ENVIRONMENTAL HEALTH RISK OF THE FUKUSHIMA NUCLEAR POWER PLANT ACCIDENT

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A massive earthquake with a magnitude of 9.0, so-called 'the Tohoku Pacific Earthquake', occurred on 14:46 March 11, 2011. The ensuing enormous Tsunami struck the north-east coast area of Japan and caused tremendous damage. The earthquake and tsunami attacked the reactors of the Fukushima Dai-ichi nuclear power plant (1F) operated by the Tokyo Electric Power Company (TEPCO) and four reactors (Unit 1 to 4) were seriously damaged. As results, a large amount of radionuclides such as ^{131}I, ^{134}Cs and ^{137}Cs was released to the atmospheric and marine environment. The total released radioactivity is estimated to be 0.37~0.63 million TBq, which corresponds to the major accident (level 7) according to the rating of the International Nuclear and Radiological Event Scale (INES).

Soon after the accident, a radiation monitor at the 1F main gate (about 1.0 km west from Unit 2) indicated high dose rates up to more than 12mSv h^{-1} on March 15 when both explosion in Unit 2 and fire in Unit 4 occurred coincidentally. On the same day, the dose rate in Fukushima city at 61km north west from 1F recorded more than 20μSv h^{-1}; the level decreased and now reached stable around 1.5 μSv h^{-1}.

Screening for local residents near 1F was performed by Fukushima prefecture using portable GM survey meters. The initial screening level was set as 13,000cpm and raised to 100,000cpm. The contamination levels of 30 residents were above the screening level, though they became much lower after decontamination. Nearly 200,000 people (about 10% population in Fukushima prefecture) have taken screening tests by the end of May.

On March 15, the local headquarter issued a direction to administer the stable iodine (KI) during evacuation from the evacuation area (20km radius) to the prefecture Governor and the heads of cities, towns and villages. At the end of March, 1,080 children (~15years old) near the evacuation zone were tested for thyroid gland exposure and it was found that the I-131 levels in thyroid are within safe limits.

Whereas, the Prime Minister directed evacuation of the residents within the 20km radius from 1F (Unit 1). At the end of May, the area within 20 km radius from 1F have been defined as 'no-entry zone', other designated areas as 'planned evacuation zone', and some areas between 20 and 30 km radius of 1F as 'emergency evacuation preparation area'.

Japanese government and Fukushima prefectural organization have inspected radioactivity in food and, from March 23, have restricted distribution of food that fails to meet provisional regulation values (e.g. 300Bq kg^{-1} for ^{131}I and 200Bq kg^{-1} for ^{134}Cs or ^{137}Cs in drinking water, milk, dairy products). Continuous, enhanced monitoring and regular inspections are necessary to reduce the anxiety of residents.

Keywords: Fukushima, nuclear power plant, radionuclide, dose, risk