



HIROSHIMA UNIVERSITY 広島大学

**Phoenix Leader Education Program (Hiroshima Initiative)
for Renaissance from Radiation Disaster**

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

The 6th International Symposium

**Reconstructing Radiation Disaster-Affected Communities:
The Mediator's Role in the Recovery Process**

**原発事故の影響を受けたコミュニティの再構築：
復興過程における「仲介者」の役割**



February 11 (Sat) - 12 (Sun), 2017

Hiroshima University Kasumi Campus

Koujin Kaikan Conference Hall

General Information

Date

February 11 and 12, 2017

Venue

Hiroshima University Kasumi Campus 'Koujin Kaikan Conference Hall'
1-2-3 Kasumi, Minami-ku, Hiroshima City, Hiroshima, Japan

Language

Sat., February 11 (Day 1) English

Sun., February 12 (Day 2) English and Japanese (simultaneous interpretation available)

Organized by

Organization of the Leading Graduate Education Program, Hiroshima University

Phoenix Leader Education Program® (Hiroshima Initiative) for Renaissance from Radiation Disaster

Development of internationally minded personnel capable of managing the recovery of people, society, and environment of areas affected by radiological disaster

This program establishes “Radiation Disaster Recovery Studies” as an interdisciplinary and practical discipline, based on Hiroshima University’s experience and achievements in supporting recovery from the atomic bombing. The program will develop personnel with the skills to “protect human lives from radiation disasters”, “protect the environment from radioactivity”, and “protect the human society from radioactivity”. Graduates from the program will become core leaders in situations requiring recovery from radiation disasters. The 5-year or 4-year integrated curriculum is designed to develop global leaders (Phoenix Leader®) who have the judgment and behavioral abilities to take appropriate actions in circumstances of radiation disaster and lead recovery with a clear philosophy and innovative knowledge across discipline.

Ministry of Education, Culture, Sports, Science and Technology – MEXT
“Program for Leading Graduate Schools (Cross Sectional Theme)” accepted for FY2011

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Welcome Address

Dear guests and colleagues,

I am honored and privileged to welcome you all to the 6th Phoenix Leader Education Program International Symposium, 'Reconstructing Radiation Disaster-Affected Communities: The Mediator's Role in the Recovery Process.' For this symposium, we are honored to welcome many distinguished experts from abroad including Dr. Jacques Lochard of the ICRP, Dr. May Abdel-Wahab of the IAEA, and Dr. Wolfgang Weiss of the BfS, as well as many other acclaimed participants who have been working at sites in Fukushima. We look forward to learning about their activities and research efforts.

Nearly six years have passed since the accident at the Fukushima Daiichi Nuclear Power Station. The people of Japan have made a concerted effort to the ongoing reconstruction of Fukushima along with the support of people from around the world. Despite these extensive efforts, it can be said that the reconstruction has just begun. Under the current circumstances, one of the challenges we are facing is how to effectively connect the local community and the specialists with the accurate scientific knowledge.

Consequently we recognize the growing need for "mediators" who are able to deliver a steady flow of accurate and accessible scientific knowledge to the local community. This 6th International Symposium will focus on the role of the mediator during the Fukushima recovery process to bridge the gap that exists between scientists and the local community.

Here at Hiroshima University we established the Phoenix Leader Education Program in 2011 through a Ministry of Education initiative. Our aim is to educate future leaders to effectively deal with the recovery from radiation disaster. We are proud to have had our first two graduating students this past September who are now active on the international stage. One of them, Ms. Momo Kurihara, will be delivering a lecture during this symposium. In addition, we welcomed nine new students this past semester. There are now a total of twelve different countries represented in our program. I am looking forward to all of their continued successes as future global leaders.

I hope this international symposium will serve as an opportunity for all attendees to consider the role of mediator from many different perspectives, and to share new findings and knowledge. Thank you again everyone for joining us.



Kenji Kamiya
Vice President (Reconstruction Support/Radiation Medicine)
Director of Phoenix Leader Education Program
Hiroshima University

Program

The 6th International Symposium
Phoenix Leader Education Program (Hiroshima Initiative) for
Renaissance from Radiation Disaster

Reconstructing Radiation Disaster-Affected Communities: The Mediator's Role in the Recovery Process

Saturday, February 11th (*Main Conference Room: 2nd floor*)

12:30- Opening Remarks

12:35- Graduate Student Oral Presentations

14:45- Graduate Student Flash Presentations

16:20- Break

(*Lobby: 1st & 2nd floor*)

16:30-18:20 Poster Presentations (Student Research Presentation)

(*Medium Conference Room: 1st Floor*)

18:30-20:30 Reception Party

Sunday, February 12th (Main Conference Room: 2nd floor)

10:00 **Opening Remarks**
Dr. Kenji Kamiya (Vice President of Hiroshima University, Director of Phoenix Leader Education Program)

Message from MEXT

Ms. Mutsuko Inoue (Director, Office for University Reform, Higher Education Bureau, Ministry of Education, Culture, Sports, Science and Technology (MEXT))

Keynote Lecture (Chair: Dr. Kenji Kamiya)

10:15-10:45 **Social Trust, Confidence, and Cooperation in Post-Nuclear Accident Situations**
Dr. Jacques Lochard (Vice-Chair of ICRP, Visiting Professor of Hiroshima University)

Session: Environment (Chairs: Dr. Thomas Johnson & Dr. Toshinori Okuda)

10:45-11:00 **Challenges toward Reconstruction of Agriculture in Fukushima**
Dr. Yuzo Mampuku (National Agriculture and Food Research Organization)

11:00-11:15 **Temporal Variation of Radiocesium Concentration in Fresh Water Inside the Evacuation Zone and Supporting Activity for Evacuees of this Region**
Dr. Tetsuo Yasutaka (National Institute of Advanced Industrial Science and Technology)

11:15-11:30 **Oil 137Cs Dynamics in Mixed Deciduous Forests in Fukushima (doctoral study)**
Dr. Momo Kurihara (Phoenix Leader Education Program Alumna / Post-Doctoral Researcher of AIST)

11:30-11:45 Q&A Session

11:45-11:55 Break

Session: Medical Support (Chairs: Dr. Albert Wiley & Dr. Shinya Matsuura)

- 11:55-12:10 **Importance of Stakeholder Involvement during the Reconstruction Period after Nuclear Disaster - What Kind of Radiological Information Should Be Shared?**
Dr. Makoto Miyazaki (Fukushima Medical University)
- 12:10-12:25 **Addressing Anxiety Regarding Thyroid Cancer Screening after a Radiation Disaster**
Dr. Sanae Midorikawa (Fukushima Medical University)
- 12:25-12:35 Q&A Session
- 12:35-13:40 Lunch Break (12:35-12:45 Group Photograph)

Session: Community (Chairs: Dr. Thierry Schneider & Dr. Tsunekazu Toda)

- 13:40-13:55 **Current Situation after the Passage of More Than Five Years since the Great East Japan Earthquake**
Ms. Atsuko Suzuki (Social Welfare Council of Minami Soma City)
- 13:55-14:10 **Developing a Common Language after the Nuclear Accident: The Experience of Suetsugi Area in Iwaki City**
Ms. Ryoko Ando (Representative of Ethos in Fukushima)
- 14:10-14:20 **Current Situation and Issues on the Restarted Cultivation of Eustoma in the Evacuation Zone**
Mr. Akihiko Hirono (Flower Farmer in Fukushima)
- 14:20-14:35 **The Berkeley Institute for Resilient Communities: Combining Science, Education, and Communities**
Dr. Kai Vetter (Director of Institute for Resilient Communities, Lawrence Berkeley National Laboratory)
- 14:35-14:55 Q&A Session

Session: Concluding Lectures (Chairs: Dr. May Abdel-Wahab & Dr. Masao Kobayashi)

- 14:55-15:15 **Key Elements of Public Health Protection in a Nuclear or Radiological Emergency**
Dr. Wolfgang Weiss (Former Head of Department Radiation Protection and Health of BfS)
Q&A Session
- 15:15-15:35 **The Gap between Radiation Science and Perception People**
Dr. Ohtsura Niwa (Chairman of Radiation Effects Research Foundation)
Q&A Session
- 15:35-15:50 Break

Panel Discussion (Chairs: Dr. Jacques Lochard (ICRP) & Dr. Ohtsura Niwa (RERF))

- 15:50-16:35 Panelist (Group 1):
Dr. May Abdel-Wahab (IAEA)
Dr. Thomas Johnson (Colorado State University)
Dr. Sanae Midorikawa
Dr. Makoto Miyazaki
Ms. Atsuko Suzuki
Dr. Wolfgang Weiss
Dr. Albert Wiley (REAC/TS)
- 16:35-17:20 Panelist (Group 2):
Ms. Ryoko Ando
Mr. Akihiko Hirono
Dr. Momo Kurihara
Dr. Yuzo Mampuku
Dr. Thierry Schneider (CEPN)
Dr. Kai Vetter
Dr. Tetsuo Yasutaka
- 17:20-17:30 **Poster Award Ceremony**
Closing Remarks
Dr. Masao Kobayashi (Professor of Institute of Biomedical & Health Sciences, Integrated Health Sciences, Hiroshima University)

Abstracts

Lectures

February 12, 2017

10:15 –15:35

Keynote Lecture

Social Trust, Confidence, and Cooperation in Post-Nuclear Accident Situations

Jacques Lochard

Professor Nagasaki University

Visiting Professor Hiroshima University

ICRP Vice Chair



The experience of Chernobyl and Fukushima demonstrates that that it is possible to involve local stakeholders in the rehabilitation of living conditions in areas affected by a nuclear accident in spite of the deep mistrust of the population vis-à-vis authorities and experts and its inexperience in the situation, in particular as regards the radioactivity. However, this involvement is only possible insofar as trust can be restored within the affected communities, conducive to the establishment of a fair and effective cooperation with the experts involved in the rehabilitation process. In the absence of trust, whatever efforts are made to inform, advise and involve those affected, it is not possible to establish the foundations of confidence necessary to ensure productive stakeholder involvement and mutually beneficial cooperation.

The presentation emphasizes the distinction between trust and confidence introduced by social scientists to better understand the role and limitations of risk communication in managing complex or conflicting situations involving risk. It also underlines the respective importance of sharing, in the co-expertise process between the affected communities and the involved experts, key ethical values and objective data describing the individual situations of the affected persons, as the basis for restoring trust and building confidence leading to cooperation.

[Biography]

Jacques LOCHARD is currently Professor at Nagasaki University Atomic Bomb Disease Institute, Visiting Professor at Hiroshima University Graduate School of Biomedical and Health Sciences, and Vice-Chair of the International Commission on Radiological Protection (ICRP).

Jacques LOCHARD was educated in Economics at the University of Besançon-France and Pantheon-Sorbonne in Paris. He joined the Nuclear Protection Evaluation Centre (CEPN), a non-profit organization for research and studies in the evaluation of the technical, health, economic and societal dimensions of radiological protection in 1977. He was the director of the Centre from 1989 to 2016.

Jacques LOCHARD's main contribution has been in the development of methodologies for the implementation of the optimisation principles. He has published several tens of articles in scientific journals and in proceedings of international conferences covering both the theoretical and practical aspects of optimisation of radiological protection. He also contributed in the field of radiation risk assessment and management to studies on the health and environmental impacts of the nuclear fuel cycle.

Since the early nineties he has been actively involved in the rehabilitation of the living conditions of the affected population after a nuclear accident, first in Belarus in the context of the management of the long-term consequences of the Chernobyl accident, then in Japan in relation to the Fukushima accident.

Jacques LOCHARD has been President of the French Society of Radiation Protection (SFRP). He was also Executive Officer of the International Radiation Protection Association (IRPA) and Chairman of the Committee on Radiation Protection and Public Health (CRPPH) of the OECD Nuclear Energy Agency.

Challenges toward Reconstruction of Agriculture in Fukushima

Yuzo Mampuku

National Agriculture and Food Research Organization



Because of the 2011 Pacific coast of Tohoku Earthquake and the accidents/incidents at the Tokyo Electric Power Company (TEPCO) Fukushima Daiichi nuclear power plant, the residents who lived in the planned evacuation zone were forced to move out. Since then, their lives have changed dramatically. Each municipality has as independent way of countermeasures, and the branches have been formed/established in the neighboring cities such as Fukushima, Koriyama, Date and Iwaki. Including evacuees who have independently evacuate, there are still close to one hundred thousand people are recognized as evacuees spread through Japan.

Immediately after the accidents/incidents, residents faced problems which directly affected their lives such as the health effects of radiation, place to live after their evacuation. With the passing time, the problems which they have faced have also changed. Through the decontamination process, there are huge amount of waste that are packed in flexible containers, and piled up on leasehold land. Once residents returned to their home, they were able to see this huge amount of piles and it caused different kind of huge stress in their lives which they have never felt while they were at the evacuation site.

Maintaining agricultural land after decontamination is another serious problem. For example, in Naraha town, 20 farmers returned to continue their farming/cultivation with 700ha of land. It is impossible for them to cultivate this limited area properly.

Without management by reconstruction unions, farming organizations, or the private sector, the decontaminated land may turn into overgrown abandoned farmland. Although regional problems will keep changing over time, it is very important for us to recognize and understand the current situation occurring at the site.

[Biography]

- 2016: Overall Management of Research on Earthquake Disaster Recovery (dispatched to Iitate Town Recovery Measures Group), Head Office Planning and Coordination Department, National Agriculture and Food Research Organization
- 2015: Japan International Research Center for Agricultural Sciences
- 2012: Iitate Town Recovery Measures Group
- 2011: Research Council Secretariat, Ministry of Agriculture, Forestry and Fisheries
- 2008: Japan International Research Center for Agricultural Sciences
- 2003: Chugoku Land Improvement Research Management Office, Chugoku-Shikoku Regional Agricultural Administration Office, Ministry of Agriculture, Forestry and Fisheries
- 2002: Midori Shigen Kiko
- 1995: Graduated from the Department of Agricultural Engineering, Faculty of Agriculture, Tokyo University of Agriculture

(Major associations with Fukushima Prefecture)

- Member of a Working Group to Discuss Reduced Amount and Reutilization Methods of Removed Soil etc. at the Interim Storage Facility, Ministry of the Environment
- Member of the Agricultural Regeneration Conference Committee at Iitate Town
- Member of the Naraha Town Decontamination Investigation Committee at Naraha Town
- Member of the Minami Soma City Decontamination Promotion Committee at Minami Soma City
- Project Leader of the Agricultural Rejuvenation Project at Naraha Town
- Member of the Agricultural Action Plan Development Committee at Tomioka Town
- Member of the Committee to Consider Developing Reviews on the Behavior of Radioactive Cesium in Soil, the Japanese Geotechnical Society

Temporal Variation of Radiocesium Concentration in Fresh Water inside the Evacuation Zone and Supporting Activity for Evacuees of this Region

Tetsuo Yasutaka

Chief Scientist of National Institute of Advanced Industrial Science and Technology (AIST)

In this lecture, we first report temporal variation of radiocesium concentration in the river or stream water inside the evacuation zone. According to the monitoring results between 2012 and 2015, radiocesium concentrations in the river water have been found to continually decrease after the accident. In 2014, particulate radiocesium was 0.01-0.5 Bq/L and dissolved radiocesium was 0.001-0.05 Bq/L. These values showed extremely low concentrations, which were 1/100-1/1000 of the index value set for radiocesium in the drinking water (10 Bq/L).

Additionally, in 2016, we also started the supporting activities of the restarted flower cultivation and related farmers in this region. We held 7 workshops in 2016. We also reported over view and purpose of this supporting activities (see photographs below).



Experienced based agriculture



Field tour



Flower arrangement using Eustoma by Yumiko Kanai and Shoko Okazawa

[Biography]

October 2013 – current Chief Researcher, Geo-environmental Risks Research Group, Research Institute for Geo-Resources and Environment at the National Institute of Advanced Industrial Science and Technology

September 2013 – current (Concurrent position) Part-time lecturer (geo-environmental engineering), College of Engineering Science, Yokohama National University

April 2012 – current (Concurrent position) Visiting researcher, Center for Material Cycles and Waste Management Research, National Institute for Environmental Studies

April 2011 - current Researcher, Geo-environmental Risks Research Group, Research Institute for Geo-Resources and Environment at the National Institute of Advanced Industrial Science and Technology

April 2008 - March 2011 Kokusai Environmental Solutions Co., Ltd.

October 2005 - March 2007 Doctoral Program for Working Students (while still under the employment of Kokusai Kogyo Co., Ltd.) majoring in Risk Management and Environmental Sciences, Graduate School of Environment and Information Sciences, Yokohama National University

Expertise

Risk evaluation, testing methods, geo-environmental engineering, soil contamination, socioeconomic analysis, monitoring technology development

Committees, etc.

- FY2016: Member of the 2016 Conference on Soil Measurement Techniques, etc., Water & Air Environment Agency, Ministry of the Environment
- FY2016: Member of the 2016 Working Group for Classification Verification at the Conference on Reduced Amount of Interim Storage of Removed Soil and Strategies for Development of Recycling Technologies, Water & Air Environment Agency, Ministry of the Environment

Soil ^{137}Cs Dynamics in Mixed Deciduous Forests in Fukushima (doctoral study)

Momo Kurihara

Phoenix Leader Education Program Alumna
Post-Doctoral Researcher of AIST



I studied ^{137}Cs dynamics in forest ecosystems and the environmental parameters from August 2013 as my doctoral study. The survey focused on ^{137}Cs contained in litter layers and soil to 10 cm depth in mixed deciduous forests located approximately 40 km northeast from the Fukushima Daiichi Nuclear Power Plant. A large part of ^{137}Cs deposited on forest ecosystems had been translocated to litter layers and surface soils (>5 cm) via litterfall and precipitation by the beginning of the study. Spatial heterogeneity of soil ^{137}Cs was predicted to be largest from shortly after the accident to the beginning of the study as results of the not only spatial heterogeneity of initial deposition but also translocation via precipitation. By August 2014, almost ^{137}Cs in litter layers found had migrated into surface soil through litter decomposition processes and leaching. The spatial heterogeneity in the surface soils became homogenous with time because of this migration. After August 2014, ^{137}Cs activities in the litter layers, the surface soils and the deeper soils (<5 cm) did not change substantially. However, small amounts of dissolved ^{137}Cs continued to migrate after August 2015. The results of my study are useful information for developing remediation activities in forest areas, determining appropriate radiation protection for local residents and workers, and resuming the use of the forest resources.

The talk is a summary of the doctoral thesis.

[Biography]

October 2012 – September 2016

Radioactivity Environmental Protection Course, Phoenix Leader Education Program, Hiroshima University

October 2016 – Present

Post-doctoral researcher, Geo-Environmental Risk Research Group, Research Institute for Geo-Resources and Environment, National Institute of Advanced Industrial Science and Technology

**Importance of Stakeholder Involvement during
the Reconstruction Period after Nuclear Disaster
What Kind of Radiological Information Should Be Shared?**

Makoto Miyazaki

Fukushima Medical University



Numerous dose measurements have been carried out to find out the situation of radioactive substances diffused and deposited by Fukushima Daiichi Nuclear Power Plant (FDNPP) accident

Measurements include individual external and internal exposure doses, as well as the environment.

Most personal dosimetry was implemented by municipalities, and the publicized results have revealed the overall picture of the situation after the accident. Meanwhile, the results of individual dosimetry are transmitted mostly to individuals by only numerical values, and the residents themselves who measured the meaning are less likely to know.

In order to understand the meaning of the numerical value, "Explainers (Setsumei-sha)" who chewed and explain the meaning of value was required, but after the FDNPP accident, few people stood at that position. The Explainers plays a role of linking the meaning of numerical values difficult to understand to the residents' lives and changing the information to information for the residents to live better. It is also one of the roles of Explainers to inform the stakeholders of the numerical distribution and the meaning of the individual dose of residents living in the area.

I am doing various activities after the FDNPP accident, and now I am in the field as Explainer. From this experience, I will present how I explained the meaning of numerical values. Furthermore, I will share the way that I communicated not only to individuals but also to stakeholders involved in community decision-making.

[Biography]

Makoto Miyazaki was born in Koriyama, Fukushima Prefecture, where he still lives with his wife and twins who were born in 2011. He worked as assistant professor in the department of radiology of FMU Hospital until 2011. He is a diagnostic radiologist by training. From 2012, He has been working with department of radiation health management at same university. Immediately after the Great East Japan Earthquake, he had to deeply involve in radiation emergency medicine. Then, his role has moved to explanation to residents and the government authorities. Using the measurements, he has explained to individuals what individual dose is. For the residents in affected areas, it is important to explain how the dose relates to his/her lifestyle choice. Also, he has explained the measurements to the authorities, too. Because they need to know the distribution of dose data is important.

Addressing Anxiety Regarding Thyroid Cancer Screening after a Radiation Disaster

Sanae Midorikawa, Akira Ohtsuru

Department of Radiation Health Management,
Fukushima Medical University



The thyroid ultrasound examination, a component of the Fukushima Health Management Survey, was launched in October 2011 after the compound nuclear disaster. The examination was initiated in response to social concerns about the health risks of radiation. Due to confusion in the aftermath of the disaster, a comprehensive explanation regarding the examination could not be supplied in advance. Many residents were insufficiently informed regarding the consequences of receiving the thyroid ultrasound examination. Specifically, they were unaware that examination of the thyroid gland using the latest ultrasound equipment signified unapproved cancer screening, which could lead to potential over-diagnosis and/or overtreatment. After the start of the examination, residents tended to have strong concerns regarding the relationship between examination results and radiation exposure in their children. Accordingly, they, especially mothers often based decision-making on results of the thyroid examination, even if the results were not medically significant. This sometimes led to feelings of self-stigmatization among mothers.

Over the past 5 years, we attempted to address the psychosocial issues surrounding thyroid ultrasound examination as a cancer screening tool. First, we held the explanatory meetings for adults and performed class dialogues for children, respectively. The purpose of these activities is to explain the implications of the thyroid ultrasound examination in the aftermath of the radiation disaster, including potential advantages and disadvantages associated with ultrasound cancer screening targeted to youth. Secondly, we conducted immediate post-examination individual counseling at the examination venue. This counseling was provided to relieve anxieties regarding examination results and to address various concerns about radiation health risks. Of course, these strategies alone are insufficient to resolve the complex repercussions of a radiation disaster, and continuous efforts should be made to address this issue. In conclusion, our activities aimed to encourage residents to make decisions based on scientific evidence and to build resilience based on mutual trust. We hope that the residents will be able to live with confidence and assurance as usual if they want.

[Biography]

I am a clinical endocrinologist in Fukushima Medical University. I was born in Fukushima, and graduated from Fukushima Medical University at 1993. After 6 years clinical training, I have engaged in medical treatment of endocrine disorders in Fukushima Medical University Hospital. After the nuclear disaster in Fukushima on 2011, I have involved in the thyroid ultrasound examination survey of Fukushima Health Management Survey.

Present Position:

Associate Professor, Department of Radiation Health Management,
Fukushima Medical University
Director, Department of Thyroid Ultrasound Examination,
Radiation Medical Science Center for the Fukushima Health Management Survey

Education:

March 1993 M.D., Fukushima Medical University
Third Department of Internal Medicine (present Department of Diabetology,
Endocrinology and Metabolism), Fukushima Medical University
March 1999 Ph.D. (Dr. of Medical Science), Fukushima Medical University

Professional Training and Employment:

October 2001 Assistant, Third Department of Internal Medicine, Fukushima
Medical University (present Assistant Professor)
April 2008 Lecturer, Department of Diabetology, Endocrinology and Metabolism,
Fukushima Medical University
January 2012 Lecturer, Department of Radiation Health Management, Fukushima
Medical University
May 2013 Associate Professor, Department of Radiation Health Management,
Fukushima Medical University
April 2015 Director, Department of Thyroid Ultrasound Examination, Radiation
Medical Science Center for the Fukushima Health Management Survey

Current Situation after the Passage of More Than Five Years since the Great East Japan Earthquake

Atsuko Suzuki

Social Welfare Council of Minami Soma City)

The Great East Japan Earthquake occurred on March 11, 2011, and 636 people in Minami Soma City lost their lives to tsunami.

Then, there was the radiation leak accident, so that one month after the earthquake, areas within a radius of 20 kilometers from the nuclear power plant (Odaka ward) were designated as restricted areas.

One year later, the restricted areas in Minami Soma City (Odaka ward) were changed to an evacuation order area. In other words, the area became a place that can be entered during the day, but was still considered unsuitable as a place to live.

On July 12, 2016, the evacuation order in the Odaka ward was lifted.

The population in Odaka ward before the disaster was about 13,000 people. When we look at the number of people who returned after the evacuation order was lifted, it was about 1,000. This is less than 10% of the original population.

Immediately after the disaster, the volunteer center for the recovery efforts worked mainly on removing tsunami debris in the areas outside of the 20 km radius from the power plants. After the restricted area became an evacuation order area, volunteers began working within the 20 km radius. Since plants had been left to grow freely, the Odaka ward looked like a jungle, with people not being able to enter their houses because of all the tall grass surrounding them. Plants were also found growing on the roofs, since garden trees, which had gone untended, had extended their branches and dropped seeds onto the rooftops. These were the sights that we commonly encountered.

Even now, many volunteers come to Minami Soma City from all over Japan, and labor with the cleanup efforts. About 80% of the volunteers come from outside of the prefecture.

Due to the disaster caused by the radiation leak, many of the generation who were raising small children had evacuated to faraway lands, and the local hotels were practically fully booked by workers, such as those doing decontamination work, so it was difficult for people to stay multiple days and do the cleanup work just amongst their

families. In this region, it was the norm to see three generations of families living together under one roof, but now, we seen many cases where the younger generation remain at the location where they evacuated to, with only the older generation returning to their homeland.

When we look at what needs are most prevalent right now, they are the separating, removing, and bagging of waste, grass-cutting, and tree trimming, among others. Minami Soma has a Clean Center within its city, but the waste from Odaka ward was not allowed to be processed at this center until the evacuation order was lifted. We had to contact the Ministry of Environment and have them pick up the waste, upon having informed them in advance of the amount of burnable, non-burnable, and large waste that we had, as well as the details of home appliances that had to be disposed of.

Havoc was wreaked by mildew and mice in houses that had remained unpopulated for more than one year, and the waste that came out from one house amounted to about 200 to 300 90-liter-sized garbage bags. This is about 20 to 30 flexible container bags that can fit one ton of waste. In many of these households, family members had dispersed for evacuation, making it difficult to complete this level of cleanup by just the remaining family members, and so, they needed the help of the volunteers.

From 2014, the hospital resumed operations, and dining places also opened. In the current Odaka ward, the railroad for the Joban Line train going to Sendai was recovered, and a train was seen running through the area on the day when the evacuation order was lifted. There are a variety of efforts being made, little by little, to take back the lifestyle that the area had before the disaster. But the road to recovery is very slow, with too many things that make it inconvenient for people to live in this area. Even though the evacuation order has been lifted, this area still does not have a supermarket. We have a hospital, but no pharmacy. We now have ride-sharing taxis, but there are no regular taxis in the Odaka ward. These types of things that are normal in everyone else's lives are still not available in the Odaka ward.

What can we do to have the younger generation willingly live on this land with a sense of reassurance? What we need are probably accurate information on the current environmental radiation level and correct knowledge that are not susceptible to rumors.

We have monitoring posts in all different places throughout the city, and the weather report in Fukushima prefecture also gives numerical information on the radiation levels of various areas.

We are starting to see a variety of ideas generated from local residents and people visiting Odaka on how to bring everyday life back to this area. A local specialty shop has

opened, and there has been the development of cooking oil, mayonnaise, and soap made from field mustard. A studio for making glass accessories has opened as a means for providing work to young women, and other trial attempts are popping up. However, everyone has aged by five years since the day of the disaster. There is an urgent need to create a framework that allows the elderly to live with a sense of reassurance.

While local houses are being torn down one after the other, we are also starting notice renovated and newly built houses. The beautifully rebuilt houses make us think of the persons who would come back to inhabit those houses. When we see more of these houses, it makes us think that there may be more people who are thinking of returning to their homelands.

During the summer Obon holiday period, we saw many families with small children in this area. The liveliness of that scene made us wish that this were something normal to be found in our daily lives.

This year in April, the elementary school, junior high school, and high school will be reopening in the Odaka ward.

There were many who voiced their disapproval for lifting the evacuation order on this area. But now that it has been lifted, we fervently hope that our national government would give out accurate information and send support so that the people here will be able to live with a sense of security and reassurance.

[Biography]

Born March 11, 1966

April 1992

Joined the Odaka-machi Social Welfare Council

January 2006

Employer changes name to Minami Soma City Social Welfare Council due to the merger of towns

Appointed to the Local Welfare Division

September 2011 Becomes Manager of the Local Welfare Division

April 2014

Appointed as Head of the Disaster Recovery Volunteer Center and begins working in the Odaka ward

April 2016

Minami Soma City Social Welfare Council's Odaka Ward Welfare Service Center resumes operations

Appointed as Head of the Odaka Ward Welfare Service Center in addition to being the Head of the Disaster Recovery Volunteer Center

**Developing a Common Language after the Nuclear Accident:
The Experience of Suetsugi Area in Iwaki City**

Ryoko Ando

Representative of Ethos in Fukushima



The disaster that occurred on March 2011 at the Tokyo Electric Power Company's Fukushima Daiichi Nuclear Power Plant resulted in spreading radioactive substances into the environment and having a great impact on the lives of the people. Radiation and radioactive substances, which penetrated deep into our livelihoods, wreaked havoc in the people's lives. But what caused the greatest turmoil was in the lack of common language when discussing radiation and radioactive substances. This issue was raised a number of times as a problem in risk awareness. But in the face of reality, this issue of not having the vocabulary to talk about what was actually happening became a greater and a more essential problem in our daily lives. The effects of radiation are events that take place in the world of physics, and require having an understanding of abstract phenomenon that is far removed from our everyday life. Thus, it was difficult to come up with the vocabulary from our everyday life to express the effects that radiation had upon our lives, and required us to go through a number of processes in order for us to be able to talk about it amongst ourselves.

The Suetsugi area, located at the northern edge of Iwaki City about 27 kilometers away from the Fukushima Daiichi Nuclear Power Plant, has been continuing to monitor radiation in its local area since spring of 2012. The monitoring activities are conducted by local participants, with the help of Fukushima's Ethos, a volunteer group that was established after the nuclear disaster. Members of the group work consistently to measure the actual amount of radiation exposure that they themselves have, in addition to measuring the radiation level in their normal living environment, and use the results to hold discussions with experts and supporters. Through the continuation of this work, we have made it possible for people to talk about radiation, not just in general terms, but using words that have more relevance to the people who live in that environment. I would like to talk about the four years of experience that the Suetsugi area has had in creating such common language.

[Biography]

Born in 1976 in Hiroshima Prefecture. Married her husband, who was born in Minami Soma City of Fukushima Prefecture, and has been living in Fukushima Prefecture since 2002. After the Fukushima Daiichi Nuclear Power Station disaster in 2011, she established Ethos in Fukushima, an organization with residents conducting radiation preventative activities.

Current Situation and Issues on the Restarted Cultivation of Eustoma in the Evacuation Zone

Akihiko Hirono

Flower Farmer in Fukushima

After the Tokyo Electric Power Company's Fukushima Daiichi Nuclear Power Plant accident caused by the Great East Japan Earthquake, the Yamakiya region in the Kawamata town was designated as an evacuation zone and continues to be as of January 2017.

Manufacture and sale of the Eustoma have been seriously restarted from 2015 since no impact of radiocesium was found in the test cultivation in 2014. The presenter worked in the Tokyo Flower Market and returned with his family to the Yamakiya region to resume their flower cultivation in 2015 and work with them in 2016. In 2016, we also started the collaborative activity of experience based agriculture with some researchers. Fortunately, present sales have recovered to the pre-accident level and the influence of the reputation damage was not so high, however there some problem.

First problem is that securing labor is a big challenge during busy periods. Moreover, since estimated returning population is not so large after the cancellation of the evacuation order, drastically depopulation and aging population combined with the diminishing number of children may be occurred. As a result, following issues may be faced: difficulty of maintenance of agricultural land (mainly paddy field) and agricultural facilities resulted from labor shortage and secure the infrastructure such as medical institutions, schools and commercial facilities for daily life in the region. Reputation problem may also be raised for producing food crop. We now faced not only environmental problem but also social, economical and regional problem.



Blooming Eustoma



Experience based agriculture

Session: Community

The Berkeley Institute for Resilient Communities: Combining Science, Education, and Communities

Kai Vetter

Director of Institute for Resilient Communities,
Lawrence Berkeley National Laboratory



Resilience is the key to a prosperous global and modern society; Efforts to mitigate physical damage, economic loss, and to protect social and political infrastructures in response to catastrophic events, such as a nuclear accident or a natural disaster, are essential for communities to survive and thrive in the aftermath of such incidents. The 2011 Fukushima Dai-ichi Nuclear Power Plant accident serves as an example of the risks associated with advanced technologies and the need to minimize physical as well as psychological effects on local and global communities. Other examples can be found reflecting the misperception of risks such as associated with vaccination or Genetically Modified Organisms or GMOs. While we have to recognize the risks associated with the development, implementation, and utilization of advanced technologies, we also have to recognize that the impact of not adopting them can have much more detrimental effects to individuals, communities, and even societies. We have established the Institute for Resilient Communities in Berkeley in collaboration with Japanese partners to address the needs for better scientific and technological capabilities to assess, predict, and minimize the impact of disruptive events in the future and to enhance the understanding of associated risks in the public. While the initial focus resides in radiological resilience and is closely related to the events in Fukushima more than 5 years ago, the goal is to establish a broader framework for researchers, educators, and communities to enhance resilience locally and globally.

[Biography]

Dr. Kai Vetter is Senior Scientist and Head of the Applied Nuclear Physics program at the Lawrence Berkeley National Laboratory and Professor-in-Residence in the Department of Nuclear Engineering at the University of California, Berkeley. He obtained his Ph.D. in Nuclear Physics at the University of Frankfurt in Germany. Professor Vetter's main research interests are in the development and demonstration of new concepts and technologies in radiation detection to address some of the outstanding challenges in fundamental sciences, nuclear security, and health. He oversees a wide range of developments in gamma-ray detection and imaging and the fusion of nuclear with complementary data that relevant for example in the mapping of contamination in Fukushima or the verification of ion-cancer therapy. He is also the Director of the Institute for Resilient Communities that was established in 2015 to address the need to better integrate advancements in sciences and technologies with communities through education and outreach locally and globally. It reflects his activities in Fukushima, Japan, and is based on a partnership with several research institutions and universities in Japan and the City of Koriyama. He has authored and co-authored more than 150 publications in peer-reviewed journals and is fellow of the American Physical Society.

Key Elements of Public Health Protection in a Nuclear or Radiological Emergency

Wolfgang Weiss and Zhanat Carr (WHO)

Former Head of Department Radiation Protection and Health of Federal Office for Radiation Protection (BfS)



By definition “health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” (WHO). Evidence about health impairment is available for a large spectrum of unwanted events, eg. chemical and nuclear accidents, natural disasters or infectious diseases.

For the purpose of radiological protection in emergency exposure situations, ICRP recommends to use “reference levels, which should be set in the band of 20–100 mSv effective dose (acute or per year). ICRP considers that a dose rising towards 100 mSv will almost always justify protective measures. A detailed set of generic dose criteria (emergency action levels, operational intervention levels) is recommended by IAEA as the basis for planning preparedness and response actions (General Safety Requirements No. GSR Part 7 and General Safety Guide No. GSG-2). No detailed recommendations are available how to assess individual risks at low doses and to consider the known differences in the susceptibility of special groups of the population to radiation exposures, eg. children, during response.

Available evidence from major nuclear accidents shows that it is necessary to broaden the view beyond radioactive dose, to include additional considerations of the impact of nuclear accidents on public health to achieve a situation in which the benefits of justified RP protective measures overall outweigh their risks and the harm they cause to individuals and to the society, eg. “do more good than harm”.

Serious health effects and disaster-related death (DRD) among vulnerable groups of the affected population have been reported after the Fukushima accident. DRD is defined as death caused by the deterioration of medical response due to poor medical access or illnesses arising from poor living environments (such as temporary shelters) or by evacuation of inpatients and elderly people at nursing care facilities without sufficient

medical care and food supply. The WHO has looked into the evidence base for basic interventions as evacuation and sheltering in case of nuclear emergencies and concluded that the evidence base is insufficient, therefore there is a research gap that needs to be addressed by indirect evidence and simulation studies.

Various risk factors for an increase of human vulnerability to disaster-related morbidity and mortality have been observed during many major accidents. Examples are low income, low socioeconomic status, lack of home ownership, single-parent family, age (older than 65 years, younger than 5 years), gender, chronic illness, disability, and social isolation or exclusion (stigma). Access to health-care for the affected populations residing in temporary accommodations, who lost jobs and associated health insurance coverage also can represent a challenge, especially for chronically ill persons. In addition, lifestyle-related health problems during emergencies have been identified. They may be related to reduced physical exercise, smoking and alcohol habits, increased risk factor for cardiovascular disease, such as obesity, hypertension, diabetes mellitus and dyslipidaemia.

Evidence for mental health and psycho-social consequences is available from many major emergencies. They may result from drastic changes in living environments with significantly long periods of relocation and separation of families/communities. The most common mental health consequences are anxiety, general distress, post-traumatic stress disorder, depression, medically unexplained somatic symptoms (e.g. fatigue, severe headaches, muscle and joint pain), and stigma as seen from Chernobyl and Fukushima experience.

Increasing the ability of governments and other stakeholders to address the known social determinants and reduce the health inequities is a high priority area; it requires focussed research activities as well as involvement/improvements in the capacity of the health sector to identify, promote and implement action on social determinants of health and health equity – both within their own functions and programmes as well as through coordination and alignment with other sectors.

There is an urgent need to develop a comprehensive, multi-sectoral long-term approach, which considers both physical and psycho-social consequences of nuclear/ radiological emergencies as well as the options to deal with them in an optimised fashion. Key emphasis for the future activities is to develop an international framework and identify

possible options for mitigating adverse psycho-social and mental health outcomes after a nuclear emergency. The aim of such a development will be to establish an evidence base for assessing health equity outcomes from radiation accidents and for understanding the factors leading to disparities in exposure and its consequences. Key areas of the required expertise are radiation protection, medical support (especially primary care and emergency medicine, mental health support), social sciences (anthropology, psychology, ethics), and communications experts. While the number of dead, injured, or hospitalized victims of an emergency can be counted, it is much more difficult to quantify and assess the psychological and social health implications. There is a need to agree on key criteria, approaches and methodologies for evaluating and managing the impact of anxiety, depression, social disruption, or family hardship, which nuclear emergencies and consequent interventions may trigger.

There is a need for training of the radiation protection community in general, radiation protection professionals, and public health specialists with respective responsibilities in planning and managing radiation emergencies on psycho-social and mental health impact and its mitigation before, during and after emergency. In particular there is a need to raise the awareness within the professional community about the available evidence and knowledge on social determinants of health and how these could be applied to management risk associated with consequences of radiation emergencies.

[Biography]

Professional and occupational background:

- Physicist, Dr. rer. nat., University of Heidelberg;
- 1980-2000: Director, Institute for Atmospheric Radioactivity, Freiburg;
- 2000 to August 2012: Federal Office for Radiation Protection (BfS), Head of Department Radiation Protection and Health, Neuherberg/Munich;

Membership in national and international organizations

- German Commission on Radiological Protection (SSK)
- UNSCEAR (chair 2011-2012, chair of the Coordination Expert Group for the Fukushima Assessment);
- OECD/NEA – CRPPH (committee for radiological protection and public health; member of the bureau);
- Honorary member of MELODI;
- Former member of ICRP, C4 (chair of TGs preparing Publications ICRP 101, 109, 122);
- Chair of the International Programme Committee for IRPA 15 (Seoul 2010).

Holder of the Order of Merit of the Federal Republic of Germany.

The Gap between Radiation Science and Perception People

Ohtsura Niwa

Chairman of Radiation Effects Research Foundation (RERF)

Natural science on the effects of radiation on human health is well developed in the past 70 years and a large proportion of the results came from the epidemiological studies of atomic bomb survivors and their offspring. The studies have indicated the lack of discernable health detriments among children of the survivors and dose dependent increases of cancer among directly exposed survivors. These results have been verified by independent studies by others and the atomic bomb survivor studies are now regarded as gold standard in the field of radiation science.

Although science of radiation health effects is thus well established, the public perception of radiation is tightly connected to the image of atomic bomb. The image of radiation is inseparably connected with that of atomic bombs. In addition, human cannot sense radiation. Thus, when placed in a situation with radiation, people do not know how to cope with radiation. When confronted with something to which people has no control, people fear and lose confidence on themselves. This is exactly what happened to people in Fukushima where people were suddenly surrounded by radiation to which they did not have any way to fight back. They were tied up with a situation they cannot handle. This means that they are not the one to control, but to be controlled by the situation, and such a situation makes people to lose confidence on themselves. Science of radiation health effects, however good, cannot help such people unless those talking them on science are trusted. Also, the only way for such people to regain confidence is to help them to take action. Science and scientists can only be of use, with trust and to working together with people especially when people are confronted by serious disaster such as Atomic Bombings and Fukushima Daiichi Nuclear Accident.

[Biography]

Ohtsura Niwa obtained B.Sc. from Kyoto University in 1967 and Ph.D. from Stanford University in 1975. He worked at Hiroshima University, Kyoto University, National Institute of Radiological Sciences, and Fukushima Medical University until June of 2015. He is currently working at the Radiation Effects Research Foundation in Hiroshima and Nagasaki. He spends most of his research career studying genetic effects of radiation, especially induction of dynamic mutations (untargeted mutation) in mice, using minisatellite sequences and the pink eyed unstable allele. After moving to Fukushima Medical University in 2012, his interest shifted from science of radiation effects to the impact of radiation on people's daily life.

Panelists

Panel Discussion

February 12, 2017

15:50 –17:20

May Abdel-Wahab

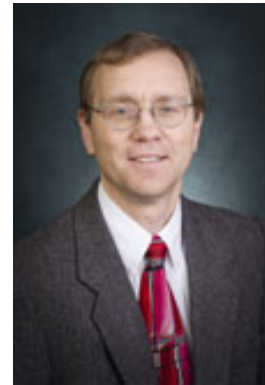
Director of the Division of Human Health at the
International Atomic Energy Agency (IAEA)



May Abdel-Wahab, MD, PhD is the current Director of the Division of Human Health at the International Atomic Energy Agency, Vienna Austria. She has over 30 years of patient care, teaching and research experience in the field of radiation medicine. Before joining IAEA she was section head of GI Radiation Oncology at the Cleveland Clinic, USA and Professor at the Cleveland Clinic Lerner School of Medicine, Case Western University. She has served, both as a member and chair, on various National and International committees. She has also served on advisory boards and professional journal editorial boards. She is a fellow of the American board of Radiology and was on the Best doctors in America listing, among other honors. Dr Abdel-Wahab has been an avid lecturer and participant on scientific panels. She has also served on expert panels for treatment guidelines and published widely (over 150 publications). She has a special interest in education and curriculum development as a former residency program director and has organized numerous symposia and scientific meetings. In addition, she has an interest in healthcare access and training, as well as novel solutions to address disparity and diversity issues.

Thomas E. Johnson

Associate Professor
Colorado State University



Dr. Johnson has extensive experience in radiation safety, nuclear detection methods, and power plants. The last 15 years Dr. Johnson has spent in academia performing research in diverse areas of radiation safety including environmental, medical, and uranium mining. He has authored or co-authored over 30 peer reviewed papers, three books, and mentored over 30 graduate students. He has been responsible for multiple research projects funded by the Department of Defense, Nuclear Regulatory Commission, Department of Energy, United States Department of Agriculture, and other agencies. Dr Johnson has a PhD in Health Physics from Purdue University, is a CHP, NRRPT and CLSO. He was appointed to the Radiation Advisory Committee for the State of Colorado in 2010, and elected chair of the committee in 2015. Prior to obtaining his current position at Colorado State University, he was an assistant professor at the Uniformed Services University. In addition to his academic duties, Dr. Johnson was an active member of the United States Air Force reserves until 2009 when he retired at the rank of major. Dr. Johnson also served for six years in the United States Navy, as an engineering laboratory technician, on the nuclear powered submarine USS Cavalla.

Thierry Schneider

Director of Nuclear Evaluation Protection Center (CEPN)



Thierry SCHNEIDER is Director of CEPN since January 2017. He got a PhD in Economics, in the field of health and insurance. He has been involved in a number of projects related to the assessment and management of the radiological risk. Since 1990, he is involved in the methodological and practical developments related to rehabilitation of living conditions of the populations living in territories contaminated by the Chernobyl accident and since November 2011, he is participating to the ICRP Dialogue Initiative in the Fukushima Prefecture and research projects in cooperation with several Japanese Universities.

He is currently President of the French Society for Radiological Protection (SFRP), Vice-Chair of the Committee on Radiation Protection and Public Health (CRPPH – NEA/OCDE), President of the European NERIS Platform Association and member of ICRP task groups on ethics and on emergency and post-accident management.

Albert L. Wiley, Jr., BNE, MD, PhD, FACR

Medical and Technical Director of REAC/TS, and Head of the World Health Organization (REMPAN) Collaborating Center at Oak Ridge

Emeritus Professor of Human Oncology and Radiology, University of Wisconsin-Madison



Albert L. Wiley, Jr., BNE, MD, PhD was reacts director (2004-2016) and now is senior physician and scientific advisor at REAC/TS and Head, WHO Collaborating Center at Oak Ridge. He was also a committee member and lead writer for medical sections of the UNSCEAR and the IAEA Comprehensive Reports on the FUKUSHIMA Accident. His professional career began as a Nuclear Engineer with a Bachelor of Nuclear Engineering and an AEC (ORINS) sponsored fellowship for nuclear engineering graduate studies at North Carolina State University. He worked in the nuclear industry prior to obtaining an MD degree from University of Rochester School of Medicine, and later a PhD in Radiological Sciences (radiobiology) from the University of Wisconsin Graduate School of Letters & Science. He received residency training in Radiation Therapy & Nuclear Medicine at the University of Wisconsin Medical Center and at the Stanford University Medical Center in Palo Alto, Calif. He is currently Professor Emeritus at the Department of Radiology & Human Oncology at the University of Wisconsin – Madison and was, prior to coming to REAC/TS, professor and chairman of the Department of Radiation Oncology, and Cancer Center interim Director at East Carolina University, Greenville, NC. He has over 180 journal, book and abstract publications in radiation oncology, nuclear medicine, radiobiology and radiation medicine. In recent years he has served as the medical team leader on NNSA sponsored training and exercises in Iraq, Kuwait, Korea, South Africa, Morocco, Vienna (IAEA), Argentina, Israel, Mexico, Ukraine, Singapore and Japan, and the NNSA (DOE) medical representative at the RADCC launch control team for the NASA Mars Science Lab and the Pluto launches. He is also a retired member of the USN Reserve (retired).

For more curriculum vitae, check the following website: <http://orise.ornl.gov/reacts/symposium/speakers/Wiley.html>

Abstracts

Student Oral
Presentations

February 11, 2017

12:35 –14:45

Phoenix Leader Education Program (Hiroshima Initiative) for
Renaissance from Radiation Disaster the 6th International Symposium
Student Oral Presentation Schedule: February 11, 2017

Abstract No	Time	Name	Institution Name	Oral Presentation Title
1	12:35-12:50	Masaya Tsujimoto	Hiroshima University	A Rice Growing Phase of Cesium Absorption in the Paddy in Fukushima
2	12:50-13:05	Scott Braley	Colorado State University	Applying BEIR VII Risk Factors to Evacuation and Reoccupation Decision Making
3	13:05-13:20	Ryan Pavlovsky	University of California Barkley	Radiation Mapping and 3D Reconstruction with LAMP in Handheld/Aerial Packages
4	13:20-13:35	Chryzel Angelica B. Gonzales	Hiroshima University	Investigation on Retrospective Dose Assessment of Medical Radiation Exposure
5	13:35-13:50	Vivien Miller	Colorado State University	Model-Based Analysis of the Cesium Dynamics in the Small Mesotrophic Reservoir Pond 4: Stochastic Evaluation of Discrete Atom Movement

(Break Time: 13:50 - 14:00)

6	14:00-14:15	Nobuaki Moriyama	Hiroshima University	Health Issues Caused Indirectly by the Fukushima Accident: A Mediator's Role from the Point of View of Health Science
7	14:15-14:30	Kyle Bilton	University of California Barkley	Gamma-ray Source Localization and Mapping Using Unmanned Aerial Vehicles
8	14:30-14:45	Ooki Kurihara	Hiroshima University	A Study on Coastal Disposal Facility for Soils and Wastes Contaminated with Radioactive Cesium

A Rice Growing Phase of Cesium Absorption in the Paddy in Fukushima

Masaya Tsujimoto^{1, 2}, Sunao Miyashita^{1, 2}, Nguyen Thanh Hai^{1, 2},
and Satoru Nakashima^{1, 2, 3}



¹ Graduate School of Science, Hiroshima University

² Phoenix Leader Education Program, Hiroshima University

³ Natural Science Center for Basic Research and Development, Hiroshima University

Keywords: food safety, cesium, potassium, rice growing, Fukushima

Since Fukushima Daiichi Nuclear Power Station (FDNPS) accident in March, 2011, food-safety matter has been argued in Japan. In particular, Fukushima is one of the prefectures primarily producing rice as Japanese staple, and the agriculture is a basic industry in Fukushima. Therefore, it is important to monitor the radioactivity of cesium derived from the nuclear accident in paddy soil and rice even now. In order to prevent rice plants from absorbing the cesium, potassium chloride has been distributed into paddies after the accident. This is because potassium and cesium are the congener each other in the periodic table and have a similar chemical behavior, and possibly cesium goes out of the absorption. However, potassium chloride is soluble and likely to be lost in the paddies which are often refilled with irrigation water. That is why it is significantly important to investigate the rice growing phase of cesium absorption and to suggest an appropriate timing of adding potassium chloride. In this study, we aim to reveal the correlation between rice growing and concentration (radioactivity) of cesium and potassium in the rice plants.

The fieldwork was held in the paddy in Fukushima City, which is northwest approximately 60 km far from FDNPS. The sampling of paddy soil and rice plants was performed, and the plant length and SPAD* value were measured as indicators of rice growing repeatedly seven times in April through September, 2016. The samples were first dried at room temperature. The paddy soil was sieved by 2 mm-mesh to eliminate gravel (> 2 mm) and pieces of organic matter, while the rice plants were separated into roots, leaves, and ears and chopped into small pieces. All samples were completely dried again at 105 °C by oven and packed in U8 vessels. Then eventually, they were measured for ^{137, 134}Cs and ⁴⁰K by Ge semiconductor detector.

The results of radioactivity measurement indicate the different trend of the concentration of potassium and cesium between the roots and leaves. Both elements were competitively absorbed by the roots. On the other hand, they were transferred into the leaves on the same way as the congeners. The concentration of potassium and cesium has changed through the rice growing.

*SPAD stands for “Soil and Plants Analyzer Development”, and this value has the proportional relation with the amount of chlorophyll.

Applying BEIR VII Risk Factors to Evacuation and Reoccupation Decision Making

G. Scott Braley

Colorado State University



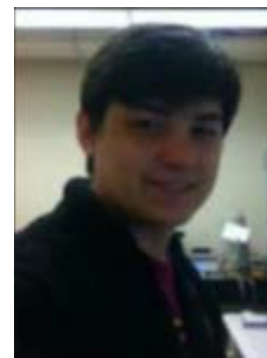
Keywords: Evacuation, reoccupation, risk factors, BEIR, radiation

Planners and emergency managers can turn to a large body of national and international guidance on evacuation, dose projection, and cleanup in order to prepare for a radiological or nuclear disaster. Relatively little guidance, however, focuses on returning evacuated populations to their homes. In the United States, the Environmental Protection Agency suggests that “[e]xposure limits in a range of one in a population of ten thousand (10^{-4}) to one in a population of one million (10^{-6}) excess lifetime cancer incidence outcomes are generally considered protective.” The Biological Effects of Ionizing Radiation VII (BEIR VII) report includes tables listing the morbidity and mortality risks of all cancers by age and gender. The present effort examines the effects of applying the BEIR VII risk factors to populations matching the demographic profiles of Japan, the United States, and Germany, and how those factors could be utilized in evacuation and reoccupancy decision making.

Radiation Mapping and 3D Reconstruction with LAMP in Handheld/Aerial Packages

Ryan Pavlovsky

Haefner, Andy; Joshi, Tenzing; Bilton, Kyle; Negut, Victor;
Vetter, Kai



Lawrence Berkeley National Lab / University of California, Berkeley

Keywords: Gamma-ray mapping, 3D reconstruction, hand-held, aerial, drone

The Localization and Mapping Platform (LAMP) is a flexible and configurable suite of radiation detectors coupled with contextual sensors for simultaneous mapping of gamma-ray emitters and 3D scene generation. This technology provides much more rich data when compared to traditional dose-rate/count-rate mapping schemes and could provide specific information for decontamination efforts. LAMP can map both indoor/outdoor environments. We built and demonstrated the operation of this package in hand-held and aerial/drone-based proximity mapping scenarios. Here we present preliminary results from these implementations as well as a discussion of planned improvements and measurements.

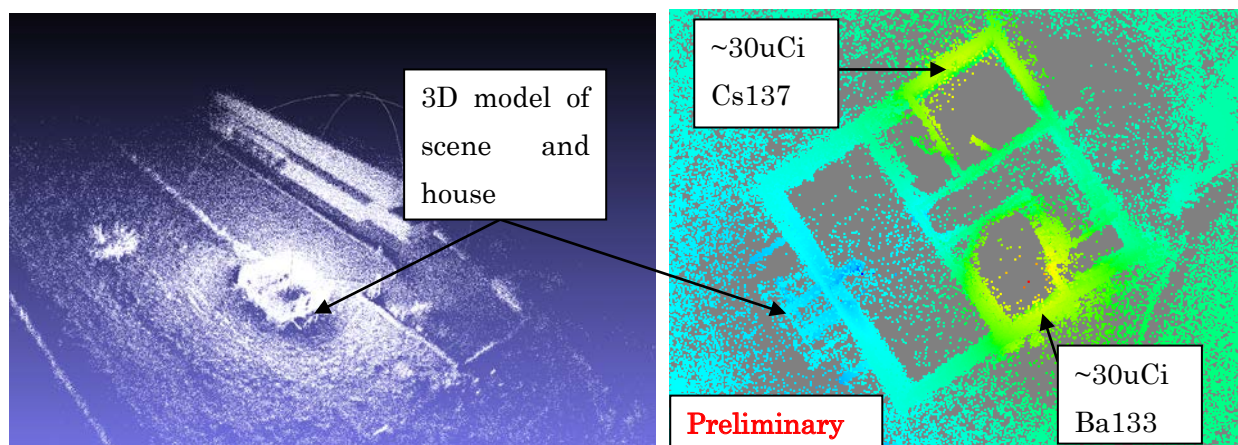


Figure 1: Walking data from LAMP. (Left) A 3D scene pointcloud from LIDAR data collected on the LAMP package while surveying an unoccupied house at the University of California Richmond Field Station. (Right) Preliminary radiation data fused with 3D scene and colored for gross count rate intensity on the pointcloud. The true source locations are noted in the figure.

Investigation on Retrospective Dose Assessment of Medical Radiation Exposure

Chryzel Angelica B. Gonzales*^{1,2}, Hiroshi Yasuda^{2,3}, Yasushi Nagata^{2,4}

Phoenix Leader Education Program (Hiroshima Initiative) for Renaissance from Radiation Disaster¹; Graduate School of Biomedical and Health Sciences, Hiroshima University²; Department of Biophysics, Research Institute for Radiation Biology and Medicine, Hiroshima University³; Department of Radiation Oncology, Institute of Biomedical and Health Sciences, Hiroshima University Hospital⁴



Keywords: retrospective dosimetry, radiation therapy, esr, osl

Many techniques for retrospective dosimetry have been developed for assessing past and unexpected radiation exposures. These techniques could be divided into two major categories: (1) Bio-dosimetry uses biological samples (e.g. blood) as biomarkers for estimation of absorbed doses and (2) Physical dosimetry wherein it uses some other solid biological (e.g. nails, teeth, etc.) or fortuitous materials (e.g. mobile phones, accessories, etc.) that a person may carry in his/her body are utilized (re phrase). Though the latter category is considered to be more accurate than the former in general, only a few studies have been undertaken on the application of physical retrospective dosimetry methods to medicine. Thus, this study attempts to establish a practical approach for assessing a patient's dose by using a retrospective dosimetry technique for medical interventions, for radiation therapy procedures in particular. As a first attempt, we investigate the use of the electron spin resonance (ESR) signals of biological samples in comparison with the responses of commercially available personal dosimeters and also with the absorbed doses calculated by the radiotherapy treatment planning system (TPS).

Model-Based Analysis of the Cesium Dynamics in the Small Mesotrophic Reservoir Pond 4: Stochastic Evaluation of Discrete Atom Movement

Miller, V., Johnson T., Pinder J.

Colorado State University,
Department of Environmental and Radiological Health Sciences



Keywords: radionuclide, aquatic model, Markov chain, cesium

The mathematical modeling of the passage of radionuclides through ecosystems after initial release into the atmosphere or water column typically has employed continuous mathematics such as ordinary differential equations whereas in reality, the process involves discrete movements of the individual atoms of the released radionuclide. These movements are random and generally occur with low probabilities. The latter observation is supported by results regarding compartment retention from the Pond 4 kinetic model as described in “Model-Based Analysis of the Cesium Dynamics in the Small Mesotrophic Reservoir Pond 4 I. Development of a Rate-Based Kinetic Model” by Jeong, et. al (*in review*). However, there has been little investigation of the extent to which the random and improbable behavior of discrete units (such as atoms) modifies, describes, or controls the variation within the components of the system. In this analysis we assess the discrete atom behaviors in influencing the midterm and long term distribution of Cs among the components using the robust and well documented experimental release of ^{133}Cs into the 11.4 ha reservoir Pond 4. This discrete behavior is modeled through the use of a Monte Carlo Markov Chain simulation. The result is stochastic in that no two releases of individual atoms result in the same distributions of atoms among the components or the same fluxes of atoms along pathways through the system. Preliminary results suggest that the largest relative variability occurs 1) during time periods when components have smaller inventories of Cs and 2) for those components with smaller retention probabilities of retaining the Cs atoms per unit time.

Health Issues Caused Indirectly by the Fukushima Accident: A Mediator's Role from the Point of View of Health Science

Nobuaki Moriyama, Yukio Urabe, Noriaki Maeda

Hiroshima University

Graduate School of Biomedical and Health Sciences, Sports Rehabilitation



Keywords: Health issues, Fukushima accident, mediator's role

The Fukushima Daiichi Nuclear Power Plant accident raised citizens' anxiety/fear regarding its effects on health, for example due to direct exposure to radiation, and the large-scale movement of local citizens.¹ A previous study reported that although the internal and external exposure levels of local residents after the Fukushima accident were too low to cause concern for a direct effect on health, deteriorating chronic conditions (e.g. increased prevalence of diabetes) was persistent after the disaster.² Although various potential causes could explain the deterioration of their health, there is no consensus on the cause.

Meanwhile, authors have identified low physical activity levels in observed evacuees in temporary housing in the City of Minamisoma as a factor of deteriorated physical performance.³ Previous studies also suggested that physical inactivity may be a risk factor for health deterioration; lack of physical activity has been found to contribute to an increased risk of non-communicable diseases,⁴ and may promote frailty.⁵ Therefore, decreased physical activity in older evacuees in temporary housing is a serious health-related problem to be solved.

To prevent this negative chain in the health of affected people, support for them should be focused on improving their circumstances, including providing easier access to medical facilities and home healthcare in affected areas, and raising awareness by encouraging them to maintain their physically active lives. It is suggested that direct communication with affected people for better mutual understanding could be a role for a mediator in the Fukushima accident recovery process from the point of view of health science.

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Gamma-ray Source Localization and Mapping Using Unmanned Aerial Vehicles

Kyle Bilton; Haefner, Andy; Joshi, Tenzing; Pavlovsky, Ryan; Negut, Victor;
Vetter, Kai

Lawrence Berkeley National Laboratory / University of California, Berkeley



Keywords: Gamma-ray mapping, source search, LiDAR, scene reconstruction, drones

The use of gamma-ray detectors in combination with contextual scene information has been explored on small unmanned aerial vehicles (UAVs) to enhance wide area radiation source localization and mapping capabilities. The Localization and Mapping Platform (LaMP) improves source localization capabilities by integrating data from scintillation detectors, visual cameras, and LiDAR, among other sensors. Applications for UAV detection platforms such as LaMP include environmental monitoring, nuclear contamination remediation, and nuclear security and safeguards. Current capabilities of LaMP are discussed, including scene reconstruction and field tests using sealed radioactive sources.

A study on Coastal Disposal Facility for Soils and Wastes Contaminated with Radioactive Cesium

Ooki Kurihara¹⁾ and Takashi Tsuchida²⁾

1) Graduate School of Engineering, Hiroshima University

2) Institute of Engineering, Hiroshima University



Keywords: waste disposal facility, contaminated soil, sealing layer, marine clay, hydraulic conductivity, adsorption

The safe disposal of waste generated in the process of decontamination around Fukushima Daiichi Nuclear Power Plant is a pressing issue. The objective of this study was to develop a sealing material that can be used as an engineered barrier for a final disposal facility for soil and waste contaminated with radioactive cesium at a concentration less than 100,000 Bq/kg. The analysis performed on the basis of 4-m-thick sealing layer found that the hydraulic conductivity of the sealing material should be maintained at 5.0×10^{-10} m/s or less, in order to avoid the leakage of contaminant over the environmentally safe limit. The sealant was developed using marine clay-bentonite mixture and the engineering properties were investigated. As a result of laboratory experiments, the hydraulic conductivity decreases due to the addition of bentonite, and when the effective consolidation stress is 27 kPa or more, the hydraulic conductivity becomes 5.0×10^{-10} m/s or less. From the adsorption property test for cesium, the sealant showed remarkable adsorption ability to cesium in seawater. It was concluded that it is possible to construct a waste disposal facility on the sandy seabed with the sealing layer proposed in this research.

Abstracts

Student

Flash Presentations

February 11, 2017

14:45 –16:20

Poster Presentations

16:30 –18:20

Phoenix Leader Education Program (Hiroshima Initiative) for
Renaissance from Radiation Disaster the 6th International Symposium
Graduate Student Flash Presentation Schedule: February 11, 2017

Time	No	Name	Presentation Title
14:45- 15:30	1	Chowdhury Abu Sayeed	Catalytic Impacts of Long-term Evacuation upon Post-disaster Chronic Health of Elderly Generation in Fukushima: Findings from the 14th Fukushima Short Field Visit
	2	Tsegmed Otgonchimeg	A Social Cognitive Perspective of Radiation Risk Perception and Risk Information Seeking Behavior of People in the Context of Fukushima Disaster: Towards Better Public Oriented Risk Communication
	3	Linh Thi Thuy Cao	Microbial Precipitation of Cesium and Other Nuclides by Cultures of Manganese Oxidizing Bacteria
	4	Doan Thi Thanh Nhan	Depth Distribution Of Long-Lived Radionuclides in Soil Profile After Fukushima Dai-Ichi Nuclear Power Plant Accident
	5	Bekelesi Chisale Wiseman	A Survey of Dose Rate Assessment at Fukushima Prefecture
	6	Le Nguyen Tra Mi	Hypermucoviscous <i>Klebsiella Pneumoniae</i> and Drug Resistance
	7	Seima Tanaka	Effects of Radiation on Skeletal Development
	8	Takahiro Inagawa	Basic Research on Severe Infections is Considered Necessary for Treatment of High-Dose Radiation Exposure Patients
	9	Mari Ishimori	The Research about the Attitude of the Others to the Evacuees of Fukushima Power Plant Accident
	10	Triyono Basuki	Activity Concentration and Vertical Distribution of ¹³⁴ Cs and ¹³⁷ Cs in Shallow Water Sediment, River Mouth Sediment and Soil of Surrounding Area of Hibara Lake, in Fukushima: an Investigation of Radiocesium Indirect Deposition into Lake
	11	Tatsuhiko Suzuki	Performance Evaluation of TLD Sheet in the Build-up Region
	12	Russell Sarwar Kabir	Resilient Relaxation: Assisting Communities to Counter the Stress Response Through the Practice of Self-regulatory Meditative Movement
	13	Yuji Hirano	Atomic-bombed Special Students from Southeast Asia and Postwar Japanese Society
	14	Chika Matsumoto	Public Attitude for Evacuation with Pets under Emergency Disaster Circumstances
Break Time 15:30-15:35			

Time	No	Name	Presentation Title
15:35-16:20	15	Nguyen Quang Tam	Mesenchymal Stem Cell Therapy for Radiation Induced Lesions (Long Term Internship Topic Review)
	16	Silvia Natsuko Akutsu	Insufficiency of <i>BUB1B</i> Gene Increases Structure - Chromosomal Instability Post Ionizing Radiation
	17	Chuon Channarena	Establishment of School-based Health Check-up Systems for Radiation Disaster Preparedness in the Kingdom of Cambodia
	18	Do Xuan Bien	Pulling and Pushing Factors of Migration in Fukushima Nuclear Affected Areas - Case Study of Minamisoma City
	19	Fumie Yamaguchi	Longitudinal Research on Effects of Trust and Perceived Procedural Fairness on Accepting the Restarting of Nuclear Power Plants
	20	Thanh Tat Nguyen	Method for Determining the Depth Profile of Radioactive Cesium in 30 cm Soil Core by IP-Based Unfolding Method
	21	Nguyen Thanh Hai	Bond Selectivity Study of CsTolena, B, C, D, and E to Cs+ by using Density Functional Theory
	22	Sharifah Nabihah Syed Othman	Spatial Analysis of Radiocesium Concentrations in a Bryophyte (<i>Hyophila propagulifera</i> , Musci) within 50km from Fukushima Daiichi Nuclear Power Plant
	23	Yen Hwa Lin	Knowledge Based Planning Model using Prioritized Optimization Dataset
	24	Ho Minh Van	Detection of ATP-Dependent Inflammasome Suppression on Innate Immune Responses in Sepsis
	25	Ekaterina Royba	Genome Editing Technique as a Useful Tool for Analysing Individual Differences of Radiosensitivity
	26	Yasushi Nabae	Migration Pathway of Radioactive Materials from the Japan Sea to the Okhotsk Sea
	27	Wim Ikbal Nursal	The Importance of Public Participation to Intermediate the Lack of Radiation Information after Fukushima Dai-ichi Nuclear Power Plant Accident
28	Yurika Oba	The Spatial Pattern of Cs-137 Contamination of Evergreen Conifer Trees, Japanese Fir	
29	Uranchimeg Tsegmed	An Investigation of the Best Setting of Collimator Angle in Automatically-Generated Volumetric Modulated Arc Therapy of Head and Neck Cancer	
Break Time 16:20-16:30			
Poster Presentation 16:30-18:20			

Catalytic Impacts of Long-term Evacuation upon Post-disaster Chronic Health of Elderly Generation in Fukushima: Findings from the 14th Fukushima Short Field Visit

Chowdhury Abu Sayeed

Graduate School of Biomedical & Health Sciences, Hiroshima University



Keywords: Long-term evacuation impacts, post-disaster chronic health, healthcare for elderly.

Longer lasting impacts of nuclear disasters have been impacting society and environment ever since the era of nuclear power harnessing. The Fukushima triple disaster has exhibited the unique impacts of radiation disaster with lesser effects related to radiation exposure than longer lasting psychological stress which is ultimately hindering overall revitalization procedures. Ongoing robust health management survey with the aim to “monitor and promote the long term health issues of Fukushima residents”, actually has less emphasize upon post-disaster chronic health, specially the elderly residents who currently constitutes a substantial portion (32.10%) of the population. These elderly residents are getting less focus in terms of intensive healthcare targeting the rapidly changed population dynamics. Among the four detailed surveys conducted by Fukushima Medical University, almost all the focus is upon early detection and preventive treatment of external radiation exposure related critical diseases. Meanwhile, the vulnerable old-age group is yet to be seen being provided with prioritized integrated health care facilities. Due to the inverse correlation among low birth rate, low mortality rate and higher life expectancy, Japan is already in dilemma with its highest rate of elderly population in the world. In Fukushima the scenario is more critical due to long-term evacuation which has spurred up the rapidity in population aging higher than the county statistics. Consequently, adequate health support towards senile diseases, trend of population statistics, procurement of physically capable workforce, individual burden of life, health insurance, quality of day to day life and living expenditures and decision to close temporary housing facility in March 2017 may lead to a complex situation to handle smoothly. I have desire to study and contribute to this issue of reconsidering estimation for providing adequate integrated health care for elderly people through the mediator efforts in affected communities.

A Social Cognitive Perspective of Radiation Risk Perception and Risk Information Seeking Behavior of People in the Context of Fukushima Disaster: Towards Better Public Oriented Risk Communication

Tsegmed Otgonchimeg^{1,2}, Atsunori Ariga^{1,2}

1. Radioactivity Social Recovery Course, Phoenix Leader Education Program
2. Graduate School of Integrated Arts and Sciences, Hiroshima University



Keywords: radiation risk perception, risk information seeking behavior of people, risk communication, disaster- related cognitive science

Background

Fukushima disaster highlighted human cognition. For example, people had to make decisions on how to behave based on limited information that may or may not be true. Such processes consisted of three psychological components; risk perception, risk communication and decision making process.

1. Risk perception-how an individual perceived and selected information
2. Risk communication- how an individual shared information with others
3. Decision making process-how an individual or a group made decisions

Purpose

It is to determine how the people engage in decision making related to the levels of risk involved during radiation leakage and the risk information seeking behaviors of people in the context of Fukushima disaster. Thus, it is important to understand human cognitive mechanisms underlying risk perception, risk communication and decision making process, by taking a lesson from the Fukushima disaster. There is a particularly urgent need to develop our knowledge in preparation for a future radiological disaster.

Materials and Methods

We will use the social –cognitive theory to empirically examine how we engage in decision making related to the levels of risk involved during radiation leakage and the risk information seeking behavior of people in the context of Fukushima disaster. To achieve this, we will first examine the information seeking behavior of people during the time of Fukushima disaster in social survey (social psychology approach). Second, based on this knowledge, we will specify social and cognitive factors that affect our risk perception, risk communication, and decision making in various psychological experiments (cognitive psychology approach). Finally, we will construct the model of human cognition under the risk, and then provide recommendations and suggestions based on it.

Microbial Precipitation of Cesium and Other Nuclides by Cultures of Manganese Oxidizing Bacteria

Linh Thi Thuy CAO^{1,2}, Moeto TAKADA², Akiyoshi OHASHI³,
Takeshi NAGANUMA^{1,2}



- 1) Radioactivity Environmental Protection Course, Phoenix Leader Education Program for Renaissance of Radiation Disaster, Hiroshima University
- 2) Department of Environmental Dynamics and Managements, Graduate School of Biosphere Science, Hiroshima University
- 3) Department of Civil and Environmental Engineering, Graduate School of Engineering, Hiroshima University

Keywords: Manganese oxidizing bacteria, biomineralization, cesium immobilization, radio-ecology, integron/gene cassette system

High concentrations of cesium (Cs) in soil and sediments in Fukushima prefecture due to 2011 Great East Japan Disaster were well reported. According to previous studies, absorption of radioactive Cs to soil and sediment particles is so stable that they are hardly mobilized to move toward down stream or diffuse to ground water. Bacterial activities on absorption and transformation of Cs were suggested that may play some role in the surface behavior of Cs. Biomineralization processes carried by manganese (Mn) oxidizing bacteria (MOB) are well-known that associated with the immobilization of a wide range of metal elements. Some Mn(II) uptake bacteria also possess radiation resistant characteristic. The possibility that MOB play a role in the precipitation of Cs and other nuclides will be investigated by cultures of isolated MOB from wastewater treatment system designated for minor metals removal and recovery, added with Cs and other nuclides. The mechanism by which MOB uptake Mn(II) and elements will also be investigated by molecular analyses of newly isolated bacteria from Fukushima fields. Mobile DNA of these bacteria (integron/mobile gene cassette system) which may contain the information about the genes that have been adapted with high concentration of metal elements and/or high radiation dose will be discovered by culture-independent techniques. Lateral gene transfer of the genes that encode novel proteins and enzymes with adaptive characteristic or metabolic functions will be facilitated by the presence of integron/gene cassette systems. The study findings are expected to have important implications for the bioremediation of Cs and other nuclides contaminations.

Depth Distribution Of Long-Lived Radionuclides In Soil Profile After Fukushima Dai-Ichi Nuclear Power Plant Accident

Doan Thi Thanh Nhan

Radioactivity Environmental Protection Course Phoenix Leader Education Program
Hiroshima University



Keywords: Radiostrontium, Radiocesium, Plutonium, Depth profiles, Migration of radionuclides

Nevertheless, almost five years after the Fukushima Daiichi nuclear power plant accident, it is important to continuously monitor the radionuclides after the Fukushima nuclear accident to provide obvious radiological considerations and basic data for decontamination campaigns as well as revitalizing and reconstructing Fukushima. The Japan topography, as well as the difference of precipitation and kind of soil between different fields, led to different deposition pattern for each radionuclide. Detailed maps which provide a picture of nuclides spatial distribution, as well as the migration and diffuseness of them, are necessary for human safety.

In this study, we aim for the following goals. First, I am going to analyze and determine vertical distribution in soil of three anthropogenic radionuclides $^{89}\text{Sr}/^{90}\text{Sr}$, $^{131}\text{I}/^{134}\text{Cs}/^{137}\text{Cs}$ and $^{239,240}\text{Pu}$ which are the most radiologically important and typical of beta, beta/gamma and alpha emitters, respectively. We intend to improve further the achievements of previous research to fully investigate vertical distribution of not only radiocesium and radioiodine but also radiostrontium and plutonium and their decay products in different soil profiles. Depth profiles of long-lived radionuclides will be characterized from the reactions of the radionuclides with each soil components along the depth. These knowledge is essential to understand their fate in the terrestrial environment. Information on vertical migration is obviously useful for present and future decontamination strategies and for modeling the migration of radionuclides into groundwater.

Secondly, we aim to simulate the radionuclide dispersion and deposition in soil using radionuclide dispersion model and compare it with experimental data to validate the model. After validating, simulation will be used to further investigate data that hardly achieved by experiments.

Last but not least, the cleanup of Japan's radioactive water and land is expected to take decades and will require a variety of corrective methods. We want to propose an effective method which not only cheaper than present method but also less disruptive to the local environment and be able to maintain the landscape.

A survey of Dose rate assessment at Fukushima Prefecture

BEKELESI Chisale Wiseman^{1,2}, NAKASHIMA Satoru^{1,2,3}

1.Rad. Environment Protection Course, Phoenix Leader Education Program

2.Department of Chem., Graduate School of Science, Hiroshima University

3.Natural Science Center for Basic Research and Devp., Hiroshima University



Keywords: Gamma Spectrometry system, Survey meter, absorbed dose, Cs-137, Fukushima

In the 14th short field visit to Fukushima Prefecture on 5th Nov 2016 absorbed dose rates (ADRs) in air were determined by means of both hand-held survey meters and car borne survey method (CBSM) using Gamma Spectrometry system with Sodium Iodide Thallium (NaI(Tl)) detector. The purpose was to assess to what extent remediation had been done in Fukushima and to set boundaries for future research in suspected areas. The results found show that the lowest dose rate was detected around Soma Thermal Power Plant (G) along the coast, Minami-soma Hospital (I) and Iwaki zones (O) with readings of 0.02 ± 0.008 and 0.04 ± 0.01 $\mu\text{Sv/h}$ respectively, while the highest was recorded near Fukushima Daiichi Nuclear Power Plant (FDNPP-M) area which ranged from 1.16 -5.52 $\mu\text{Sv/h}$ with a mean value of 3.22 ± 1.48 $\mu\text{Sv/h}$. The average background dose rate for the whole study segment excluding FDNPP-M premises was 0.09 ± 0.05 $\mu\text{Sv/h}$. However, there is still need to measure soil, water and plant samples for levels of Ra-226, Th-232 and K-40 in addition to Cs-137, Cs-134 in order to assess radionuclides' health hazards and risks to people and their migration in the environment. The tentative results agree with other studies which show that most parts of Fukushima Prefecture have been decontaminated while the areas close to the nuclear power plant and few others still contain high levels of radioactivity.

Methods

Data on ADRs in air was obtained 1 meter above the ground by using hand held survey meters, the NaI(Tl) detector mounted in a moving vehicle respectively. Over 20,000 measurements were made by CBSM (Fig 2) from Fukushima Station to FDNPP and back covering about 200km.

Preliminary results

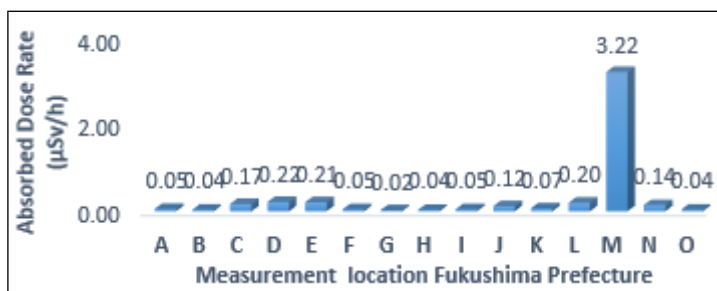


Fig 1: ADRs by Survey meter

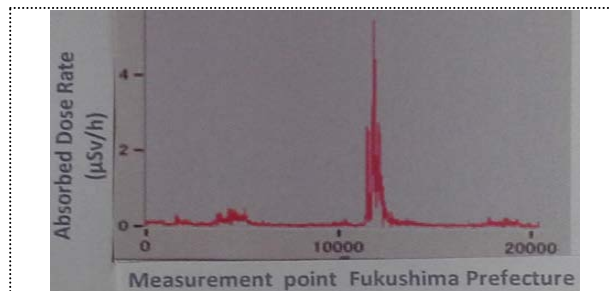


Fig 2: Over 20,000 ADRs measured by CBSM

Future Research

The results show that most areas have been decontaminated. However, there is still need to monitor K-40, Ra-226 and Th-232 in soil, water and plants in selected areas in addition to Cs-137, Cs-134 in order to study radionuclides' concentration, migration and their health hazard and risks on people.

Hypermucoviscous *Klebsiella pneumoniae* and Drug Resistance

Le Nguyen Tra Mi, Shizuo Kayama, Motoyuki Sugai

Department of Bacteriology, Graduate School of Biomedical and Health Science, Project Research Center for Nosocomial Infectious diseases



Keywords: *Klebsiella pneumoniae*, hypermucoviscosity, *rmpA*, ESBL, carbapenemase

Klebsiella pneumoniae is a common Gram-negative bacterium causing opportunistic infection mostly in immunodeficient hosts. It can be acquired through community or hospital pathway, leading to many serious diseases such as pneumonia, primary pyogenic liver abscess or distinctive invasive syndrome.

Variety of virulence factors of *K. pneumoniae* have been known including capsular polysaccharide, LPS O-antigen, several pili or fimbrial adherence factors, enterobactin, aerobactin siderophores, and mucosity. The hypermucoviscosity (HV) phenotype relates to a muco-polysaccharide network outside the capsule which assists these bacteria to colonize the mucosa and protects them from anti-capsule-specific antibodies to escape phagocytosis. The HV-phenotype of some specific strains were reported to be responsible for the increasing virulence of *K. pneumoniae*. Some studies in diabetic mice had indicated that HV-phenotype of *K. pneumoniae* isolates was one of the main virulence factors causing bacteremia and might also involving in systemic spread of bacteria. The HV-phenotype was suggested to be enhanced by the expression of 2 capsular polysaccharide genes: *rmpA* (regulator of the mucoid phenotype A) and *rmpA2* (transcriptional activator). However, relation between *rmpA* genes and HV-phenotype is not yet clear since some of HV-positive isolates do not possess these genes or a minor proportion of HV-negative isolates carry *rmpA* and/or *rmpA2*.

Recently we are observing rapid increase of extended-spectrum β -lactamase (ESBL)-producing Enterobacteriaceae in nosocomial setting. Moreover, in West Japan, we started to observe emergence of carbapenemases producing *K. pneumoniae*. This strain carries ESBL, CTX-M-2 and carbapenemases, IMP-6, and is virtually resistant to all β -lactam antibiotics. Among the isolates, we found several strains with HV-phenotype. Interestingly, these strains are negative for *rmpA* genes.

In this study, we plan to retrospectively review molecular mechanism of *K. pneumoniae* hypermucoviscosity and try to present initial study on the correlation between the expression of the HV-phenotype and virulence genes in *K. pneumoniae* isolates in our research center, as well as the relationship between the HV-phenotype and ESBL/carbapenemase-production.

Effects of Radiation on Skeletal Development

Seima Tanaka¹ and Chisa Shukunami²

¹Department of Molecular Biology and Biochemistry, Biomedical Science Major,
Graduate School of Biomedical and Health Sciences, Hiroshima University

²Department of Molecular Biology and Biochemistry, Basic Life Sciences, Institute of Biomedical and Health Sciences,
Hiroshima University



Keywords: Irradiation, Chondrogenesis, Chondrocytes, ATDC5, Microarray

Massive amounts of radioactive materials were accidentally released at the Fukushima Daiichi on March 11, 2011. Since then, local residents in the affected areas have been forced in to live in fear and anxiety. Indeed, radiation could increase the risk of cancer or other mental and physical health problems. Among local residents, pregnant women and infants are a group of who need special consideration when exposed to radiation. Radiation could elevate the risk of abnormal bone formation in fetuses and children, but so far our knowledge on hazardous effects of radiation on skeletal development is limited. During embryonic development, most of the bones in the body are formed through the process called endochondral ossification in which cartilaginous bone primordium initially acts as a template for the future bone and is eventually replaced by bone and bone marrow after invasion of blood vessels into the primordium (1). After birth, growth plate cartilage at the epiphysis contributes to the longitudinal growth of bone, thus allowing the long bones to grow until the end of the puberty. In the growth plate, proliferating chondrocytes become hypertrophic to mineralize their surrounding extracellular matrices prior to vascular invasion. Radiation-induced arrest of bone growth during radiation therapy in childhood is considered to be caused by the impaired growth and maturation of chondrocytes at the growth plate. However, the molecular mechanisms that regulate the disorders of growth plate cartilage by radiation remain uncertain. In this study, effects of radiation on skeletal formation will be investigated by taking advantage of the chondrogenic cell line ATDC5 which can simulate a multistep differentiation process of chondrocytes contributing to endochondral bone formation *in vitro* (2, 3). To reveal effects of irradiation on chondrogenic differentiation of ATDC5 cells at a molecular level, gene expression profiling will be analyzed by DNA microarrays.

References

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Basic Research on Severe Infections is Considered Necessary for Treatment of High-Dose Radiation Exposure Patients

Takahiro Inagawa

Radiation Disaster Medicine Course



Keywords: Acute radiation syndrome, immunocompromised, infection, emergency radiation medicine, *Staphylococcus aureus*

Acute radiation syndrome (ARS) can be said to be the most severe pathological condition in emergency radiation medical care. Patients exposed to high doses become ARS and serious condition due to multiple pathologies such as myelosuppression, gastrointestinal mucosal disorders, skin disorders. Because of myelosuppression, patients are fallen into an immunocompromised state, furthermore they become collapse of the defense mechanism by causing skin and mucosal damage, then bacterial invasion easily occurs in them.

In this way, patients who are in an immunocompromised state may have any kind of infections, and once it occurs, it become critically illness. Thus, treatment of patients with high-dose radiation exposure is a battle against serious infections.

Treatment of ARS requires highly intensive care, and it is considered that there are few hospitals that can be handled throughout the country.

We so far have been treating severe infections in patients with various immunosuppressed conditions at the Advanced Emergency and Critical Care Center, ICU in Hiroshima University Hospital. Furthermore, regarding radiation medicine, we have experience as A-Bomb exposure site, many research institutes, and have had a lot of knowledge and training on emergency radiation medicine. We consider that Hiroshima University Hospital is one of few hospital in the world in which we can treat patients in ARS.

Basic research on severe infections is considered necessary for treatment of coming high-dose radiation exposure patients. I haven't decided the concrete methods of my study yet, but as the Bacteriology laboratory in our university is good at studies for especially *Staphylococcus aureus*, I consider that I will applied Focus to *Staphylococcus aureus*, and its pathogenicity, severity factors, treatment resistance factors.

The Research about the Attitude of the Others to the Evacuees of Fukushima Power Plant Accident

Mari Ishimori, Kiriko Sakata

Graduate School of Integrated Arts and Sciences, Hiroshima University



Keywords: Attitude, evacuee, conflict, human relationships, Fukushima

The Fukushima atomic power plant accident that happened in 2011 devastated the public who lived in East Japan. One characteristic of this devastation is that the atomic power plant accident produced many evacuees. According to a Reconstruction Agency announcement, on December 26, 2016, there were at least 83,000 evacuees merely in the Fukushima prefecture. Among the evacuees, some were forced to move, and some moved voluntarily. Nobody knows the correct numbers of the voluntarily evacuated. The evacuees went all over Japan. Some of them moved into Fukushima prefecture, and some moved to the Tohoku area, Kanto area, West Japan, and Hokkaido (Takahashi, 2014). Some of the evacuees want to stay in their new home. Some have not decided where they would like to stay—and the ratio of evacuees who have not yet decided increases year after year (Takahashi, 2014). According to many researchers, evacuees encounter economic difficulties in adapting themselves to their new place; among such difficulties, how to support the evacuees is discussed (Yamane, 2013). One reason for the difficulties of evacuees adapting themselves and their anxiety is conflict in relationships with pre-existing residents and the children being bullied in their new home. Moreover, original residents criticize the evacuees because they left Fukushima when the crisis was at its height, yet refuse to allow evacuees to return to Fukushima, their original home, according to the evacuee group “Asuchika”. Similarly, evacuees meet difficulties not only at their new residence but also their original one, especially regarding human relationships. However, there is almost no research concerning evacuees’ relationship challenges. Accordingly, I will research in this field the breakdown of the evacuees’ human relationships, including the attitudes of the new and old locations’ residents toward the evacuees. This research is expected to obtain knowledge to resolve the conflicts underlying the evacuees’ relationships and the social rejection the evacuees have experienced.

To investigate this topic, I will administer an online survey to the 500 residents of the contaminated area (Fukushima, Miyagi, Iwate, Ibaraki, Tochigi, Gunma, Saitama, and Chiba).

First, I will gather information about the respondent’s attributes, including sex, age, educational background, occupation, income, the experience of evacuating, and conflicts in the family related to the evacuation.

Subsequently, I will ask the respondents to work with my original psychological scale, which inquiries about attitudes toward the evacuees.

Last, from a preceding study (e.g., Kikuchi & Takagi, 2015), I will conclude the recognition of the degree of radioactive contamination of the residence, trust in the administration, knowledge about the radiation, manner of critical thought.

Activity Concentration and Vertical Distribution of ^{134}Cs and ^{137}Cs in Shallow Water Sediment, River Mouth Sediment and Soil of Surrounding Area of Hibara Lake, in Fukushima: an Investigation of Radiocesium Indirect Deposition into Lake

Triyono Basuki^{1,2}, Sunao Miyashita², Masaya Tsujimoto^{1,2} and Satoru Nakashima^{1,2,3}

¹Radioactivity Environment Protection Course, Phoenix Leader Education Program

²Department of Chemistry, Graduate School of Science, Hiroshima University

³Natural Science Center for Basic Research and Development, Hiroshima University



Keywords: Radiocesium, Vertical Distribution, Indirect Deposition

Introduction

Lake is one of main environment for long term assessment of radioactivity after nuclear disaster. It is due to its important role as accumulation area in radionuclide migration pathway from upstream and surrounding areas. Beside through direct deposition of radiocesium from atmosphere, the radiocesium is also deposited to the lake through indirect deposition from upstream through river and from surrounding area. We investigated the radioactivity of radiocesium on the sediments of Hibara lake and surrounding area in order to identify the indirect deposition process of radiocesium into lake.

Experiment

Soil and sediment samples were collected from flood plain (2 sampling points), shallow water of lake (7 sampling points) and river mouth of 2 rivers (2 sampling points each) by using the hand core sampler. The samples were sliced each 5 cm and measured using Ge semiconductor detector in wet weight. Samples were dried by oven at 105C° and sieved using 2 mm and 75 μm sieves in order to characterize the particle size composition of samples.

Results and Discussion

Base on the radiocesium activity concentration and particle size composition data, we found that there was an enough clear relation between activity concentration of radiocesium in shallow water sediment and soil of surrounding area as well as sediment of river mouth. The high activity concentration of radiocesium in shallow water sediment was found in area near river mouth (inlet) and near high slope surrounding area. This results suggested that the accumulated radiocesium in shallow water sediment of lake could be from upstream area through river and from surrounding area through water runoff. Furthermore, the total activity concentration in shallow water sediment based on the vertical distribution data has potential to be used for indirect deposition rate calculation of radiocesium into lake for long term assessment.

Performance Evaluation of TLD Sheet in the Build-up Region

Tatsuhiko Suzuki

Department of Radiation Oncology

Graduate school of Biomedical & Health Sciences, Hiroshima University.



Keywords: Dose assessment, Accuracy, Skin, TLD sheet

Purpose: The accuracy of dose measurements using the ionization chamber and dose calculations of RTPS has large uncertainty in build-up region. This study, I evaluated the basic performance of new developed TLD sheet, and compared the measurement accuracy of the built-up area and Monte Carlo to verify the measurement accuracy.

Methods: I evaluated property of TLD sheet as flatness of the two-dimensional, the dose response, dose resolution, high-energy dependence and the beam quality dependence, that were measured using Varian TrueBeam. The measurement accuracy of the built-up region compared with the monte carlo calculation.

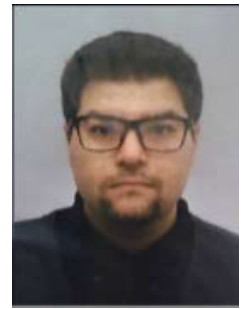
Results: Flatness of the two-dimensional is 6% in the radiation field of $10 \times 10 \text{cm}^2$, dose resolution was 11mGy. There was also the linearity of the dose response to 50Gy that was measured in this study. High energy dependent of therapeutic 4, 6, 10MV were within the error range, however, there has a systematic difference. And also, low energy dependence was measured using the dose conversion table of the high-energy in fluoroscope 100kV has a large uncertainty, nevertheless at low doses tended linear dose response. In the measurement of the build-up region 0 cm was good agreement with monte carlo calculation, on the other hands, in the 0.5-1.5 cm has occurred 0.8% systematic difference.

Conclusion: I confirmed a broad range of dose linearity is characteristic of TLD and low energy dependence. The property of TLD sheet was fulfilled required performance in the build-up region of the non-electron equilibrium. However, systematic difference was occurred for heated reading measurements. So, systematic difference in the reading of the TLD sheet is required improvement as uncertainty reduction of reading.

Resilient Relaxation: Assisting Communities to Counter the Stress Response Through the Practice of Self-regulatory Meditative Movement

Russell Sarwar Kabir, Yutaka Haramaki

Graduate School of Education, Department of Psychology



Keywords: Self-regulation, resilience, community salon intervention, dosahou, Self-Active Relaxation Therapy

Self-regulation skills are crucial for managing various kinds of threats to the human experience (Southwick et al., 2014). Our sense of agency and mastery over our own health is a powerful protective factor, and thus a boon to our psychological resilience. The common physical manifestations of stress, known as the stress response, have been shown to be reduced by activating the relaxation response system that is driven by the hypothalamic-pituitary-adrenal axis to result in decreased sympathetic nervous system activity, decreased heart rate, lower metabolism, and decreased respiratory rate (Stahl et al., 2015). Chronic technological disasters proliferate psychosocial stress, and there is evidence to suggest that psychological distress will become chronic in Fukushima (Couch & Coles, 2011; Bromet, 2014). Bodymind approaches to relaxation may be useful and appropriate to reduce stress and maintain psychological resilience resources in the Fukushima recovery context. This presentation summarizes this intersection between the Japanese original psychotherapy known as dosahou and health psychology, my experiences as a facilitator of it through a salon activity in Iwate, Japan, and the potential application of relaxation programs as self-regulatory tools in the prolonged reconstruction from radiation disaster.

Atomic-bombed Special Students from Southeast Asia and Postwar Japanese Society

Yuji Hirano

Graduate School of Letters, Hiroshima University



Keywords: foreign atomic-bomb victims, Special Students from Southeast Asia, Japanese Society, memory

From the viewpoint of the fact that Special Students from Southeast Asia (NANTOKU Students) were victimized as a minority group of A-bombed foreign victims, I would like to study the process of recalling and memorizing them in the postwar Japanese society. Although few, less than ten, had victimized by A-bomb, this fact has been kept alive and passed on in Japanese society. In this research, I would like to clarify the process of recalling A-bombed NANTOKU students as a minority in Japanese society, focusing on the period from the mid-1950s to the mid-1970s.

1. Process of Recall by Hiroshima University

In 1952, an elder brother of the late Mr. Syed Omar, an A-bombed NANTOKU student, sent a letter to the president of Hiroshima University to ask for his death certificate. Hiroshima University began to investigate this matter by interviewing with persons concerned such as University staff members, students, citizens of Hiroshima at that time. As a result of the analysis, this investigation became an official record and memory of Hiroshima University through response to his brother's request.

I have also concluded that such response of Hiroshima Univ. might have been based on not only the intension of revealing actual situation of A-bombed students but also the social intention of internationalizing the ban-the-bomb movement at that time.

The results of this investigation was succeeded as an important record in editing the "Seisi-no-hi: Hiroshima Univ. Record of A-Bomb Disaster" in 1975.

2. Construction of Gravestones and Relatives Visit to Japan (Process of Consolation and Reconciliation)

Asian Students Cultural Association (ABK) invited the relatives of the two A-bombed NANTOKU students to Japan to pray their gravestones in Hiroshima and Kyoto in 1964. ABK closely communicated with Kozenji and Enkoji for this visit. It triggered the construction of Nik Yusof's gravestone. Also, Malaysia Embassy in Tokyo had involvement in this visit.

Thus, a series of these events has two aspects; (1) consolation of A-bombed students and reconciliation with relatives and (2) the viewpoint of bilateral relationship between Japan and Malaysia.

Public Attitude for Evacuation with Pets under Emergency Disaster Circumstances

Chika Matsumoto¹, Kiriko Sakata¹, Hitomi Sugiura²

¹Graduate School of Integrated Arts and Sciences, Hiroshima University

²College of Sport and Health Science, Ritsumeikan University



Keywords: pets, evacuation with pets, pet owners, non-owners

The Fukushima Daiichi Nuclear Disaster following Great East Japan Earthquake occurred in 2011. Not only humans, but also many animals suffered from the disaster. In Fukushima Prefecture, the exclusion zone was set for the area around the Fukushima nuclear power plant accident. Because of its urgency, the residents of the area had to evacuate quickly and their pets were left behind, released outdoors, left tied up, and so on. After this disaster, the Ministry of the Environment recommended to their booklet “Guidelines for aiding pets during a disaster” that people should evacuate with their pets during disasters. It is important for not only animal protection, but also supporting victims’ mental health.

This study was designed to identify psychological variables of the general public that could facilitate or inhibit the evacuation with pets and living with pets in shelters or temporary housing during emergencies. An Internet-based survey was conducted in 2015 focusing on differences in attitudes between pet owners and non-owners ($N = 600$). Multivariate regression analysis was conducted with “Co-evacuation with pets” and “Willing to accept others’ pets during evacuation and in shelters” as objective variables. Results indicated that pet owners’ “Worrying about around the other people” did not significantly inhibit co-evacuation. Moreover, approval of pets among pet owners aware of Ministry of the Environment recommendations was significantly higher than among unaware pet owners. Furthermore, “Worrying about around the other people” by people without pets had a significantly negative effect on each objective variable. Also, “Treating pets as equal to humans”, or having an “Equal status” had a significantly positive effect on the objective variables. These results suggest that the treatment of pets as equals by pet owners might be one factor facilitating positive attitudes in people without pets about co-evacuation with pets and having others’ pets during evacuations and in shelters.

Mesenchymal Stem Cell Therapy for Radiation Induced Lesions (Long Term Internship Topic Review)

T. Nguyen Quang ⁽¹⁾, O. Belyakov ⁽²⁾

¹Dept. of Molecular Oral Medicine & Maxillofacial Surgery, Hiroshima University

²Applied Radiation Bi



Keywords: mesenchymal stem cell, autologous bone graft, cutaneous radiation syndrome, radiation burn

Acute radiation syndrome (ARS) or cutaneous radiation syndrome is caused by accidental overexposure to radiation or in a radiation disaster are affected by radiation are skin, bone marrow, and other target organs. Those lesions are complex and difficult to heal, due to several and long-term effects of radiation and sterilization of local stem cells. Currently, many wound treatment protocols are being developed to improve the healing process after radiation damage to restore the barrier function and esthetical outcome of the skin. Mesenchymal stem cells (MSCs) therapy has been developed for nearly ten years to treat skin burns from localized exposure to ionizing radiation using mouse and pig models. Although the use of this therapy is limited, and patients should undergo surgery, this is a promising therapy for treating radiation induced lesions.

Insufficiency of *BUB1B* Gene Increases Structure - Chromosomal Instability Post Ionizing Radiation

Silvia Natsuko Akutsu, Ekaterina Royba, Kosuke Hosoba, Tatsuo Miyamoto,
Shinya Matsuura



Department of Genetics and Cell Biology, Research Institute for Radiation Biology and Medicine,
Hiroshima University

Keywords: PCS (MVA) syndrome, chromosome instability, ionizing radiation, BubR1 protein

The germline mutations of *BUB1B* gene encoding BubR1 protein, a central player of mitotic spindle assembly checkpoint, cause Premature Chromatid Separation (PCS) [Mosaic Variegated Aneuploidy (MVA)] Syndrome. These patients show predisposition to develop childhood cancer (Wilms tumor or rhabdomyosarcoma), due to numerical chromosomal instability (N-CIN). However, it's unknown whether PCS (MVA) syndrome is related with structure chromosomal instability (S-CIN) post ionizing radiation (IR).

In this study, we tried to evaluate the S-CIN post IR in PCS (MVA) syndrome using cytogenetic study and cytokinesis block micronucleus (CBMN) assay. We irradiated the fibroblasts from two patients (CB1SK and CB4SK) and two normal individuals (GM03941 and GM22277) with different high dose rates (0Gy, 1Gy and 2Gy) of gamma-radiation using Cs-137 (Gammacell 40 Exactor, 1Gy/min) and evaluate the structure chromosome instability (S-CIN) post IR. We counted dicentric, ring and acentric chromosome fragments in 100 metaphases of the irradiated cells using PNA-FISH assay. The PCS (MVA) syndrome patient cells showed S-CIN post IR more than normal control cells in a dose-dependent manner.

To consolidate the S-CIN post IR, we performed cytokinesis block micronucleus (CBMN) assay. We found that PCS (MVA) syndrome patients had higher percentage of micronuclei post IR in comparison with normal individuals in a dose-dependent manner. These results suggest that PCS (MVA) syndrome is a unique type of radio-sensitivity disease characterized with S-CIN post IR.

To clarify the biochemical and cell biology role of *BubR1* protein under ionizing radiation exposure, I established *BUB1B* gene knockout (KO) cell lines using genomic editing technology, Clustered Regularly Interspaced Short Palindromic Repeats/Cas protein 9 (CRISPR/Cas9) system. Currently, I attempt to perform a time-lapse imaging of dicentric and ring chromosome formation in *BubR1*-KO cell lines labeled with GFP-H2A (DNA) and CENP-A mRuby2 (centromere) fluorescent proteins.

Establishment of School-based Health Check-up Systems for Radiation Disaster Preparedness in the Kingdom of Cambodia

Chuon Channarena^{1, 3}, Svay Somana², Junko Tanaka¹

¹Department of Epidemiology, Infectious Disease Control and Prevention, Institute of Biomedical and Health Sciences, Hiroshima University, Hiroshima, Japan

²Ministry of Health, Phnom Penh, Cambodia

³Phoenix Leader Education Program, Hiroshima University, Hiroshima, Japan



Keywords: Health promotion; health checkups; schoolchildren; Cambodia; radiation disaster preparedness

Background: The Cambodian demand for energy is on the increase due to the increasing electricity use to develop the country and the growing standards of living of the Cambodian. The government of Cambodia is progressing with the plan to construct nuclear power plants as the demand for energy supply continues to rise, while, concerns are being raised regarding past nuclear power plant accidents including the Three Mile Island (US), Chernobyl (Former Soviet Union) and lastly Fukushima Daiichi Power Plant (Japan). Radiation disaster preparedness can be improved by having baseline data before the occurrence of the disaster. To date, health promotion as a national policy lacks capacity in the Cambodian educational sector. Moreover, data of health problems in the schools is scarce as compared with data from public hospitals. **Aims:** The purpose was to investigate the prevalence of health problems among schoolchildren in Siem Reap Province as a baseline assessment to help the Ministry of Health of Cambodia design health screening systems for schoolchildren. The ultimate aim is to have necessary data that can be used as baseline data for disaster management.

Methods: It was a cross-sectional study where a total 162 schoolchildren (3rd and 4th grade) from Siem Reap Province Teacher Training Elementary School were selected for this study. After obtaining written consents from parents/legal guardians of each child, questionnaire about past medical history and current health problems of each child was answered by parents/legal guardians at home. Children were examined at the school for health problems including lung and heart diseases, Ear Nose Throat diseases, urinary infection and nutritional status in June 2016. Those suspected with disease were advised to visit a local hospital.

Results: 135 (83.3%) study participants were completely examined among 137 schoolchildren. The age of schoolchildren ranged from 8 to 15 years old (average age was 9.9 ± 1.1 years old) as of 2016. Prevalence of chronic otitis media was 7.4% and that of impacted cerumen was 14.1%. Anthropometric measurement showed that 7.4% of the schoolchildren had severe thinness ($BMI < -3SD$), whereas 7.4% also were obese ($BMI > +2SD$).

Conclusion: Undiagnosed health problems were common among the schoolchildren. This cross-sectional study may be important to prevent burden of diseases in Cambodian schoolchildren, as well as in their communities. This study can help in providing basic data of the schoolchildren to the Royal government of Cambodia. It would be important to establish a health checkup system in Cambodia. In case of nuclear accident this health checkup may be help in the recovery phase.

Pulling and Pushing Factors of Migration in Fukushima Nuclear Affected Areas - Case Study of Minamisoma City

Do Xuan Bien

Department of Geography, Graduate School of Letters, Hiroshima University

Keywords: Fukushima nuclear disaster evacuation, disaster migration, push and pull factors, disaster migration determinants.



The Fukushima nuclear accident has triggered a massive evacuation from its affected areas. Recent statistical data reports that among 160,000 evacuees, nearly 90,000 people have not returned to their home yet. To understand the nuclear disaster induced dynamics, different approaches have been employed in various studies. Distance Decay Theories, Social Capital, and Gravity Model are widely used in investigating the mechanism of different types of migration. One of the primary approaches that I use in examining the motives of migration due to Fukushima Nuclear Disaster is Push and Pull Analysis. This theory is broadly employed to elucidate migration patterns by analyzing the attraction and barriers of migration in both migration destinations and location of origin.

In this presentation, I would like to present the outcomes of my analysis of push and pull factors in Minamisoma City, which was located in 3 different evacuation zones and has the largest number of evacuees among 12 municipalities in the affected areas. This analysis bases primarily on the questionnaire survey on 286 evacuees, both returned and not returned, from May to October 2016. Push factors are derived from the reasons of not returning (by not returned group), and from the comparisons of the living conditions of Minamisoma City before the accident and at the present (by returned group), and the comparisons of the living conditions between Minamisoma City and evacuation destinations. The possible disparities referring to gender and ages will also be discussed.

Longitudinal Research on Effects of Trust and Perceived Procedural Fairness on Accepting the Restarting of Nuclear Power Plants

Fumie Yamaguchi, Kiriko Sakata

Graduate School of Integrated Arts and Sciences, Hiroshima University



Keywords: nuclear power plant, procedural fairness, trust, Elaboration Likelihood Model

The Elaboration Likelihood Model (ELM), which is a general theory of attitude change, was used to investigate effects and changes in trust, perceived procedural fairness, and perceived benefits on situation dependent acceptance of restarting nuclear power plants (NPPs) in Japan. Two longitudinal internet surveys were conducted ($N = 91$) before and after restarting NPP. Multiple regression analyses indicated that increased perceived procedural fairness and perceived benefits influenced accepting the restarting of NPPs in people with a strong interest in restarting NPPs, regardless of their original attitude towards NPPs, whereas only original attitudes about NPPs influenced acceptance in people with a weak interest in restarting NPPs. Moreover, a high degree of trust in NPP operators increased perceived benefits of restarting in people with a strong interest in restarting NPPs. Our results suggest that both perceived procedural fairness and trust in NPP operators are used as information in the central route of ELM.

Method for Determining the Depth Profile of Radioactive Cesium in 30 cm Soil Core by IP-Based Unfolding Method

Thanh Tat Nguyen, Tsuyoshi Kajimoto, Kenichi Tanaka and Satoru Endo

*Quantum Energy Applications, Graduate School of Engineering, Hiroshima University,
1-4-1 Kagamiyama, Higashi-Hiroshima, Hiroshima 739-8527, Japan*



Keywords: Depth profile by IP, IP-Based unfolding method

The Fukushima Daiichi Nuclear power plant accident in March 2011 led to large amount of radioactive materials released into environment. In these radioactive materials, ^{134}Cs and ^{137}Cs have quite long half-live of 2.06 and 30.2 years, respectively, therefore, it takes time to decay out. Depth profile of ^{134}Cs and ^{137}Cs is useful information for investigation of radioactive cesium movement in the soil. The depth profile of radioactive cesium is determined based on the division of soil core into layers, and determination of radioactivity concentration in these layers by gamma measurement. However, the resolution of the depth profile is bad, because it is difficult to divide the soil core to layer with thickness lower than 1 cm. In this research, a method for increasing the resolution of the depth profile which is named IP-Based unfolding method is proposed.

The IP-Based unfolding method is to determine the true distribution of the radionuclides by the unfold analysis of an imaging plate (IP: Fujii film Co., Ltd, BAS-IP MS 2040) intensity profile of the soil core. To obtain the IP intensity profile of the soil core, the soil core rolled with the IP is put in the lead chamber for one day. Then, a 2-dimension image is read by the Image Analyzer Typhoon FLA 7000 (GE Healthcare Life Science Co.). The IP intensity profile is obtained by taking average intensity in each 0.1 mm x 150 mm of the 2-dimension image of the soil core. The unfolding analysis is performed based on the IP intensity profile and response functions of $^{134, 137}\text{Cs}$ and ^{40}K . The response function is the relation between the distance from a source to the deposition position, and the total deposited energy of the β -ray and γ -ray emitted from this source on the sensitive layer of the IP. The response functions of $^{134, 137}\text{Cs}$ and ^{40}K are calculated by PHITS version 2.82. The depth profile of soil core is achieved by scaling the obtained results by unfolding analysis with the gamma measurement results.

To validate the applicability of the proposed method, the unfolding analysis are performed on the different shapes of IP intensity profile of the samples which were collected at Iitate village in 2013, and 2015. The unfolded results show the method is good application for the different shapes of the IP intensity profile. The calculated depth profiles show good agreement with the gamma measurement results. In addition, the advantage of the IP-Based unfolding method is the depth profiles of the soil cores are made clearer than those obtained by gamma measurement.

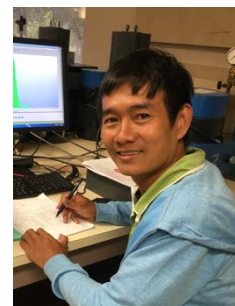
Bond Selectivity Study of CsTolenA, B, C, D, and E to Cs⁺ by using Density Functional Theory

Nguyen Thanh Hai^{1,2)}, Sunao Miyashita²⁾ and Satoru Nakashima^{1, 2, 3)}

¹Radioactivity Environmental Protection Course, Phoenix Leader Education Program, Hiroshima University

²Department of Chemistry, Graduated School of Science, Hiroshima University

³Natural Science Center for Basic Research and Development, Hiroshima University



Keywords: cesium tolerance, bond selectivity, conductor-like screening model, density functional theory

Various materials such as zeolites have been proposed as Cs⁺-capturing agents for the decontamination of radioactive waste water. Recently, it was reported that CsTolen A, which contains multiple nitrogen in formula, enables a plant to avoid Cs⁺ uptake and thus harmful accumulation⁽¹⁾. It was also reported that CsTolen A has a larger affinity to Cs⁺ compared with K⁺ in the presence of water molecules. On the other hand, we have studied the uptake of radioactive cesium in rice after nuclear accident. Therefore, in the present study, we tried to consider the bond selectivity of CsTolenA to E with Cs⁺ by using the density functional theory (DFT).

DFT calculation revealed that CsTolenA, B, C, D, and E have a larger affinity to K⁺ compared with Cs⁺ in gas phase. This is due to larger electrostatic interaction between CsTolenA to E and K⁺. In the next step we will build the optimized model of CsTolen's structures in aqueous solution and calculate binding energy of cesium and potassium with CsTolens. The benchmark for conductor-like screening model (COSMO) calculation of CsTolens is unknown, therefore we will refer to the selectivity of dibenzo-18-crown-6 for alkali metal cations in aqueous solution⁽²⁾. The results will be shown on the poster.

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Spatial Analysis of Radiocesium Concentrations in a Bryophyte (*Hyophila propagulifera*, Musci) within 50km from Fukushima Daiichi Nuclear Power Plant

Sharifah Nabihah Syed Othman¹, Toshinori Okuda¹, Toshihiro Yamada¹, Endo Satoru²,

¹ Graduate School of Integrated Arts and Sciences, Hiroshima University

² Graduate School of Engineering, Hiroshima University



Keywords: *Hyophila propagulifera*, Radiocesium, Environment factors, Fukushima accident

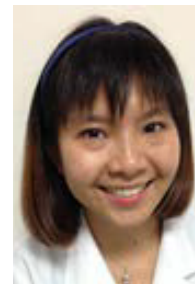
An analysis was conducted to understand environmental influence towards radiocesium concentrations in *Hyophila propagulifera* collected around northeast region of Fukushima prefecture on November 2014, 3 years after Fukushima Daiichi Nuclear Power Plant (FDNPP) accident. The sampling area was conducted in three distance ranges from FDNPP; remote (40 km - 50 km), middle (25 km – 40 km) and close (10 km – 25 km) ranges and two different altitude areas; High elevation (>100 m above sea level) and Low elevation area (< 100 m above sea level). A total of 45 samples were collected to analyze the ¹³⁷Cs concentration (Bq/kg) in relation to distance from FDNPP, altitude, air dose rate, and slope angle. The analyses revealed significant relationship between air dose rate (μSv/hr) and radiocesium concentration in the moss (R=0.87, p<0.001, Pearson's rank correlation coefficient). The influence of altitude was analyzed between those ranges using ANOVA and the graph illustrated shows samples collected in remote range has more influence in altitude compare to close range-collected samples. No correlation was found between radiocesium concentration in the moss and the slope angle of the sampling site. The study site will be expanded and incorporated with GIS tool to compare the contamination map distribution between radiocesium concentrations in the moss with the air dose rate (μSv/hr) recorded on March 11,2011. The results may reveal the potential of the moss as a biodetector in monitoring the contamination level in Fukushima.

Knowledge Based Planning Model using Prioritized Optimization Dataset

Yen Hwa Lin¹, Sean L. Berry², Linda Hong², Margie A. Hunt²

¹ Graduate School of Biomedical and Health Sciences, Hiroshima University, Hiroshima, Japan

² Department of Medical Physics, Memorial Sloan Kettering Cancer Center, New York, USA



Keywords: Knowledge based planning, prioritized optimization.

Radiation treatment planning is a multi-step process. While the goal is to produce consistent plans so that one can expect consistent treatment outcomes, individual differences in skill, experience, and training lead to variability in the planning result. Clinically, plan variability is managed by supplementing target and organ-at-risk dose-volume planning objectives with allowable tolerances and variations. Many studies have been proposed to reduce plan inconsistency. One is knowledge based planning (KBP) which uses database of prior treatment plans to predict an acceptable plan for a new patient. Another method is to produce treatment plans on the Pareto front by using a prioritized optimization (PO) algorithm. We hypothesize that using PO to populate plans for KBP modelling will efficiently create a high quality model that will predict the best possible plans for new sets of patients. Plans produced with PO-KBP will be compared with those produced with traditional-KBP using dosimetric analysis.

Detection of ATP-Dependent Inflammasome Suppression on Innate Immune Responses in Sepsis

Ho Minh Van¹, Hirohashi Nobuyuki¹, Kong Weng Sheng², Kanno Masamoto², Shime Nobuaki¹



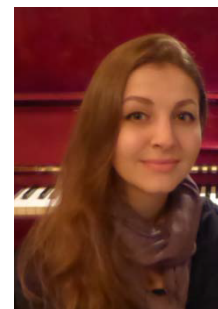
¹Department of Emergency and Critical Care Medicine, ²Department of Immunology, Graduate School of Biomedical and Health Sciences, Hiroshima University

Keywords: sepsis, immunoparalysis, DAMPs activities, ATP, innate immune responses

Introduction: Sepsis is characterized as an organ dysfunction caused by a dysregulated host response to infection. Innate immune responses via a release of damage-associated molecular patterns (DAMPs) due to sepsis-induced tissue damage might play additional roles in the complicated pathophysiology of sepsis. This study aims to investigate the mechanism of serum on DAMPs activities during sepsis. **Materials and methods:** We collected serum samples from 10 traumas and 49 septic patients admitted to the ICU of Hiroshima University Hospital, and 5 healthy controls. For assays, THP-1 macrophages were treated by serum in the presence or absence of known DAMPs molecules. Detection of IL-1 β and intracellular components associated with pathway were used to evaluate DAMPs activities. **Results:** We found a group of septic serum (85.7%) resulted in significantly lesser IL-1 β production. The suppression of IL-1 β secretion was observed in almost all of septic patient sera in the presence of ATP, but not in MSU, HMGB1. Furthermore, the suppression of IL-1 β secretion was evident from day-1 to day-7 of admission period. We observed clear difference between survival and non-survival serum on suppressive profile of IL-1 β secretion in the presence of ATP at day 7 ($p < 0.01$). On mechanisms of ATP-induced IL-1 β pathway, the concentration of intracellular ATP, inositol 1,4,5, -triphosphate, and cytosolic calcium are significantly decreased in septic serum day-1 ($p < 0.01$). Especially, significant downregulation of active caspase-1 was observed in the presence of non-survival septic serum day-7 ($p < 0.01$). **Conclusion:** This study indicated that septic patient serum contains ATP-dependent inflammasome suppressive factor, that inhibit IL-1 β by immune cell via intracellular pathway, possibly leading to immunoparalytic status. Therefore, we would like to propose this factors as ATP-dependent Immunoparalysis factors (AIPF) in septic patient serum.

Genome Editing Technique as a Useful Tool for Analysing Individual Differences of Radiosensitivity

Ekaterina Royba¹, Tatsuo Miyamoto¹, Silvia Natsuko Akutsu¹,
Kosuke Hosoba¹, Yoshiki Kudo², Satoshi Tashiro³,
and Shinya Matsuura¹



¹ Department of Genetics and Cell Biology, Research Institute for Radiation Biology and Medicine, Hiroshima University, Hiroshima 734-8553, Japan

² Department of Obstetrics and Gynecology, Graduate School of Biomedical Sciences, Hiroshima University, Hiroshima 734-8551, Japan

³ Department of Cellular Biology, Research Institute for Radiation Biology and Medicine, Hiroshima University, Hiroshima 734-8553, Japan

Keywords: individual radiosensitivity, cytokinesis-block micronucleus assay, genome editing

Current standards for radiological protection of the public have been uniformly established. However, numerous scientific publications have been postulated that individual differences of radiosensitivity exist in human populations. Development of screening assay for quantitative estimation of individual radiosensitivity might allow more personalized treatment of cancer and improve therapeutic index of radiotherapy for patients with mild radiosensitive phenotype.

Line of studies in the field of radiation biology has suggested that the individual difference of radiosensitivity is probably attributed to the nucleotide variants on the DNA repair genes. Thus, it is possible to develop a predictive assay that will help to detect and estimate individual difference in radiosensitivity using a key genetic regulator of DNA damage response in human cells.

Ataxia-telangiectasia mutated (*ATM*) is a gene encoding a key intracellular master kinase that control reparation of DNA double-strand breaks (DSBs) induced by ionizing radiation (IR). It is estimated that about 1% of general populations carry heterozygous mutations on the *ATM* gene. To evaluate impact of such mutations on individual radiosensitivity, we have developed semi-automated cytokinesis-block micronucleus (CBMN) assay and applied it for adherent human cells.

Evaluation of size effects of mutations on DNA repair genes using CBMN assay might be affected by genetic heterogeneity and confounding factors (such as age, gender, smoking, life style, etc.) existing in human population. To overcome this issue, we have designed CRISPR/Obligare genome-editing strategy using a human cell line with uniform genetic background (not affected by confounding factors). We have generated model cell lines and evaluated impact of homozygous and heterozygous mutations on *ATM* gene on individual radiosensitivity.

We propose that the genome editing technique could be implemented into radiation biology to investigate size effects of mutations on DNA repair genes on individual radiosensitivity.

Migration Pathway of Radioactive Materials from the Japan Sea to the Okhotsk Sea

Yasushi Nabae^{1,2)}, Sunao Miyashita¹⁾, Satoru Nakashima^{1,3)}

1) Radioactivity Environmental Protection Course, Phoenix Leader Education Program for Renaissance from Radiation Disaster, Hiroshima University

2) Hydrographic and Oceanographic Department, Japan Coast Guard

3) Natural Science Center for Basic Research and Development, Hiroshima University



Keywords : Japan Sea, Okhotsk Sea, radioactive cesium, migration pathway.

1. Introduction

The Fukushima Daiichi Nuclear Power Plant (FDNPP) accident occurred in March 2011. ^{134}Cs was detected in seabed soil at Agano River Mouth offing and Ishikari Bay. However, the migration pathway of radioactive cesium from FDNPP is unknown. The purpose of this study is identification of migration pathway of radioactive cesium.

2. Methods

We collected seabed soils at sampling sea areas of Figure 1. Radioactive cesium in seabed soils was measured with a germanium semiconductor detector. The γ radioactivity was measured for 80,000 – 600,000 seconds.

3. Results and Discussion

Figure 2 shows that concentration of ^{134}Cs at Agano River mouth offing was the highest and ^{134}Cs was not detected in seabed soil at Naoetsu offing. It was suggested that Agano River mouth was an outflow source of ^{134}Cs and ^{134}Cs was not migrated to Naoetsu offing.

Concentration of ^{134}Cs decreased exponentially with migration distance. There is a gap between Ishikari Bay and Soya Strait. The Tsushima Warm Current and the Soya Warm Current exist in this sea area and east Karafuto Current merges near Soya. It was supposed that ^{134}Cs migrated from the Agano River mouth to the Notsuke Strait by ocean currents, and these ocean currents affected the change of concentration of ^{134}Cs in seabed soil.

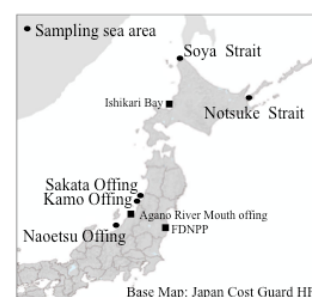


Fig. 1 Sampling sea areas

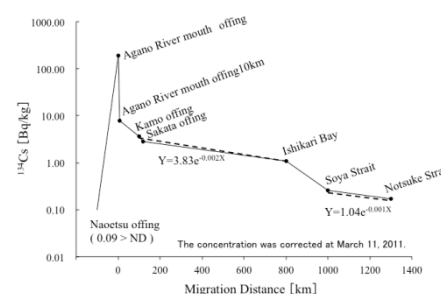


Fig. 2 ^{134}Cs vs Migration Distance from Agano River mouth

The Importance of Public Participation to Intermediate the Lack of Radiation Information after Fukushima Dai-ichi Nuclear Power Plant Accident

Wim Ikbal Nursal

Graduate School of Integrated Arts and Sciences
Hiroshima University



Keywords: citizen science, Fukushima, nuclear disaster, public participation, SAFecast

The lack of radiological information for public after Fukushima nuclear disaster had motivated a group of citizen to assemble and craft a way to collect radiation data by developing a simple and affordable device for detecting and storing radiation data and system for centralizing and visualizing it. We motivated to see how comparable the data collected by lay people to that collected by official experts or scientists. The data used in this study were retrieved from Japan Atomic Energy databases which represents the scientist-group data and SAFecast databases represents citizen science data. Specifically, the data were subset based on certain mission dates and/or comparable period within the geographic boundary of Fukushima Prefecture. We perform correlation analysis on crowdsourced with expert data to see how much conformity between these two different datasets. The result shows that correlation of expert data of the second, fourth, and seventh missions with the corresponding crowdsourced data are relatively high that is 0.93, 0.96, and 0.87 subsequently, which means the air dose rate values of two datasets are agree to each other. The magnitude of air dose rate change within the period of November 2011 to October 2012 is about 25% and October 2012 to December 2013 is about 30% for the expert data and 30% and 40% for the crowdsourced data in the same period. We also noticed that just right after the disaster, the extent of citizen measurement were spatially larger than those expert groups. These evidences, shows that the non-scientist group data is reliable relatively to the scientist group data. Based on these findings, we would like to emphasize the importance of public participation during the crisis and strongly encourage the government to give more recognition and collaboration with citizen in data collection as a strategic response to anticipate disaster in the future.

The Spatial Pattern of Cs-137 Contamination of Evergreen Conifer Trees, Japanese Fir

Yurika Oba, Toshihiro Yamada

Graduate School of Integrated Arts and Sciences, Hiroshima University



Keywords: The Fukushima accident, radiocesium, natural forests, evergreen trees, needle-leaves

Japanese fir (*Abies firma*) growing in Fukushima was investigated for the assessment of radioactivity contamination caused by the Fukushima Daiichi Nuclear Power Plant (FDNPP) accident. The study site was located approximately 45 km northwest from the FDNPP. Field survey was conducted in March 2016, 5 years after the accident. We sampled needle-leaves of this species and soils under the sampled trees, and measured the concentration of radiocesium (Cs-137) in samples. Using these results, we performed statistical analysis for spatial structures of contamination level of the sampled trees. We calculated the Moran's I values to analyze the spatial autocorrelation of data.

The results from the statistical analysis indicated that there was no correlation between the contamination levels of needle-leaves and soil. Moreover, there was a difference in spatial pattern of the contamination levels between needle-leaves and soil. These results indicated that the root uptake of radiocesium from soil into plant was very small in Fukushima forests 5 years after the accident.

From the results of Moran's I statistics, the significant positive spatial autocorrelation between the concentration of Cs-137 in trees within 2.5 m was found, indicating that the sampling should be conducted by keeping at least 2.5 m interval between target trees.

An Investigation of the Best Setting of Collimator Angle in Automatically-Generated Volumetric Modulated Arc Therapy of Head and Neck Cancer



Uranchimeg Tsegmed¹⁾, Yuji Murakami¹⁾, Takeo Nakashima²⁾, Tomoki Kimura¹⁾, Ippei Takahashi¹⁾, Ikuno Nishibuchi¹⁾, Kentaro Miki¹⁾, Akito Saito¹⁾, Masahiro Kenjo¹⁾, Shuichi Ozawa¹⁾, Yasushi Nagata¹⁾

1) Department of Radiation Oncology, Hiroshima University

2) Division of Radiation Therapy, Hiroshima University Hospital

Keywords: Collimator angle, automated treatment planning, volumetric modulated arc therapy, head and neck cancer

Intensity modulated radiation therapy (IMRT) has been widely used as a curative treatment for head and neck (HN) cancers because of its ability to increase dose to the tumor and spare radiation dose to the salivary glands and other critical organs. Recently, volumetric modulated arc therapy (VMAT), which is rotational variant of IMRT, is increasingly being used as an effective and time-efficient alternative. However making the best VMAT plan is labor-intensive, time consuming and plan quality is not consistent. Currently IMRT optimization helper softwares, which are fully automated treatment planning techniques, are available to apply for VMAT to solve the problems.

Like for manually-generated VMAT plan, an optimal choice of collimator angle of automatically-generated VMAT (AG-VMAT) plan can increase the better dose distribution.

The objective of this study is to investigate the dose–volume variations of planning target volume (PTV) and organs at risk (OARs) in nasopharyngeal cancer (NPC) patients planned with AG-VMAT when varying collimator angles to determine best setting of collimator angle.

The double arc AG-VMAT plans will be created using Auto-planning (AP) software (Pinnacle3. 9.10.) for seven NPC patients with collimator angle set to 20°/340°, which is a reference collimator angle pair of AP. The dose prescription will be set at 46 Gy to large-field including both gross targets and the elective regions and 70 Gy at 2 Gy/fraction to the gross and high risk-target volumes delivered as a two-step VMAT planning. The AG-VMAT plans will be re-optimized with different collimator angles using the same set of optimization objectives and priorities for each patients. Monitor units, dose coverage of PTV and OARs' doses will be compared in different collimator angles.

This study will determine the best setting of collimator angle in double arc automatically generated VMAT plan for NPC patients.

Understanding Mental Health Strength for Children in Fukushima from the View-point of Positive Psychology

Tatsuru Honda

Department of Psychology, Graduate School of Education, Hiroshima University



Keywords: Mental health strength, Psycho-educational program, Recovery from radiation disaster, Awareness of the strength inherent

In the case of the Great East Japan Earthquake and the Fukushima Daiichi Nuclear Power Plant accident, radiation disasters and related information disasters occurred in addition to natural disasters, which is quite different from prior disasters. Fukushima disaster resulted in direct and indirect radiation influences on people. Due to these influence, especially the long-term ones coursed by radiation, many people have not adjusted well mentally and physically. This is the reality of Fukushima. Although most of children could have adjusted to the changed environment by utilizing their mental health strength, some children who are vulnerable to these issues have been under the strong influence of that.

In this presentation, I discuss my research plan to investigate children's mental health strength and develop a psycho-educational program to grow the strength inherent for children in Fukushima based on fundamental studies in positive psychology. This research encourages awareness of the inherent strengths of individuals and emphasizes finding ways to support them. I believe that this paradigm succeeds because it helps people, nurture the foundation that forms psychological well-being and targets ways to lower their felt sense of psychological burden. The idea of preventing mental health issues by supplementing inherent strength is quite different from conventional models that focus on psychopathology. When thinking about recovery and reconstruction processes in disasters, I think that ideas based on mental health strength can lead to more effective prospects. At the present time, I am evaluating possible candidates for psycho-educational program and their associated mechanisms for my research plan. My chief aim is to encourage children's own self-understanding as a means of encouraging awareness of the strengths inherent in each child. While specific activities are still under consideration, I hope to discover ways to boost children's minds as they become a driving force in recovery from radiation disaster.

Commissioning Optically Stimulated Luminescence Dosimeter (OSLD) System and OSLD Batch

Chryzel Angelica Gonzales^{1,2}, Yasushi Nagata^{1,2}, Paola E. Alvarez^{3,4}, and Stephen F. Kry^{3,4}

¹Graduate School of Biomedical and Health Sciences, Hiroshima University

²Department of Radiation Oncology, Hiroshima University Hospital

³Department of Radiation Physics, The University of Texas MD Anderson Cancer Center

⁴Imaging and Radiation Oncology Core (IROC-H) - Houston



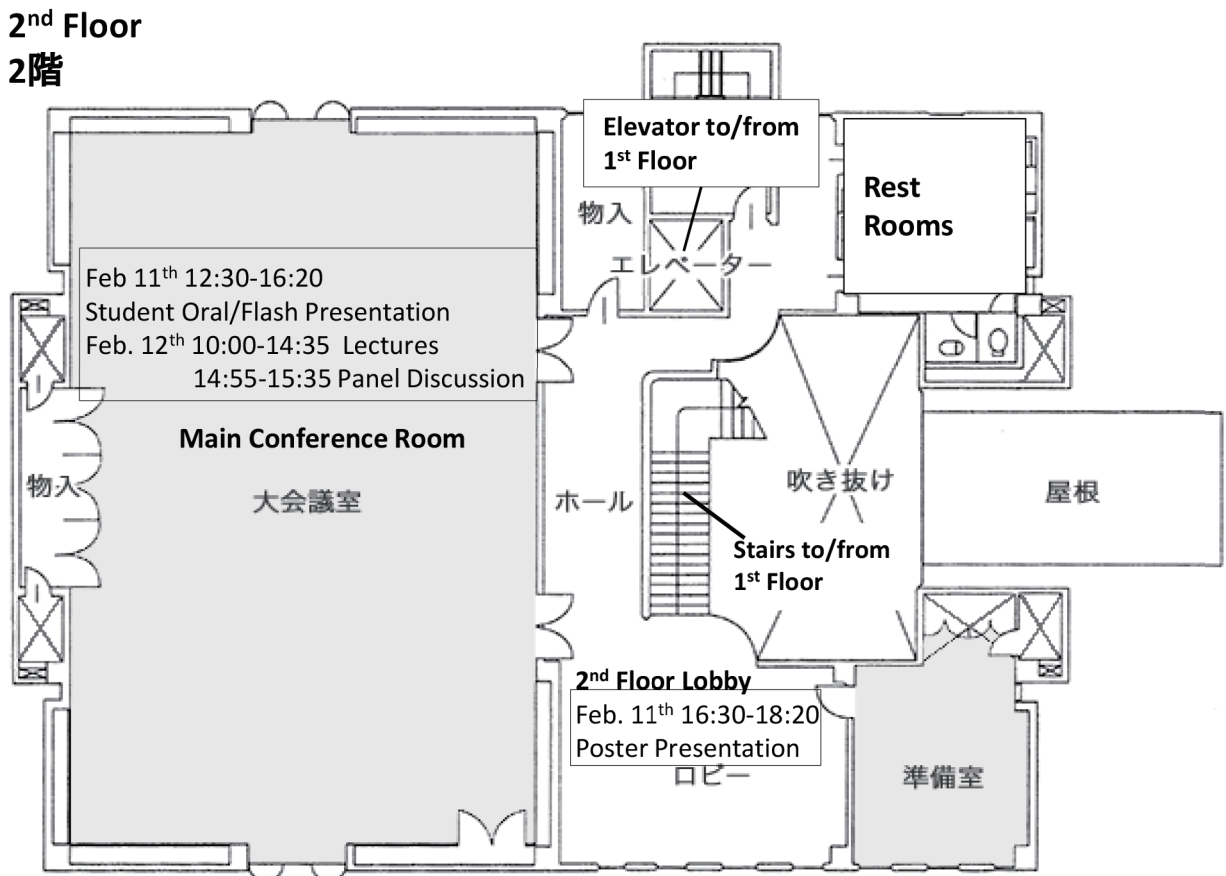
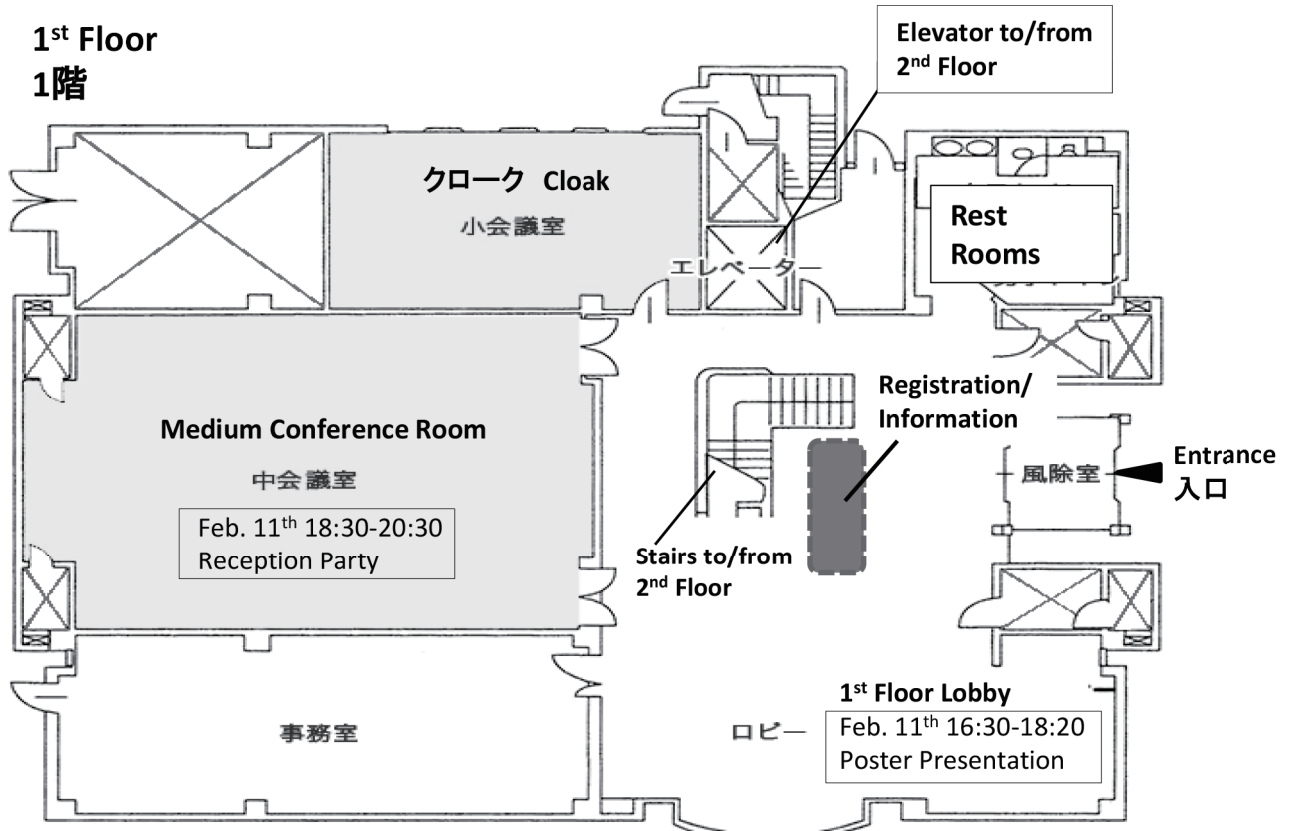
Keywords: nanodot, dosimetry, OSL, IROC

The commissioning process of an OSLD system is performed to determine the parameters needed for dose determination of the system before it is released for clinical use. The Imaging and Radiation Oncology Core Houston QA office (IROC-H) commissioned their nanodot OSLDs to be used for remote audit verification of photon and electron beams output.

The OSLD commissioning process includes the evaluation of the reader and characterization of the detectors. The reader used is the Microstar reader from Landauer. The detectors used are the nanodots, unscreened, from Landauer. The commissioning tests performed on the reader include determination of the baseline for the QA measurements (Dark count, LED count and PMT count), characterization of adapter used to support the detector within the reading process, reproducibility of the readings, and definition of a reading technique. The commissioning of the detectors includes the evaluation of correction factors needed to determine the dose based on the detectors' readings. These corrections are dose response, fading of signal, energy response, and individual response of each detectors in comparison with the batch (ECF).

An example of commissioning process was designed for training purposes with a Microstar reader, 5 adaptors and a group of 136 nanodot OSLDs. The reference energy used was Cobalt-60 and the reference dose level was 100 cGy. The results were evaluated using the acceptance criteria defined by IROC-H for these procedures. The corrections for dose response and ECF were determined in the group of detectors. Correction factors were compared with the commissioning data determined by IROC-H during the commissioning process for the OSLD batch.

Koujin Kaikan Conference Hall Floor Plan



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CONTACT

Hiroshima University Phoenix Leader Program Office

1-1-1 Kagamiyama, Higashihiroshima 739-8524

TEL: 082-424-4689

E-mail: phoenix-program@office.hiroshima-u.ac.jp

<https://www.hiroshima-u.ac.jp/en/phoenixlp>