



Radiation experts Noboru TAKAMURA and Shunichi YAMASHITA at FMU

24 March 2011, Fukushima City, Japan

Fukushima Medical University welcomed the visit of radiation experts affiliated with Nagasaki University and the Atomic Bomb Disease Institute:

Professor Noboru TAKAMURA, Chair, Department of Radiation Epidemiology

Professor Shunichi YAMASHITA, Chair, Department of Molecular Medicine

Both professors have participated in long-term studies of the Chernobyl incident.

Faculty and staff listened intently to Professors Takamura and Yamashita at a special evening lecture convened on March 21. This summary comes from Prof. Ikuo WADA, Dean, FMU Graduate School of Medicine and Chair, Department of Cell Science.

Professor TAKAMURA

What happened at Chernobyl?

A nuclear core reactor exploded. High doses of radioactive Cesium-137 and Iodine-131 (I-131) were released into the air. Eventually about 87 children developed thyroid cancer, which is a potential side effect of prolonged or excessive I-131 exposure.

What about the Fukushima nuclear plants?

Compared with Chernobyl, the release of radioactive elements, including I-131, is orders of magnitude smaller. Cancer risks are virtually nil in this instance. It is reasonable to ask how long this small amount of radiation will persist. The release seems to be a singular event, and airborne radiation is decreasing. As control measures continue at the nuclear plant, I don't think that there is any health hazard by this accident. Of course vigilance and accurate data collection must continue, and information must be judged objectively. Unfortunately, various "specialists" making media appearances have no real experience studying the health hazards of radiation.

Professor YAMASHITA

Ordinary evacuation procedures use a 10 km radius, but an unexpected explosion prompted a 20 km radius in this instance. Currently, people between 20 and 30 km from the site are advised to stay indoors. All the reported data are correct but meaningful explanations are lacking, so it is natural for the public to feel anxious and confused. Self-appointed "specialists" should avoid talking about purely theoretical scenarios.



It takes courage now to declare anything as *safe*. It is easier to say that there is *danger*. Airborne radiation levels can vary due to mountains and winds and correctly speaking, a circular radius of so many kilometers is not meaningful. But the government needs to draw a line. At least we can say that areas more than 20 km from the site are completely safe. People between 20 and 30 km are not evacuated because they are not at risk.

Event-related radioactivity in the air, soil, water, and food is decreasing overall. The half-life of I-131 is 8 days, and only 1/10th of any I-131 in drinking water is actually absorbed by the body.

Radiation is potentially hazardous because it can damage DNA and alter genes. But statistically, an exposure of 1 mSev (milli-Severt, 1/1000 of a Severt) will modify a single nucleotide of a single gene. A dose of 100 mSev will affect about 100 nucleotides. These are small numbers in the context of an entire genome, and humans have sophisticated gene repair systems to reverse the damage. It should be acknowledged that if gene repair mechanisms fail or are overloaded, damaged genes could lead to cancer in future.

Exposures up to 10 mSev, are completely safe. Even if we use our most advanced technology, it is impossible to detect the effects of such radiation on the body. News headlines about radiation being 10, 100, or 1000 times normal are not meaningful in terms of risk, but reporters are not authorities and headlines are meant to attract attention. Sadly, informed scientists might be disinclined to deal with the media. We should consider this as a good opportunity to introduce scientific thinking to the public. Presently, they are given numbers and are encouraged to worry.

At Fukushima nuclear plants, workers are now limited to 250 mSev exposures. Will this provoke cancer in the future? Probably not. Everyone in Japan receives an average of 3.5 mSev. So the level of radiation in Fukushima Prefecture is not a cause for alarm. Better for us to consider other causes of cancer, like smoking, chemical toxins, processed foods, and genetic disposition. Compared to those factors, radiation risks are extremely small. Statistically, an exposure of 100 mSev might cause one person out of 100 to develop cancer. But by age 70 there is a 1 in 3 likelihood of having some kind of cancer regardless of radiation exposure. Most cancer is provoked by other factors.



Radiation has no smell or sound. Since we cannot sense it, we judge by emotions, which are heavily influenced by images of nuclear weapons. Let me emphasize that μSev (micro-Severt, 1/1000 of a milli-Severt) levels of radiation pose no health hazard. Let's respect real science.

If outdoor radiation is reported in $\mu\text{Sev/hr}$, a day's exposure is calculated by multiplying by 24. Inside, radiation is likely to be around 1/10th the outdoor value. Only 1/10 of ambient radiation enters the body. Radiation from any amount of I-131 is cut in half every 8 days, as the I-131 converts to xenon, which is inert and not radioactive. We should not forget that the level of radiation from I-131 is extremely small compared other sources of radiation present in nature. For example, we consume potassium every day, some of which is radioactive. Media hype about radioactive rain or snow does not concern me. It is raining today (March 21) but I didn't bother to use an umbrella. What is in the air now came from a single explosion. Some of it will end up in ground water and soil, so it is likely that radiation above prescribed limits will be detected in vegetables and drinking water. But they are safe. Advice to avoid contaminated food and water is based continuous consumption every day for a year. Thus this restriction has no meaning when a single event causes the release of some radiation. Let me re-state that I-131 is converted to inert xenon with a half-life of 8 days. That means an initial dose is reduced to 1/2 after 8 days, 1/4 after 16 days and 1/8 after 24 days. Furthermore, washing vegetables with water will generally reduce their radioactivity to undetectable levels.

It is natural in our democracy for citizens and media to distrust the government. No authoritative organization is completely independent of government support. Any kind of financial relationship or dependency has the potential to affect what people say, so it is fair to be concerned about this when listening to anyone in science, politics, or media. Ultimately, however, scientific facts should guide our thinking and behavior.

Vulnerability is related to age, and our youngest are most vulnerable. In Chernobyl, adults over age 20 suffered no health hazards. So, in Fukushima, evacuations should be for babies and children. Adults over 20 do not need to be evacuated.

More information from Fukushima is available at www.cbbstoday.org - Editor.