Radiation Risks of Reactor Meltdown Both Short and Long Term

March 14, 2011 — The distribution of potassium iodide tablets in northern Japan underlines the fear of a catastrophic meltdown at the Fukushima Daiichi nuclear plant and the massive dispersion of deadly radioactive materials, with health implications for not only that country but also its neighbors.

Earlier in the crisis, radiation emitted by the plant's 3 overheating reactors was said to be at low, nonhazardous levels. However, radiation levels would skyrocket if the nuclear fuel in any of the reactors manages to escape its thick steel container. That possibility further worried Japanese authorities Monday evening EDT (Tuesday morning in Japan) when an explosion rocked reactor 2, the last of the units to blow. Kyodo News of Japan reported a spike in radiation, raising suspicions of a container breach.

"Each reactor has the radioactivity of 1000 Hiroshima bombs," said Ira Helfand, MD, an expert on radiation exposure in Leeds, Massachusetts, and a board member of the group Physicians for Social Responsibility, referring to the atomic bomb dropped on Hiroshima, Japan, during World War II.

The ***potassium iodide tablets (130 mg of iodine for 3-7 days, to a maximum of 10 days after exposure) were given out as protection against iodine-131***, a radioisotope of iodine that can cause thyroid cancer. Iodine normally accumulates in the thyroid, so saturating the organ with a safe version by means of the tablets blocks the uptake of the radioactive version.

However, a busted nuclear reactor can throw off other dangerous particles, each with its own adverse effects on the body, Dr. Helfand told *Medscape*

Medical News. "***Strontium-90 is absorbed by bone, which leads to bone cancer and leukemia,"*** he said. ***"Cesium-137 spreads throughout the body but favors muscle tissue. Plutonium is primarily toxic when inhaled and causes lung cancer."***

Each particle's half-life also calibrates risk. For iodine-131, it is a mercifully short 8 days; for strontium-90, it is an agonizingly long 29 years.

Symptoms of Acute Radiation Syndrome Subside, Return

In addition to long-term risks such as cancer, radioactivity can pose short-term risks. When most or all of the human body is exposed to a massive dose of radiation in a matter of minutes — a possibility with a nuclear reactor meltdown — the result is acute radiation syndrome (ARS).

The first ***symptoms of ARS — typically nausea, vomiting, and diarrhea*** — hit immediately, subside, and then come back strong, accompanied by ***loss of appetite, fatigue, fever, and possibly seizures and coma.*** Most people who do not recover die within several months, according to the US Centers for Disease Control and Prevention. In most cases, death results from the ***destruction of bone marrow, which leads to infections and internal bleeding***.

A corollary to ARS is acute radiation damage to the skin, or ***cutaneous radiation injury (CRI). Symptoms such as transient itching, tingling, erythema, or edema can emerge within hours, days, or week***. As with ARS, people with CRI usually experience a latent period of weeks to months. When skin lesions return, they can be debilitating or even life-threatening.

Shifting Winds a Factor

As a precaution, Japanese authorities have evacuated roughly 180,000 people from towns near the Fukushima Daiichi nuclear plant, even though radiation levels outside it as of Monday afternoon EDT were thousands of times below those considered dangerous. Japan also has benefited from westerly winds that have blown the small amounts of radioactive material east toward the Pacific Ocean. That drifting contamination does not pose a health threat to Hawaii, Alaska, or the West Coast, given the thousands of miles between Japan and the United States, according to the US Nuclear Regulatory Commission.

Rick Morin, PhD, chair of the safety committee of the American College of Radiology, explained that ***airborne radioactive material from the Japanese reactors is like smoke from a smokestack, diffusing and becoming less harmful the farther it travels. Traveling eastward, much of it would fall into the sea.***

However, weather forecasts predict that winds in northern Japan will reverse direction tomorrow, which means any radioactive material from the reactors would be blown inland.

If a reactor meltdown spewed enormous quantities of radioactive particles in that weather scenario, Japan would have to worry about it coming down to earth and poisoning the food chain. Dr. Morin said thyroid cancer broke out among children after the meltdown of the nuclear reactor in Chernobyl, Ukraine, because they drank milk from cows that had eaten grass contaminated with iodine-131.

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