivors and their children, the international scientific community, and the public is crucial to the mission of RERF. Toward that end we interact with local liaison councils representing the communities of Hiroshima and Nagasaki, and also provide information via public lectures and other activities (details provided later in this report). In FY2024 RERF hosted an international workshop on Ethical, Legal and Social Issues regarding the return of genomic results, hosted 12 seminars presented by national and international visitors, and published more than 40 scientific papers. Other activities engaging the international community include seminars, workshops, participation at international scientific conferences, and international publication of results.

Collaborative Research Projects

- *Communicating Research Results:* In addition to the above activities, development of national and international collaboration 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, Kurume
  b. Collaboration with the U.S. National Cancer Institute
  c. Collaboration with the University of Washington
  d. Collaboration with Outside Investigators:
     51 Japanese Institutions
     6 North American Institutions
     9 European Institutions
     1 Asian Institution

5. Training Programs for Domestic and Overseas Specialists

1) RERF held an 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. This course was scheduled to take place on August 29 and 30, but the training for the 30th was canceled due to the approach of a strong typhoon. An additional training session was held online for participants from outside RERF on November 1.
   (August 29, 2024; 79 participants consisting of 40 and 39 from inside and outside RERF, respectively. November 1, 2024; 38 outside RERF participants)
2) RERF cooperated with the activities of the Hiroshima International Council for Health Care of Radiation-exposed (HICARE), the Nagasaki Association for Hibakushas' Medical Care (NASHIM), and the Japan Atomic Energy Agency (JAEA) and other organizations, and accepted a total of 124 domestic and overseas trainees.
3) RERF cooperated with the International Atomic Energy Agency (IAEA) /HICARE International Training Course (February 10 through 14, 2025; about 30 participants), dispatch three lecturers, and provide the venue on the 14th.
4) RERF posted the application guidelines for the Ministry of Health, Labor and Welfare

(MHLW)-sponsored International Exchange and Research Program on its website to openly recruit trainees. In FY2024, five people applied and two were accepted.

5) The Department of Statistics uses the 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).

6. Public Information Programs

1) Notification about research

As part of its public relations activities regarding the Genome Sequencing Study of Genetic Effects, RERF is currently preparing a dedicated portal on its official website and has implemented the following projects:

- April 6: Explanatory session for study participants (Held twice in Hiroshima with 63 participants)
- April 13: Public lecture (Hiroshima participants: 199)
- April 20: Public lecture (Nagasaki participants: 100)
- July 27: Explanatory session for study participants (Nagasaki participants: 19)
- August 5–6: Explanatory session held at the Open House (Held four times in Hiroshima with 70 participants)
- August 8: Explanatory session held at the Open House (Held twice in Nagasaki with 21 participants)
- November 29: Social gathering with media agencies (Part 1: 15 participants, Part 2: 16 participants)
- December 13: Press conference at the ELSI international symposium (11 media agencies)

The results of the questionnaires given to the participants in the research explanatory sessions and public lectures showed that over 70% of respondents answered that the trio genome research project was necessary. When the responses of those who answered that it was somewhat necessary were included, the figure reached 80–90%. The results show that these sessions and lectures were somewhat effective in promoting public understanding and interest. There was an increasing trend in requests for study sessions from the public as a result of their attending these events, revealing a secondary benefit of increased contact with the public.

2) Open House

The Hiroshima and Nagasaki Laboratories held their 29th and 27th Open House events respectively. Since the new coronavirus was downgraded to category 5 under the infectious disease law in May 2023, RERF held these events face-to-face with pre-registration, taking into account the status of infection rates.

- August 5–6: Hiroshima Laboratory: 502 visitors
- August 8–9: Nagasaki Laboratory: 98 visitors

3) Activity plans for the 80th anniversary of the A-bombing and the 50th anniversary of the establishment of RERF

To commemorate the 50th anniversary of its establishment, RERF will have the opportunity this year to widely disseminate research findings, contributions to the health and welfare of A-bomb survivors and to improving human health, and the importance of future research activities. RERF is preparing to give lectures at the commemorative ceremonies and publish a commemorative journal for the A-bomb survivors, their children, and the local community,

who have understood and cooperated with RERF's research and study activities for many years, to raise awareness of RERF both in Japan and overseas.

4) Official website

Starting in FY2018, RERF has been posting easy-to-follow synopses of published papers for non-specialists on its official website. The new one was added in FY2024. RERF continued its website's regular updates, and the following information was posted in FY2024:

- What's New section: 15 articles
- Tendering-related information: 34 posts
- The report of the activities of FY2023, and other materials on work and finance

From April 1, 2024 to March 31, 2025, there were 1,160,000 views of the RERF official website, with the daily average being about 3,178, and there was a total of 180,000 website visitors, with the daily average being about 493.

5) Facility tour and school visit

Compared to last fiscal year, the number of requests for facility tours and school visits increased. The reclassification of the new coronavirus may have been one of the factors in the increase in school trips and international training programs. Requests for study sessions from groups such as chroniclers of A-bomb experiences and interpreter guides also increased. The following is a record of facility tours in FY2024:

- Facility tours: 20 (about 265 participants)
  Main visitors
  - Ambassadors to Japan who attended the peace memorial ceremony on August 6 (37 participants)
  - U.S. Consulates General in Osaka and Kobe (three participants)
  - Ambassadorial delegation of India to Japan (five participants)
  - Anthropological researchers from Eikei University and the University of Amsterdam (five participants)
  - Peace volunteers of memory keepers of A-bomb experiences in Hiroshima (15 participants)
  - Japan Society for Occupational Health (10 participants)
  - NNT (New National Theatre, Tokyo) Drama Studio training on radiation health effects (12 participants)
- One school visit (about 50 participants)

Other PR activities

RERF held a guidance session with peace volunteer guides and chroniclers of A-bomb experiences from external organizations of the Hiroshima Peace Memorial Museum (nine participants) to improve knowledge of radiation. Since some of the participants had expressed concern about their knowledge of radiation in their guide activities, RERF solicited the research staff's support and provided the participants with a more technical session than a normal school visit, which was highly appreciated by the participants.

As the tour of Hijiyama Hall held last year was well received, RERF received many inquiries and requests to open the hall to the public this year. In addition to the Open House events, the hall was open to the public during the Hiroshima-sponsored architecture event *Tatemonogatari* Festa, and many visitors came from far away. The hall finished its role as a staff dormitory, and its regular maintenance has been discontinued. There are no plans to open the hall to the public at this time.

（Attachment 1）

FY2024 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	1 person	(Hiroshima)	
UNSCEAR-related activity	2 people	Visitors related to HICARE	18 people
ICRP-related activity	3 people	Visitors related to JAEA	49 people
IAEA-related activity	None	ICAN Academy	21 people
Medical checkup for A-bomb survivors residing in South Korea-related activity	2 people	Nagoya Graduate School, YLP Program	7 people
Others	25 people	Visitors related to RERF (International Exchange Research Program)	2 people
		(Nagasaki)	
		Visitors related to NASHIM	27 people
Total: 33 people		**Total: 124 people (Hiroshima: 97 people, Nagasaki: 27 people)**	

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 (1 person)

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

Kanya Hamasaki, Associate Senior Scientist, Cellular Genomics Laboratory, Department of Molecular Biosciences attended the 7th WHO BioDoseNet Coordination Meeting (September 24, 2024, Hirosaki)

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 18, 2024, Online, and March 10, 2025, Online).

2) *RERF*

Alina Brenner, Senior Scientist, Department of Epidemiology, attended meetings as a lead writer for UNSCEAR Epidemiological studies of Radiation and Cancer (April 2, May 3, July 18, August 15, October 9, November 7 and December 3, 2024, Online, and September 11-12, 2024 (Ottawa, Canada), and January 15 and February 19, 2025, Online).

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

(1) Preetha Rajaraman, Vice Chair, attended meetings as an elected member of ICRP Standing Committee 1 on Health Effects (27-28 May 2024 in Vienna; 18-21 November

2024 in Foshan; 9-11 April 2025, online) and a member of Task Group 111 Factors Governing the Individual Response of Humans to Ionizing Radiation (April 2024-March 2025).

(2) Alina Brenner, Senior Scientist, Department of Epidemiology, attended meetings as a member of the ICRP Task Group 122 (Update of Detriment Calculation for Cancer) (May 7 and October 31, 2024, Online).

(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) (October 30, 2024, Online, February 5 and March 24, 2025, Online).

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

This activity was not done in FY2024.

5. Medical checkup for A-bomb survivors residing in South Korea-related activity (2 people)

Nagasaki Prefecture

(1) Ayumi Hida, Department Chief, Department of Clinical Studies, Nagasaki, participated in the 35th A-bomb survivors medical checkup in Korea (July 14-18, 2024 Hapcheon, Korea).

(2) Misa Imaizumi, Assistant Department Chief, Department of Clinical Studies, Nagasaki, participated in the 36th A-bomb survivors medical checkup in Korea (November 10-14, 2024 Busan, Korea).

6. Others (25 people)

(1) Hiromi Sugiyama, Assistant Department Chief, Department of Epidemiology, attended a board meeting of International Association of Cancer Registries (IACR) (April 11, 2024, October 30, 2024, Online, November 4, 2024, Beijing, China).

(2) Mai Utada, Associate Senior Scientist, Department of Epidemiology, visited Korea University to give a lecture on the effects of atomic bomb radiation on prostate cancer (May 21, 2024, Seoul, Korea).

(3) Preetha Rajaraman, Vice Chair, gave an invited presentation at the National Academies of Science, Engineering and Medicine (June 3, 2024, Washington D.C., USA).

(4) Preetha Rajaraman, Vice Chair, gave an invited presentation at the U.S. National Cancer Institute (June 4, 2024, Rockville, MD, USA).

(5) Preetha Rajaraman, Vice Chair, gave an invited presentation at the U.S. Nuclear and Radiation Studies Board (June 6, 2024, Washington D.C., USA).

(6) Preetha Rajaraman, Vice Chair, gave an invited presentation at the Nuclear Energy Agency/ Electric Power Research Institute Joint Workshop (June 26, 2024, virtual).

(7) Preetha Rajaraman, Vice Chair, gave an invited presentation at the Joint U.S.-Japan Summer Program, University of Hiroshima/ University of Texas-Austin/Purdue University/Arizona State University (August 5, 2024, virtual)

(8) Munechika Misumi, Assistant Department Chief, Department of Statistics, gave an invited presentation at the Korea Institute of Radiological & Medical Sciences (September 26, 2024, Seoul, South Korea).

(9) Kenji Kamiya, RERF Chair, gave a lecture at HICARE's seminar on the medical care for radiation-exposed in Los Angeles, U.S. (Los Angeles, CA, USA, October 12, 2024).

(10) Preetha Rajaraman, Vice Chair, gave a presentation to visiting U.S. Congressional Staff Delegation (October 18, 2024, RERF Hiroshima Laboratory).

(11) Hiromi Sugiyama, Assistant Department Chief, Department of Epidemiology, attended as a member of CONCORD-Lancet Global Commission on Cancer (October 28, 2024, Online, January 9, 2025, Online).

(12) Richard Sposto, Department Chief, Department of Statistics, gave a lecture at the 2024 United Nations Disarmament Fellowship Program (November 1, 2024, Hiroshima).

(13) Hiromi Sugiyama, Assistant Department Chief, Department of Epidemiology, attended as a chair of an oral session at the IACR Scientific Conference (November 5-7, 2024, Beijing, China).

(14) Kenji Kamiya, RERF Chair, chaired the 15th Asia Pacific Conference on Disaster Medicine and gave a lecture (November 26, 2024, Seoul, South Korea).

(15) Kenji Kamiya, RERF Chair, gave a lecture at the Korea Institute of Radiological and Medical Sciences (KIRAMS) (November 27, 2024, Seoul, South Korea).

(16) Hiromi Sugiyama, Assistant Department Chief, Department of Epidemiology, attended the European Society for Medical Oncology (ESMO) Asia (December 6-7, 2024, Singapore).

(17) Kazunori Kodama, Executive Director, Ritsu Sakata, Acting Department Chief of Epidemiology, and Kanya Hamasaki, Associate Senior Scientist, Cellular Genomics Laboratory, Department of Molecular Biosciences gave lectures at the IAEA/HICARE Workshop on Biological and Internal Dosimetry: Development and Clinical Application of Biological Dosimetry Technology (February 11, 13 and 14, 2025, Hiroshima).

(18) Alina Brenner, Senior Scientist, Department of Epidemiology, gave an invited online presentation at the Melodi Workshop “Radiation Effects in the Central Nervous System” (February 18, 2025, Online)

(19) Kenji Kamiya, RERF Chair, attended the 2025 Fukushima Medical University International Symposium on the Fukushima Health Management Survey (February 20, 2025, Fukushima).

(20) Preetha Rajaraman, Vice Chair, gave an invited presentation at the U.S. Ambassador’s Youth Council (February 20, 2025, virtual).

(21) Kenji Kamiya, RERF Chair, attended an IAEA Consultancy meeting on the medical doctors’ radiation education and communication—Global perspectives in training and research (March 12, 2025, Fukushima).

(22) Preetha Rajaraman, Vice Chair, gave a presentation to a visiting delegation from the Schull Institute (Houston, TX) (March 13, 2025, RERF Hiroshima Laboratory).

(23) Zhenqiu Liu, Senior Scientist, Department of Statistics, gave an invited presentation at the Gilbert W. Beebe Symposium on AI and ML Applications in Radiation Therapy, Medical Diagnostics, and Radiation Occupational Health and Safety (March 13-14, 2025, Washington DC, USA).

II. Acceptance of visitors from overseas for briefing and training (124 people)

【Hiroshima 97 people】

1. Visitors related to *Hiroshima International Council for Health Care of the Radiation Exposed (HICARE)*: 18 trainees

(1) South Koreafor the “Short-term training group of medical treatment for A-bomb survivors living in South Korea.”
-June 18, 2024: 6 trainees

-October 8, 2024: 3 trainees
-November 19, 2024: 5 trainees

(2) August 27, 2024: 4 trainees, medical doctors from United States

2. *Japan Atomic Energy Agency (JAEA)* (49 trainees)

(1) October 25, 2024: 25 trainees from Australia, Bangladesh, Brunei, etc. for "JAEA's Training Couse on the Physical Protection of Nuclear Material and Facilities"

(2) November 29, 2024: 24 trainees from Australia, Cambodia, Indonesia, etc. for "JAEA's Training Course on State Systems of Accounting for and Control of Nuclear Material"

3. Young Leaders' Program of Graduate School of Medicine, Nagoya University (7 trainees)

November 7, 2024: from Malaysia, Lao PDR, Mongolia, etc.

4. Hiroshima-ICAN Academy for Nuclear Weapons and Security (21 trainees)

November 14, 2024: from U.S., Canada, Argentina, etc.

5. *RERF (MHLW International Exchange Research Program)* (2 trainees)

(1) December 9–20, 2024: Department of Environmental and Radiological Health Sciences, Colorado State University

(2) December 9–20, 2024: Biostatics, High Institute of Public Health, Egypt

【Nagasaki 27 people】

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

1) Kazakhstan:
July 12, 2024: 5 trainees

2) Korea
(1) October 9, 2024: 10 trainees
(2) January 22, 2025: 10 trainees

3) Brazil
January 22, 2025: 2 trainees

（Attachment 2）

FY2024

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 are conducted based on this contract.

   (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 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.

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

   Munechika Misumi, Assistant Department Chief, Department of Statistics and Hiromi Sugiyama, Assistant Department Chief, Department of Epidemiology are 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.

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

   Zhenqiu Liu, Senior Scientist, Department of Statistics, 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.

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

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

6. *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.

7. *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).

8. *RERF* international collaborative studies on cancer registries

   (1) Hiromi Sugiyama, Assistant Department Chief, Department of Epidemiology, is participating in the CONCORD-4 at the London School of Tropical Hygiene and Tropical Medicine, using data from the Hiroshima and Nagasaki cancer registries.

   (2) Hiromi Sugiyama, Assistant Department Chief, Department of Epidemiology, is collaborating with cancer registry researchers from 16 prefectures in Japan and Dr. Veronica Di Carlo, Dr. Claudia Allemani, and Dr. Michel P. Coleman from the London School of Hygiene and Tropical Medicine to write and edit the Japanese CONCORD-3 Monograph 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6年度　外部資金研究一覧表
FY2024 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 organizations)
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	¥22,438,000
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	13	¥24,288,000

注）
- **間接費を含む。**
- **研究分担者の配分額を含む。**

* **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, because the RERF researcher takes part in the research as a cooperative investigator.

令和6年度 外部資金研究一覧表
FY2024 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6年度開始日 First project date in FY2024	令和6年度終了日 Last project date in FY2024	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 がん情報･対策研究分野 分野長 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, 2024	March 31, 2025	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 oversea 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, 2024	March 31, 2025	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 副所長 Health and Labour Sciences Research Grants (MHLW) Promotion of Comprehensive Research Project for Cancer Control Manami Inoue Deputy Director, National Cancer Center, Institute for Cancer Control	**研究分担者** (Collaborator) 杉山　裕美 Hiromi Sugiyama	¥400,000	April 1, 2024	March 31, 2025	RP-S2-17	日本人のがんの疫学研究 Epidemiological study of cancer in Japanese population

令和6年度 外部資金研究一覧表
FY2024 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6年度開始日 First project date in FY2024	令和6年度終了日 Last project date in FY2024	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 副所長 National Cancer Center Funds for Cancer Research and Related Technology Development Manami Inoue Deputy Director, 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, 2024	March 31, 2025	RP-A2-15	日本人のがんの疫学研究 Epidemiological study of cancer in Japanese population

令和6年度 外部資金研究一覧表
FY2024 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6年度開始日 First project date in FY2024	令和6年度終了日 Last project date in FY2024	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, 2024	March 31, 2025	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) ¥800,000 間接経費 (Indirect cost) ¥240,000 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, 2024	March 31, 2025	RP 6-70 RP 5-90 RP 3-94 RP-S2-15 RP 5-02 RP-P1-23	がん研究 （被爆者がん研究への応用） Cancer research (Application to cancer research among A-bomb survivors)

令和6年度 外部資金研究一覧表
FY2024 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6年度開始日** First project date in FY2024	**令和6年度終了日** Last project date in FY2024	**関連**RP Related RPs	**関連性** Relationship to RERF's mission
統計部 Department of Statistics							
1 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) Munechika Misumi	**研究代表者** (P.I.) 三角　宗近 Munechika Misumi	直接経費 (Direct cost) \300,000 間接経費 (Indirect cost) \90,000	April 1, 2024	March 31, 2025	RP-S4-18 RP18-61	LSS LSS

令和6年度 外部資金研究一覧表
FY2024 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6年度開始日 First project date in FY2024	令和6年度終了日 Last project date in FY2024	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 超可変メガゲノム領域を含むゲノム情報の次世代継承メカニズム Mechanisms of next generation inheritance of genomic information including hypervariable mega-genomic regions	日本学術振興会・科学研究費助成事業 「学術変革領域研究（A）（公募研究）」 研究代表者 内村 有邦 JSPS Grant-in-Aid for Scientific Research Transformative Research Areas (A) (open research) Satoru Seo Professor, School of Medicine, Kochi University	**研究代表者** (P.I.) 内村 有邦 Arikuni Uchimura **研究協力者** (Cooperative Investigator) 佐藤 康成 Yasunari Satoh	直接経費 (Direct cost) \3,600,000 間接経費 (Indirect cost) \1,080,000	April 1, 2024	March 31, 2025	RP 3-23 RP 2-13	内村らが発見したゲノム上に複数点在するハイパーバリアブル領域の変異を解析する技術は、今後の被爆二世のゲノム解析に応用される。 The technology of methods that Dr. Uchimura has developed for detecting mutations in the hypervariable regions scattered in the genome fall will be applied to future genome analysis of offspring of A-bomb survivors.
2 低線量率放射線長期被ばくがもたらす生物影響の高速高感度解析 Rapid and high-sensitive analysis of biological effects of long-term exposure to low dose rate radiation	日本学術振興会・科学研究費助成事業 「基盤研究（A）」 研究代表者 権藤 洋一 大阪大学 核物理研究センター 協同研究員 JSPS Grant-in-Aid for Scientific Research Scientific Research (A) Yoichi Gondo Cooperative Researcher, Research Center for Nuclear Physics, Osaka University	**研究分担者** (Collaborator) 内村 有邦 Arikuni Uchimura	直接経費 (Direct cost) \1,610,000 間接経費 (Indirect cost) \483,000	April 1, 2024	March 31, 2025	RP 3-23 RP 2-13	本研究は自然突然変異と低線量被曝による突然変異の検出を試みるものであり、放影研の研究とも強く関連している。 Dr. Gondo's study is to analyze spontaneous and low dose-induced mutations, which are closely associated with RERF studies.
3 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ドシメトリ Time-resolved biodosimetry 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 田邉 修 Osamu Tanabe 濱崎 幹也 Kanya Hamasaki 松田 由喜子 Yukiko Matsuda **研究協力者** (Cooperative Investigator) John B. Cologne（統計部） (Dept. Statistics)	直接経費 (Direct cost) \4,200,000 間接経費 (Indirect cost) \1,260,000	April 1, 2024	March 31, 2025	RP1-23-1	本研究は放射線被ばくに関連したクローン造血変異を同定し、変異クローンの生成時期を推定することにより、新規バイオドシメトリ法の開発に貢献できる。 This study contributes to the development of a novel biodosimetry method by identifying clonal hematopoiesis mutations associated with radiation exposure and estimating the timing of the mutant clones' emergence.

令和6年度 外部資金研究一覧表
FY2024 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6年度開始日 First project date in FY2024	令和6年度終了日 Last project date in FY2024	関連RP Related RPs	関連性 Relationship to RERF's mission
分子生物科学部 Department of Molecular Biosciences								
4	T2Tレベルの全ゲノムシーケンシングに基づく次世代影響のリスク評価 Risk assessment of next-generation effects based on Whole Genome Sequencing at the T2T Level	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 内村 有邦 JSPS Grant-in-Aid for Scientific Research Scientific Research (B) Arikuni Uchimura	**研究代表者** (P.I.) 内村 有邦 Arikuni Uchimura	直接経費 (Direct cost) \5,000,000 間接経費 (Indirect cost) \1,500,000	April 1, 2024	March 31, 2025	RP 3-23 RP 2-13	全ゲノムシーケンシング技術による放射線の遺伝影響解析技術のゲノム、エピゲノムレベルでの開発は、今後の被爆二世のゲノム解析に応用される。 Development of pertinent analysis systems for detecting genetic effects of radiation at whole genome and epigenome levels will be applied to future genome analysis of offspring of A-bomb survivors.
5	DNA修復阻害剤による放射線誘発変異シグネチャーの変化と発がんリスクへの影響解析 Effects of DNA repair inhibitors on mutational signatures and oncogenic risk due to radiation exposure	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 松田 由喜子 JSPS Grant-in-Aid for Scientific Research Scientific Research (C) Yukiko Matsuda	**研究代表者** (P.I.) 松田 由喜子 Yukiko Matsuda **研究分担者** (Collaborator) 内村 有邦 Arikuni Uchimura 田邉 修 Osamu Tanabe	直接経費 (Direct cost) \1,400,000 間接経費 (Indirect cost) \420,000	April 1, 2024	March 31, 2025	New RP in preparation	本研究計画は、原爆被爆者における悪性腫瘍のリスク上昇など放射線被曝による晩発障害における放射線誘発変異の役割を解明できる可能性がある。 This research may lead to elucidation of roles of radiation-induced mutagenesis in late adverse effects of radiation exposure including increased risks for malignant neoplasms.

令和6年度 外部資金研究一覧表
FY2024 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6年度開始日 First project date in FY2024	令和6年度終了日 Last project date in FY2024	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 田邉 修 JSPS Grant-in-Aid for Scientific Research Scientific Research (C) Osamu Tanabe	**研究代表者** (P.I.) 田邉 修 Osamu Tanabe **研究分担者** (Collaborator) 松田 由喜子 Yukiko Matsuda 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) \200,000 間接経費 (Indirect cost) \60,000	April 1, 2024	March 31, 2025	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6年度 特別会計一覧表
FY2024 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)	3	¥8,604,000
独立行政法人 国立がん研究センター National Cancer Center	1	¥200,000
広島県 Hiroshima Prefecture	1	¥18,206,397
長崎県 Nagasaki Prefecture	1	¥8,700,000
総合計　Grand total	6	¥35,710,397

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6年度　特別会計一覧表
FY2024 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 Investigators) 今泉　美彩 Misa Imaizumi	¥3,000,000	April 1, 2024	March 31, 2025	RP 1-24	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 1F 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	July 1, 2024	March 31, 2025		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	原爆放射線による健康影響に関する国際交流調査研究事業 International Exchange Program on Health Effects of the Atomic Bomb Radiation	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	¥3,730,000	September 30, 2024	March 31, 2025		放射線の人に及ぼす影響及びこれによる疾病に関する調査研究の成果の管理、報告及び公表並びに研修を行うこと To report and publicize the results of research and studies, and to provide training on the effects of radiation and associated diseases in humans
4	がんの統計情報の整備と活用に関する研究 Research on the development and utilization of statistical information on cancer	国立がん研究センター 研究開発費 研究代表者　片野田　耕太 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 データサイエンス研究部 部長 National Cancer Center (Research and Develop expenses) Kota Katanoda Division Chief, Division of Surveilance and Policy Evaluation, National Cancer Center Institute for Cancer Control	研究分担者 (Collaborative Investigators) 杉山　裕美 Hiromi Sugiyama	¥200,000	April 1, 2024	March 31, 2027	S2-17	科学的知見に基づき、国民や市民のがん対策推進のためのがん統計の整備を目指す。 This study group aims to develop a system for providing cancer statistics to promote cancer control among the public and citizens based on scientific evidence.

令和6年度　特別会計一覧表
FY2024 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
5	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	¥18,206,397	April 1, 2024	March 31, 2025	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
6	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, 2024	March 31, 2025	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

To implement RERF's "Strategic Plan", the Research Resource Center (RRC) is planned to be established with the goal of improving research infrastructure and enhancing research management efficiency. The mission of the RRC consists of the following three objectives:

(1) Preserving RERF's research resources and historical materials, such as paper-based research documents, photographs, films, research manuscripts, and datasets.

(2) Integrating research data and biosample inventory information to improve accessibility and usability of these research resources. This includes providing systems for data assembly and visualization.

(3) Establishing an Office of Research Support to enhance research management.

As the infrastructure primarily for objectives (2) and (3), we have developed the RRC portal site, which consists of three main components: biosamples, data resources, and the Office of Research Support. Regarding biosamples, we have implemented data visualization of inventory information using Tableau® software. The key visualized information includes AHS sample data, which links inventory details managed in the laboratory information management system (LIMS) with radiation dose information. As for data resources, we have provided a high-performance computing (HPC) environment for data assembly. This environment is provided by a server comprising three devices equipped with high-speed central processing units (CPUs) and large-capacity main memory. For the Office of Research Support, we have compiled inventory information on research resources within RERF. This includes a list of key contacts responsible for research resources, categorized by data type (*e.g.*, mortality, mail survey data, clinical information, radiation dose, *etc.*), data manager, storage location, system ID number availability, and data format (*e.g.*, database, Excel files, text files, *etc.*). Additionally, we held seminars to introduce the RRC portal site and promote its use within RERF. To ensure the maintenance and management of the portal site's content, we also hired temporary staff with joint assignments in both the Department of Epidemiology and the Department of Information Technology.

2. Relocation of the Hiroshima Laboratory

The detailed design for the new building at Hiroshima Laboratory's relocation site was completed, and a public tender for the construction project was announced on October 1, 2024. A bid opening took place on November 27, but the tender was unsuccessful. The tender was reannounced on November 29, and Asanuma Corporation won the tender on December 26. RERF concluded a contract for construction work with the corporation on January 8, 2025, and made preparations for construction to start promptly.

3. Revision of the rules and regulations

RERF in FY2024 reviewed its regulations to enhance its operational framework as a public interest incorporated foundation. The following are the main regulations that were revised or established.

- Standards of Employment and Salaries of Temporary Employees [Effected on February 14, 2024]
  The standards were revised to comply with the revised Labor Standards Act (effected in April 2024).

- Standards of Employment and Salaries for Visiting Research Associates and Expert Staff and Payment of Expenses for Activities of Outside Experts, Including Consultants and Others [Effected on March 8, 2024]
  The appointment of visiting research associates was fundamentally reviewed to establish the standards and to partially revise the payment procedures.

- Regulations Concerning Disciplinary Action [Effected on April 1, 2024]
  The regulations were formulated to ensure the effectiveness of the Regulations on Prevention of Harassment and Others.

- Rules of Employment [Effected on April 1 and December 6, 2024]
  Revisions were made in relation to the establishment of the Regulations Concerning Disciplinary Action and to conform to the Child Care and Family Care Leave Act, which was amended in June 2021.

- Regulations on Prevention of Harassment and Others [Effected on April 1, 2024]
  Partial revisions in relation to the establishment of the Regulations Concerning Disciplinary Action were made.

- Due to the decommissioning of the Radioisotope Facility, the regulations relating to this facility were partially revised. [Effected on April 1, 2024]

- Operational Procedures of RERF Institutional Review Board [effected on July 1, 2024]
  As the Ethical Guidelines for Human Genome/Gene Analysis Research were abolished in June 2021, the operational procedures were partially revised, and steps for the implementation of ethical review were separately established.

- Administrative Guidelines for the Selection and Duties of the Representative of the Majority of Employees [effected on February 10, 2025]
  Guidelines were established regarding the selection and duties of the representative of the majority of employees legally required for the conclusion of agreements between labor and management.

- Regulations for Protection of Personal Information and Detailed Regulations on Handling of Personal Information [effected on March 13, 2025]
  RERF Regulations were revised to comply with the Act on the Protection of Personal Information.

Appended documents to FY2024 report of activities

There were no items considered to be important matters for supplementing the contents of the FY2024 report of activities.