

FY2016 Report of Activities

Introduction

Epidemiologic data on mortality and cancer incidence among A-bomb survivors (the Life Span Study [LSS], the *in utero* study) 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, long high-quality follow-up, and comprehensive data on mortality and cancer incidence. However, the LSS is only one facet of RERF's research activities. Clinical examinations and the collection of biosamples in the Adult Health Study (AHS, a subsample of the LSS) and the clinical, epidemiological and genetic studies of the children of A-bomb survivors provide more detailed information on health conditions of interest, including radiation-related non-cancer conditions, and the pathogenesis of those conditions in relation to radiation exposure. We are also staging heritable mutations. Our basic science groups in collaboration with the clinical studies and epidemiology departments utilize the biosamples to further address the nature and extent of genetic (both heritable and somatic) effects, and molecular changes associated with the health risks. These three components within the RERF research program provide a unique and important integrative approach into epidemiological, clinical, biological, and mechanistic aspects of human radiation risk. Such integrated opportunities are unique to RERF and make essential that the best science possible is conducted.

1. Report of Major Activities

1. Research Projects Examining A-Bomb Survivors Health

1) Radiation and Cancer Risks

An increased incidence of cancer is recognized as the primary risk. A summary of some of the activities that focus on providing information related to risks and characterization of potential mechanisms involved in radiation related cancer is provided below:

- *Updated cancer incidence:* Periodic reporting on the radiation risks of cancer incidence is an important task for RERF. A comprehensive analysis to update radiation risk estimates for cancer incidence through 2009 has been completed using updated individual doses and information of lifestyle factors such as smoking in collaboration with the US National Cancer Institute. Papers on all solid cancer (Grant EJ, et al) and lung cancer (Cahoon EK, et al) are in press in *Radiat Res* and a paper for the breast has been submitted for internal review. A number of additional papers on individual tumor sites will follow and focus on the shape of the dose-response curves, low-dose risk and risks among those young at exposure, while adjusting for relevant life-style factors.
- *Site-specific cancer studies with histological reviews in the LSS cohort:* RERF has a long history of performing joint studies in collaboration with the US National Cancer Institute. These studies attempt to study specific cancers in detail. We currently have a number of studies active, specifically:
- *Genomic study of thyroid cancer:* Somatic mutations/genetic alterations that increase susceptibility to radiation-induced thyroid cancer and improve our understanding of radiation-induced carcinogenesis are of great interest because thyroid cancer has been the

key disease risk for both Chernobyl and Fukushima. Therefore, a genomic study of papillary adenocarcinoma of the thyroid is underway in collaboration with the US National Cancer Institute and RIKEN of Japan as well as local hospitals in which those samples have been stored. Under the auspices of a pilot study, the feasibility of extracting DNA/RNA from old formalin-fixed paraffin-embedded tissue samples for genome sequencing is being tested and improved using the latest techniques. A full-scale study will commence at the successful completion of the pilot study, which is expected in early 2017.

- *Breast cancer:* Since breast cancer is one of the most radiosensitive tumor sites, we aim to learn more about its radiation pathogenesis. We identified 1,615 histologically confirmed female breast cancer cases. Of them, 1,330 ‘intrinsic subtypes’ of estrogen and progesterone receptors and HER2 were determined. In a separate nested case-control study of postmenopausal breast cancer, a paper exploring the joint effects of radiation exposure and endogenous hormone levels has been re-submitted to an international journal. Data are also being analyzed collaboratively in pooled studies of breast cancer and serum hormone biomarker levels at Oxford University and of premenopausal breast cancer and selected lifestyle factors at the Institute of Cancer Research, UK.
- *Uterine cancer:* We continue histological review by a panel of pathologists of 381 possible cases. Revisions to the research project extended the follow-up period until 2011 to add about 90 cases.
- *Malignant lymphoma:* The tumor incidence data have suggested an association with radiation for men but not for women, but which subtypes and whether other factors may account for this are unknown, so a detailed study is underway. Histological review has identified 477 cases during 1950–1995. A manuscript exploring radiation risks and characteristics of the 477 cases for which subtypes were immunohistochemically diagnosed is being drafted.
- *Soft tissue and bone tumors:* Since most data about radiation risk for sarcomas are after high-dose radiotherapy exposures, we are determining whether there is also risk after low-to-moderate doses. A total of 126 cases (91 histologically confirmed cases and 35 cases confirmed by medical records with histological examinations) during 1957–2003 is being analyzed in collaboration with the US NCI.
- *Fallout rain exposure:* Reported exposure to fallout rain was obtained from early ABCC questionnaires. Because of public concerns, especially after the Fukushima accident, the data have been analyzed. A paper of analysis on fallout rain exposure and reported acute symptoms (e.g., epilation) was published (Ozasa K, et al., *Radiat Res* 185:604–615, 2016).
- We have been investigating the pathogenesis of radiation-associated HCC by identifying measured markers that form clusters of chronic inflammation, insulin resistance, and liver fibrosis, and by examining possible radiation-HCC mediation by HBV in collaboration with the Statistics Department. A new multidisciplinary project is being developed to include researchers from Clinical Studies, Epidemiology, Molecular Biosciences, and Statistics.

2) Radiation and Risks of Circulatory Disease

While studies of cancer risks has been the main focus of studies at RERF it has been more recently recognized that significant risks for non-cancer effects may also exist. Risks of cardiovascular disease have been of particular interest and a few of the ongoing studies are described below:

(1) Cardiovascular Disease

It has been recognized since the 1960s that the heart may be damaged by substantial doses of radiation (> 30 Gy), such as doses used during mantle radiotherapy for Hodgkin lymphoma. With regard to lower dose radiation, epidemiological data are insufficient and biologically plausible mechanisms are lacking, although there are several theories which may be applied to lower dose exposure, including microvasculature effects, oxidation, inflammation, and mutation theories. With regard to the implication of lower dose studies, risks of cardiovascular disease (CVD) from exposure to lower dose has a large impact both on public health and patient care, because there are large number of patients and radiation workers exposed to this level of radiation. RERF is in the unique situation in studying non-cancer effects because the large amount of information on non-cancer diseases is available and a multidisciplinary approach including epidemiological, clinical and basic studies can be applied.

- Although the LSS study and other studies in the literature have recently identified radiation risks for CVD at low-to-moderate doses, the etiological and pathogenic pathways are not well characterized. We have recently started data analysis examining physiological indices of arteriosclerosis and potential related biomarkers with radiation dose in the AHS.
- The LSS and certain other studies have recently shown that heart failure and valvular disease, in addition to ischemic heart disease, are associated with radiation exposure (Takahashi I, et al., *Radiat Res* 187(3):319-32, 2017). On this basis we are continuing a study to obtain early indicators of these types of disease, using echocardiography and relevant biomarkers to confirm and elucidate these disease risks in the AHS.
- We have initiated analyses of a CVD incidence study using consistent criteria over the study period since AHS had started, especially for ischemic heart disease (IHD) and stroke in the AHS.
- We have continued analyses of the association of chronic kidney disease (CKD) and albuminuria with radiation dose. Preliminary analyses showed that radiation dose was significantly associated with CKD and macro-albuminuria among AHS subjects in Hiroshima and Nagasaki after adjustment for age, sex, city, smoking and alcohol habit. However, these significant associations were lost after additional adjustments for CKD risk factors, which suggest a possible mediating effects through CKD risk factors or confounding. We now have a plan for mediation analysis.
- Investigators have published a first-author paper on the prognostic significance of premature ventricular contractions by electrocardiography (*Ann Noninvasive Electorcardiol*, 2016; 21: 142-51). Analysis of a study examining radiation dose and atrial fibrillation (AF) is ongoing. Preliminary analysis showed that radiation dose was not significantly associated with AF incident risk with adjustment for sex and city.

3) Other Noncancer Risks:

(1) Cataract

Radiation effects on posterior sub-capsular opacity have been well documented among A-bomb survivors and other exposed population. With regard to radiation effects on cortical/nuclear opacities, however, evidence appears to be insufficient and study results are inconsistent. Therefore, we have developed new ophthalmological study to obtain lens images by 3 devices; slit-lamp, retro-illumination camera, Scheimpflug camera with standardized method to evaluate the grade of posterior sub-capsular, cortical, and nuclear opacities.

- Started full-scale ophthalmologic examinations for a cataract study in Hiroshima and Nagasaki in April 2016 in collaboration with ophthalmologists in Hiroshima and Nagasaki Universities. Supervision for this study is made by a cataract specialist and scoring of cataract severity will be made by the same person using photographed images. In order to shorten data collection period by one year from 3 years to 2 years, original plan has been modified by increasing number of participants for data collection from 4 to 6 per week.

(2) Other Noncancer Studies

- According to suggestions made by SAC, we started medical chart review to detect diabetes with standardized criteria in Hiroshima and Nagasaki.
- We have submitted a paper of radiation effects on thyroid dysfunction and autoimmune diseases in the AHS subjects exposed at younger ages to the scientific journal. No dose-responses were observed.
- We continued analyses of thyroid diseases in AHS subjects exposed in utero. Preliminary analysis suggests a significant dose-response for thyroid nodules.
- The LSS and AHS data have shown that chronic liver disease and liver cirrhosis are related to radiation dose. Radiation exposure may accelerate the severity of liver fibrosis irrespective of hepatitis virus infection through insulin resistance or inflammation. Continued cleaning a data set which includes measurement of liver stiffness with the elastometer and blood cytokine levels such as TNF- α , IL-6, MCP-1, adiponectin, leptin, and IGF-1 for AHS subjects exposed at younger ages.
- RERF investigators have published a first-author paper showing that radiation did not significantly affect cognition's trajectory from 1992 to 2011 among atomic bomb survivors exposed at or after adolescence (*Am J Med*, 2016).

4) Activities to Enhance Ongoing and Future Analysis:

Establishing a strong infrastructure is essential to conduct high quality studies. Some of the most significant activities are described below:

- *Mortality surveillance:* A primary responsibility of the Department of Epidemiology. Mortality follow-up for all cohorts (LSS, F₁, *in utero*) continues on a 3-year cycle. Mortality data are complete through 2012 and include underlying cause of death as well as associated causes of death. Archiving early-time materials (scanning and digitization) including questionnaires of the major cohorts and other subjects in the early period has been conducted.
- *Hiroshima and Nagasaki tumor/tissue registries:* Case collection by notifications and

death certificates is complete through 2013 in both Hiroshima and Nagasaki including case abstraction in Nagasaki. The cancer incidence information through 2011 in Hiroshima and 2012 in Nagasaki has been cross-checked with the database of the LSS, *in utero*, and F₁, and summarized. Annual reports of each registry were released. The recent data were provided to the Cancer Incidence in Five Continents, Vol. XI, and the International Incidence of Childhood Cancer, Vol. III, by the International Agency for Research on Cancer, and the CONCORD-3 (a global comparison of population-based cancer survival) by the London School of Hygiene and Tropical Medicine. As the Japanese National Cancer Registry started from January 2016, both Hiroshima and Nagasaki Cancer Registries have prepared for compliance with the new registry system. Cooperative studies with the National Cancer Center of Japan are also being conducted to refine the connection between current local systems treating the existent data up to 2015 and the nationwide system.

- *Pathology studies*: A database that indexes RERF specimens of formalin-fixed paraffin-embedded tissues is being developed for future specimen utilization and storage in the Biosample Center of RERF. Preservation and utilization of pathological materials from the A-bomb survivors in Hiroshima and Nagasaki areas continues in collaboration with community hospitals and universities. Expanded collaboration is being organized.
- *Biosample Center (Research Resource Center)*: The center has completed an inventory of about 620,000 biosample tubes stored in departmental deep freezers and handed over their control to the Biosample Center (Hiroshima). An inventory of about 150,000 blood and urine samples among 490,000 tubes stored in -80°C freezers or in liquid nitrogen tanks (Nagasaki) has also completed.

(2) Activities for promotion of the health and welfare of study participants:

The Adult Health Study (AHS) and the F₁ clinical study contribute to the promotion of the health and welfare of the A-bomb survivors and their children through regular health examinations and health consultation via telephone contacts or home visits. At the health examinations, physicians provide guidance for disease prevention to study participants, report examination results to their attending physicians, or refer them to medical institutions when more detailed examination or treatment is necessary. Continued support activities provided on occasions other than such medical examinations include health consultation by public health nurses, assistance for the elderly or physically challenged in their hospital visits, advice on application procedures involving government allowances for A-bomb survivors, and provision of information regarding governmental consultation services related to welfare benefits. In addition, educational brochures for health promotion are distributed to study participants on a regular basis.

(3) Research on biological mechanisms related to health effects from radiation among A-bomb survivors:

Crucial to the understanding of risks and to facilitate our focus on the health of A-Bomb Survivors are programs focused on mechanistic studies.

Immune Function (Vaccination response): The hypothesis that past radiation exposure exacerbates age-associated deterioration in immune response to influenza vaccination was tested in 292 AHS subjects over two influenza vaccination seasons. Gender or advanced age did not give a consistent and significant impact on strain-specific flu vaccine response. Individuals exposed to 1 Gy or higher were more likely to seroconvert to two antigens than lower dose exposure, suggesting that more than 65 years after the A-bombing, there is no negative effect of radiation exposure on vaccine responses in individuals.

2. Research Projects on the Health of A-Bomb Survivors Children (F1)

An important question for understanding of risks following the atomic bombings, and exposure to radiation in general, is whether there are transgenerational effects that could result in an increased cancer or non-cancer risk in the children of survivors (F1). Studies of these F1 offspring include clinical studies, epidemiological studies, and basic science.

1) F1 mortality study and F1 clinical study

- *Clinical exams:* The second round examination of the longitudinal F₁ offspring clinical study (FOCS) that was initiated in November 2010 on a four-year cycle has almost been completed. 10,304 subjects participated and participation rate during this cycle was 78.7%.
- *Analysis:* We have now started to conduct preliminary tabulation of the prevalence and incidence of individual multifactorial disease outcomes among about 10,000 FOCS participants between November 2010 and October 2015.

2) Research on biological mechanisms related to the health of A-bomb survivors' children

- *Epidemiological F1 cohort study:* Long-term studies of the F₁ cohort provide a framework for studying germline effects of radiation exposure and provide unique data as the only study with such data. After a major paper of mortality risk assessment was published in 2015, routine collection of case information is continuing. Parental individual doses are being updated to DS02R1. A paper describing the results from the F₁ Mail Survey was published (Milder CM, et al., *Asian Pac J Cancer Prev* 17:1313-23, 2016).
- *Molecular studies in an experimental system:* A mouse CGH study determined that the mutation rate was 1×10^{-2} / Gy per genome for induced deletions. The results indicated that the mean response to transgenerational effects of radiation is far lower than expected from the mean response of the mouse 7-locus tests. A manuscript describing these results has been published (Asakawa et al., *Radiat Res* 186:568-76, 2016). The junction sequences of the deletions were also determined (Kodaira et al., *Radiat Res* 197:1-10, 2017).
- *Molecular studies in F1's:* A CGH study on offspring of A-bomb survivors and their parents identified 5 *de novo* deletions and 6 duplications and determined the parental origin of 5 deletions and 5 duplications. The junction sequences were also determined, and this study was terminated (manuscript in preparation).

Genomic analysis in a model system: In WGS study of irradiated human cell clones, we had a proof of concept for whole genome analysis and validated the array-CGH data of the same samples in accordance with suggestions from an external collaborator. WGS identified more small indels in F1 mice born to irradiated spermatogonia cells than those in controls

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

Fundamental to all of the RERF studies is well defined dosimetry. This is an ongoing process as new information is obtained and new techniques become available.

- In a collaboration involving the Statistics and Epidemiology Department and the U.S. National Cancer Institute on an extensive new analysis of cancer incidence, including methodology for imputation of missing smoking data, updating of residence probabilities for estimating the effect of out-migration from tumor registry catchment areas, and various methods for risk estimation such as models for joint effects of smoking and radiation and non-parametric smoothing of the dose-response, with a dosimetry manuscript and a manuscript on all-solid cancer completed and under internal review, and several related manuscripts in preparation.
- We are continuing collaborations with external investigators in several areas related to new radiation risk models, including mechanistic modeling of leukemia and multi-model inference for circulatory disease outcomes, including a new collaboration with the German Institute of Radiation Protection on mechanistic modeling studies of thyroid cancer after childhood exposure and combined effects of radiation exposure and smoking on lung cancer.
- The bivariate effect modification of radiation risk by age-related variables was analyzed by applying multidimensional smoothing methods including uncertainty estimation, and presented the result at the Conference on Radiation and Health 2016.
- Fluorescent in situ hybridization (FISH) analysis showed a wide scatter of individual translocation frequencies against physical dose as seen in a previous solid Giemsa staining study. A summary report is underway.
- ESR dose and cytogenetic dose were compared in the same donors, and we found that these two doses agreed well to each other. Scientific reports are being prepared.

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 a number of activities. These include seminars, workshops, participation at international scientific conferences, and international publication of results. This year 2 workshops and 12 seminars were held at RERF presented by international visitors to RERF, and published more than 80 scientific papers.

1) 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. Partnership with Kurume University
- b. Collaborations with the US National Cancer Institute
- c. Collaborations with the US National Institute of Allergy and Infectious Diseases
- d. Collaborations with Outside Investigators:

45 Japanese Institutions
22 North American Institutions
12 European Institutions
6 Asian Institutions
Nuclear Emergency Workers Study (NEWS): 10 Japanese Institutions

2) Workshops

- a. Exchange Seminar of RERF Young Scientists with ICRP Members
- b. Joint RERF-ICRP Workshop on Health Risk on Radiation and the System of Radiological Protection

5. Training Programs for Domestic and Overseas Specialists

- 1) A “Training course for biologists: Let us learn more about epidemiology” was held to deepen biologists’ understanding of RERF’s epidemiological studies and to also promote exchanges among researchers working for radiation-related organizations (August 29–30, 2016; 48 participants in total).
- 2) RERF accepted overseas research trainees, either on their own initiative or in support of the activities of such organizations as the Hiroshima International Council for Health Care of the Radiation-exposed (HICARE), the Nagasaki Association for Hibakushas’ Medical Care (NASIM), and the Japan International Cooperation Agency (JICA) (65 trainees in total). During the long-term training (about one month), trainees received lectures on research methods and the results of past studies and took part in experiments and analyses to deepen their understanding of the health effects of radiation.
- 3) RERF cooperated in the international training course jointly held by the International Atomic Energy Agency (IAEA) and HICARE (January 30–February 2, 2017; 36 participants in total), and provided lecturers and offered a venue for the training course on February 2, 2017.
- 4) RERF accepted visits by students from schools and universities in Japan for tours including research lectures (21 students in total).
- 5) RERF prepared and provided part of the training materials for IAEA radiation protection specialists and other personnel at the IAEA’s request.
- 6) RERF further reviewed future directions for its training activities, including an approach of publicly inviting overseas trainees in the International Exchange Research Program, and called for applications from researchers and others from abroad to receive training at RERF by posting an invitation and the guidelines for application on the RERF website. This fiscal year, RERF received 11 applications and accepted 4 trainees.

6. Public Information Programs

- 1) RERF Open Houses

In FY2016, RERF held its 22nd Open House on August 5–6 in Hiroshima and its 20th Open House on August 8–9 in Nagasaki. The events this year were held under the theme “Come to RERF.” With a continued high level of public interest in radiation due to the Fukushima Daiichi nuclear power plant accident, the Open House events in 2016 featured

a special exhibit titled “Considering the health effects of low-dose radiation exposure based on atomic-bomb radiation studies,” in addition to a feature exhibit titled “Epidemiological Study of Health Effects in Fukushima Emergency Workers.” The feature exhibit touches on a project that was entrusted to RERF by Japan’s Ministry of Health, Labour and Welfare (MHLW) in 2014.

In addition, several science corners were set up: “Liquid nitrogen show,” “Extracting DNA from vegetables,” and so on, at which science experiments were conducted, with hands-on learning opportunities also provided. The main event of the Open House in Hiroshima was guided tours of RERF’s Biosample Center’s robotic biorepository, which began operations in 2015. As a first-time event, an animated film in Japanese was shown for the study of peace. Also, as usual, a “Quiz stamp rally” was conducted, in which young visitors moved throughout the facilities to complete the quiz.

The Open House lectures, which have become part of the regular program in Hiroshima, were delivered on August 5, with Dr. Hiromi Sugiyama, Acting Office Chief, Tumor and Tissue Registry Office, Associate Senior Scientist, Department of Epidemiology, providing a lecture titled “What are Cancer Registries?” given that the national cancer registry system was enshrined into law starting this year in Japan. Another popular lecture, since the time it was first held at the 2014 Open House, was “That’s why translation is fun!” delivered in English by Mr. Jeffrey L. Hart, Chief, Public Relations and Publications Office. The next day, August 6, Dr. Norio Takahashi, RERF Consultant, gave a lecture about the basics of radiation titled “What is radiation?” and Dr. Kyoji Furukawa, Associate Senior Scientist, Department of Statistics, delivered the lecture “Statistics can be fun!” illustrating the likelihood of the local Hiroshima Carp baseball team winning the pennant this season. The lectures were attended by large enthusiastic audiences, who asked many questions after the lectures had ended.

The two-day Open House events attracted 1,003 and 503 visitors in Hiroshima and Nagasaki, respectively.

2) Public lecture

The RERF Public Lecture this year was presented as part of the 59th Meeting of the Japanese Radiation Research Society, with the Society acting as co-sponsor. The lecture was held in the evening of October 26 at the JMS Aster Plaza in Naka-ku, Hiroshima. About 120 persons attended, including members of the public and Society participants. Because this year marks the fifth anniversary of TEPCO’s Fukushima Daiichi nuclear power plant accident, the Public Lecture featured four presentations based on the theme “Message to Fukushima from Hiroshima and Nagasaki five years after the accident—harmony between health monitoring and scientific research.” Dr. Toshiya Inaba, Professor, Research Institute for Radiation Biology and Medicine of Hiroshima University, and Ms. Reiko Horimukai, Assistant Office Chief, Public Relations and Publications Office, RERF, served as co-presenters.

In his opening address, Dr. Sunao Tsuboi, Chairman, Hiroshima Prefecture Confederation of A- and H-Bomb Sufferers Organizations, spoke passionately about his own experiences immediately after the atomic bombing of Hiroshima.

Dr. Kazunori Kodama, RERF Chief Scientist, explained that RERF has been thinking about how to go about conveying its research findings to people in Hiroshima, Nagasaki, and throughout the world. He emphasized that RERF is making every effort to carry out

such activities, including releasing information on its website, holding Local Liaison Council meetings, and hosting events such as the Open House and Public Lecture.

Dr. Michiaki Kai, Professor, Oita University of Nursing and Health Sciences, used figures and charts to present a readily understandable explanation of radiation protection systems and talked about how radiation protection standards are based on the outcomes of health effects studies conducted by RERF in Hiroshima and Nagasaki.

Dr. Sanae Midorikawa, Professor, Fukushima Medical University, spoke about a major thyroid screening project conducted after the Fukushima accident for mothers who feared the onset of thyroid cancer among their children, noting that the outcome ironically multiplied the mothers' fears.

3) Media forum

RERF held its fifth round of media forums on April 13, 2016, at Nagasaki RERF and on April 18 in Hiroshima. The Nagasaki forum gathered 11 media representatives from eight organizations. The Hiroshima forum hosted 13 reporters from seven media outlets. The purpose of the annual media gathering is to present new research achievements and increase understanding among media representatives about the studies conducted over a period of nearly 70 years at ABCC-RERF. In this way, the forums provide knowledge the media can use to better inform the public about the atomic bombings of the two cities and the health effects from A-bomb radiation. At both the Nagasaki and Hiroshima forums, Dr. Ohtsura Niwa, Chairman, opened this—his first—event by providing greetings and his impressions of RERF's operations in a general sense. Dr. Kazunori Kodama, Chief Scientist, followed by giving an extensive presentation titled "Overview of RERF research," including the topics of RERF research issues and policies. Mr. Takanobu Teramoto, in charge of public relations as the Executive Director, closed the presentations by speaking on the topic "FY2016 plans for events/projects." Mr. Teramoto described the major events scheduled for both Nagasaki and Hiroshima in the upcoming fiscal year, including the Open House events in August, the Local Liaison Council meetings in both cities in September, and the public lectures scheduled for some time in the fall. At the forums, media participants raised questions regarding the Epidemiological Study of Health Effects in Fukushima Emergency Workers (NEWS) and its progress, about the new RERF "research cluster" concept, and for further clarification of RERF epidemiological findings.

4) School Visit Program

An RERF scientist gave lectures at two elementary schools in Hiroshima this year to initiate a new endeavor called the School Visit Program in an attempt to broaden RERF's reach to younger school students to ensure young people and teachers understand the true risks and rewards of radiation.

5) Permanent exhibits

The Hiroshima Laboratory has established a permanent exhibit space showing the history of ABCC-RERF, the organization's international collaborative activities, and basic information on radiation. This historical panel information was being updated at the end of FY2016, so that it includes both Japanese and English explanations, the latter of which was missing previously. Also, other more general information about RERF's structure and funding, as well as a message to the A-bomb survivors and a translation of a representative survivor's remarks, was added to the side of the panel. The RERF

overview poster, which explains its research in a straightforward manner, was translated into six languages in addition to Japanese and English, with pamphlets made available in a total of eight languages at the permanent exhibit corner.

The Nagasaki Laboratory has established a permanent exhibition room, which exhibits general information about studies/research. The same pamphlets in eight languages are also made available there.

6) Updating public relations materials

The RERF *Update* newsletter (2016 summer and winter editions) was published in Japanese and English. The Annual Report has been discontinued in its previous hard-copy format and is to reappear only online in a different format and name by the end of the fiscal year.

7) Enhanced RERF website

- A comprehensive overhaul of the RERF public website has been initiated. A beta version will be completed by June 2017, with the full website completed later in the year.
- When papers were published in scientific journals, easy-to-follow short summary explanations continued to be posted in the “What’s New” section on the public website.
- The total number of RERF website hits between April 1, 2016, and March 31, 2017, was about 32.91 million (compared to about 37.24 million in the corresponding period of the previous year), with the daily average being about 90,000 (compared to about 100,000 in the previous year). The total number of website visitors for the same period was about 872,000 (compared to about 794,000 in the previous year), with the daily average about 2,391 (compared to about 2,179 in the previous year).
- The RERF Facebook page continues to convey information to readers. The Facebook page now has around 550 followers.

8) Other public relations activities

- As part of its public relations activities through the media, RERF held press conferences at the time of important functions and newsworthy events, as well as publication of topical papers. RERF also responded to inquiries and requests for interviews from many domestic and overseas media organizations.
- In addition to the Open House events, visitors are welcome to tour RERF’s facilities upon request. Last fiscal year, as of the end of March 2017, 945 individuals from Japan, including students on school excursions, and 284 individuals from overseas toured the RERF facilities in Hiroshima and Nagasaki.
- In what was a first, RERF’s Chairman Ohtsura Niwa spoke before the Foreign Correspondents Club of Japan in Tokyo in February 2017. The theme of the presentation related to RERF’s research results, how they are used worldwide in the creation of radiation protection guidelines and how the results are relevant to the understanding of radiation exposures following the radiation release from the Fukushima Daiichi nuclear power plant after the Great East Japan Earthquake of 2011, a topic of great interest to the media and public, especially in the Kanto area.

FY2016 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	4 people	(Hiroshima)	
UNSCEAR-related activity	5 people	Visitors related to HICARE	30 people
ICRP-related activity	11 people	Visitors related to NASHIM	6 people
IAEA-related activity	3 people	Visitors related to JICA	8 people
International Agency for Research on Cancer-related activity	1 person	Visitors related to RERF (International Exchange Research Program)	4 people
Semipalatinsk-related activity	1 person	Visitors related to MEXT	10 people
NEWS-related activity	1 person	Visitors related to IPPNW	1 person
Others	12 people	(Nagasaki)	
		Visitors related to NASHIM	6 people
Total: 38 people		Total: 65 people (Hiroshima 59 people, Nagasaki 6 people)	

*In italics: Funding Organization***I. Participation in international collaborative activities by RERF directors and staff members (excluding participation in international scientific meetings)****1. World Health Organization (WHO)-related activity (4 people)****1) *RERF (MHLW International Exchange Research Program)***

Kazunori Kodama, Chief Scientist and Misa Imaizumi, Chief, Division of Radiology, Department of Clinical Studies, Nagasaki Laboratory, visited WHO headquarters to discuss collaboration between RERF and WHO. (Geneva, Switzerland, February 23, 2017)

2) *RERF*

(1) Hiroaki Katayama, Chief, ITD, attended the WHO/WPRO meeting. (Manila, Philippines, November 28–29, 2016)

(2) Hiroaki Katayama, Chief, ITD, visited WHO to discuss with Dr. Zhanat Car about the Radiation Emergency Medicine. (Geneva, Switzerland, February 23, 2017)

2. United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR)-related collaborative activity (5 people)**1) *UNSCEAR***

(1) Kyoji Furukawa, Associate Senior Scientist, attended a meeting on the project “Selected evaluations of health effects and inferred risk from radiation exposure.” (Vienna, Austria, July 19–22, December 13–16, 2016)

(2) Kotaro Ozasa, Chief of Epidemiology, Hiroshima, attended the UNSCEAR domestic committee meeting. (Tokyo, Japan, September 30, 2016, March 30, 2017)

2) *RERF*

- (1) Kazunori Kodama, Chief Scientist, attended the 63rd UNSCEAR meeting. (Vienna, Austria, June 24– July 3, 2016)
- (2) Kazunori Kodama, Chief Scientist, attended the meeting with UNSCEAR members and Japanese government on UNSCEAR Fukushima assessment. (Tokyo, Japan, October 31, 2016)
- (3) Kazunori Kodama, Chief Scientist, attended the UNSCEAR domestic committee meeting. (Tokyo, Japan, November 1, 2016 and March 30, 2017)

3. *ICRP (International Commission on Radiological Protection)*-related activity (11 people)

- (1) Ohtsura Niwa, Chairman, participated as a member of the ICRP Main Commission in its meeting to discuss radiation protection. (Cape Town, South Africa, May 14–18, 2016)
- (2) Ohtsura Niwa, Chairman, participated in ICRP-sponsored dialogue seminars for Iitate-mura. He toured the area where the evacuation order is to be lifted in six months, had a dialogue with local residents, and discussed the issue of Iitate-mura's reconstruction. (Iitate-mura, Fukushima, Japan, July 8–10, 2016)
- (3) RERF and ICRP, in collaboration with the Japan Health Physics Society, held a RERF/ICRP workshop that was open to researchers and citizens, with the goal of exchanging opinions about the latest findings on radiation health effects and disseminating knowledge among citizens. (Lecture room, The University of Tokyo Faculty of Engineering, October 9, 2016)
- (4) Ohtsura Niwa, Chairman, participated as a member of the ICRP Main Commission meeting to discuss radiation protection. (Shenzhen, China, October 24–28, 2016)
- (5) Ohtsura Niwa, Chairman, attended ICRP-sponsored dialogue seminars for Futaba-Okuma with residents in the restricted areas and discussed the issue of reconstruction in these troubled areas. (Iwaki, Fukushima, Japan, March 10–12, 2017)

4. International Atomic Energy Agency (IAEA)-related activity (3 people)

1) *RERF (MHLW International Exchange Research Program)*

Kazunori Kodama, Chief Scientist and Misa Imaizumi, Chief, Division of Radiology, Department of Clinical Studies, Nagasaki Laboratory, visited IAEA headquarters to discuss collaboration between RERF and IAEA. (Vienna, Austria, February 20–21, 2017)

2) *RERF*

Hiroaki Katayama, Chief, ITD, visited IAEA to discuss about the drill of Radiation Emergency. (Vienna, Austria, February 20–21, 2017)

5. International Agency for Research on Cancer-related activity (1 person)

Agence Nationale de la Recherche (ANR)

Harry M. Cullings, Chief, Department of Statistics, attended the Peer Review Panel meeting CONCERT call 2016. (Paris, France, October 26–27, 2016)

6. Semipalatinsk (Kazakhstan) related activity (1 person)

JSPS/MEXT Grant-in-Aid for Scientific Research

Hiroaki Katayama, Chief, ITD, visited IARC to discuss with Dr. Grosche (Germany), Dr.

Simon (NCI, USA), Dr. Kesminiene, Dr. Ostroumova (IARC). (Lyon, France, November 9–10, 2016)

7. NEWS related activity (1 person)

Clinical Studies on Occupational Injuries and Illnesses MHLW Research Program

Hiroaki Katayama, Chief, ITD, attended the Scientific Symposium Chernobyl: 30 years after and oral presentation. (Lyon, France, June 10–11, 2016)

8. Others (12 people)

- (1) Ohtsura Niwa, Chairman, gave a presentation-based lecture at the first Forum on the Decommissioning of the Fukushima Daiichi NPS, sponsored by the Nuclear Damage Compensation and Decommissioning Facilitation Corporation. (Iwaki, Fukushima, Japan, April 8–11, 2016)
- (2) Robert Ullrich, Vice Chairman, participated in the Annual Meeting of the NCRP. (Washington DC, U.S.A., April 11–12, 2016)
- (3) Robert Ullrich, Vice Chairman, participated and gave a lecture in a Symposium in Celebration of the Centennial of the Columbia University (Center for Radiological Research). (New York, U.S.A., April 28–29, 2016)
- (4) Ohtsura Niwa, Chairman, attended the 240th U.S. Independence Day Reception. (Osaka, Japan, July 1, 2016)
- (5) Ohtsura Niwa, Chairman, gave a lecture at the 11th ICRC Southeast and Northeast Asia Session on International Humanitarian Law. (Hiroshima, Japan, July 13, 2016)
- (6) Ohtsura Niwa, Chairman, and Kazunori Kodama, Chief Scientist, presented a lecture at a meeting related to a visit to the Quebec Medical Association, sponsored by the Hiroshima Prefecture Medical Association. (Hiroshima, Japan, September 2, 2016)
- (7) Robert Ullrich, Vice Chairman, participated in Radiation Protection Week Oxford 2016. (Oxford, U.K., September 19–23, 2016)
- (8) Ohtsura Niwa, Chairman, gave a lecture on cancer risk with low doses of radiation and low-dose rates at an international conference sponsored by the U.S. Electric Power Research Institute. (Charlotte, North Carolina, U.S.A., November 8–12, 2016)
- (9) Ohtsura Niwa, Chairman, has been appointed as external scientific councilor for CONCERT project, initiated under the supervision of the Multidisciplinary European Low-Dose Initiative (MELODI), a leading organization in the field of radiation effects research in Europe; he attended a CONCERT-related meeting as an external review member and participated in discussions. (Brussels, Belgium, November 15–21, 2016)
- (10) Ohtsura Niwa, Chairman, attended a DOE-sponsored dosimetry meeting on atomic-bomb radiation and participated in discussions. (Washington, D.C., U.S.A., January 9–10, 2017)
- (11) Robert Ullrich, Vice Chairman, participated in Human Research Program Investigators' Workshop. (Houston, U.S.A., January 24–26, 2017)

II. Acceptance of visitors from overseas for briefing and training (Total: 65 people)

[Hiroshima: 59 people] *In italics: Funding Organization*

1. Visitors related to *Hiroshima International Council for Health Care of the Radiation Exposed (HICARE)* (30 people)

1) South Korea (18 people)

- (1) June 13, 2016: 3 trainees from South Korea for the “A-bomb survivors residing in South Korea.”
- (2) September 27, 2016: 10 trainees from South Korea for the “A-bomb survivors residing in South Korea.”
- (3) October 25, 2016: 5 trainees from South Korea for the “A-bomb survivors residing in South Korea.”

2) United States (7 people)

- (1) July 14, 2016: 3 trainees from United States
- (2) November 17, 2016: 4 trainees from United States, South Korea, and Latvia

3) Others (5 people)

- (1) November 1–30, 2016: 1 trainee from Latvia
- (2) February 17, 2017: 3 trainees from Brazil
- (3) February 17 2017: 1 trainee from Vietnam

2. Visitors related to *the Nagasaki Association for Hibakushas’ Medical Care (NASHIM)* (6 people)

August 12, 2016: 6 trainees from Russia, Ukraine, Belarus, and Kazakhstan for the “FY2016 NASHIM Training Course”

3. Visitors related to *International Cooperation Agency (JICA)* (8 people)

Japan Anti-Tuberculosis Association (8 people)

November 16, 2016: 8 trainees from Kenya, Afghanistan, Philippines, and Liberia for FY2016 JICA group training on “Management enhancement of Tuberculosis Laboratory examinations in UHC age” at the request of the Research Institute of Tuberculosis

4. *RERF (MHLW International Exchange Research Program)* (4 people)

- (1) November 8–25, 2016: 1 trainee, National Cancer Center, South Korea
- (2) November 29–December 9, 2016: 1 trainee, Environmental Health Unit, Ministry of Health Malaysia
- (3) November 29–December 9, 2016: 1 trainee, School of Energy Systems, Lappeenranta University of Technology, Finland
- (4) November 29–December 9, 2016: 1 trainee, Department of Preventive Medicine, College of Medicine, Korea University

5. *Ministry of Education, Culture, Sports, Science and Technology, MEXT* (10 people)

Nagoya University Graduate School of Medicine (10 people)

February 3, 2017: 10 trainees from Mongolia, Myanmar, Afghanistan, Laos, Bangladesh, Kyrgyzstan, Cambodia and Vietnam for Nagoya University Graduate School of Medicine, Young Leaders' Program FY2016–2017

6. *International Physicians for the prevention of Nuclear War (IPPNW)* (1 person)

September 8, 2016: 1 trainee for an exchange student from IPPNW German Branch

[Nagasaki: 6 people]

Visitors related to *the Nagasaki Association for Hibakushas' Medical Care (NASHIM)* (6 people)

July 20, 2016: 6 trainees from Russia, Ukraine, Belarus, and Kazakhstan for the “FY2016 NASHIM Training Course”

III. Joint programs between RERF and overseas researchers/research organizations

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

- (1) Under the research contract entered into by and between RERF and the U.S. National Cancer Institute (NCI), in which Kotaro Ozasa, Chief of Epidemiology, Hiroshima, serves as a responsible person of the RERF side, he is working on analysis of solid cancer incidence risks in the LSS cohort, site-specific cancer studies based on histopathological diagnoses, and preliminary reviews for genomic analysis of thyroid cancer.
- (2) Dr. Dale Preston, Principal Scientist from Hirosoft International Corporation, visited RERF to conduct collaborative studies including a solid cancer incidence risks study of A-bomb survivors. (April 9–22, 2016, January 14–28, 2017)
- (3) Dr. Megumu Fujiwara, Chief of the Department of Pathology, Hiroshima Red Cross Hospital & Atomic-Bomb Survivors Hospital and Tomonori Hayashi, Assistant Department Chief of Molecular Biosciences, Hiroshima, visited NCI to hold a preparatory meeting to review DNA/RNA extraction and quality improvement of specimens as part of the preliminary work for genomic analysis of thyroid cancer. (April 17–24, 2016)
- (4) Dr. Kiyohiko Mabuchi of Radiation Epidemiology Branch, NCI, visited RERF to conduct NCI-funded collaborative studies including a site-specific cancer study. (August 22–September 1, 2016)
- (5) Ritsu Sakata, Senior Scientist of Epidemiology, Hiroshima, is joining with the data of tumor of the central nervous system from RERF as a part of the pooled analysis conducted by Dr. Alina Brenner of Radiation Epidemiology Branch, NCI.
- (6) Harry M. Cullings, Chief, Department of Statistics, collaborated with the RERF Department of Epidemiology and the U.S. NCI in preparation of data and methods for a series of upcoming papers on improved analyses of solid cancer incidence and mortality.

2. Collaborative studies with research grants from *U.S. National Institute of Allergy and Infectious Diseases (NIAID)*

- 1) In 2009 RERF initiated a research program funded by the U.S. National Institute of Aging and Infections Disease with the aim of examining possible effects of radiation on the immune system in survivors of the atomic bombings. This study entitled

“Immunosenescence and Other Late Effects of Acute Ionizing Radiation Exposure in Atomic Bomb Survivors”, which was funded by a contract to RERF, was a collaborative study with eight other institutions including: Memorial Sloan-Kettering Cancer Center; University of Georgia; University of Arizona; Duke University; University of Tokushima; Chiba University; National Institute of Health Sciences (Japan); and The National Institute on Aging (USA).

These studies were funded as a contract with RERF with five-year funding for five projects on 1) hematopoietic stem cells, 2) dendritic cells, 3) influenza vaccination response, 4) scoring system for immune competence, and 5) thymus architecture and function. Measurements using A-bomb survivors’ blood samples finished in 2014, and after a two-year extension for data analyses and manuscript preparation, this collaborative study project has been completed in September 2016.

FY 2016 activities are as follows:

- (1) Ad hoc interactive teleconferences on statistical analyses and publication plans in particular NIAID projects have been held several times between RERF scientists and U.S. collaborators.
- (2) The following papers have been published (RERF authors underlined):
 1. Kajimura J, Kyoizumi S, Kubo Y, Misumi M, Yoshida K, Hayashi T, Imai K, Ohishi W, Nakachi K, Weng NP, Young LF, Shieh JH, Moore MA, van den Brink MRM, Kusunoki Y. Relationship between spontaneous γ H2AX foci formation and progenitor functions in circulating hematopoietic stem and progenitor cells among atomic-bomb survivors. *Mutat Res-Gen Tox En*, 2016; 802:59–65.
 2. Lustig A, Shterev I, Geyer SM, Shi A, Hu Y, Morishita Y, Nagamura H, Sasaki K, Maki M, Hayashi I, Furukawa K, Yoshida K, Kajimura J, Kyoizumi S, Kusunoki Y, Ohishi W, Nakachi K, Weng NP, Hayashi T. Long term effects of radiation exposure on telomere lengths of leukocytes and its associated biomarkers among atomic-bomb survivors. *Oncotarget Journal*, 2016; 7(26):38988–98.
 3. Pugh JL, Foster SA, Sukhina AS, Petravic J, Uhrlaub JL, Padilla-Torres J, Hayashi T, Nakachi K, Smithey MJ, Nikolich-Zugich J. Acute systemic DNA damage in youth does not impair immune defense with aging. *Aging Cell*, 2016; 15(4):686–93.
 4. Ito R, Hale LP, Geyer SM, Jie Li, Sornborger A, Kajimura J, Kusunoki Y, Yoshida K, van den Brink MRM, Kyoizumi S, Manley NR, Nakachi K, Sempowski GD. Late effects of ionizing radiation exposure and age on human thymus morphology and function. *Radiat Res*, 2017; doi: 10.1667/RR4554.1.
- 2) Munechika Misumi, Research Scientist, and Kyoji Furukawa and Benjamin French, Associate Senior Research Scientists in the Department of Statistics, provided statistical analysis and supports for the manuscript on the effects of radiation and aging on hematopoietic stem cells, leukocyte telomere lengths, and dendritic cells in atomic bomb survivors by RERF Department of Molecular Biosciences under the NIAID program.
3. Research exchange between *RERF* and *ICRP*
 An exchange seminar between RERF’s junior research staff and ICRP’s research staff was

held to coincide with an ICRP task-group meeting at RERF. (Hiroshima, Japan, October 8, 2016)

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

Atsuko Sadakane, Associate Senior Scientist of Epidemiology, Hiroshima, is joining the collaborative project with the ACC entitled: *Tobacco smoking, alcohol drinking, body mass index and risk of rare cancers*.

5. Collaboration between *RERF and London School of Hygiene & Tropical Medicine*

Hiromi Sugiyama, Associate Senior Scientist of Epidemiology, Hiroshima, and Hiroshima Prefecture cancer registry, are joining the working group of CONCORD-3, global surveillance of cancer survival, conducted by Dr. Michel Coleman of London School of Hygiene & Tropical Medicine.

6. Collaboration between *RERF and Institute of Cancer Research, U.K. and U.S. National Institute of Environmental*

Atsuko Sadakane, Associate Senior Scientist of Epidemiology, Hiroshima, 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.

7. Collaboration between *RERF and Bilateral Programs, Open Partnership with Riga Stradins University*

Kotaro Ozasa, Chief of Epidemiology, Hiroshima, Tomonori Hayashi, Assistant Department Chief of Molecular Biosciences, Hiroshima, Kengo Yoshida, Research Scientist of Molecular Biosciences, Hiroshima and Kanya Hamasaki, Research Scientist of Molecular Biosciences, Hiroshima, participated in discussing about the molecular epidemiology study of 600 cleanup workers exposed to radiation in the Chernobyl nuclear accident with Dr. Kurjane in the Riga Stradins University. (December 12–16, 2016)

8. *RERF* international collaborative studies on statistical analysis

(1) A researcher from Oregon Health and Science University, U.S., visited Hiroshima RERF to conduct a collaborative study, “Issues related to correction of RERF dose-response analysis for the effect of errors in dose,” with Department of Statistics. (Hiroshima, Japan, April 1–22, 2016)

(2) Harry M. Cullings, Chief, Department of Statistics, collaborated with a researcher from the Fred Hutchinson Cancer Research Center, Seattle, Washington, U.S., on semiparametric methods for using biodosimeter results in evaluating dosimetric uncertainty in RERF studies, which has been published as indicated below.

Wang CY, Cullings HM, Song X, Kopecky KJ. Joint non-parametric correction estimation for excess relative risk regression in survival analysis with exposure measurement error. *J Roy Statist Soc Ser B* 2017; DOI: 10.1111/rssb.12230.

(3) Kyoji Furukawa, Associate Senior Scientist, continued a collaborated project with researchers at Institute of Radiation Protection, Helmholtz Zentrum in Germany, on mechanistic modelling of radiation-induced cancer, and one researcher of Helmholtz Zentrum visited Hiroshima RERF to conduct a collaborative study. (Hiroshima, Japan, March 27–April 7, 2017).

平成28年度 外部資金研究一覧表
FY2016 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	¥2,120,000
文部科学省 Ministry of Education, Culture, Sports, Science and Technology (MEXT)	1	¥300,000
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)]	13	¥49,305,000
公益財団法人 原子力安全研究協会 (環境省委託事業の受託機関) Nuclear Safety Research Association (NSRA) [Contract project organization commissioned by the Ministry of the Environment (MOE)]	1	¥6,039,853
公益財団法人 喫煙科学研究財団 Smoking Research Foundation	1	¥2,000,000
国立研究開発法人 国立がん研究センター National Cancer Center	1	¥0*
米国国立がん研究所 (NCI) 契約 U.S. National Cancer Institute (NCI) Contract	1	¥20,551,480
米国国立アレルギー感染症研究所 U.S. National Institute of Allergy and Infectious Diseases	1	¥3,788,900
総合計 Grand total	22	¥84,105,233

注)

- ・ 間接費を含む。
- ・ 研究分担者の配分額を含む。
- * 連携研究者として研究参加のため、配分資金の配分なし。

Notes)

- ・ These amounts include indirect cost.
- ・ These amounts may include subsidies allocated to collaborators.
- * No research fund is allocated because the RERF researcher takes part in the research as an associate investigator.

平成28年度 外部資金研究一覧表
FY2016 External Research Funds

疫学部 Department of Epidemiology	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)	開始日 Initiation Date	終了日 Termination Date	関連RP Related RPs	関連性 Relationship to RERF's mission
1	原爆被爆者におけるがんの疫学的研究支援 Support for Epidemiological studies of cancer among atomic bomb survivors	米国国立がん研究所 (NCI) 契約 米国メリーランド州ベセスダ、 米国国立がん研究所 NCI 契約 HHSN261201400009C 主任研究者 小笹 晃太郎 U.S. National Cancer Institute (NCI) Contract National Cancer Institute, Bethesda, Maryland, USA NCI Contract HHSN261201400009C Kotaro Ozasa	主任研究者 (Program Director) 小笹 晃太郎 Kotaro Ozasa 研究管理者 (Project Managers) Eric J. Grant (主席研究員) (Associate Chief of Research) Harry M. Cullings (統計部) (Dept. Statistics)	直接経費 (Direct cost) ¥14,246,163 間接経費 (Indirect cost) ¥6,305,317	April 1, 2014	July 31, 2019	RP 1-75 RP 18-61 RP 3-94 RP 6-02 RP 1-06 RP 4-07 RP 5-08 RP 6-10 RP-S2-15 RP-S2-16 RP-P1-16	がんの疫学研究、 LSS、胎内被爆者、 F ₁ 集団 Epidemiological study of cancer, LSS, <i>in utero</i> , and F ₁ populations
2	ワクチンの有効性・安全性評価とVPD (vaccine preventable diseases) 対策への適用に関する分析 疫学研究 Analytical epidemiologic study of evaluation of effectiveness and safety, and application for countermeasure against vaccine preventable diseases (VPD)	厚生労働省・厚生労働行政推進調査事業費補助金 「新興・再興感染症及び予防接種政策推進研究事業」 研究代表者 廣田 良夫 医療法人相生会 臨床疫学研究センター長 Health and Labour Sciences Research Grants (MHLW) Research on Emerging and Re-emerging Infectious Diseases and Promotion of Vaccination Policy Yoshio Hirota Director, Clinical Epidemiology Research Center, Medical Co. LTA	研究分担者 (Collaborator) 小笹 晃太郎 Kotaro Ozasa	¥200,000	April 1, 2016	March 31, 2017	No RP	慢性疾患、免疫疾患等宿主に おけるインフルエンザおよび その他の予防接種の免疫原性 および有効性の評価 Evaluation of effectiveness of vaccination of influenza and other respiratory diseases on immuno- compromised host
3	全国がん登録、院内がん登録および既存がん統 計情報の活用によるがん及びがん診療動向把握 に関する包括的研究 Study to grasp trends of cancer and medical care for cancer by using materials on national cancer registry, hospital based cancer registry and existing 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 西本 寛 国立研究開発法人国立がん研究センター がん登録センターセンター長 Health and Labour Sciences Research Grants (MHLW) Comprehensive research project for cancer control Hiroshi Nishimoto Chief, Division of Surveillance, Center for Cancer Control and Information Services, National Cancer Center	研究分担者 (Collaborator) 歌田 真依 Mai Utada	¥300,000	April 1, 2016	March 31, 2017	RP 18-61	被爆者のがん罹患調査 Study of cancer incidence among A-bomb survivors
4	科学的根拠に基づく発がん性・がん予防効果の 評価とがん予防ガイドライン提言に関する研究 Study for proposal of cancer prevention guidelines and evaluation of carcinogenic and cancer preventing effects based on scientific evidences	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 毎月 静 国立研究開発法人国立がん研究センター がん予防・検診研究センター 予防研究部長 National Cancer Center Funds for cancer research and related technology development Shizuka Sasazuki Chief, Division of Prevention, Research Center for Cancer Prevention and Screening, National Cancer Center	連携研究者 (Associate Investigator) 定金 敦子 Atsuko Sadakane	連携研究者のため、研 究資金の配分なし Since this person is an associate investigator, research funds were not allocated to her.	April 1, 2016	March 31, 2017	RP-A2-15	日本人のがんの疫学研究 Epidemiological study of cancer in Japanese population

平成28年度 外部資金研究一覧表
FY2016 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)	開始日 Initiation Date	終了日 Termination Date	関連RP Related RPs	関連性 Relationship to RERF's mission
疫学部 Department of Epidemiology							
5 博士課程教育リーダーディングプログラム「放射線 災害復興を推進するフェニックスリーダー育成 プログラム」 Leading Programs in Doctoral Education "Phoenix leader education program (Hiroshima Initiative) for renaissance from radiation disaster"	文部科学省「博士課程教育リーダーディングプログラム」 国立大学法人広島大学 学長 越智 光夫 Ministry of Education, Culture, Sports, Science and Technology Graduate School Leader Education Program Mitsuo Ochi President, Hiroshima University	研究者 (Investigator) 小笹 晃太郎 Kotaro Ozasa	¥300,000	April 1, 2016	March 31, 2017	No RP	原爆放射線の被爆者およびそ の子供への健康影響に関する 知見の教育普及活動の一環 Activity of education and distribution on the findings of health effects of atomic bomb radiation on survivors and their children

平成28年度 外部資金研究一覧表
FY2016 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)	開始日 Initiation Date	終了日 Termination Date	関連RP Related RPs	関連性 Relationship to RERF's mission
臨床研究部 Department of Clinical Studies							
1 循環器疾患における集団間の健康格差の実態 把握とその対策を目的とした大規模コホート 共同研究 Understanding of health status disparity of circulatory diseases among cohorts and a large-scale collaborative cohort study to address the disparity	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 岡村 智教 教授 慶應義塾大学医学部 教授 Health and Labour Sciences Research Grants (MHLW) Comprehensive Research on Life-Style Related Diseases including Cardiovascular Diseases and Diabetes Mellitus Tomonori Okamura Professor, School of Medicine, Keio University	研究分担者 (Collaborator) 山田 美智子 Michiko Yamada	¥1,620,000	April 1, 2016	March 31, 2017	RP 2-75	広範囲な医学的調査 (生活習慣病) Broad-based medical research (Lifestyle disease)
2 現代の後期高齢者における循環器リスク 要因の検証 Inspection of the circulatory disease risk factors in the modern old-old	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 大久保 孝義 教授 帝京大学医学部 教授 JSPS Grant-in-Aid for Scientific Research Scientific Research (B) Takayoshi Okubo Professor, School of Medicine, Teikyo University	研究分担者 (Collaborator) 山田 美智子 Michiko Yamada	直接経費 (Direct cost) ¥200,000 間接経費 (Indirect cost) ¥60,000	April 1, 2016	March 31, 2017	RP 2-75 RP 5-92	広範囲な医学的調査 (生活習慣病) Broad-based medical research (Lifestyle disease)

平成28年度 外部資金研究一覧表
FY2016 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)	開始日 Initiation Date	終了日 Termination Date	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 原爆被爆者における免疫老化とその他の 放射線被ばく後影響の調査 Studies of immunosenescence and other late effects of acute ionizing radiation exposure in atomic bomb survivors	米国立アレルギー感染症研究所 主任研究者 中地 敏 放影線影響研究所顧問および プロジェクト代表研究者 U.S. National Institute of Allergy and Infectious Diseases Kei Nakachi, RERF Consultant and Project Principal Scientist 共同主任研究者 楠 洋一郎 Yoichiro Kusunoki (Co-P.I.) 共同主任研究者 林 泰権 Tomonori Hayashi (Co-P.I.)	主任研究者 (P.I.) 中地 敏 Kei Nakachi 共同主任研究者 (Co-P.I.) 楠 洋一郎 Yoichiro Kusunoki 林 泰権 Tomonori Hayashi 研究分担者 (Collaborators) ロバート L. ウーリック (副理事長兼業務執行理事) 京泉 誠之 伊藤 玲子、梶村 順子 吉田 健吾 大石 和佳 (臨床研究部) 小笹 晃太郎 (疫学部) 古川 恭治、三角 宗近 (統計部) Robert L. Ullrich (Vice Chairman & Executive Director) Seishi Kyoizumi Reiko Ito Junko Kajimura Kengo Yoshida Waka Ohishi (Dept. Clinical Studies) Kotaro Ozasa (Dept. Epidemiology) Kyoji Furukawa Munekika Misumi (Dept. Statistics)	直接経費 (Direct cost) ¥880,285 間接経費 (Indirect cost) ¥2,908,615	October 1, 2015	September 29, 2016	RP 3-09 RP 4-09 RP 5-09 RP 2-15	放射線影響研究所 免疫学研究 分子疫学研究 RERF Immunology and Molecular Epidemiology Study

平成28年度 外部資金研究一覧表
FY2016 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)	開始日 Initiation Date	終了日 Termination Date	関連RP Related RPs	関連性 Relationship to RERF's mission
分子生物科学部 Department of Molecular Biosciences							
2 原爆被爆者集団における放射線関連がん発生の 分子疫学研究 Molecular epidemiology study of inflammation- associated disease development on the basis of long- term follow-up of 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 林 泰雄 JSPS Grant-in-Aid for Scientific Research Scientific Research (B) Tomonori Hayashi	研究代表者 (P.I.) 林 泰雄 Tomonori Hayashi 連携研究者 (Associate Investigators) 中地 敬 吉田 健吾 Kengo Yoshida John B. Cologne (統計部) (Dept. Statistics)	直接経費 (Direct cost) ¥4,100,000 間接経費 (Indirect cost) ¥1,230,000 東京大学と佐賀県医療センター好生館の研究 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 collaborator at the University of Tokyo and Saga- ken Medical Center Koseikan.	April 1, 2016	March 31, 2017	RP 4-02 RP 4-04	放射線影響研究所 免疫学研究 免疫ゲノム研究 RERF Immunology and Immunogenome Study
3 喫煙の免疫および炎症関連生体指標と 生活習慣病発生に及ぼす影響の分子疫学研究 Molecular epidemiology study of cigarette smoking effects on immunity- and inflammation-related biomarkers and lifestyle-related disease development	公益財団法人 喫煙科学研究財団 研究代表者 林 泰雄 Smoking Research Foundation Tomonori Hayashi	研究代表者 (P.I.) 林 泰雄 Tomonori Hayashi	¥2,000,000	April 1, 2016	March 31, 2017	RP 5-04	放射線影響研究所 免疫学研究 分子疫学研究 RERF Immunology and Molecular Epidemiology Study
4 放射線甲状腺発がんにおけるEML4-ALK融合遺伝 子の生物学的役割に関する研究 Biological significance of EML4-ALK fusion gene in radiation thyroid carcinogenesis	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 濱谷 清裕 JSPS Grant-in-Aid for Scientific Research Scientific Research (C) Kiyohiro Hamatani	研究代表者 (P.I.) 濱谷 清裕 Kiyohiro Hamatani 研究分担者 (Collaborator) 伊藤 玲子 Reiko Ito	直接経費 (Direct cost) ¥0 間接経費 (Indirect cost) ¥0	April 1, 2016	March 31, 2017 補助事業期間延長により、平成27年度の 未執行額 (1,009,191円) を使用。 平成28年度に新たな助成金の交付はなし。 With extension of the funded term, the unexecuted amount for FY2015 (1,009,191yen) was used. No grant was provided for FY2016.	RP 1-14	放射線影響研究所 分子腫瘍学研究 RERF Molecular Oncology Study

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分子生物科学部 Department of Molecular Biosciences							
5 韓国と日本の子宮頸がんと乳がんの異なる 治療応答に関連する分子疫学的要因 Molecular epidemiological factors associated with different treatment response of uterine cervical and breast cancers in Korean and Japanese populations	日本学術振興会 二国間交流事業 韓国との共同研究 (NRF) 研究代表者 林 泰権 JSPS Bilateral Programs Japan-Korea Joint Research Project (NRF) Tomonori Hayashi	研究代表者 (P.I.) 林 泰権 Tomonori Hayashi 連携研究者 (Associate Investigators) 中地 敬 Kei Nakachi 吉田 健吾 Kengo Yoshida 研究協力者 (Cooperative investigator) Kim Young Min (統計部) (Dept. Statistics)	¥960,000	April 1, 2016	March 31, 2017	RP 4-04 RP-S4-11	放射線影響研究所 分子疫学研究 免疫学研究 RERF Molecular Epidemiology and Immunology Study
6 肺がんに関連する融合遺伝子の形成に対する 放射線影響の解析 Analysis of radiation effects on the formation of fusion genes involved in lung cancer	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 多賀 正尊 JSPS Grant-in-Aid for Scientific Research Scientific Research (C) Masataka Taga	研究代表者 (P.I.) 多賀 正尊 Masataka Taga 研究分担者 (Collaborators) 濱谷 清裕 Kiyohiro Hamatani 伊藤 玲子 Reiko Ito	直接経費 (Direct cost) ¥1,200,000 間接経費 (Indirect cost) ¥360,000	April 1, 2016	March 31, 2017	RP 1-13	放射線影響研究所 分子腫瘍学研究 RERF Molecular Oncology Study

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FY2016 External Research Funds

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分子生物科学部 Department of Molecular Biosciences							
7 ラトビアと日本の放射線被曝者の炎症関連疾患 発生の比較分子疫学研究 Comparative molecular epidemiology study of inflammation-related disease development between radiation-exposed populations in Latvia and Japan	日本学術振興会 二国間交流事業 オープンパートナーシップ共同研究(ラトビア) 研究代表者 吉田 健吾 JSPS Bilateral Programs Open Partnership Joint Research Project (Latvia) Kengo Yoshida	研究代表者(P.I.) 吉田 健吾 Kengo Yoshida 連携研究者 (Associate Investigators) 林 泰雄 濱崎 幹也 児玉 喜明 小笹 晃太郎 (疫学部) 大石 和佳 (臨床研究部) Tomonori Hayashi Kanya Hamasaki Yoshiaki Kodama Kotaro Ozasa (Dept. Epidemiology) Waka Ohishi (Dept. Clinical Studies)	¥2,000,000	April 1, 2016	March 31, 2017	RP 4-02 RP 4-04	放射線影響研究所 分子疫学研究 RERF Molecular Epidemiology Study
8 全ゲノムシークエンス法による放射線のマウス 精原細胞に及ぼす遺伝的影響評価 Estimation of genetic risk of radiation on mouse spermatogonia by whole genome sequencing	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 佐藤 康成 JSPS Grant-in-Aid for Scientific Research Scientific Research (C) Yasunari Satoh	研究代表者(P.I.) 佐藤 康成 Yasunari Satoh 連携研究者 (Associate Investigator) 小平 美江子 Mieko Kodaira	直接経費 (Direct cost) ¥100,000 間接経費 (Indirect cost) ¥30,000	April 1, 2016	March 31, 2017	RP 2-13	放射線被曝の遺伝的影響 Genetic effects of radiation exposure

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分子生物科学部 Department of Molecular Biosciences							
9 In vivo, in situ突然変異検出系を用いた環境および放射線リスク評価 In vivo, in situ mutagenic risk evaluation of radiation and environmental chemicals using newly developed knock-in mouse systems	日本学術振興会・科学研究費助成事業 「基盤研究(S)」 研究代表者 野田 朝男 JSPS Grant-in-Aid for Scientific Research Scientific Research (S) Asao Noda	研究代表者 (P.I.) 野田 朝男 Asao Noda 研究分担者 (Collaborator) 濱崎 幹也 Kanya Hamasaki	直接経費 (Direct cost) ¥27,000,000 間接経費 (Indirect cost) ¥8,100,000	April 1, 2016	March 31, 2017	RP 1-08	放射線被曝の遺伝的影響 Genetic effects of radiation exposure
10 胎生期に被ばくしたマウス造血幹細胞の放射線感受性に関する研究 A study for radiation-sensitivity in hematopoietic stem cells (HSCs) following fetal irradiation mice	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 濱崎 幹也 JSPS Grant-in-Aid for Scientific Research Scientific Research (C) Kanya Hamasaki	研究代表者 (P.I.) 濱崎 幹也 Kanya Hamasaki	前年度からの繰越 Carryover from previous year 直接経費 (Direct cost) ¥310,000 直接経費 (Direct cost) ¥1,500,000 間接経費 (Indirect cost) ¥450,000	April 1, 2016	March 31, 2017	RP 6-11	生物学的線量推定 Biodosimetry

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情報技術部 Department of Information Technology							
1 セミパラチンスク旧核実験場近郊住民を対象と した疫学解析用統一データベース構築 Construction of the integrated database of an epidemiological analysis for the people living in Semipalatinsk test site area	日本学術振興会・科学研究費助成事業 「基盤研究(B)」 博昭 研究代表者 片山 博昭 JSPS Grant-in-Aid for Scientific Research Scientific Research (B) Hiroaki Katayama	研究代表者 (P.I.) 片山 博昭 Hiroaki Katayama	直接経費 (Direct cost) ¥0 間接経費 (Indirect cost) ¥0	April 1, 2016	March 31, 2017	No RP	低線量被曝による 人体への影響 Low dose radiation effects to human being
2 カザフ核実験場周辺住民の放射性降下物被曝の 実態解明-線量評価及び健康影響解析- Study on exposure to radioactive fallout in people residing around the Semipalatinsk nuclear test site -Dose estimation and analysis of radiation's health effects-	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 星 正治 広島大学 平和科学研究所センター 名誉教授 JSPS Grant-in-Aid for Scientific Research Scientific Research (A) Masaharu Hoshi Professor Emeritus, Institute for Peace Science, Hiroshima University	研究分担者 (Collaborator) 片山 博昭 Hiroaki Katayama	直接経費 (Direct cost) ¥50,000 間接経費 (Indirect cost) ¥15,000	April 1, 2016	March 31, 2017	No RP	低線量被曝による 人体への影響 Low dose radiation effects to human being
3 医療施策の評価を目的とした保健医療情報の レコード・リンクージュに関する研究 Study of healthcare record linkage for assessment of medical measures	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 井岡 亜希子 琉球大学 医学部 委託非常勤講師 JSPS Grant-in-Aid for Scientific Research Scientific Research (C) Akiko Ioka Instructor, Faculty of Medicine, University of the Ryukyus	研究分担者 (Collaborator) 片山 博昭 Hiroaki Katayama	直接経費 (Direct cost) ¥100,000 間接経費 (Indirect cost) ¥30,000	April 1, 2016	March 31, 2017	No RP	がん登録における 個人同定精度の向上 Improvement of the identification method on Cancer Registry

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その他 Other Office							
1 どの程度低い放射線被曝、どの程度低い線 量率被曝が循環器疾患と関連するか？ How lower radiation dose and how lower radiation dose rate associate with circulatory diseases?	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 高橋 規郎 JSPS Grant-in-Aid for Scientific Research Scientific Research (C) Norio Takahashi	研究代表者 (P.I.) 高橋 規郎 Norio Takahashi 研究分担者 (Collaborators) 大石 和佳 (臨床研究部) Waka Ohishi (Dept. Clinical Studies) 三角 宗近 (統計部) Munehika Misumi (Dept. Statistics)	直接経費 (Direct cost) ¥1,400,000 間接経費 (Indirect cost) ¥420,000	April 1, 2016	March 31, 2017	RP 1-11 RP 2-12	循環器疾患研究 RERF Circulatory Disease Study
2 低線量放射線は循環器疾患のリスクを上げ るか？低線量放射線は？放射線関連循環 器疾患の機序の解明 Can low-dose radiation exposure increase the risk of circulatory diseases? How about low- dose rate radiation? Inferring potential mechanisms underlying the radiation associated circulatory diseases.	公益財団法人 日本原子力安全研究協会 環境省「平成28年度原子力災害影響調査等事業 (放射線の健康影響に係る研究調査事業)」 研究代表者 高橋規郎 Nuclear Safety Research Association MOE Research Project for Nuclear-Power Disaster Influence in FY2016 (Research to Affect the Health Effect of the Radiation) Norio Takahashi	主任研究者 (P.I.) 高橋 規郎 Norio Takahashi 研究協力者 (Cooperative Investigators) 大石 和佳 (臨床研究部) Waka Ohishi (Dept. Clinical Studies) 三角 宗近 (統計部) Munehika Misumi (Dept. Statistics) 村上 秀子 (分子生物科学部) Hideko Murakami (Dept. Molecular Biosciences)	¥6,039,853 茨城大学の分担研究者への配分額は、上記の研 究資金に含まれている。 The above amount includes funds allocated to the collaborator at Ibaraki University.	April 1, 2016	March 31, 2017	RP 1-11 RP 2-12 RP-S1-15	循環器疾患研究 RERF Circulatory Disease Study

II. Activities necessary for the above projects

1. Secretariat reorganization plan

To cope with the mandated personnel reduction of general employees, the Foundation has proposed to and negotiated with the RERF Labor Union since FY2013 on a labor-management agreement over the reorganization of the Secretariat to a group-based system and related changes to position allowances. In response to the counter-proposal presented by the Labor Union in January 2016, we again held negotiations with the Labor Union but failed to reach a final agreement over the implementation of the reorganization. In FY2016, the Secretariat staff in supervisory positions met to review the reorganization plan and reached a conclusion that a merger of sections through natural personnel attrition and other steps would be a more efficient and less disruptive method for achieving the same results. In September 2016, the Executive Committee approved termination of the plan.

2. Review of personnel planning in preparation for aging of the general staff

In accordance with the 13th personnel reduction plan (FY2015–2019) by the Japanese government, the number of budgeted employees was reduced to 206 employees at the end of FY2016. The plan calls for further reducing of the number of budgeted employees by four each year through FY2019, resulting in a total of 194 employees by the end of FY2019.

In addition, a total of 55 general employees are expected to retire mandatorily over the next five years: 11 in FY2017, 13 in FY2018, 16 in FY2019, six in FY2020, and nine in FY2021.

Under such circumstances, to facilitate hiring of young employees, we transferred some re-employed staff members previously budgeted under personnel costs (general fund) to the category of overhead costs (special funds), thus maintaining personnel slots budgeted under the general fund. This made it possible for us to permanently hire five persons in FY2014, six persons in FY2015, and five persons in FY2016, leveling the personnel age structure of current RERF general employees. As a result, the average age of current RERF general employees, which had been rising steadily year by year, became about 50.8 years as of April 2016, putting a certain curb on the average age increase.

Aging of RERF's staff who has acquired valuable expertise and know-how over the years is significant. In order to ensure the passing of RERF's valuable know-how on to the next generation, RERF needs to continue to recruit young people, paying careful attention to the changes in the number of personnel.

3. Improvement of the audit system

An internal audit system was introduced in FY2016 to ensure that our procedures work effectively to 1) confirm the reliability of financial statements in daily accounting and in the overall system; 2) enforce compliance with the relevant laws and ordinances; and 3) protect assets. A decision was made to outsource the planning, implementation, and reporting of internal audits, and a contract was signed with Deloitte Touche Tohmatsu LLC in April 2016. Subsequently, a framework for the internal audit and the Regulations Concerning Performance of Internal Audit has been established, completing the preparations for introduction of internal auditing.

In accordance with the Regulations Concerning Performance of Internal Audit, the internal auditors (Tohmatsu) will receive directions and orders from the Auditors in performing internal audits and will report the audit results to the Auditors. The internal audit for the first

fiscal year is being conducted for the period from April 2016 through March 2017 and was initiated in July 2016.

4. Facility upgrades

(1) The following two projects were carried out as facility upgrades to the Hiroshima Laboratory:

- 1) Repair of the electric system involving low-voltage distribution boards in each building (excluding Buildings A and Da) and Hijiyama Hall has been going on since Jan. 2016 and was completed in Feb. 2017 (cost: 177,120,000 yen).
- 2) An automatic gas fire-extinguishing system was installed in August 2016 to protect RERF's valuable research materials and data from fire at the Hiroshima and Nagasaki Laboratories (cost: 138,240,000 yen).

Hiroshima Laboratory		Nagasaki Laboratory	
Storage sites	Floor area (m ²)	Storage sites	Floor area (m ²)
1) Bldg. C 131 Chart storeroom	123	1) 1F Chart storeroom	62
2) Bldg. H 129 Work station room	80	2) 2F X-ray film storeroom	29
3) Bldg. E 105 Epidemiology Dept. storeroom	135	3) 4F Master File Section storeroom	52
4) Bldg. I 205 Master File Section storeroom	83	4) 4F Tumor & Tissue Registry Office and archives room	48
5) Bldg. C 212 Tumor & Tissue Registry Office storeroom	10	5) 4F Server room	18
6) Bldg. J 207 Historical Archives Room	120		
Total for Hiroshima	551 m ²	Total for Nagasaki	209 m ²

(2) The following project was carried out as facility upgrade to the Nagasaki Laboratory:

- 1) Waterproofing of the roof of the Nagasaki Laboratory was redone in January 2017. (Cost: 1,500,444 yen. The expense, however, is equally shared with the Nagasaki Prefectural Education Association, and as a result, RERF will bear 750,222 yen.)

5. Revision of rules and regulations

To enhance RERF's operation as a public interest incorporated foundation (PIIF), revisions have been made to the following rules and regulations:

- Operational Procedures of RERF Institutional Review Board [Effective date: April 1, 2016]

The Institutional Review Board (hereinafter referred to as “IRB”) was established in accordance with the Regulations for Protection of Study Subjects (which were approved at the 15th meeting of the Board of Directors [March 4, 2016]) by merging the Human Investigation Committee and the Ethics Committee for Genome Research. These operational procedures set forth the composition and operation of the IRB. Accordingly, the former “Operational Procedures of RERF Human Investigation Committee” and “Operational Procedures of Ethics Committee for Genome Research” have been abolished by the enactment of these operational procedures.

- Establishment and revision of rules and regulations in compliance with the guidelines of the Ministry of Education, Culture, Sports, Science and Technology (MEXT)

To incorporate the necessary considerations prescribed by MEXT’s Guidelines for the Management and Audit of Public Research Funds in Research Institutions (adopted on February 15, 2007, by the Minister of Education, Culture, Sports, Science and Technology; and revised on February 18, 2014), the following six rules/regulations have been established or revised; accordingly, RERF has established systems in accordance with the requirements for a research institute handling public research funds.

<Establishment>

- Code of Conduct Regarding Research Activities [Effective date: June 1, 2016]
- Standards for Handling of Suspension of Transaction and Other Actions Relating to Contracts for Purchase of Goods and Services [Effective date: June 1, 2016]

<Revisions>

- Regulations Concerning Prevention of and Response to Improper Research Conduct [Effective date: June 1, 2016]
- Regulations on Reporting in the Public Interest [Effective date: June 1, 2016]
- Guidelines for Purchase of Goods [Effective date: June 1, 2016]
- Framework Concerning Plans for Prevention of Misuse of Research Funding [Effective date: October 7, 2016]

- Guidelines for Compliance with Ethics and Laws and Regulations [Effective date: August 1, 2016]

These guidelines have been established to declare the basic policy for compliance with ethics, laws, and regulations from the standpoint of a PIIF. They are designed to prevent any unethical or unlawful acts by making these stipulations completely clear to the directors, employees, and others associated with RERF.

- Regulations Concerning Performance of Internal Audit [Effective date: September 7, 2016]

These regulations have been established to define the procedures for the planning and implementation of internal audits concerning the operations and finances of RERF, pursuant to paragraph 2, Article 34, of the Articles of Incorporation.

- Regulations Concerning Organization of the Biosample Center [Effective date: March 1, 2017]

On the grounds that approximately four years have passed since the creation of the Biosample Center and that the operation of the Center has been smooth thus far, the

provisions on the numbers and the term of office of the Center staff have been abolished, and the involvement of research scientists and the related RERF committees have been revised to match the present situation.

Appended documents to FY2016 report of activities

There were no items considered to be important matters for supplementing the contents of the FY2016 report of activities.