

Medical Cooperative Projects: from Nagasaki to Chernobyl and Semipalatinsk

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For many years, Nagasaki University, particularly the Atomic Bomb Disease Institute, has been engaged in research regarding the late health effects of radiation exposure in Nagasaki atomic bomb survivors. Since 1991, we have participated in several Chernobyl projects including the Chernobyl Sasakawa Medical Cooperation Project which demonstrated a marked increase in the incidence of childhood thyroid cancer around Chernobyl, especially in the Gomel region, Belarus. Furthermore, we have performed both fieldwork and research to clarify the late effects of radiation exposure around Semipalatinsk Nuclear Testing Site and participated in bilateral official medical assistance projects between Japan and Kazakhstan to strengthen the medical infrastructure in this area. Through these humanitarian and scientific projects, we have been collaborating closely with our counterparts in the former USSR for the past 15 years.

Here, we present a brief review of our past activities and future directions of international cooperative radiation research from Nagasaki to Chernobyl and Semipalatinsk.

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Introduction

Within the framework of the Chernobyl Sasakawa Medical Cooperation Projects, medical cooperative projects from Nagasaki University to the former USSR have been performed around Chernobyl Nuclear Power Plant since 1990. These projects have revealed a marked increase in incidence of childhood thyroid cancer in this area. In addition to such humanitarian projects, Nagasaki University has promoted collaborative scientific studies, mainly in the fields of molecular epidemiology, endocrinology, and radiation research, with various national institutions in Belarus, Ukraine, and Russian Federation. Furthermore, since 1995, we have promoted medical assistance programs for residents exposed to fallout around Semipalatinsk Nuclear Testing Site (SNTS).

Through such activities, we have established an international consortium with the following national institutions, and collaborated in basic and field studies on radiation medicine.

- Belarussian Medical University (Belarus)
- Gomel Medical University (Belarus)

- Medical Radiological Research Center of RAMS (Russia)
- Institute of Endocrinology and Metabolism (Ukraine)
- Research Center for Radiation Medicine (Ukraine)
- Semipalatinsk Medical Academy (Kazakhstan)
- Institute of Radiation Medicine and Ecology (Kazakhstan)
- Altai Medical University (Russian Federation)

Within these frameworks, we have promoted various exchange programs for researchers and medical students to strengthen the medical infrastructure (including medical education) in these areas, to promote collaborative studies to clarify the effects of radiation, and finally to develop human resources to contribute to the relief of people exposed to radiation in future. The following sections present a summary of our current activities in Chernobyl and Semipalatinsk.

Current and future problems of Chernobyl

Large amounts of various radionuclides were released into the environment after the accident at Chernobyl Nuclear Power Plant on

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April 26, 1986, resulting in internal irradiation among children around Chernobyl. Nagasaki University has been participating in the Chernobyl Sasakawa Medical Cooperation Project to clarify the health effects of radiation exposure on the population around Chernobyl.¹ In this project, children aged 0-10 years at the time of the accident were identified being considered to be at greatest risk of health effects of radiation, and screening was performed focusing mainly on the possible late effects of radiation using common procedures of thyroid and hematological examinations, and whole-body ¹³⁷Cs measurement in all subjects.

The results of screening indicated a marked increase in the incidence of thyroid cancer, especially papillary thyroid adenocarcinomas, in children around Chernobyl. This increase in thyroid cancer rate is probably due to internal exposure to short-lived radionuclides, such as ¹³¹I.² On the other hand, there was no evidence of an increase in childhood leukemia in this area; this may probably due to the relatively low dose or dose rate of radiation exposure by the accident.

From 1997, the second Chernobyl Sasakawa projects were commenced in Belarus and Russia, and the results indicated that people exposed during childhood constitute a "high risk group" for thyroid cancer and that their careful follow-up is essential.³

The World Health Organization (WHO) and Sasakawa Memorial Health Foundation (SMHF) considered that one of the most important tasks in the continuation of humanitarian assistance to countries affected by the Chernobyl accident is the strengthening of medical care facilities, mainly in those areas most radio-contaminated and with the largest number of childhood thyroid cancer patients, through the development of "healthtelematics." Early in 1999, we participated in the joint project as specialists of endocrinology and radiation research to implement three key tasks of this project: establishment of telecommunication infrastructure, development of telepathology (remote diagnosis of thyroid cancer) and tele-education. In detail, the following activities have been performed within the framework of this project.

- Establishment of special network links between medical institutions in Minsk and Gomel, in cooperation with the Belarusian Center for Medical Technologies (BelCMT).
- Development of telepathology software and training of specialists by Belarussian State Medical University.
- Development of tele-education software for medical students and doctors by Belarussian State Medical University and Gomel State Medical University.

In July 2004, the system was completed and the opening ceremony was held in the presence of representatives of WHO/HQ, SMHF and the Ministry of Health of the Republic of Belarus. For further development of the project, this system will be linked to the Chernobyl Tissue Bank project (<http://www.chernobyltissuebank.com/>), to improve the pathological review system of thyroid cancer around Chernobyl. Indeed, several new findings have been obtained through the Chernobyl Tissue Bank.^{4,6}

Field and basic research cooperation between Nagasaki and Semipalatinsk

A total of 220 nuclear weapon tests were conducted on and above the ground at SNTS from August 29, 1949. It is estimated that more than 300,000 residents were irradiated by repeated fallout from these tests.

Information about these nuclear tests at SNTS has come to light since the collapse of the former USSR. However, due to the difficulties in dose reconstruction for each of irradiated individuals, it is difficult to accurately evaluate the late health effects for residents of this area. Thus, it is more beneficial to improve the medical infrastructure through improvement of accurate and rapid diagnostic systems for radiation-related diseases such as malignancies.

Under the official memorandum of the Ministry of Foreign Affairs of Japan and Kazakhstan circulated in March 1999, the Tokyo International Conference was held on September 6-7, 1999, and technical cooperation and grants-in-aid have been extended under the Official Development Assistance (ODA) program of the Japanese Government. Based on experience in Chernobyl, Nagasaki University participated in this program and promoted the establishment of a medical screening system around SNTS.

In addition to participation in such governmental projects, Nagasaki University has also developed scientific projects with Semipalatinsk Medical Academy and other medical institutions. We have promoted collaborative studies in the following areas:

- Identification of ret/PTC rearrangement of thyroid cancer.⁷
- Screening of thyroid function and urinary iodine.⁸
- Immunohistochemical study of thyroid cancer.⁹
- LOH on chromosome 9q22.3 in basal cell carcinoma.¹⁰
- Evaluation of benign thyroid diseases in residents around SNTS and liquidators of Chernobyl.^{11,12}

These results are expected to contribute to the development of future collaborative studies in the following areas:

- Molecular epidemiological and pathological studies closely linked with humanitarian assistance such as the JICA project.
- Clinical approach to "non-malignant diseases," such as "lifestyle-related diseases" to improve the health system in this area.

However, the most pressing current concern is how to maintain medical screening and data management already established after completion of the JICA Medical Aid Program in June 2005. The International Consortium of Radiation Medical Research is now under negotiation, but is still unclear. Therefore, Nagasaki University should take an initiative for the continuation of medical support and joint radiation research based on our past and current activities.

Contribution to Chernobyl and Semipalatinsk from Nagasaki Governing Body

To support worldwide Hibakusha (radiation-exposed victims) as well as A-bomb survivors abroad, the Nagasaki Association for Hibakusha Medical Care (NASHIM: <http://www.nashim.org>) was

established in 1992, financially supported by Nagasaki Prefecture and Nagasaki City. The main activities of NASHIM are as follows:

- Acceptance of trainees mainly from the former USSR and Korea, and delegation of Japanese medical doctors and specialists.
- Publication of educational and scientific materials for specialists in the field of radiation medicine and radiation research.
- Awarding the *Takashi Nagai Memorial Nagasaki Peace Award* to medical specialists who make contributions to the relief of "Hibakusha" throughout the world.
- Promotion of events to increase understanding of radiation safety for the general public.

Since 1993, NASHIM has accepted in total over 100 specialists every summer within the framework of the original NASHIM project and of joint projects with other organizations. In addition, NASHIM has published textbooks and reports, such as *Pediatric Thyroidology* (in Russian), *Radio-contamination Report in Taiwan* (in Japanese), *Atomic Bomb Rescue and Relief Report* (in English) and *Thyroid Pocket Manual* (in Russian). These publications are distributed to medical and academic institutions in Japan as well as the former USSR.

Furthermore, NASHIM awards the *Takashi Nagai Memorial Nagasaki Peace Award* every two years to medical specialists who have made a contribution to the relief of "Hibakusha" throughout the world. Dr. Balmkhanov, who first reported the health effects in residents around SNTS, and Dr. Demidchik, who first clarified the increased incidence of childhood thyroid cancer around Chernobyl, were awarded this prize. Further information regarding this prize is now available from the NASHIM website.

The contribution of Nagasaki Governing Body through NASHIM, in cooperation with Nagasaki University, plays an important role in the smooth implementation of international medical care of radiation victims in the former USSR from Nagasaki.

Conclusions

One of the main aims of the 21st century COE program of Nagasaki

University is to promote molecular epidemiology based on on-site field research activities. It is necessary to reconsider how best to integrate our past and current medical activities into scientific evaluations. Medical cooperation involves not only one-sided communication from high level to low one but also bi-directional communication. Considering the patient-oriented medical assistance around Chernobyl and Semipalatinsk, Nagasaki University must continue our mission on the basis of our atomic bomb experience and knowledge to achieve a final goal of the establishment of world peace. Without peace, there can be no health protection or disease prevention.

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