

Report

Collaborative Seminar at Hirosaki University
with Korea Institute of Radiological and Medical Sciences (KIRAMS)
and Chang Gung Memorial Hospital (CGMH)

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Received 2 April, 2025; revised 13 May, 2025; accepted 16 May, 2025

A joint seminar was held at the Graduate School of Health Sciences of Hirosaki University on 18 and 19 July 2023 with Hirosaki University (Institute of Radiation Emergency Medicine, Graduate School of Health Sciences and the Radiation Emergency Medicine and Cooperation Promotion), the Korea Institute of Radiological and Medical Science (KIRAMS) and Chang Gung Memorial Hospital (CGMH), Taiwan. Hirosaki University has held six joint research seminars with KIRAMS, and this year's seminar was held with officials from CGMH, the main institution in Taiwan for radiation emergency medicine. The most recent three years were online-only due to the COVID-19 pandemic, but this year the meeting was held face-to-face, with six participants from KIRAMS and three officials from CGMH. It was the first time in three years that we were able to hold a face-to-face seminar, and the two-day event reaffirmed the importance of mutual collaboration and gave us hope that we can further expand the scope of our cooperation. This report introduces an overview of the joint seminar as well as presentations on the main themes of each of the organizations.



Fig. 1. Group photo of the seminar participants.

1. Donovan Anderson, 2. Susan Yang, 3. Masahiro Hosoda, 4. Shinji Tokonami, 5. Tomisato Miura, 6. Ikuo Kashiwakura, 7. Ki Moon Seong, 8. Minsu Cho, 9. Toshiko Tomisawa, 10. Masaru Yamaguchi, 11. Chih-Chuan Lin, 12. Seung Bum Lee, 13. Takakiyo Tsujiguchi, 14. Geum-cheol Jeong, 15. Jaemin Jeong, 16. Hiroyuki Hanada, 17. Po-Cheng Chen, 18. Ching-I Kuo.

1. Introduction

Hirosaki University has organised joint trainings and seminars with the Korea Institute of Radiological and Medical Sciences (KIRAMS) since 2013. The impetus for holding these joint seminars goes back to our visit to KIRAMS in 2013 with the aim of expanding international collaboration in radiation emergency medicine activities. Subsequently, Dr Minsu Cho of KIRAMS proposed a joint nuclear terrorism response training exercise in South Korea to Professor Toshiya Nakamura of the Graduate School of Health Sciences and his colleagues, who were attending an international symposium in Munich in May 2013. Eight members of Hirosaki University immediately participated in a joint training exercise at the World Cup Soccer Stadium on Jeju Island, South Korea, in November of the same year, and had an extremely meaningful experience. Since then, mutual visits have continued, and since 2017, the exchange has expanded to academic exchanges on radiation science.

In 2023, on 18 and 19 July, Hirosaki University and KIRAMS were joined by Chang Gung Memorial Hospital (CGMH), the main institute for radiation emergency medicine in Taiwan, for a joint seminar by institutions from three countries (Fig. 1). For the past three years, the meeting has been held only online due to the COVID-19 pandemic, but this year we were able to hold it face-to-face. Six participants from KIRAMS and

three participants from CGMH attended the meeting. The first day mainly consisted of a research exchange meeting and a tour of the facilities. The presentations from each organization were given by Professor Hiroyuki Hanada (Advanced Emergency Medical Center), Professor Toshiko Tomizawa (Graduate School of Health Sciences), and Associate Professor Hirofumi Tazoe (Institute of Radiation Emergency Medicine, IREM) from Hirosaki University, Dr. Geum-cheol Jeong and Dr. Ki Moon Seong from KIRAMS, and Dr. Chih-Chuan Lin from CGMH gave presentations on their activities (Table 1).

On 19 July, the participants were divided into groups on nuclear emergency preparedness systems and distribution of stable iodine, biodosimetry training and radioprotective agent development, each discussing issues in their respective countries. In particular, the biodosimetry group received technical guidance from Professor Tomisato Miura and Assistant Professor Donovan Anderson of the IREM. In the afternoon, members of each organization gathered for a lively discussion about future collaboration. By holding a face-to-face seminar for the first time in three years, the two-day seminar reaffirmed the importance of mutual collaboration and is expected to further expand the scope of collaboration.

This report summarized the presentations made on the day of the seminar by key members of each organization

Table 1. Schedule of the collaborative seminar at Hirosaki University with KIRAMS and CGMH

Tuesday, July 18, 2023. Main meeting room (Building-A, 2F)	
Prof. Masahiro Hosoda (Graduate School of Health Sciences)	
09:00 ~ 09:05	Opening ceremony: Prof. Ikuro Kashiwakura (Director, Radiation Emergency Medicine and Cooperation Promotion)
09:05 ~ 09:35	Lecture (20 min for presentation, 10 min for Q&A) Prof. Hiroyuki Hanada (Director, Advanced Emergency and Disaster Medical Center) "Clinical aspects of our radiation emergency department before, during and after the Fukushima Daiichi Nuclear Power Plant accident."
09:35 ~ 10:05	Dr. Geum-cheol Jeong (KIRAMS) "Introduction about National Radiation Emergency Medical Center of KIRAMS"
10:05 ~ 10:35	Prof. Toshiko Tomisawa (Graduate School of Health Sciences) "Human resources development for radiation emergency preparedness using AI and VR"
10:45 ~ 11:15	Dr. Ki Moon Seong (KIRAMS) "Current status of biological dosimetry in KIRAMS"
11:15 ~ 11:45	Dr. Hirofumi Tazoe (Institute of Radiation Emergency Medicine) Prof. Naofumi Akata (Institute of Radiation Emergency Medicine) Dr. Ryohei Yamada (Institute of Radiation Emergency Medicine) "Current status and human resource development of bioassay analysis for internal dose evaluation"
11:45 ~ 12:15	Dr. Chih-Chuan Lin (Chang Gung Memorial Hospital) "Taiwan's medical system for radiation emergency medicine and training"

on their activities. It is hoped that it can be used in the future as a record of future activities.

2. Summary of the presentation by Prof. Hiroyuki Hanada

The radiation emergency system before the Fukushima accident was the same system as the usual emergency medical system that consisted by primary, secondary, and tertiary center in Japan. A criticality accident happened at JCO in September 1999. Three men had acute radiation syndrome, and they were transferred to the tertiary center of the National Institute of Radiological Science. After this JCO accident, a radiation emergency medical system was established for the first time in Japan. These systems mainly focused on patients with injuries and contaminated in nuclear facilities. During and soon after the Fukushima accident, we had to treat not only contaminated patients but also manage a lot of evacuating citizens. Soon after the Fukushima accident, disaster control headquarters in Fukushima invited a radiation emergency medical managing team from Hirosaki University. Hirosaki University send a lot of people to Fukushima for the management of the acute phase of citizen evacuation, to participate in the project for evacuating residents to temporarily return to their houses in restricted areas, and for on-site medical care for people working inside the Fukushima Daiichi Nuclear Power Plant. After the Fukushima accident, the government launched the Nuclear Regulatory Authority. Subjects of radiation emergency medicine have been changed from on-site

workers to off-site citizens. Nuclear emergency core hospitals were designated 1-4 hospitals in each prefecture which has Nuclear Power Plants. Several nuclear emergency medical teams were also designated in every core hospital. Five advanced radiation emergency medical support centers (AREMSC), four nuclear emergency medical support centers (NEMSC), and one core AREMSC were designated. AREMSCs are responsible for providing highly specialized medical care and advanced specialized training in radiation emergency medicine. NEMSCs are responsible for network construction among medical institutions related to radiational emergencies and dispatch coordination of nuclear emergency medical teams. A new educational system for nuclear medicine had been also established and modification of the system is still ongoing. Clinical aspects of Hirosaki University and the Japanese radiation emergency medical system before, during, and after the Fukushima Daiichi Nuclear Power Plant were presented.

3. Summary of the presentation by Prof. Toshiko Tomisawa

Online human resource development has spread with the COVID-19 pandemic. In 2021, Hirosaki University conducted hybrid training (face-to-face and online) for radiation emergency preparedness, which was as effective as face-to-face training. In 2022, the training was conducted entirely online, with the Geiger-Mueller (GM) counter practice replaced by virtual reality (VR) developed by the University, and the treatment of victims

with radioactive materials was discussed by watching videos of the previous practice. Discussions were held to examine how to prioritize lifesaving measures, radiation protection, and prevention of contamination spread while viewing videos of treating the victims with radioactive materials. As a result, the understanding of the treatment of the wounded and sick was higher than that of the face-to-face training, and the overall level of knowledge and satisfaction was equivalent to that of the face-to-face training. Practicing GM counter in VR is equal to actual training. In the future, we will promote empirical studies in Japan and with resident physicians in Taiwan and consider overseas deployment.

4. Summary of the presentation by Dr. Ki Moon Seong

Dose assessment for the victims from radiation accidents is one of integral parts of radiation emergency medicine, and the biological dosimetry using chromosome aberrations can provide a valuable information considering inter-individual variation in susceptibility to radiation. In this lecture, several features of biological dosimetry in KIRAMS were presented as a medical examination. Based on the capacity building of biodosimetry after Fukushima Daiichi Nuclear Power Plant accident, KIRAMS acquired the international standard accreditation for medical testing laboratory (ISO 15189) in 2014. Dicentric chromosome assay and translocation assay were listed up as medical techniques in the Ministry of Health and Welfare, and were registered in the list of medical tests in the national health care insurance system in South Korea. The lay people can easily visit to the hospital to take the medical examination of the biodosimetry, without any special permission or process, reducing the concern of radiation exposure and radiation-induced health risk. For the high competence of biodosimetry in KIRAMS, innovative research and development has been attempted to enable much more people to take the test even faster with far lower doses in detection limit using deep-learning algorithms (artificial intelligence), an emerging analytic machine (image Flowcytometer) and new biomarkers for both dose assessment and disease risk assessment from radiation exposure (extracellular vesicles and miRNAs). They also have invented the educational materials for human resource development overcoming the hurdle of conventional assays for biodosimetry which require highly trained analysts for chromosome aberrations, including on-the-job training

program and digital application for mobile platform. Furthermore, KIRAMS has constructed a national network of biological dosimetry (K-BioDos, Korean Biological Dosimetry network) for joint-responding to large number of tests from the mass-casualty accidents, implementing the inter-laboratory comparison exercise and technical harmonization. It can be a domestic bridge to international collaboration of biodosimetry with worldwide leading communities.

5. Summary of the presentation by Dr. Chih-Chuan Lin

The presentation was mentioned the different levels of Taiwan's medical system for radiation emergency medicine and training. Three kinds of radiation-responsible hospitals were activated when a radiation emergency happened. Dr. Chih-Chuan Lin briefly introduced these hospitals in the presentation. Responses and the main training content of firefighters/emergency medical teams were presented. Taiwan Society of Emergency Medicine organized the ALL-HAZARD education center and provided training materials to Regional Medical Emergency Operation Centers and responsible hospitals. Therefore, the training process in radiation emergency medicine is uniform. Unlike the training system in Japan and South Korea, all emergency medicine residents in Taiwan should accept the training in radiation emergency medicine, which is included in their disaster medicine residency training. In addition to that, a short discussion regarding iodine preparation in Taiwan was presented.

6. Conclusion

Since 2013, we have been collaborating with KIRAMS on issues related to radiation emergency medicine. This year, we organised the collaborative seminar not only with KIRAMS, but also with Chang Gung Memorial Hospital, Taiwan. In this seminar, we were able to exchange information on activities related to clinical assessment, radiological education system, and dose assessment in radiation emergency situation. In addition, the participants were divided into groups on nuclear emergency preparedness systems and stable iodine distribution, biodosimetry training, and radioprotectant development, each of which discussed issues in their respective countries. We should continue such cooperation in order to establish the emergency preparedness and response systems for nuclear and radiation-related disasters.