The Real Chernobyl: Q&A With a Radiation Exposure Expert

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August 5, 2019 By Nicoletta Lanese

The Emmy-nominated HBO mini-series Chernobyl, which is a dramatized account of the 1986 nuclear power plant disaster, has rekindled conversation about the accident, its subsequent cleanup and the long-term impacts on people living near the power plant.

UC San Francisco’s Lydia Zablotska, MD, PhD, grew up in Ukraine, trained as physician in Belarus, and has studied the long-term health impacts of radiation exposure on the Chernobyl cleanup workers, local children and others in the region. Her research helped uncover the connection between radiation exposure, thyroid conditions and leukemia, and remains relevant to global health today.

We talked with her about the real-life health impacts from the disaster portrayed in the HBO miniseries. The following answers have been edited for length and clarity.

What kind of radiation were people exposed to at Chernobyl?

The first responders, including firefighters and nuclear workers who tried to put out the multiple fires and prevent the explosion of other reactors at the nuclear power plant, were exposed to large doses of gamma radiation. Gamma radiation originates during the decay of radioactive isotopes of uranium or plutonium used as a nuclear fuel in nuclear power plants. As a result of decay, packets of electromagnetic radiation, which consist of high-energy photons, are emitted and could penetrate body tissues and cause damage to cells and their genetic material. Subsequently, DNA mutations could lead to the development of cancer.

The mini-series shows some workers dying instantly from acute radiation syndrome — what symptoms did they really experience?

The latest report from the United Nations Scientific Committee on the Effect of Atomic Radiation found 134 first responders who were diagnosed with acute radiation syndrome (ARS) after the Chernobyl accident. Of these, 28 died in the first four months, but not instantaneously. Then 19 more died over the next 20 years. But the majority of these survived and lived a long life after that. There were no cases of ARS among the general public living in cities and villages around the
Chernobyl power plant.

Large doses of radiation could affect a number of systems in the body that are necessary for survival. Patients with ARS could develop a bone marrow syndrome, which suppresses their immunity, or a gastrointestinal syndrome, which could lead to damage to the lining of the intestines and associated infection, dehydration, and electrolyte imbalance. Then, a couple days later, the circulatory system collapses so people start having blood volume issues and so forth. The whole body is essentially collapsing.

Can those exposed to intense radiation exposure “pass on” their radioactivity to others, as the HBO show suggests?

There are types of radiation where human bodies could retain radioactive particles and remain radioactive over time, but this is not the type that was seen at Chernobyl. After gamma radiation has passed through the body, the person is no longer radioactive and can’t expose other people.

Based on what we know, at Chernobyl, there were also no effects on children who were exposed to radiation in utero. There are published reports on the effects of exposure in utero on their thyroid glands but findings are not statistically significant, and there are no additional scientific data for other harmful effects.

More importantly, we have the study of atomic bomb survivors in Japan, which tracked a very large group of people over a long time. Atomic bomb survivors and Chernobyl cleanup workers were exposed to the same kind of radiation, so the findings from Japanese survivors could shed some light on the expected effects after the Chernobyl accident. The study of atomic bomb survivors did not show any increase in major birth defects or other untoward pregnancy outcomes among children of survivors, nor there were any indications of hereditary effects.

How does radiation exposure relate to thyroid conditions?

We conducted two studies of thyroid conditions in children who lived at the time of the Chernobyl accident in affected areas in Ukraine and Belarus. We confirmed that the particular type of radiation in Chernobyl, radioactive iodine, could cause thyroid cancer. Unexpectedly, we also showed that radiation to the thyroid gland from ingesting radioactive iodine within two months after the Chernobyl accident by children and adolescents could lead to development of non-cancer thyroid diseases, such as thyroid follicular adenoma, thyroid benign nodules, and hypothyroidism.

We also showed that the youngest children were at the highest risk for developing these diseases. Children’s thyroid glands are very active and act as a sponge for iodine, because our body needs iodine. But our bodies cannot distinguish between dietary iodine, from salt or fish, and radioactive iodine. After the explosion of the nuclear reactor, parts of the core were dispersed in clouds and carried by the prevailing winds. This is how Belarus, which was in the path of winds in the first days after the accident, got really large doses. One of the most contaminated products was milk from pastured cows, mostly consumed by children.

What about leukemia?
We did a study of cleanup workers in Ukraine and confirmed that gamma radiation causes leukemia, as was found in atomic bomb survivors in Japan. Our truly unique finding was that radiation exposure can cause many types of leukemia, not just a select few. In particular, we showed that radiation doses of gamma radiation were associated with chronic lymphocytic leukemia, the most prevalent type of leukemia in adult, Caucasian men. CLL was not increased in the study of atomic bomb survivors, but as our group at UCSF reported in a later study, CLL is very rare in Japan, so this finding could have been missed.

What is the biggest misconception about the health impacts from the Chernobyl disaster?

The biggest misconception is that radiation is the cause of all adverse health effects. Radiation can cause cancer and non-cancer outcomes, but it does not cause every type of cancer and non-cancer outcome and small doses of radiation have not been associated with an appreciable increase in risk. This is actually on us, as scientists, that we didn’t explain scientific findings properly to the public both immediately after the accident and in the years since.

Studies suggest that the biggest effect of Chernobyl was the effect on the public — the psychosocial effect — which was exacerbated by the collapse of the Soviet Union, shortages of food and lack of proper medical care and medications. The collapse of the social system exacerbated any and all potential effects of radiation. And it’s very hard to disentangle them from the long-term health effects of radiation exposure after the Chernobyl accident.

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