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Is Our Food Safe From Radioactive Contamination?

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This document has been developed in an effort to provide guidance to consumers and members of the food industry in understanding radioactive contamination in the wake of Japan's nuclear power disaster on March 11, 2011. Note that the information contained in this document reflects the accepted thinking of the general scientific community based on scientific data up to April 19, 2011. This information, however, is subject to change and will be updated as necessary based on new research findings. Users of the document are encouraged to consult with their respective Extension Agents and Specialists to insure that they are referencing the most recent version.

Accidental Core Melting

The March 11, 2011, events that occurred in Northeastern Japan dramatically changed the world. Never before had anyone seen such a display of the extreme power of Nature: one of the most massive earthquakes ever recorded and the unimaginable tsunami that immediately followed. As they were designed to do, the active reactors of the Fukushima I Nuclear Power Plant in Northern Japan automatically shut down after the earthquake, which had a magnitude of 9.0, but the subsequent tsunami flooded the plant and incapacitated the emergency generators that cool and control the reactors. Since the nuclear fuel inside the reactor core continued to produce heat that was not adequately removed, heat continued to accumulate, and explosions and fires resulted in some reactors. An accidental melting of the core (termed nuclear meltdown in the vernacular) followed. This is a serious stage because of the potential for release of radioactive material into the environment. One of the many layers of safety in a nuclear power plant is that the reactor is built in a containment building made of about 4 to 8 feet of special steel-concrete in an airtight dome. The containment building has a series of valves and filters intended to prevent the release of radiation. Thus, failure of the reactor vessel does not automatically mean that radioactive material will be released to the environment because of this containment building.

The severity of the combination of the earthquake and tsunami was such, however, that cracks in the building occurred and some of the water contaminated with radiation leaked to the surrounding environment. Attempts to contain the contaminated water in the reactor by pouring concrete in the cracks were minimally successful and various additional strategies were tried. Elevated radiation levels were then detected in the nearby Pacific Ocean. The Tokyo Electric Power Company (TEPCO) that owns the nuclear power plants reported on April 19, 2011 that a total of 70,000 tons of contaminated water needed to be removed from the reactors, the associated power plant buildings, and surrounding areas. TEPCO began the removal process and will monitor the radiation levels inside the power plants to determine when their workers may resume the task of repairing the cooling systems of the reactors and restoring the cooling functions of the spent fuel pools. TEPCO stated that the process could take months to complete.

Ironically, Japan is respected worldwide for its advances in technology and establishment of high standards for its nuclear power plants to withstand earthquakes and tsunamis. But reaching the power plant immediately was almost impossible because roads were made impassable by the earthquake and tsunami. The magnitude of these severe events was such that the world felt ill equipped to help Japan. The people who were displaced by these events had no shelter and replacement clothing and a very limited supply of food and water. Many were without their families. It was only a matter of time until the safety of whatever food they could find in the area would be questioned. That time has come.

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Sources of Radiation

It helps to understand that on any ordinary, disaster-free day, there is background radiation in and around us. Most radiation comes from naturally occurring sources such as space (e.g., protons, electrons, neutrons, etc.); the earth (some naturally occurring in our food and water); the human body (isotopes of potassium-40 and carbon-14); and the atmosphere (e.g., radon). We are also exposed to other sources of radiation such as radiological imaging and therapy, self-luminous dials and signs, and emissions from fossil fuels. The maximum radiation absorbed in the U.S. is 620 millirem (6.2 millisieverts) per year. Half of this dosage is from natural sources (cosmic, the earth, our body, and radioactive gases such as radon). The other half comes almost entirely from medical diagnostics and treatments.

What Does Detection Mean?

Present detection technology is more sensitive than in the past such that much smaller quantities can now be measured. The radiation from the above sources is detectable but is at low levels not ordinarily harmful to the human body. Thus, detected radiation is not always harmful. Detection of radiation does not always mean that levels are in violation of regulatory standards. Detection of radiation does not always imply it has exceeded safe limits.

Steps to Guard Against Food Contaminated with Radiation

In Japan and Other Countries.

During nuclear accidents, foods at the highest risk for radioactive contamination are dairy products and fresh produce. Radiation levels of contamination reported in milk, water, and fresh produce in the surrounding production areas around the Fukushima I nuclear power plant were initially at trace amounts, but reports from Japan have indicated that the levels of contamination in food in the vicinity of the damaged nuclear power plant have continued to rise. As a result, Japan food authorities have banned the sale and consumption of some foods, including water, within 20 miles of the damaged nuclear power plant, and of some other foods as far away as Tokyo. In addition, although Japan is not a large exporter of fresh foods, countries importing foods from Japan are testing most if not all shipments from Japan for radiation contamination before releasing to the marketplace those foods they consider safe.

As of March 23, 2011, Singapore and Hong Kong have temporarily banned imported foods from areas near the damaged nuclear plants of Japan. Australia joined the restriction on March 24. On March 25, the Philippines banned Japanese chocolate made with milk from the affected prefectures of Japan. China has also banned the importation of all dairy products, fruits, vegetables, aquatic products, and harvested products from the prefectures of Fukushima, Ibaraki, Tochigi, Gunma, and Chiba. Taiwan has banned all imported foods from the same five Japanese prefectures. South Korea has banned milk, spinach, broccoli, cauliflower, cabbage, and turnips from the prefectures of Fukushima, Ibaraki, Tochigi, and Gunma. The EU has reinforced food safety controls on all feed and food originating from the 12 prefectures of Japan, including the most affected four prefectures. Japan has suspended all exports of milk, spinach, broccoli, cauliflower, cabbage, and turnips after the nuclear plant released radioactive materials. To decrease the risk of contaminated fish being sold in the market, fishing in the northeastern prefectures of Fukushima, Miyagi, and Iwate has been suspended. As of March 27, 2011, the ocean waters near the nuclear power plant show elevated levels of radioactive contamination. Diligent monitoring continues.

In the United States.

Since 1973, the Environmental Protection Agency (EPA) has implemented a continuous program for monitoring environmental radiation in our air, drinking water, milk, and precipitation. The program is called RadNet (formerly ERAMS) and is an existing nationwide radiation monitoring system with an online searchable database at http://www.epa.gov/narel/radnet/modes.html (accessed April 19, 2011). RadNet provides radiation levels data to the people during both routine and emergency monitoring. To make the monitoring transparent, the EPA has sent additional mobile monitors to Hawai‘i, Alaska, and Guam, the parts of the U.S. closest to Japan. According to the EPA, radiation levels in the air as of April 19, 2011, detected in Alaska (Anchorage, Juneau, Fairbanks), California (Anaheim, Bakersfield, Eureka, Fresno, Los Angeles, Riverside, Sacramento, San Diego, San Francisco, San Jose), Hawai‘i (Honolulu), Oregon (Corvallis, Portland), and Washington (Olympia, Richland, Seattle, and Spokane) “have been far below levels of public-health

concern." Since earlier "precipitation samples collected by EPA have shown trace amounts of radioactivity," it is expected that harmless trace amounts of radioactivity will be found in some samples of drinking water in the coming weeks. Data from these monitors indicate that no dangers exist as of this moment. In addition, since 9/11, the U.S. Department of Agriculture and the U.S. Customs and Border Protection have implemented a blanket radiation screening for almost all shipments entering the country, including food.

Foods from Japan make up about 4% of all foods imported to the U.S. from all sources. The most common foods imported from Japan are seafood (e.g., scallops and tuna), snack foods, processed fruits and vegetables (e.g., potatoes, frozen vegetables, citrus fruits, and melons), and milk products (e.g., casein and cheese). On March 22, 2011, the United States became the first nation to restrict all milk and milk products, fresh fruits, and vegetables from the affected Japan prefectures of Fukushima, Ibaraki, Tochigi, and Gunma. The US FDA is utilizing its import tracking systems to flag food shipments from Japan automatically to determine if they are from the affected prefectures. The US FDA has also expanded the monitoring to feed and pharmaceuticals from Japan.

How to Limit Radioactive Contamination of Foods

As of March 27, 2011, low levels of radioactive iodine-131 from the Japan nuclear reactors have been detected in Massachusetts rainwater. The Massachusetts Department of Public Health officials tested samples of water from the reservoirs serving the Greater Boston area, and all results were negative. On March 29, low levels of radioactivity were detected in snow samples in New Hampshire "at least 25 times below the level of concern even for infants and pregnant women" and in air samples in Maine "at much lower than naturally occurring radiation" such as from sunlight and radon. On April 6, 2011, EPA reported that trace and harmless amounts of Iodine-131 from Fukushima were detected in drinking water samples from Boise, Idaho and Richland, Washington. To put the amounts in perspective, EPA stated that the levels were so low that "even an infant would have to drink almost 7,000 liters of this water to receive a radiation dose equivalent to a day's worth of the natural background radiation exposure we experience continuously from natural sources of radioactivity in our environment." On April 12, 2011, EPA reported very low and harmless traces of radiation in milk produced on the Big Island. Monitoring of drinking water, milk, and precipitation will be stepped up as a precautionary measure, but radiation levels in food in the U.S. are expected to remain low. It is unnecessary to stay away from sushi and other seafood delicacies. It is also not advisable to start taking iodide tablets as of this moment. But because these are unprecedented and complicated times, it is important to remain aware of directives from health and law enforcement officials concerning possible radioactive contamination of food and to follow their instructions completely.

It is recommended that the following steps be followed to limit hazards in food, just as in any ordinary, disaster-free time:

- Use only food and fresh produce from reliable sources.
- Inspect the packaging of all foods you intend to consume. Only eat food whose packaging has not been compromised.
- Wash your hands and food contact surfaces thoroughly with soap and water before handling any food. Using disinfectant gels or lotions does not replace proper hand washing.
- Rinse fresh produce very well before serving. Do not use detergent or soap.
- Serve the food immediately.
- Report any questionable food to health and law enforcement officials.

Act in the Proper Perspective

There are practically no zero radioactivity levels in this world. Technology advances have made it possible to detect very low levels of radiation that do not pose any harm to humans. Let us not panic when radiation levels are detected. We should be glad that we are able to detect such inconsequential levels of radiation. Yes our food is safe as of this moment. But let us also stay alert and mindful of directives from our health and local enforcement officials. They are, after all, also consumers; they have families of their own to protect and have the public's well-being as their number-one priority.

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