Excerpts from KQED's May 2012 interview with University of California, San Francisco, epidemiologist Lydia Zablotska, about her research on the long-term health effects of the 1986 accident at the Chernobyl nuclear power plant.

Interview conducted and condensed by KQED Science and Environment TV producer Gabriela Quirós

LYDIA ZABLOTSKA: I grew up in Ukraine, and when the Chernobyl accident happened I was in high school. I lived many, many miles away, so I wasn't, I didn't observe it firsthand. But when I went to medical school in Belarus, I saw the first patients coming into the wards with thyroid cancer. These were very young children, under age 5

What makes Chernobyl the worst nuclear accident to date?

A very large amount of radioactive materials were released into the air and contaminated large territories in Ukraine and in neighboring countries: in Belarus, Russia, and further north, in Finland and Sweden.

Twenty-eight workers died from radiation soon after the accident. What are the accident's long-term health effects?

There has been a lot of research on the long-term health effects of exposure to Chernobyl radiation and the primary finding so far is an increased risk of thyroid cancer and other thyroid diseases in those who were children and adolescents at the time of the accident, and also increased risk of leukemia, but only among those who participated in the cleanup work at the Chernobyl power station and received substantial doses of radiation.

What radioactive materials were released at Chernobyl?

There was a multitude of isotopes. We're talking about probably hundreds. The major one, with the largest radioactivity, was iodine-131, and its half-life is eight days, which means that by the eighth day half of the radioactivity is gone, has disintegrated. That's why two months after the accident there was no longer radiation from radioactive iodine. There are other isotopes, such as cesium and strontium – various isotopes of these two – which persist in nature for 30 years and longer. And these still emit radioactivity. And that's why the 30-kilometer zone (around the plant) is still closed and former residents are not allowed to come back, because it's still highly radioactive.

What is the health impact of iodine-131?

The thyroid gland preferentially absorbs these radioactive iodine isotopes and sort of acts as a sponge for these particles. In children, the thyroid gland is very active, much more active than in adults. And that’s why children received higher doses of radiation. And later on, we observed increased risk of thyroid cancer in children, but not among adults.

Unfortunately, in Ukraine and Belarus, those are known areas with very low iodine in the soil. And so supplementation programs should have been in place. And they were in place, but they were not uniform, and that’s why a lot of children, school-aged children, kindergarten children, were very low on iodine. And that sort of precipitated the problem. They got even larger amounts of radiation, because their diet was iodine-deficient.

How many people have died from thyroid cancer as a result of the accident?

Based on the tumor registries in Ukraine, Belarus and Russia, and death certificates, we know that only 14 people have died from thyroid cancer. It’s a very benign cancer. But it does cause a lot of complications.

How is thyroid cancer treated?

Treatment usually includes complete removal of the thyroid gland and then treatment with radioactive iodine to target other metastases. The major complication is that for the rest of their lives patients have to take replacement hormones. And so the morbidity later on in life is related to this hormone imbalance.

How well does the public understand the health risks of radiation?

People are generally very afraid of radiation. It strikes me as a fear of the unknown. It’s something that you cannot see, cannot perceive, cannot smell. I have seen that in several reports people have said that the biggest consequence of Chernobyl so far was psychological effects, primarily because people associated any kind of disease, or any kind of problem, with radiation. And it didn't help that at the time the country was disintegrating, so there were a lot of economic hardships, political unrest. And they all got tangled in with radiation in Ukraine, Belarus and Russia. And so in many instances, the fear of radiation got really exaggerated because of that.

Tell us about your study of the population near the accident site.

Our studies involve 25,000 young people at this time. And they have showed a tremendous support for our studies. We send them invitations to come, they always come in. Even if they go to study at a different university far away from our studies, they will come back just to participate in our study. And that's why we were able to maintain the return rate. The screening rate in our studies is 95 percent. So some people came for screening four times. The majority of them came for screening four times. That, actually, is not observed in any screening studies that you would do, for example, in the U.S. So they were very supportive of us, and they understood that we are trying to get to the bottom of it. We want to know exactly what radiation does. We're on their side. And that's our main goal: to give good answers to them.

What happened to the workers who cleaned up after the accident?

The cleanup zone was the so-called 30 kilometer exclusion zone, with Chernobyl power plant in the middle of it, in the epicenter of it. People who went into that zone got exposed to gamma radiation. And gamma radiation exposes the entire body, not just one gland or one tissue, and among them, bone marrow. And bone marrow is one of the most radiosensitive tissues in the body. We know that approximately 600,000 workers participated in the cleanup work, and we are talking about the time from 1986 to 1990, when the cleanup finished. So during those years, 600,000 workers from Ukraine, Russia and Belarus participated in the cleanup. Some of them got substantial doses because they were firefighters, early responders. Some of them got really small doses because they were just driving cars and bringing the supplies and something like that. So there is a large variability in the dose distribution.

How many cases of cancer do you estimate the accident will cause?

There are some risk projections based on previous study of atomic bomb survivors and studies of people who are exposed to radiation because of cancer. So when we use these mathematical prediction models, we can estimate that approximately 4,000 to 6,000 thyroid cancers are due to exposure to Chernobyl. The numbers for leukemia are slightly less accurate. But we also think about perhaps 3,000 or 4,000 cases of leukemia. But again, leukemia is only observed among those with really substantial doses. There are no studies that showed increased risk of leukemia among people who lived around the power plant at contaminated areas.

What have health researchers learned from the accident?

One good example is distribution of potassium iodide, which if you take the pill, it prevents the radioactive iodine from entering your body and depositing in the thyroid gland. We have an example of two countries: Ukraine and Poland. In Ukraine, the distribution of potassium iodide was not done. In Poland it was done within two days. And as a result of such a campaign we do not see an increase in thyroid cancer in Poland in children and adolescents, but we do see it in Ukraine. So it's a clear indication that having a plan in place, having a stockpile of these pills, distributing them in a timely manner – immediately after the accident – does have a positive role in preventing long-term thyroid cancer.

What does research tell us about other health risks of nuclear energy?

We did a study of U.S. professional nuclear power workers. It's a study of approximately 50,000 workers who wear radiation dosimeters every day. So their doses are carefully monitored throughout their occupational life. So we followed up these people for a long time – 10, 20, 30 years. And the average dose was lower than the dose from one chest computer tomography. A computer tomography includes many, many, many X-rays, and so when you add them up they're in the hundreds and thousands, and that's when the dose increases. So something like flying, X-ray of luggage, X-ray when you go through (airport) security, those are very minimal, very small doses.

What about the health risks to uranium miners?

I've done a study in Canada, where we've looked at the Eldorado Company Limited workers. And it's a very interesting group of workers because it includes uranium miners, who were working deep down in the mines and were exposed to the byproduct of uranium, inhaled it, the dust, and later on were at increased risk of lung cancer. But this group also includes workers who worked in the processing of uranium and got exposed to very different, many different types of radiation, including gamma. And we are looking at that group in particular, trying to find out if they have increased risk of other cancers, such as leukemia, for example. So these studies are, we're still analyzing the data, but it's a very interesting group of workers. Uranium miners only have an increased risk of lung cancer, nothing else. But the other group, who worked in processing, may have different risks.

How should countries weigh the benefits of nuclear energy with its health risks?

A lot of countries have weighed this question and have come up with different answers. So for example, in France, 80 percent of energy comes from nuclear power plants. A much larger proportion of energy in Canada comes from nuclear energy, compared to the U.S., where maybe 20 percent comes from nuclear energy. So every society has decided differently on that.