

Chernobyl's Long Shadow

By Barbara Ruben

Ten years ago this April, the Chernobyl nuclear power plant, in what is now Ukraine, exploded, releasing a radioactive cloud that spread over a wide swath of the Soviet Union and central Europe. The accident killed 31 workers at the Chernobyl site, sent hundreds of others to the hospital and exposed five million people to ionizing radiation. More than 800,000 workers were exposed to radiation during clean up of the site. Nearly 135,000 residents were evacuated from the areas of highest contamination.

In the decade since the worst nuclear power plant accident in history, medical professionals have grappled with questions of how this radiation exposure has affected populations and, given the long latency periods of many cancers, what health effects residents might experience in the future. They have struggled with a lack of information and sometimes conflicting data, exacerbated by the scattering of information once the Soviet Union broke up five years after the accident, a dearth of health data on the population before the accident and the psychological stress experienced by those who live near Chernobyl. Because of a significant increase in the quantity and quality of diagnostic facilities in the areas around Chernobyl, doctors may also be finding diseases that otherwise may have gone undetected or diagnosing them far earlier than before the accident.

"What we do know is that the greatest amount of radiation exposure occurred in parts of the Russian Federation, Belarus and Ukraine. And there is no question anymore that thyroid cancer in children in these areas has gone up," said Thomas Foley, Jr., MD, an endocrinologist with the Children's Hospital of Pittsburgh in Pennsylvania, one of AIHA's partner hospitals. "The questions we still have to answer are about leukemia, lymphoma, brain cancer. These are areas we have absolutely no idea about."

To help sift through some of these questions, last November the World Health Organization (WHO) sponsored a conference attended by more than 600 scientists, researchers, public health specialists and policy makers from 59 countries. And as the tenth anniversary of the April 26, 1986 accident approaches, conferences in Vienna, Austria, organized by the International Atomic Energy Agency and in Minsk, Belarus, organized by the European Union, are also planned. Foley and oncologist Evgeni Demidichik, director of the Minsk Medical Institute, outlined the research done on health effects of Chernobyl on children during an AIHA-sponsored symposium on pediatrics held in Minsk in April.

Given the long latency periods of many diseases associated with radiation exposure, it's still too early to fully assess Chernobyl's health effects, and long-term follow-up of those living in the path of the radiation is important, Armin Weinberg, PhD, director of the Center for Cancer Control Research at the Baylor College of Medicine in Houston, Texas wrote last year in an article in the *Journal of the American Medical Association*. Weinberg works with AIHA's partnership between Houston and Semipalatinsk, Kazakstan.

Several international organizations are working with doctors in Belarus to establish a childhood cancer registry. They are combing through pediatric oncology records kept since 1965 to construct an accurate, comprehensive picture of cancer patterns over the last 30 years.

Thyroid Cancer

Demidichik's research on pediatric thyroid cancer shows a marked rise in the disease since 1990. Between 1990 and 1993, Demidichik reported 233 cases of thyroid cancer in children. For the entire decade between 1976 and 1985, he found only seven cases. The rate of thyroid cancer before the accident was one case per million children. By 1994, it had risen to 36 cases

per million. In Gomel, the region of Belarus directly north of the reactor, the rate has reached more than 100 cases per million, WHO reports.

Numbers have also risen in the northern area of Ukraine, where Chernobyl is located. Between 1990 and 1993, 86 cases of thyroid cancer were reported in children.

"The thyroid cancer issue is really very astounding," said Martin Cherniack, MD, medical director of the Ergonomics and Technology Center of Connecticut. "Nowhere else, including Hiroshima and Nagasaki, has anything like this occurred," said Cherniack, who was a former field director of the National Cancer Institute.

Children are at higher risk for thyroid cancer than adults because their relatively small thyroid glands have been exposed to the same amount of radiation as adults, according to Jacob Robbins, MD, an endocrinologist with the National Institutes of Health, who specializes in the study of thyroid cancer. Children living near Chernobyl may be particularly vulnerable because many had a shortage of iodine in their diet, causing their bodies to quickly absorb radioactive iodine, mainly iodine-131, spread from the accident. When iodine is absorbed by the body either through inhalation or in food, it accumulates primarily in the thyroid.

"The concern is that so many cases have come so early," Robbins said. "But the good news is that even though the cancers have been very aggressive, the mortality rate is low." Treatment includes surgery and radiation.

The highest number of patients that developed thyroid cancer were less than one year old at the time of the Chernobyl accident, according to a study by Yuri Nikiforov, MD, an endocrinologist at the University of California School of Medicine. The study, published in the January 1996 issue of the *Journal of Clinical Endocrinology and Metabolism*, notes that although the distribution of thyroid cancer is about equal between boys and girls, girls are much more likely to develop benign thyroid lesions.

Leukemia

Radiation exposure associated with leukemia comes primarily through ingestion of cesium-137 in fresh fruits and milk. Although there has been an upward trend in the number of cases of leukemia in the most contaminated areas of Belarus, Ukraine and Russia, the disease has so far not been conclusively linked with Chernobyl, according to a report by WHO's International Program on the Health Effects of Chernobyl (IPHEC) issued last year. The incidence of leukemia has been rising in both contaminated and non-contaminated areas. According to WHO, Belarus recorded an average of 97 cases of leukemia per year between 1979 and 1985; from 1986 to 1993, there were 103 cases per year. For the same time periods, Bryansk Oblast, the Russian region nearest Chernobyl, saw 30 cases of leukemia before the accident and 36 after. In Ukraine, there were an average of 24 cases of leukemia reported each year from 1980 through 1985 and 32 per year from 1986 through 1993.

WHO also cautions that along with an increase of leukemia in the next few years, the incidence of breast cancer, cancer of the bladder and kidney diseases could also rise.

Birth Defects

After Chernobyl, the frequency of congenital defects has steadily increased, according to a 1995 report issued by the Ministry for Emergencies and Population Protection from the Chernobyl Catastrophe in Belarus. Birth defects occurred in 12.5 of 1,000 births in 1985 and in 17.7 of 1,000 births in 1994 in the republic. These defects include polydactyly, or extra fingers or toes, and deformed arms and legs.

WHO's IPHEC conducted a study that compared groups of children who had been in utero in highly contaminated areas just after the accident and those that were in clean areas. Researchers found a higher incidence of mental retardation in the exposed children as well as an upward trend in behavioral disorders and emotional problems. However, researchers cautioned that they have not been able to conclusively link these problems with the accident.

Psychological Effects

Stress and anxiety about the Chernobyl accident have compounded the difficulty of assessing health effects of residents in contaminated regions. A 1989 survey of 1,350 residents in contaminated and non-contaminated villages in Belarus, Ukraine and Russia by the United Nations' International Atomic Energy Agency found that nearly half of those questioned in all villages believed they had an illness related to radiation.

Those surveyed reported low morale and symptoms associated with depression. In the contaminated villages, 62 percent said they were "too tired in the morning to get up." More than 70 percent of those in the contaminated villages said they wanted to move, but only 17 percent of those in the uncontaminated villages wanted to relocate.

"The legacy of Chernobyl will stay with us for a long time in the shape of radiation-induced diseases and psychosomatic disorders," said Wilfried Kreisel, executive director in charge of health and environment at WHO. "We shall be doing a disservice if we fail to extract benefits for mankind out of this monumental human tragedy. If history is not to repeat itself, we should learn very well the lessons of Chernobyl."

Selected Sources

"Caring for Survivors of the Chernobyl disaster: What the Clinician Should Know," by A.D. Weinberg, S. Kripalani, P.L. McCarthy and W.J. Schull, *JAMA*, 274: p. 408-412, 1995

"Health Consequences of the Chernobyl Accident," report by WHO, 1995.

"Nine Years After Chernobyl: Situation, Problems, Action." report by the Belarus Ministry for Emergencies, 1995.

"The Psychological Consequences of the Chernobyl Accident," findings from the International Atomic Energy Agency Study, 1990.

"Thyroid Cancer After Chernobyl," by VS Kazakov, EP Dimidchik and LN Astakhova, *Nature*, 350: p. 20-27, 1992.

"Thyroid Lesions in Children and Adolescents After the Chernobyl Disasters: Implications for the Study of Radiation Tumorigenesis," by Y. Nikiforov, D. Gnepp and J. Fagin, *Journal of Clinical Endocrinology and Metabolism*, Vol. 81, No.1: p.9-14, 1996