

# **Some General Observations from the Consumer Perspective Regarding Food Safety in Japan after the Great East Japan Earthquake and Nuclear Disaster on March 11, 2011**

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The effects of the extraordinary catastrophe on March 11, 2011 in northeastern Japan are difficult to assess even as four months have passed since the 9.0 earth quake and tsunami. In addition, the ongoing crisis at the Fukushima Daiichi Nuclear Plant, with radiation leaking from at least four reactors, has led to evacuation of areas in Fukushima prefecture, and restrictions on food grown and produced in certain areas. It is a humanitarian disaster that affects all citizens in the Tohoku region, but specifically its farmers, fishermen and food producers; for consumers, it also poses specific challenges that need to be addressed based on what we know so far.

This paper will deal with general food safety issues in the wake of the crisis. It is not my aim to discuss the details of the radiation as such, or to go into great detail about the safety standards set by the government or others. We know that measurements of radioactive substances can give some information about the general level of contamination, but making specific statements about the safety of food is much more difficult. On-going official measurements are performed in Japan and the results are continuously published by the Ministry of Health and by the local governments. Also, private groups and non-governmental organizations are performing independent measurement and publishing data and analysis. Moreover, other chemical pollution such as dioxins should be carefully monitored. Based on this, what can be concluded about the general level of safety or risk, looking at it from the perspective of consumers?

## **Safety Standards**

Setting safety standards or levels for radioactive substances in food is a task that gained a lot of attention after the Chernobyl accident in 1986. 1)

There are international standards agreed upon by FAO/WHO Codex Alimentarius Commission, geared at facilitating trade in food. Codex calls them "guidance levels" rather than "safe levels" while Japan officially calls them "provisional regulation values."

Countries may set national standards that are higher or lower than the Codex standards, depending on specific intake variations of local food and cultural preferences. After Chernobyl, the main concern was for grazing cattle, sheep, and reindeer in Europe. Japan, instead, is a country where people consume a large amount of rice, vegetables and fish. Thus, the country may decide to set more strict safe levels for such foods, as the total exposure will be higher than in a country with other dietary traditions and preferences.

The safe levels are based on estimates on annual consumption, which means that eating a product with elevated levels is unlikely to have any harmful effects if it is eaten only once or not eaten over a long period of time. Other doses, for example by inhaling radioactive particles in the air, as well as by receiving radiation from external sources such as soil, will also add to the total health effect and should be taken into consideration. Generally speaking, safe levels are different for the adult population and for pregnant mothers and infants/children, as there is a scientific consensus that vulnerable consumers need extra protection.

Japan did not have any guidance levels or restrictions for nuclear substances on food at the time of the nuclear disaster, and hurried to draw up provisional regulation values by March 17 2) and legislation by March 29, 2011.

Japan's Food Safety Commission (FSCJ) notes:

"Due to this radiation leakage, from the perspective of the Food Sanitation Act, which aims to prevent sanitation hazards resulting from eating and drinking, the "Indices relating to limits on food and drink ingestion" indicated by the Nuclear Safety Commission of Japan was adopted for the time being as provisional regulation values. So the foods which exceed these levels are regulated to ensure those foods are not supplied to the public to eat, and local governments have been notified by the Ministry of Health, Labour and Welfare on 2011 March 17. This provisional regulation values [sic] were adopted without an assessment of the effect of food on health by FSCJ because of its urgency, therefore on 2011 March 20, the Minister of Health, Labour and Welfare requested FSCJ

for an assessment of the effect of food on health.” 3)

WHO does not appear to have made any serious effort to look into the specific situation in Japan post-March 11, which is unfortunate, and we would urge them to make more efforts to consider the wider health issue in Tohoku, especially in the coastal areas. WHO notes: “The Japanese authorities have regulations in place relating to provisional regulatory limits of radioactivity in food and food monitoring is being implemented. Measurements of radionuclide concentrations in food are now taking place and are being released by the Japanese authorities. The presence of radioactivity in some vegetables and milk has been confirmed...” 4)

Mainly, the isotopes being measured in Japan are radioactive Iodine and Caesium, but other substances like Plutonium and Strontium are also relevant and should be measured carefully. It is unclear which radioactive isotopes were tested for or detected in the early days of the crisis. The way sampling is done at the local level is still sometimes unclear at this point, and needs to be further investigated and assessed by independent experts to increase consumers’ trust in the process.

The initial data published by the government showed extraordinarily high levels of Iodine-131 on vegetables such as broccoli, spinach, parsley and celery in many locations in several prefectures, especially in Fukushima 5), but also in Ibaraki 6) and Chiba 7). Raw milk was tested and found to have slightly elevated levels in all parts of Fukushima with levels above the safe levels in certain areas 8), 9) and slightly elevated levels in Saitama and Gunma, 10) but not nearly as high as in Fukushima.

Note that such food products are not for sale. In all the cases where detected levels were found to be higher than the government’s provisional regulation values, the foods have been prohibited from being placed on the market. Hence, no milk from the places where high levels were measured is allowed to be sold three to four months after the crisis. Of course, this does not mean that all food products with high levels have been kept away from consumers; some may have been shipped before testing had been initiated. There is also a possibility that vegetables or milk from areas that had not yet been tested were put on sale. That does not mean that the public has been exposed to unsafe amounts of contamination, as the exposure would appear to be for a short time only, especially in the case of spinach or broccoli harvested in mid-March in the most heavily contaminated areas in Fukushima prefecture.

There are efforts to urge consumers to show support for farmers in the Tohoku region, both through special marketing events and by commercial groups that sell directly to members. One such effort that seems to require particularly thorough testing and measurement is the “Cheer Up by Eating” boxes sold by Daichi wo Mamoru Kai, a Chiba-based company, with produce sourced directly from selected farmers in the Tohoku region. 11), 12)

Three to four months after the initial release of radioactivity, high levels of radioactive Caesium were still found in a few products, mainly takenoko (bamboo shoots) and shiitake mushrooms, and these levels do not appear to decrease. Most of such contamination is confined to certain areas in Fukushima prefecture, especially in areas directly north and northwest of the Fukushima Daiichi Nuclear Plant.

Caesium isotopes have a long half-life and will likely be present in contaminated soil for a long time. 13) This could have consequences for rice production, and the harvest later in 2011 should be carefully monitored. It is worth noting that levels of radioactive Iodine has mostly decreased to levels that cannot be detected, which is consistent with expectations, as its half-life is 8 days.

In one incident, beef from cattle raised on hay exposed to very high levels of radiation (because the hay had been stored outdoors) at one farm in Minami Souma city in Fukushima, which is just to the north of the nuclear reactors, was found to have elevated levels of Caesium. 14)

These cows were raised immediately outside the evacuation zone between 20 and 30 km radius from the Fukushima Daiichi Nuclear Plant. The evacuation zone includes the Katsurao, Namie and Iitate towns. On April 19, MAFF decided to order some 20,000 meat cows and dairy cows inside the evacuation zone to be moved to other parts of Japan, but it is unclear how successful this policy has been. The same farm has previously shipped cows to Tokyo and Tochigi, but no checks were made at that time. The Fukushima prefectural government has now asked the Minami Souma city government to stop shipping or transporting cattle that has been raised in their area and not allow it to be processed for consumption. 15)

It is obvious that livestock in Fukushima must be monitored much more closely than first thought, and wild game from the region is very likely contaminated to a large extent. Even though we now know which areas that need

special attention, three to four months after March 11, there is a great uncertainty about the lack of consideration for the sentiments of consumers who are worried about radioactivity in their food. Those who want to take short-cuts in order to make a profit are seriously undermining the efforts of all the other, more careful food producers, as well as everyone from areas that are clearly safe. It is a tragedy if all food from Fukushima will be regarded as unsafe while it actually may be only the most heavily contaminated towns and cities that deserve such severe judgment.

Regarding fish and seafood, large amounts of radioactive substances have been released into the Pacific Ocean. This contamination is observed in the measurements done on fish and seafood along the Pacific Ocean coast in Japan. Three to four months after the initial release, and most likely also due to continued release over the time period, low levels of both Caesium-134 and Caesium-137 have been found in a large number of samples, ranging from salmon in Hokkaido, 16) mackerel in Chiba prefecture, 17) and in a range of other types of fish and seafood products in Iwate, Miyagi and Fukushima prefectures. 18) In most cases where sampling has been undertaken, however, no radioactive substances have been detected, or the levels are considerably lower than the government standards.

The contamination of inland waterways (and possibly lakes) appears to be serious. On June 23, 2011, high levels of Caesium were detected in five samples of river fish out of 36 investigated near the Fukushima Daiichi Nuclear Plant. The fish with levels above the safe levels had been caught in Mano River and Niida River in Minami Souma city and in Abukuma River in Date City. 19)

For tea, high levels of Caesium-134 and Caesium-137 were found in Gunma prefecture 20) and in Chiba and Kanagawa 21) prefectures. The nation's largest tea producing region in Shizuoka prefecture, some 300 km southwest of the Fukushima Daiichi Nuclear Plant, has also found elevated levels of radioactive substances on its products. 22)

The radioactivity levels in so-called "first harvest processed tea" were all somewhat high, but not above the government standard. Voluntary tests conducted on June 9, 2011 by a private company reported that tea produced in Warashina and Ryogohchi areas, both within Shizuoka City, exceeded regulatory values. Official tests were immediately conducted, and it was indeed confirmed that radioactive levels had exceeded regulatory values in Warashina area.

The Shizuoka Prefectural Government called for shipment restraint and voluntary recall of the concerned tea sources. However, according to research conducted by Shizuoka Tea Research Center, "when brewed for drinking, the radioactive cesium level significantly drops (1/85) and therefore does not present any negative health influence." It is unclear how Caesium-134 and Caesium-137 have accumulated on or in tea leaves, and why it took so long for tests to reveal the contamination. It is also important that tests are being done on tea for other radioactive nuclides.

### **Criticism of Testing**

Is everyone satisfied with the methodology of the measurements? We note that none of the figures published by MHLW are explained or presented in a particularly academic way. We do not know how the testing has been done or which equipment was used. Greenpeace, the anti-nuclear environmental organization, notes that Japan needs to improve its testing regime and use the more sophisticated monitors that were used by European governments after Chernobyl. 23)

Simply put, the data as presented on the government's website would not stand up to peer review for an academic paper. We now desperately need detailed studies, however, they should be done by experts with a background in food safety science and consumer protection.

So far, no independent organization or research institute has published any real analysis of the Japanese government's data, and frankly we are at a loss. The data is sparse and incomplete even after three to four months. It is not presented on the official websites in a way that is easy to search or understand. One independent website that provides such useful service is the ATMC.jp website. 24)

Unsystematic sampling methodology means we do not have a clear grasp of how the levels of radioactive contamination have decreased, for example in the case of Iodine, with its 8-day half-life, on products such as broccoli and spinach. Consequently, and due to a lot of other reasons related to the mishandling of the great nuclear crisis since March 11, some consumers feel that they cannot rely on the official data.

Japanese citizens are responding to this by taking matters in their own hands. One example of an activity at the local level in Fukushima prefecture is the use of a sophisticated device (LB200) kindly provided by CRIIRAD, who visited Japan and Fukushima from May 24 to June 3, 2011 as part of a joint effort with a group of Japanese citizens. This equipment is now used by citizens who have been trained by CRIIRAD experts to test their own food. 25)

### **Other Health Risks**

Other pollution except for radioactive nuclides will also enter the food chain, and may pose completely different risks to consumers. Chemical factories, oil refineries, and other petrochemical industrial complexes were destroyed or seriously damaged along the entire 400 km coast of Tohoku from Iwate and Miyagi to Fukushima, Ibaragi and Chiba. The large number of fires immediately after the earthquake and tsunami as well as indiscriminate burning of debris and garbage will have health effects that are very difficult to estimate. Data is not yet available from systematic testing of the substances such as asbestos or dioxins that have been released into the air and water after March 11, 2011 as testing of air quality, public water areas, groundwater, soil, seafloor, and tsunami sediment is still in the planning stages.

The burning of a large, open-air pile of debris as part of the clean-up effort in Minami Sanriku harbour could be observed by this author on July 9, 2011. Thick, black smoke and a smell that is associated with burning plastic could be observed. There appeared to be no effort by anyone, be it government officials or private initiatives, to monitor the airborne pollutants. Concerns about similar fires have been voiced by Bird and Grossman in their very important article in *Environmental Health Perspectives*. 26)

The authors note: "Such fires have great potential to emit additional hazardous contaminants such as dioxins. These known human carcinogens result from incomplete burning of PVC, which is used extensively in wiring, construction materials, and numerous other consumer, industrial, and infrastructure applications. Dioxins can also be produced by burning seawater-soaked wood."

Soil testing for dangerous chemicals have begun in certain areas, including Sendai city in Miyagi prefecture, and has so far revealed oil contamination and persistent organic pollutants (POPs), and low levels of other chemicals such as arsenic, PCBs or heavy metals. But a more pressing concern for farmers in the tsunami-hit areas is the salt content in their soil, and if it can be washed out from the fields quickly enough to allow farming to resume. 27)

Consumers in Japan and other countries have held Japanese agricultural products in high esteem thanks to the diligence of the farmers, fishermen and food producers. It is impossible to estimate the real effects of this crisis and how Japan's food supply system will recover. The damage in the coastal Tohoku region to the fisheries sector is overwhelming, with over 21,500 boats and 319 harbours damaged or destroyed. For the agricultural sector, over 33,000 farms, facilities, sewerage facilities, drains, pumps etc. have been damaged or destroyed. The total damage to agriculture, forestry and fisheries by July 5, 2011 was estimated to be 2,115 billion yen, a staggering amount. 28) We can only express our deepest sympathies to everyone involved in the rebuilding of the Tohoku region.

### **Conclusions**

It is important to note that vegetables or other foods that are being measured outside of the most contaminated region in Fukushima prefecture show very low levels or do not show any detectable levels of radioactive substances three to four months after the nuclear disaster at Fukushima Daiichi Nuclear Plant. In most parts of the Tohoku region in northeastern Japan, there is zero or almost no detectable nuclear contamination. In the rest of Japan, consumers can rest assured that there is no radioactive material on their dinner tables.

Based on the official data as published by Japan's Ministry of Health, thus, it emerges that three to four months after March 11, with the exception of food from certain areas in Fukushima prefecture (and possibly tea that have grown outdoors on tea shrubs since March), Japan's farmed food supply and its products can be generally regarded as safe. However, at this point, fish and seafood caught in rivers in Fukushima and possibly along parts of coastal region of the Pacific Ocean need more attention and surveillance before any conclusions can be made.

Thinking ahead, the issue of soil contamination and accumulation needs to be addressed and carefully monitored, as it will affect rice production, especially in parts of Fukushima prefecture. Pollution problems such as asbestos, dioxin and PCB due to post-March 11 fires and indiscriminate burning of debris and garbage will also add to the health risk. There are also those who worry that there are small or large radioactive "hot-spots" in areas with

higher levels of contamination from the Fukushima Daiichi Nuclear Plant. More precise maps of the contamination must be prepared by reliable methods.

A lot needs to be done in order to limit long-term contamination and protect consumers in addition to generally help regain the trust and confidence in Japanese food. Farmers, fishermen and food producers need to be compensated and their loss of income should not be used as an excuse to encourage consumers to purchase questionable products; the damage is much too big for that, and the stakes too high.

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