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RADIATION FEARS MAY BE GREATLY EXAGGERATED

Japanese workers at the stricken nuclear plant face grave danger, but the risks to the general population remain slight

BY JULIE STEENHUYSEN
CHICAGO, MARCH 18

AS WORKERS STRUGGLE to contain the fallout from the crippled nuclear plant in northeastern Japan, people as far away as Illinois are calling public health officials in a state of panic.

They are hoping to get their hands on potassium iodide pills to protect them from radiation -- despite warnings that, in the absence of a real nuclear threat, taking the medicine is riskier than doing nothing.

Sixty-six years after the first atomic bomb exploded over the city of Hiroshima, radiation spooks people everywhere. But

the anxiety is largely disproportionate to the actual danger.

"People in general have an exaggerated fear of radiation. That is true in the United States, and it is probably even more so in Japan," said Jerrold Bushberg, director of health physics programs and clinical professor of radiology and radiation

oncology at the University of California Davis. Despite the Japanese government's assurances that the risk so far is minimal, residents of Tokyo have flooded out of the city and foreigners have fled the country, hoping to escape a threat they cannot see.

The fact is that everyone is exposed to small amounts of radiation every day just from living on earth or flying in an airplane. That all adds up to about 2.4 units, known as millisieverts, a year. This can vary widely, ranging from 1 to 10 millisieverts, depending on where you live.

Background radiation will cause 1 out of 100 people to die of cancer in their lifetimes, said Dr. Donald Bucklin, who spent 10 years as medical director for the Palo Verde nuclear plant in Arizona, the largest nuclear plant in the United States. Additional exposure increases this risk.

In Tokyo, 150 miles (240 km) from the Fukushima Daiichi plant, people grew fearful when readings rose about 10 times above the normal reading. At that level, residents were exposed to 0.809 microsieverts per hour -- 1,000 times less than a millisievert, or about 10 times less than a chest X-ray.

"The levels of radiation experienced by the public at present should be no cause for concern," said Dr. Richard Wakeford, visiting professor of epidemiology at the Dalton Nuclear Institute at University of Manchester in Britain.

"To put radiation doses into context, many Japanese undergo CT scans for cancer screening purposes, and these scans produce radiation doses of about 10 millisieverts (10,000 microsieverts) -- much more than they are receiving from the Fukushima reactors."

300 HEROES

EXPERTS ARE FAR MORE worried about the effects on the 300 or so workers trying to cool reactors at the damaged nuclear plants, where radiation at one point reached 400 millisieverts per hour -- about 20 times the annual exposure for some nuclear-industry employees and uranium miners.

High doses of radiation can penetrate the body, sort of like an X-ray. This kind of direct exposure attacks quickly dividing cells in the body such as the lining of the gut.

A lot of radiation over a short period causes burns or radiation sickness and also significantly raises one's cancer risk. Symptoms of radiation sickness include nausea, weakness, hair loss, skin burns and reduced organ function. If the exposure is

EFFECTS OF RADIATION

Skin
Caught in roots of body hair causing skin cancer

Eye cataracts

Thyroid gland
is susceptible to radioactive iodine which can destroy it

Lung cancer

Breast cancer

Stomach
Damage to intestinal tract lining will cause nausea, bloody vomiting and diarrhea

Reproductive system
Damage to ovaries and eggs in women
Damage to prostate and testes in men

Blood system
Severe loss of white blood cells leaves victim more susceptible to infection

Bone marrow damage leading to leukemia or aplastic anaemia

Symptoms after moderate exposure:
Fever, hair loss, vomiting and diarrhea

Graphic: Kinyen Pong

"PEOPLE IN GENERAL HAVE AN EXAGGERATED FEAR OF RADIATION. THAT IS TRUE IN THE UNITED STATES, AND IT IS PROBABLY EVEN MORE SO IN JAPAN."

radioactive particles. That can help. But you are talking about intensive beam radiation. You can only shield so much against that. You can't walk around with 300 pounds of lead wrapped around you," said Bucklin, who is now an occupational health expert for U.S. HealthWorks.

"These people, I think, are doing the moral equivalent of throwing themselves on a hand grenade."

OVERESTIMATED RISK

IN GENERAL, PEOPLE TEND to overestimate the risks of radiation exposure, possibly because of the link to cancer.

A World Health Organization study two decades ago of the 1986 meltdown at Chernobyl, the most recent nuclear accident that affected a large population, estimated that up to 9,000 people could eventually die as a result of radiation exposure from the power plant.

The blast spewed radiation over most of Europe, but as of mid-2005 only 56 deaths had been directly attributed to the explosion, nearly all of them among highly exposed rescue workers.

About 4,000 people developed thyroid cancer as a result of the accident, most of whom had been children or adolescents in 1986. But survival rates of this type of cancer are high -- about 99 percent so far, based on figures in Belarus.

But scientists are still fighting over this. Environmental group Greenpeace argued in 2006 that 270,000 people would develop cancers as a result of Chernobyl fallout, and 93,000 would die.

And a study released on Thursday by researchers at the National Cancer Institute in Bethesda, Maryland, suggests that children and teens who were exposed to radioactive iodine at the time of the accident still face a higher risk of developing thyroid cancer. Although they, too, say the cancer is typically not lethal if it is caught early.

Kirby Kemper, a 70-year-old nuclear

large enough, it can cause premature ageing or death.

Experts believe radiation levels measured at the Fukushima plant are high enough to cause radiation sickness.

"These people are very brave. Nuclear workers in general all have 10 times more exposure than the rest of us because you get a little bit more working around the plant," said Bucklin.

"You can keep them from inhaling

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physics professor at Florida State University, said the closest comparison to the Fukushima accident is the 1979 Three Mile Island nuclear accident in Pennsylvania. There were no deaths directly linked with the leak.

"Chernobyl didn't even have a containment vessel. It's not similar," he said. "Most of the issues from Chernobyl were from the fire and soot just coming up loaded with radioactivity."

Reports from the Three Mile Island accident show there were no health effects. "The reason is you are trying to pick out some very small signal," Kemper said, noting that there were 500 cancer deaths out of a population of 200,000.

"That is a very small number. You can't unfold the effects of smoking. People in my generation smoked all of the time in the house. It's difficult to pick out."

But he said comparisons to other nuclear accidents are not helpful because each one is so different. "This is a serious, serious chain of events. We can't predict what will happen. No one has ever been through this."

LIMITING RISK

FOR THE GENERAL POPULATION, the worry in Japan is from plumes of radioactive particles that are carried in the air and may be deposited in dust or taken up in plants or animals. The concern is getting radioactive particles inside the body by breathing, eating or drinking them in.

The Japanese government has taken several steps to limit this kind of risk. People who live within 20 km (12 miles) of the plant have been evacuated. Those who live 20 to 30 km (12 to 19 miles) have been told to stay indoors.

That is a bit short of the 50 mile (80 km) radius the U.S. government considers safe, but the idea is the same -- keeping people away from the immediate area of risk.

Unlike the meltdown, explosion, and fires at Chernobyl, radioactivity at Fukushima Daiichi remains largely contained within the reactor -- at least for now.

In the Chernobyl accident, most of the extra risk was not from



HANDS ON: Customers flock to buy salt at a supermarket in Lanzhou, Gansu province March 17, 2011. REUTERS/CHINA DAILY



RUN ON SALT: Customers line up outside a store selling salt at a market in Hong Kong March 17, 2011, as shoppers in the territory rush to buy salt which they believe could help to protect them from radiation. REUTERS/BOBBY YIP

airborne exposure, but the fact that people had ingested radioactive particles.

"The problems with Chernobyl were people were continuing to drink the water, continuing to eat vegetables and so on and that was where the problems came from," Sir John Beddington, the British government's chief scientific adviser, said in a transcribed conversation with the British Embassy in Tokyo.

"That's not going to be the case

here," said Beddington, whose comments were released through the Science Media Centre in London. He said even in a worst case scenario of a meltdown and explosion sending radioactive material up about 500 meters into the air, the real risk was still only for people in the immediate vicinity of the plant and the people working there.

"Beyond that 20 or 30 kilometers, it's really not an issue for health," he said.

That is why people in the area near the



BEFORE AND AFTER: A combination of handout satellite images show the Fukushima Daiichi nuclear plant on November 21, 2004 (L) and on March 14, 2011 (R) as the No.3 nuclear reactor is burning after a blast following an earthquake and tsunami. **REUTERS/DIGITAL GLOBE/HANDOUT**

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plant have been told to stay inside with the windows closed. This simple barrier can reduce exposure.

"Shielding is critical if there is any risk of radiation," said Dr. John Chute, a cancer biology expert at Duke University. "If there is any doubt, people who live in a radiation fallout area should stay indoors and resist the temptation to get in your car and drive away."

The Japanese government has also distributed potassium iodide pills -- ordinary iodine like the kind found in "iodized" table salt. Taking iodine pills in a nuclear disaster floods the thyroid gland with this harmless form of iodine, allowing harmful iodine to flush out of the body.

Bucklin said some people see these as "magic pills" that will make them immune to



RADIATION CLICK: A woman who just returned from Japan gets checked for radiation levels at a research laboratory in Shanghai March 17, 2011. **REUTERS/NICKY LOH**

"TO BE FRANK, MY BIGGEST CONCERN IS INDIVIDUALS WILL REFUSE TO GET CHEST X-RAYS."

the effects of radiation exposure.

While usually harmless, the pills can be risky for people with allergies to iodine or shellfish, those with certain skin disorders, kidney disease, some chronic diseases, or thyroid problems.

And they only protect the thyroid gland against radioactive iodine, not other types of radioactive elements released in a nuclear accident, such as Cesium-137, which can stay in the environment much longer than radioactive iodine.

HOW MUCH IS SAFE?

MOST SCIENTISTS AGREE that keeping all radiation exposures to a minimum is important. But it is not clear what level, if any, can be considered safe.

"There are different philosophies," said Kemper, who has who has been involved in nuclear physics research for more than 45 years.

"You could talk to someone from the Physicians for Social Responsibility and they would tell you any radiation exposure is horrible," Kemper said.

"We simply don't know what happens at very low levels. If you were in Denver, Colorado, you would be getting twice the radiation exposure than I do in Florida."

"Yet people in Denver tend to live longer. Is it a lifestyle issue? Is it that they smoke less or drink less? At very low levels, it is extremely difficult to untangle that. We really don't know."

But he said the situation in Japan has raised new fears in his own community, sparking worried conversations in the local supermarket and at his favorite barbecue restaurant in Tallahassee.

"To be frank, my biggest concern is individuals will refuse to get chest X-rays -- things like that. People are going to question going through X-ray scanners in the airport.

"There is going to be a huge change in our perception of use of radiation."

(Additional reporting by Brendan Borrell of Reuters Health in New York; Editing by Jim Impoco and Claudia Parsons)



WIDESPREAD FEAR: A staff member of the Malaysian Atomic Energy Licensing Board scans for possible nuclear radiation on Yeoh Yun Ci, 3, after she arrived with her family on a flight from Narita International Airport in Japan, at Kuala Lumpur International Airport in Sepang, outside Kuala Lumpur March 18, 2011. **REUTERS/BAZUKI MUHAMMAD**

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LEAVING HOME: A Japanese family arrives on a flight from Tokyo, in Hong Kong's airport March 17, 2011. **REUTERS/TYRONE SIU**

COVER PHOTO: Medical staff use a Geiger counter to screen a photographer for possible radiation exposure at a public welfare center in Niigata, northern Japan March 16, 2011. **REUTERS/YURIKO NAKAO**

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