

Founded in 2011, The Citizen-Scientist International Symposium on Radiation Protection (CSRIP), is a non-profit organization established by citizens and scientists concerned about the issue of low dose exposure. Since the explosion at Fukushima's nuclear plant in March 2011, CSRIP has held several workshops each year, as well as an annual international symposium, on radiation protection from the viewpoint of citizens, inviting researchers and citizens from both Japan and overseas to find the most effective ways to deal with the issue together. The 6th CSRIP symposium was held in Nihonmatsu, Fukushima Prefecture, between October 7 and 10, 2016 (for full details of the symposium, please refer to our website <http://csrrip.jp>). The symposium published two recommendations — the “Conclusions” and the “Nihonmatsu Declaration on the Risks of Exposure to Low Doses of Ionizing Radiation” — based on four days of presentation sessions and roundtable discussions. We sincerely hope that discussions by both experts and members of the public on this issue allow us to deepen our understanding of the situation and better able us to recommend the wisest policy decisions in regard to management of the disaster, beyond positions and paradigms, for better radiation protection measures.

— CSRIP

The 6th Citizen-Scientists International Symposium on Radiation Protection

For further scientific elucidation of health risks due to radiation exposure caused by the 2011 TEPCO Fukushima Daiichi nuclear power plant accident, in order to practice better public protection and response measures

Conclusions

Radiation protection measures should be carried out in agreement with the research of scientists from relevant disciplines, based on the underlying epidemiological findings. In particular, there are a number of epidemiological evidences supporting the linear non-threshold (LNT) model that states that the health effects of ionizing radiation have no safety threshold and are linearly proportional to the exposure dose even at a cumulative dose lower than 100 millisievert (mSv). All the radiation protection measures should presuppose this model from a precautionary standpoint. (Note 1)

Recommendations to the Japanese Government and relevant parties

Expansion of thyroid cancer examination and enhancement of support

Several epidemiological views conclude that the results of the Fukushima prefectural health management survey are already clearly showing the frequent occurrence of thyroid cancer. Considering the diagnosed tumor sizes and the surgery cases that resulted from the survey, the currently practiced thyroid examination is consistent with one of the objectives of the survey, “early detection, early treatment.” The survey should be expanded, and the support should be enhanced for people suffering from thyroid cancer and other thyroid abnormalities. (Note 2)

Expansion of health survey

Health protection must be provided not only to the affected residents, but also to the people who are at risk of exposure to radiation while carrying out accident-related work, such as the nuclear plant workers and the off-site decontamination workers. The survey of health effects should be expanded to these people in order to determine what damages are being caused by radiation exposure, whether the current measures are effective enough and what should be done to improve the situation. (Note 3)

Respect of the victims' rights

The emigrated ex-residents or the evacuees should not be forced to return to their hometowns. Those who wish to stay evacuated or emigrated, those who wish to evacuate or emigrate hereafter, or those who want

to return to their hometowns, as well as those who have decided to stay in their hometowns despite the accumulating exposure dose — all of the parties should be supported so that they can build the life they desire, all while avoiding radiation exposure as much as possible. (Note 4)

Revision of risk communication

In order to improve the current social environment that dissuades the victims from expressing their concern about the health effects of radiation, it is necessary to revise the “risk communication” measures led by the central and the local administrative authorities. Measures that aim to persuade the victims of the small risk of health effects without providing sufficient evidence and impelling them to act as the authorities want, should be revised. (Note 5)

Education and public information on nuclear power and radiation

School teaching materials and learning places are provided from the pro-nuclear standpoint, unilaterally stressing the safety of nuclear power plants and downplaying the risk of health effects. Instead, the standpoint of those who bear the risk (accident victims, workers and future generations) should be taken into account fully. (Note 6)

Role of citizens and scientists

Citizens, including scientists, researchers and media professionals, are requested to promote an open dialogue in which each party accomplishes its original mission for the pursuit of truth. Together, the victims and all the people involved are expected to create a living environment and public space that enable each of them to express what they really think and feel, to form a consensus, and thus to give rise to mutual trust. (Note 7)

Notes

(Note 1) On this issue, a separate joint statement by the epidemiologists who participated in the 6th Citizen-Scientist Symposium on Radiation Protection is to be published.

(Note 2) It is necessary to re-examine the thyroid surveys conducted on those who were 18 years old or younger at the time of the accident, by expanding the ranges (ages and regions) and frequency of the surveys. Cases of thyroid cancer diagnosed by examinations other than the Fukushima prefecture health management survey should be disclosed, including those diagnosed in other regions that may also suffer from radiation effects. Several municipalities located outside the Fukushima prefecture indeed do carry out their own surveys. In addition, it is required to examine thyroid abnormalities other than cancer and to publish the results.

Five years after the accident, when the health effects of radiation exposure are now expected to emerge, the appearance instead, of arguments aiming to reduce the thyroid surveys is an issue. Building a debate based on the unsound concept of the “negative effects of the survey” does not appear as a scientifically driven decision. It is historical fact that the delay after which thyroid cancer appears after exposure to radiations, originally estimated to 10 years or more based on data from the Hiroshima and Nagasaki A-bomb survivors, had to be revised to five years after the Chernobyl nuclear accident. Continuing the survey is thus crucial because it ties into the issue of future compensation. Therefore, the review committee for the Fukushima prefectural health management survey should not be limited by past ideas but should take new data and findings into full consideration.

Studies should be promoted to estimate how much irradiation happened just after the accident, and the results should be made public. As was discussed at the 5th International Expert Symposium in Fukushima on Radiation and Health (September 2016), data on the contamination by iodine-131 are scarce. The only way to determine the initial exposure dose is to investigate the existing contamination by iodine 129 and other fission products in the environment and to reconstruct the initial dose. Studies need to be extended to regions outside the Fukushima prefecture, because contamination spreads in wide areas in Eastern Japan as shown by results from the airborne monitoring of the Ministry of Science and Technology (MEXT) and the Nuclear Regulatory Agency.

(Note 3) The Fukushima prefectural health management survey has been criticized from the very beginning for its narrowness of application. For example, blood testing, whose importance has been emphasized in the areas affected by the Chernobyl accident, has been treated lightly in the case of the Fukushima Daiichi nuclear power plant accident. Moreover, given that contamination has spread to areas beyond the border of Fukushima prefecture, it is difficult to understand why the comprehensive health check is limited to evacuation zones in Fukushima prefecture. Cancer registration data and other medical information essential for comparative studies of the health status in the affected areas are not made public. Concerns have been expressed about the exposure management of subcontracted workers. A re-examination of the health care system for all workers at risk of radiation exposure, including the off-site cleanup workers is imperative. The fact that the Government and TEPCO have failed to disclose necessary information, has given rise to the suspicion that they might be concealing inconvenient information. They are required to take action to address the spreading distrust.

(Note 4) The current policy promoted by the government under the name of “reconstruction” is laying a disproportionate emphasis on the return of evacuees to their hometowns, through the prompt cancellation of evacuation orders and while neglecting support towards victims who desire to emigrate or to remain evacuated. The government has announced the cut off, in March 2017, of the provision of

free housing for what they call “voluntary evacuees” (evacuees from outside the evacuation order area). A similar policy is expected to be applied to evacuees from the current evacuation order areas, once the orders are lifted. Such policies leave no choice to the victims who wish to remain evacuated and avoid further radiation exposure, but to return to their hometowns. Meanwhile, long-term support is needed for those victims who are living in contaminated regions, inside or outside the Fukushima prefecture, including support to residents who wish to evacuate hereafter.

(Note 5) The government’s so-called “risk communication” currently underplays the health effects of radiation exposure caused by the nuclear power plant accident and merely consists in delivering basic knowledge of radiation while claiming that the risks are small, often comparing the health risk of low level radiation to those of medical radiation, smoking, and obesity. This “risk communication” activity has been nothing but a unilateral delivery of information that highlight optimistic views on the risk of radiation exposure. It has failed to install a dialogue that considers the diverse points of view held by the affected residents.

In particular, the conventional government-led “risk communication” has created a social atmosphere in which choosing to avoid being exposed to low-level radiations for long-term safety, is regarded as “wrong”. Victims who wish to emigrate or to remain evacuated from areas where exposure is possible, or those who desire to avoid as much radiation as they can from the food, clothing and shelter even though they chose to remain in their regions, all of them are repressed from expressing their concerns. At times, this causes conflict and cleavages between family members, friends and neighbors.

Intrinsically, “risk communication” should consider the wide range of opinions that exist regarding the risks and, through dialogue between experts and residents, it should elaborate a set of measures that are adapted to each resident’s lifestyle. Initiatives such as collecting straightforward scientific data that is useful for avoiding exposure in daily life, illustrate the importance of mutual learning and common efforts between residents and experts.

(Note 6) In public teaching materials, such as the supplementary reader on radiation issued by MEXT in 2014, the instructional materials issued by the Fukushima Prefectural Board of Education (the 1st to the 5th editions) in 2011-16, and the exhibition of the Exchange Building (Komyutan Fukushima) inaugurated by the Fukushima Prefectural Environmental Innovation Center in July 2016, there is almost no explanation on the official limits of radiation exposure doses, including those in radiation controlled areas (5.2 mSv/year), the additional exposure for the general public (1 mSv/year) and those of the evacuation order area (20 mSv/year). Nor is there any explanation on emergency radiation protection measures such as the administration of stable iodine, or on the Nuclear Accident Child Victims’ Support Law, enacted in 2012 to protect the victims’ rights.

(Note 7) Since the beginning of the accident, not only the information needed in order to avoid radiation exposure was insufficiently disclosed, but also the voices of victims were not reflected in the policy decision process related to radiation protection. In order to devise countermeasures that reflect the voices and needs of the most affected victims, it is also required on the side of the citizens, to make opportunities for communication, that is, dialogues widely involving citizens, including scientists, researchers, media, etc.

The symposium participants who agree on this document are as follows:

Cécile Asanuma-Brice, National Center for Scientific Research (CNRS), France

Keith Baverstock, University of Eastern Finland, Finland

Iuliia Davydova, Institute of Paediatrics, Obstetrics and Gynaecology, NAMS of Ukraine :Ukraine

Shinobu Goto, University of Fukushima, Japan

Cornelia Hesse-Honegger, Scientific illustrator, Switzerland

Wolfgang Hoffmann, Urnst-Moritz-Arndt-Universität, Germany

Paul Jobin, Academia Sinica, Taiwan

Toshiki Mashimo, Citizen-Scientist Symposium on Radiation Protection, Japan

John Mathews, University of Melbourne, Australia

Sebastian Pflugbeil, Society for Radiation Protection, Germany

Yoshiyuki Segawa, Citizen-Scientist Symposium on Radiation Protection, Japan

Susumu Shimazono, Sophia University, Japan

Nanako Shimizu, University of Utsunomiya, Japan

Ben Spycher, University of Bern, Switzerland

Yasuyuki Taneichi, Kuwano Kyoritsu Hospital, Japan

Tomoko Tsuchiya, NPO HSE Risk C-cube, Japan

Takuya Tsujiuchi, University of Waseda, Japan

The Nihonmatsu Declaration

on the Risks of Exposure to Low Doses of Ionising Radiation

*A statement by participants to the 6th Citizen-Scientist International Symposium on Radiation Protection
(7–10 October 2016) in Nihonmatsu, Japan*

Over recent years, some interested parties have claimed that human exposure to low doses (100 mSv/mGy or less) of ionising radiation does not confer an increased risk of cancer, or that the risk is so small that it cannot be estimated.

Our understanding of the risks of ionising radiation leads us to conclude that:

- The accrued epidemiological data do not support there being a threshold of risk at 100 mSv for the induction of cancer.
- Most of the available evidence^[1-11] together with mechanistic considerations^[12-14], point to linearity of dose response at both high and low dose-rates;
- Direct measurement of risk below 100 mSv^[1-5,7,9] and extrapolation from higher doses^[3,5,6,10,11,15], support the use of the linear dose response model for doses less than 100 mSv and for the estimation of risks for the protection of public health after nuclear accidents.

The INWORKS study^[3] of workers is particularly important because the mode of exposure is similar to that which will be experienced by returning evacuees. It provides important information in relation to the risks in the dose range 0 to 100 mGy. Over this range the risk (0.8 per Gy) is higher, but not significantly so, than the overall estimate of 0.48 per Gy. This estimate is not influenced by the slope at higher doses. The paper states: “INWORKS thus provides supportive evidence for a positive association between radiation dose and all cancer other than leukaemia, even if less precise when analyses are restricted to data for the 0-100 mGy dose range.”

This position is consistent with:

- The 2000 report of the United Nations Scientific Committee on the Effects of Ionising Radiation (UNSCEAR)^[16], subsequently endorsed in their 2012 White Paper^[17].
- The 2006 BEIR VII report from the US National Academy of Sciences^[18] and the 2012 analysis of the Japanese bomb survivor data^[6].
- The World Health Organisation report of 2013^[19] on the Fukushima accident.

We conclude that a recommended “reference level” of 20 mSv/year for returning evacuees from areas adjacent to the Fukushima Daiichi accident will entail an increased lifetime risk of cancer, particularly for those exposed as children.

Signatories

Keith Baverstock, Department of Environmental and Biological Sciences, University of Eastern Finland, Kuopio, Finland.

Iuliia Davydova, Institute of Paediatrics, Obstetrics and Gynaecology, National Academy of Medical Science of Ukraine, Kiev, Ukraine.

John Mathews, School of Population and Global Health, University of Melbourne, Carlton, Australia

Sebastian Pflugbeil, Society for Radiation Protection, Berlin, Germany

Ben Spycher, Institute of Social and Preventive Medicine (ISPM), University of Bern, Bern, Switzerland.

Wolfgang Hoffmann, Institute für Community Medicine, Ernst-Moritz-Arndt-Universität, Greifswald, Germany

References

1. Spycher, B. D., *et al.*, (2015) Background ionizing radiation and the risk of childhood cancer: a census-based nationwide cohort study. *Environ Health Perspect.* **123**: 622–8.
2. Mathews, J. D., *et al.*, (2013) Cancer risk in 680,000 people exposed to computed tomography scans in childhood or adolescence: data linkage study of 11 million Australians. *Bmj.* **346**: f2360.
3. Richardson, D. B., *et al.*, (2015) Risk of cancer from occupational exposure to ionising radiation: retrospective cohort study of workers in France, the United Kingdom, and the United States (INWORKS). *Bmj.* **351**: h5359.
4. Kendall, G. M., *et al.*, (2013) A record-based case-control study of natural background radiation and the incidence of childhood leukaemia and other cancers in Great Britain during 1980–2006. *Leukemia.* **27**: 3–9.
5. Cardis, E., *et al.*, (2005) Risk of cancer after low doses of ionising radiation: retrospective cohort study in 15 countries. *Bmj.* **331**: 77.
6. Ozasa, K., *et al.*, (2012) Studies of the mortality of atomic bomb survivors, Report 14, 1950–2003: an overview of cancer and noncancer diseases. *Radiat Res.* **177**: 229–43.
7. Pijpe, A., *et al.*, (2012) Exposure to diagnostic radiation and risk of breast cancer among carriers of BRCA1/2 mutations: retrospective cohort study (GENE-RAD-RISK). *Bmj.* **345**: e5660.
8. Pearce, M. S., *et al.*, (2012) Radiation exposure from CT scans in childhood and subsequent risk of leukaemia and brain tumours: a retrospective cohort study. *Lancet.* **380**: 499–505.
9. Bithell, J. F. and A. M. Stewart, (1975) Pre-natal irradiation and childhood malignancy: a review of British data from the Oxford Survey. *Br J Cancer.* **31**: 271–87.
10. Preston, D. L., *et al.*, (2003) Studies of mortality of atomic bomb survivors. Report 13: Solid cancer and noncancer disease mortality: 1950–1997. *Radiat Res.* **160**: 381–407.
11. Preston, D. L., *et al.*, (2007) Solid cancer incidence in atomic bomb survivors: 1958–1998. *Radiat Res.* **168**: 1–64.
12. Brenner, D. J., *et al.*, (2003) Cancer risks attributable to low doses of ionizing radiation: assessing what we really know. *Proc Natl Acad Sci U S A.* **100**: 13761–6.
13. Brenner, D. J. and R. K. Sachs, (2006) Estimating radiation-induced cancer risks at very low doses: rationale for using a linear no-threshold approach. *Radiat Environ Biophys.* **44**: 253–6.
14. Goodhead, d. T. *Clustered damage to DNA: Time to re-evaluate the paradigm of radiation protection. in Proceedings of the Eleventh International Congress of Radiation Research.* 2000. Dublin Ireland: Allen Press, Lawrence, KS.
15. Preston, D. L., *et al.*, (2003) Dose response and temporal patterns of radiation-associated solid cancer risks. *Health Phys.* **85**: 43–6.
16. UNSCEAR, *Report of the United Nations Scientific Committee on the Effects of Atomic Radiations: Sources and Effects.* 2000, United Nations: New York.
17. UNSCEAR, *Biological Mechanism of Radiation Action at Low Doses: A white paper to guide the Scientific Committee's future programme of work.* 2012, United nations: New York.
18. NAS, *Health Risks from Exposure to Low Levels of Ionizing Radiation: BEIR VII - Phase 2.* 2006, National Academy of Sciences: Washington.
19. WHO, *Health Risk Assessment from the Nuclear Accident after the 2011 Great East Japan Earthquake and Tsunami.* 2013, World Health Organization: Geneva.