

JAPAN

Radiation risks unknown

Scientists struggle to calculate long-term effects of low-dose exposures in Fukushima.

BY GWYNETH DICKEY ZAKAIB

One thing is certain about the human costs of the radiation leaking from the Fukushima Daiichi nuclear plant in Japan: they will pale in comparison to the catastrophic consequences of the 11 March earthquake and tsunami that triggered the crisis. Nevertheless, experts are tracking radiation levels worldwide to learn more about the accident and to assess the possible impacts on health.

Radioactive vapour and particles released from the plant have spread across the region and followed prevailing winds across the Pacific (see 'Plume projections'). "The plume is very large," says Ted Bowyer, a nuclear physicist at the Pacific Northwest National Laboratory in Richland, Washington, one of the first US stations to detect isotopes released from Fukushima. Bowyer adds that the tiny concentrations of radioactive iodine, caesium, tellurium, xenon and lanthanum that have reached the United States are far below normal background levels and not a health risk. The fact that some of the isotopes are short-lived indicates that at least some of the radiation must have originated from breaches in the reactor vessels and not from the plant's overheated caches of spent fuel, he says.



A farmer destroys spinach in Ibaraki prefecture after it was contaminated by radioactive iodine.

In Fukushima and adjacent prefectures, the Japanese government is reporting radioactive contamination in sea water near the plant and in the food and water supply. Radioactive iodine-131 and caesium-137 have been detected in milk and leafy vegetables such as spinach, as well as in tap water, in some cases above allowable levels for consumption. Such safety limits are based on long-term consumption of these foods, says William McCarthy, deputy director of the radiation protection programme within the Environment, Health and Safety Office at the Massachusetts Institute of Technology (MIT) in Cambridge. "The prudent thing is to not eat that food," he says. "That doesn't mean it poses immediate health risks."

Authorities in Japan have banned the shipment of milk from Fukushima prefecture, as well as some produce from Fukushima and three neighbouring prefectures. In the short term, the main concern is iodine-131, which can cause cancer in the thyroid gland. With a half life of 8 days, iodine-131 will effectively be gone from the environment in a matter of months once releases have stopped. But

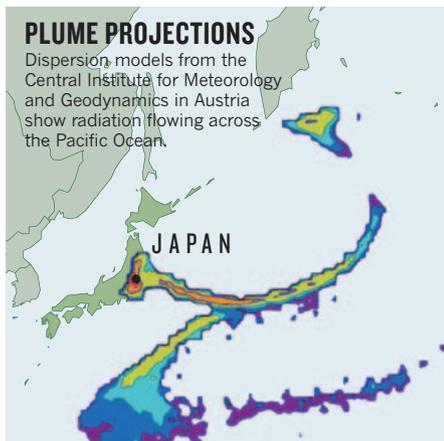
caesium-137, another cancer-causing isotope, has a half-life of 30 years and will persist for much longer. Steve Wing, an epidemiologist from the University of North Carolina, Chapel Hill, points out that even the low levels of radiation that remain in the environment could be significant in the long run "because so many more people are exposed, even though the dose per person decreases farther from the plant".

Jacquelyn Yanch, a radiation physicist at MIT, thinks that it is too early to say what the impact will be. "We haven't come up with risk estimates for a situation like this," she says. "We don't know how much is too much."

Experts agree that any long-term effects are most likely to be seen in the workers battling the crisis at the Fukushima nuclear station. The government has increased the allowable dose for workers from 100 millisieverts per year to 250 millisieverts per year — five times the annual allowable dose for US radiation workers — to allow emergency operations to continue. This dose is considered by the US National Institutes of Health as the lower limit for the first symptoms of radiation sickness. ■

PLUME PROJECTIONS

Dispersion models from the Central Institute for Meteorology and Geodynamics in Austria show radiation flowing across the Pacific Ocean.



SOURCE: CENTRAL INST. FOR METEOROLOGY AND GEODYNAMICS



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