EDITORIAL

# Understanding the Potential Health Hazards from the Nuclear Disaster at Fukushima

*Mark Leiserson*

By now, Fukushima Daiichi, the name of the Japanese nuclear power plant struck by a tsunami on March 11th of this year, is as notorious as Three Mile Island and Chernobyl, the sites of the world's previous worst nuclear disasters. However, despite the quarter century since the Chernobyl accident that exposed 34 million people to nuclear fallout[1], public knowledge of the dangers of radiation exposure from nuclear fallout continues to be relatively sparse. What is more, even nuclear experts are unclear about the long-term effects of accumulated radiation[2]. While the situation on the ground at Fukushima is still in flux, meaning the types and extent of radiation leaks could still change, this essay will examine the potential health hazards of the malfunctioning Fukushima nuclear plant. First, I will present an overview of the types of radiation that can be released from nuclear fallout and their subsequent risks. Then, I will explain what are currently thought to be the most likely risks specifically from Fukushima.

Fallout from a nuclear power plant such as Fukushima produces four main types of radioactive elements. The first is radioactive iodine. Radioactive iodine has a half-life of only 8 days–meaning that half of the radioactive iodine loses its radioactivity every 8 days. Consequently, the radioactive substance degrades to its non-radioactive form within a few months[3]. The other three elements, cesium-137, strontium, and plutonium-238, have half-lives of around 30, 29, and 90 years, respectively[4]. As a result, an area that is contaminated with any of these three radioactive elements can be expected to remain dangerous for hundreds or thousands of years, unless the elements are actively identified and removed.

Exposure to any of these products of nuclear fallout results in irradiation. The dangers of extended irradiation are extreme and well-known, though the consequences depend on the severity of the dose of radiation. For example, the current maximum radiation dosage allowed for emergency workers at Fukushima is 0.25 sieverts (to understand the scale of a sievert, the radiation from a CT scan is 0.01 sieverts). At three times that level, vomiting and hair loss is expected. At higher levels such as 3 sieverts, half of people who experience full-body exposure for a few hours will die within weeks[5]. Only people at a nuclear power plant at the time of a breach may encounter such sustained, high-levels of radiation. For most civilians, exposure is more likely to be piecemeal.

The dangers of accumulated exposure, or a number of small exposures over time, are much less well-known and understood. An increased risk for developing cancer is the main consequence, but because the prevalence of cancer is so high–around 40% of any group of people is likely to develop cancer at some point in their lifetimes [2]–it is difficult to measure the magnitude of the increase in risk. As a result, scientists still dispute whether accumulated radiation exposure follows a model where any increase in exposure corresponds with a proportional increase in cancer risk, or whether accumulated exposure increases the risk of cancer whenever it surpasses certain fixed thresholds. In the case of Chernobyl, where thousands were subject to multiple small doses of radiation over time, there simply has not been the rampant increase in cancer and mortality that scientists first feared after the nuclear meltdown.

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However, Chernobyl did provide nuclear safety experts with a different lesson: the largest increase in disease in those exposed to radiation from Chernobyl was a huge spike in the incidence of thyroid cancer[3]. The reasons for this spike have been researched and are now well-understood. The thyroid requires iodine, and is unable to differentiate between radioactive and normal iodine. Iodine is often taken into the body via food such as milk and vegetables, all of which were contaminated by radioactive iodine as a result of the Chernobyl meltdown. As a result, with excessive amounts of radioactive iodine being taken into the body via food, many individuals' thyroids began using radioactive iodine instead of normal iodine[3]. Over time, the thyroids' continued irradiation led to a huge increase in the incidence of thyroid cancer. However, scientists believe that the intake of radioactive iodine is preventable, both by avoiding foods that have possibly been contaminated by radiation, and also by taking potassium iodide pills, which flood the thyroid with normal iodine[3].

For Fukushima, the main risk to date has been radioactive iodine contamination. Since radioactive iodine degrades so rapidly, the main risk is of thyroid intake as explained above. Thankfully, both of the recommended steps for reducing the risk of radioactive iodine intake have been adopted at Fukushima. High concentrations of cesium-137 have been

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found in two spots up to 25 miles away from the reactors, but it is unclear if there are more areas of high-concentration that have not yet been detected[6].

However, it is important to note that, at this time, "environmental levels of radiation outside the 20-km evacuation zone around the power plant are currently far below levels that warrant concerns about human health"[2]. The main sources of radiation from the Fukushima plant have come from radioactive steam produced by efforts to keep the fuel rods cool, which prevents a large-scale meltdown as occurred at Chernobyl, and the release of radioactive water that did not directly reach the fuel rods. Most of the radiation released has been sent out to sea, by prevailing winds in the case of the steam and by intentional dumping by the Japanese authorities. As a result, in order to prevent the intake of radioactive material, fishing will come to a standstill in that area of Japan until radiation levels return to normal.

Consequently, the current situation at the Fukushima Daiichi power plant does not seem to pose any imminent health risks to those not involved in the cleanup. While cesium-137 and radioactive iodine have been released in the surrounding environment, precautions have been taken, including evacuation, distribution of potassium iodide pills, and a moratorium on the consumption of food-products in the area. Therefore, at this time, it seems that the preventative measures taken by the Japanese authorities will limit the public health problems from the damage to the Fukushima nuclear power plant.

**References for this editorial can be found at**

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## Cardiovascular Damage in Children

*By Eriene-Heidi Sidhom*

In a study conducted as part of the Project Health Schools in Michigan, children as young as 10 years of age were exhibiting symptoms of cardiovascular damage. In a first study, with 1,104 students, 16% of students had low HDL cholesterol levels and a second study with 1,276 students showed children with poor cardiovascular fitness. Additionally, these findings correlated with other risk factors: a low HDL cholesterol level correlated with higher BMI and at least two additional symptoms of metabolic syndrome (high LDL and triglycerides, elevated blood pressure or abdominal obesity).

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## Americans under Medicaid Unable to Access Adequate Healthcare

*By Alex Sakers*

Under Obama's health care bill, Medicaid plays a vital part in providing health insurance, and thus access to healthcare for many uninsured Americans. Medicaid aims to reimburse doctors, dentists, hospitals, and other healthcare providers enough to ensure that its recipients have the same access to care as the general population. However, as payment rates have been cut in many states, many with Medicaid are finding it hard or impossible to find doctors and specialists to accept their insurance. For example, Kim Hardy, an OB-GYN in Lafayette, LA reported that Medicaid pays $1,000 for the same level of prenatal care that private insurance pays $2,400. The increasing disparity in reimbursement between Medicaid and private insurance has been driven by the need to control the Medicaid budget while accommodating the surge of people now insured under this program; it is expected that the number of people covered under Medicaid will surge from 56 million to 76 million in the next 10 years. Already, over 20 states have cut payments to healthcare providers by 15-20%. With each cut, it becomes harder for Medicaid enrollees to find specialists to provide the care they need. For example, Nicole Dardeau described her Medicaid card as "a useless piece of plastic" after being unable to find an orthopedic surgeon to treat three herniated disks in her neck that keep her from being able to work. Stories like hers are far too common; sadly Medicaid simply does not afford the same level of healthcare to its enrollees as private insurance.

**REFERENCE**

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