Learning measurements of internal exposure

Technical college students received practical training at Sasakino Analytical Laboratories, JAEA

How much radioactivity is contained in the foods we are eating every day? One of the methods to measure this is the inspection by the “Kagezen” method (duplicate portion study).

The Kagezen inspection is a method to use the same foods that are consumed in each meal or in a day as samples, and to estimate the amount of radioactivity contained in them. From February 25 to 27 this year, the National Institute of Technology held a practical training on nuclear energy and radiation for students from around Japan at Fukushima National College of Technology. The Japan Atomic Energy Agency (JAEA) cooperated on the training in measuring internal exposure etc. Fukushima National College of Technology included the Kagezen inspection in the training this year. The following is a report on the practical training.

The practical training was held at the JAEA’s Sasakino Analytical Laboratories in Fukushima Prefecture. A total of eight male and female students from six technical colleges ranging from Okinawa to the Tohoku region participated in the event.

In the training, the students learned to measure the radiation in environmental samples, as well as

to measure the internal exposures using a whole body counter. On the day before, the training for the Kagezen inspection was conducted at Fukushima National College of Technology as part of these internal exposure measurements.

Two students brought their typical dinners for one meal (rice balls, tempura soba noodles, fried vegetables, and croquettes). A food radiation monitor at Fukushima National College of Technology was used to measure the radioactive substances contained in the food. Dr. Shigekazu Suzuki, (Associate Professor of Fukushima National College of Technology) outlined the procedures required for the Kagezen inspection, and then students started to measure radiation by filling the measurement vessel with foods. The purpose of this measurement was to determine whether radioactive potassium (K-40) would be detected. Students showed a keen interest in finding what type of measurement results they would find.

The measurements took 30 minutes, and the results confirmed that there was no radioactive cesium. Also, there was unfortunately no radioactive potassium that was expected to be detected. This may have been due to the short measurement time. However, the students learned that radioactive potassium (K-40) naturally exists around us by the measurement using potassium chloride as a standard sample.

The Sasakino Analytical Laboratories is equipped with a whole body counter. The students first received a lecture by JAEA staff on what internal exposure is, how to measure it, why there are radioactive materials in our body, and whether radiation in our body has effect or not. The students then operated the whole body counter by themselves (photo: below), and all of them received radiation measurements. While there were some differences in results among individuals, the students learned that radioactive potassium is always present in our body and understood that we take naturally-existing radioactive materials into our body every day, which they had learned at the practical training of the Kagezen inspection.

As to the practice for radiation monitoring, the students actually used germanium semiconductor

Students operating a whole body counter by themselves

A student being measured by a stand-up type whole body counter

detectors and survey meters. These are precious instruments that students never get to handle in their college. After learning the principle of the measurement and important points for using the instruments, the students learned that common materials and foods around us emit radiation, as well as experienced the characteristics of radiation (photo: lower left). The students also measured radiation dose rates outside around the Sasakino Analytical Laboratories buildings (photo: lower right), which helped students recognize that the radiation dose rates change depending on the environments.

In addition to the practical training, the students visited areas damaged by the tsunami, residences

Samples used for learning radiation measurements and characteristics of radiation (kombu, granite, chemical fertilizer, mantle, etc.), and radiation-shielding material (steel plate)

Measuring the air dose rate outside of the building using a sodium iodide (NaI) survey meter

evacuated due to the nuclear disaster, places where decontamination works are conducted, and temporary storage sites for decontamination waste. On the way, the students saw many cars traveling to the Fukushima Daiichi Nuclear Power Station. They seem to have realized the present situation of Fukushima.

Meeting was held on the final day to report the result of the practical training. The students presented the details of what they learned and exchanged their impressions. At the end, Associate Professor Suzuki concluded the meeting by saying, “Fukushima suffered from multiple disasters such as huge earthquake, tsunami, nuclear accident and reputation damage. The effects of these disasters still continue. The people of Fukushima need to come face-to-face with radiation and radioactivity. I would like you all to acquire the correct knowledge about nuclear energy and radiation, and apply that in the future. On the other hand, we must never forget the fact that poor preparation and foresight by scientists and immature technology can lead to tragic accidents that can affect so many people. These concerns are not only for those who are planning to work in nuclear energy and the other energy fields but also for everyone.

Students packing their foods of one meal into the measurement vessel. The vessels filled with the samples are shown on the right.

Presentations on the final day

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