Radiation Exposure at Locations Other Than the Afflicted Areas

Updated: July 20, 2011 17:00 (JST)

Currently, as of July, the radioactive materials leakage from Fukushima Dai-chi Nuclear Power Plant into the environment is yet to be brought to a definitive end. However, the amount of the leakage has been drastically decreased. The atmospheric concentration in locations other than the afflicted area, (the cautionary zone of 20-kilometer radius of the plant) is less than minimum detectable quantity. Unless vast amount of radioactive materials are released due to the deterioration of the reactors' conditions, we don't have to worry about the atmospheric concentration of radioactive materials in such a distant locations. Above-the-normal dose rate has been observed in some areas not stricken by the disaster. However, it mostly is due to the surface-deposited radioactive cesium, and is not because of the radioactive materials suspended in the air. Therefore, opening windows does not affect the dose rate inside a residence. As searing summer nears, closing windows or wearing long-sleeved clothes, which usually are preventative measures against atmospheric radioactive materials, would not be the effective radiological protection. In fact, it may work adversely, for it could be the cause of heat disorder. For more details, please refer to the explanation below.

The released radio-nuclides such as iodine (I) and cesium (Cs) have been generated by nuclear fission during reactor operations. The chain reaction of nuclear fission has been stopped, and there has been no confirmation that a large amount of neutron radiation has been released.

Iodine is one of the halogens that may be easily turned into gaseous form at a high temperature, which is why iodine is one of the elements easily released by a nuclear accident. Moreover, cesium is one of the water-soluble alkali metals that may be easily conveyed to the coolant water in which damaged fuel rods are immersed. Also, it may be easily released into the atmosphere in the form of mist.

The exposure to these radioisotopes, as widely reported by media, can be roughly categorized into two types: external exposure and internal exposure. The former is the exposure to radiation from radioisotopes outside one's body, and the latter is the

exposure to radiation from radioisotopes that reside in internal organs and tissues when ingested or inhaled. As for the much-reported iodine and cesium, they are water-soluble and thus may be easily removed by washing even when they come in contact with skin or clothes. On the other hand, internal exposure means that one is at greater risk of ionizing radiation for an extended period when the radioisotope remains inside his/her body for a long period of time.

Meanwhile, the radioactive substance taken into a human body is tend to be distributed to specific organs and tissues depending on its physical and chemical properties, and is excreted by means of metabolism. The iodine confirmed to have been flown from the afflicted areas has such characteristics that, while 70 % is not absorbed and excreted, the remaining 30 % stays inside human body mainly in thyroid gland. Effective half life (the period of time in which the activity of a radioactive isotope decreases by half) is about 7.5 days (Iodine-131). The cesium, also confirmed to have been flown from the site, may be absorbed into human body in the full amount and distributed throughout the entire body muscles. Effective half-life is approximately 110 days (Cesium-137, ICRP Pub.78). The amount of internal exposure to radioactive material lowers in accordance with the effective half-life, and the effects of exposure may in turn lessen. Even so, minimizing the intake of radioactive material is encouraged. As preventative measures, wearing a moist mask, washing hands, and avoiding direct exposure of skin whenever leaving home, were all encouraged in the first few weeks after the outbreak of accident, where large amount of radioactive materials were released into the environment.

Radioisotope: a version of chemical element whose number of neutrons differs. The isotope may be either stable or unstable, and the unstable one emits radiation during its decay to a stable form. The unstable isotope is called the radioisotope.

Effective Half Life: the period of time in which the activity of a radioactive isotope decreases in a biological organism, resulting from a combination of radioactive decay and biological excretion.