Security of radioactive material at low ebb

Terrorists building a 'dirty bomb' could find the ingredients all around.

By Carrie Peyton Dahlberg -- Bee Staff Writer - *(Published July 21, 2002)*

Radioactive materials are scattered across California at thousands of sites, and hundreds of them hold enough for a "dirty bomb," state and federal records show.

Machines that operate using large amounts of radioactivity have become commonplace in medicine, research and construction, among other fields. Radioactive material can be found in the lunchbox-sized construction tool used to peer inside pipelines and walls; in the giant irradiators used to purify foods and sterilize medical supplies; in the medical equipment used to cut brain tumors and treat blood.

In some places, such equipment is left unattended for hours or days behind locked doors.

The finding underscores fears raised by Sept. 11: With the exception of nuclear plants and weapons sites, the nation's system of radiological safeguards is aimed at preventing accidents, not thwarting well-planned thefts.

"Safety is different from security. We need to do a much better job of controlling the radioactive materials we have out there," said Steven E. Koonin, a nuclear physicist and provost at the California Institute of Technology who has advised the government on security issues.

Across the nation, there are countless sources that could make a bomb "dirty," spreading radiation that has been packed in with standard explosives.

At three sites less than two dozen blocks from California's Capitol, for example, are a surgical "gamma knife," two blood irradiators and several small radiography cameras, the tools used for examining pipelines, welds and the insides of walls. Together, the machines hold enough radioactivity to produce at least nine big dirty bombs or thousands of smaller ones -- if someone could get to them and break through their shielding.

A dirty bomb, known formally as a radiation dispersal device, probably would kill no more people than a conventional blast. It would cause far fewer deaths than a chemical or biological attack, experts say.

But awareness that it could be used as a terrorist tool has soared since federal officials announced in June they had arrested a man in Chicago suspected of planning to build one. Some predict the dirty bomb is one of the likeliest weapons to be unleashed by terrorists because the ingredients are so easy to get and the potential damage in panic and cleanup costs so huge.

"I would be surprised if we didn't see one within a decade," said Koonin.

Although medical and industrial uses of radiation are widely documented, The Bee has chosen not to name the owners of significant quantities in light of concerns about how simple it might be to gather enough radioactivity to create a dirty bomb.

While nuclear power plants have been ordered to impose some added safeguards since Sept. 11, far less attention has been given to other uses of radioactive materials.

Today, the radioactive cores of research calibrators, radiographic cameras and other equipment are manufactured in nondescript industrial parks where curious neighbors can get tours of the process. Product lists and driving directions can be found on Web sites.

The tools they produce are shipped by FedEx or other carriers, often without guard or escort. The cobalt 60 cores of giant irradiators arrive from Canada on flatbed trucks.

People have to take safety courses before getting a license to own even small amounts of radioactive materials, but they do not need to undergo criminal or background checks. A federal law to require background checks for hazardous materials haulers is at least two months away from being implemented.

The U.S. Nuclear Regulatory Commission recently reduced the frequency of inspections for most radioactive materials license holders and does not fully check large inventories to ensure their owners know what is on hand.

"The NRC is horrifically undermanned," said John Wolfsthal, deputy director of the nonproliferation project at Carnegie Endowment in Washington, D.C.

And the industry that nuclear regulators oversee is not accident proof.

Last month, the NRC fined owners of a Connecticut power plant $288,000 for losing track of two intensely radioactive rods of spent fuel -- something the NRC called an unprecedented safety breach. After months of investigation, regulators still are not certain what happened. They believe the rods were not stolen but probably accidentally shipped to a low-level waste site in South Carolina or perhaps Washington state.

Smaller amounts of radioactive materials go missing far more often, and many never have been accounted for.

In a chilling international episode that illustrates how little technology is needed to pry open a sealed radioactive source, a stolen radiotherapy machine in Brazil was disassembled in 1987 with a power saw and other hand tools by those searching for salvage material.

The niece of one of the dismantlers discovered the cesium power inside glowed in the dark. She decorated herself, and showed her mother and friends. Days passed before anyone in the city of Goiania realized they had been exposed to hazardous levels of radiation. The girl, her mother and two others died within six weeks. Twenty others were hospitalized and about 250 were contaminated. Three buildings were demolished and dozens were decontaminated.

While the episode shows that closed equipment can be opened with time and effort, it also demonstrates the health risks.

Terrorists wanting to make a dirty bomb would have to steal equipment that holds radioactive material or get lengthy, uninterrupted access. They would have to open the equipment, risking a slow death or a fast one, depending on how much radioactivity it contains. Finally, they'd have to assemble the bomb itself and get it to its target site. During that time, they would get increasingly intense doses of radiation and risk detection from authorities who have begun checking for radiation on roads and bridges.

In the Brazilian incident, the radiotherapy machine contained about 1,400 curies of cesium 137. A curie is a unit of radioactivity, measuring how many atoms per second are decaying and emitting particles and rays.

A recent study of dirty bomb impacts concluded that just two curies of cesium 137 would be enough to contaminate about 40 city blocks.

By comparison, one blood irradiator sitting in a Sacramento building less than 25 blocks from the state Capitol contains 2,700 curies of the substance. A gamma knife in a nearby basement contains 6,000 curies of cobalt 60.

These are big machines, weighing more than a ton because of their heavy shielding, and at least one is constantly surrounded by people. But others around the state are unattended for hours, their owners acknowledge, relying on remote alarm systems to warn of intruders.

Michael Levi, a nuclear security expert with the Federation of American Scientists, said the optimal radioactivity for dirty bomb material would be more than one curie and less than 10,000. The smallest one would spread low levels of radioactivity for a few blocks. The largest could taint hundreds of square miles and contaminate a Manhattan-sized core where cancer risks would rise for anyone who kept living there.

Hundreds of different tools in medicine and industry use a curie or more, said John Hickey, chief of the NRC's materials safety branch. He estimated that at least one-third of the 20,000 licenses issued nationwide are for amounts greater than a curie.

In California, more than 600 licenses have been granted for one curie or more.

The industrial radiography camera, which can be lifted by hand, contains 100 curies of iridium 192. The cameras are mishandled with such regularity that the NRC has singled them out as the only piece of equipment whose owners still must submit to annual inspections.

"The industrial part of this has gotten very little attention," said Daniel Hirsch, who heads a nuclear watchdog group called Committee to Bridge the Gap. "People are not used to looking at a construction site as a national security location."

Large caches of radioactive material abound in California, even excluding weapons sites and the two operating and two shuttered nuclear power plants. The state is home to at least one major manufacturer of iridium 192 and a supplier of radioactive sources for a range of equipment, including research devices used for taking exacting measurements. Their material departs by Federal Express or is carried away by customers.

Recently, one industrial irradiator, which has rods containing more than 1 million curies of cobalt 60 sitting in an underground pool, announced a two-day holiday closure with a sign on its door. The building, in a well-kept light

industrial park, had no guards, no cameras and no alarm that would sound remotely if anyone broke in during the time it was vacant, its operator said.

The operator said the 3-foot-thick steel shielding surrounding the cobalt would thwart any thieves. Health officials said the intensity of the radiation alone probably would keep a would-be thief from leaving that building alive.

But Rep. Edward Markey, D-Mass., called the situation a glaring security hole typical of other potential risks his staff has found. He and Sen. Hillary Rodham Clinton, D-N.Y., have introduced a "Dirty Bomb Prevention Act" that would require the NRC and other agencies to form a task force to improve material tracking, handling and safeguards.

After Sept. 11, the NRC sent a list of recommended security precautions to research reactors, irradiators and other sites where large amounts of radioactivity are found, but unlike some of its edicts to power plants, it did not require that the recommendations be followed.

"We're still contemplating additional security improvements like better alarms and better barriers to prevent intrusion," said the NRC's Hickey.

He said the commission isn't publicly discussing what levels of radioactivity could be subject to tougher controls but might do so after it has announced more security improvements "over the next few months."

In California, officials with the state Department of Health Services, which oversees radiological health, say they have stepped up security but offer few specifics, citing a federal request that details not be disclosed.

The state passed along frequent NRC safety reminders and warnings in the days after Sept. 11 to about 50 of the largest users, said Kevin Reilly, a Health Services deputy director.

About two months ago, it also began denying access to records that once were available for public inspection: lists of those licensed to hold radioactive materials and the licenses themselves.

The decision was made because of the "potential for terror," Reilly said.

But there could be bigger risks in secrecy than in disclosure, according to Tri-Valley Cares, a prominent community group that has prompted safety changes after inspecting licenses and other documents.

Most recently, said Marylia Kelly, the group's executive director, the Department of Energy abandoned plans to ship plutonium in containers that were not crush-proof after her group found an internal memo outlining the shipment plan and sued to stop it.

"That list should be publicly available," Kelly said.

Like federal regulators, the state has given license holders its recommendations for preventing theft and attacks but has not required that its suggestions be followed.

Most of its ideas have been adopted anyway, said Reilly.

"Licensees themselves typically are very cooperative," he said. They're "very interested in security."

Radioactive Materials and Their Uses

Scores of radioactive materials are used daily in medicine, industry and research. Some of those used in large amounts include:

Americium 241: Used in trace amounts in many smoke detectors. Used in larger amounts in many types of research and to help determine where oil wells should be drilled.

Cesium 137: Used to treat cancers, to measure and control the liquid flow in oil pipelines and to disable white blood cells before some transfusions.

Cobalt 60: Used to sterilize surgical instruments and research products, to provide interior views of very thick substances and to preserve poultry, fruits and spices.

Iridium 192: Used to test the integrity of pipeline welds, boilers and aircraft parts, and to survey deep inside concrete slabs and other solid materials.

Plutonium 238: Used to power at least 20 NASA spacecraft since 1972.

Plutonium 239: Used in nuclear weapons.

Uranium 235: Fuel for nuclear power plants and naval nuclear propulsion systems. Also used to produce fluorescent glassware, a variety of colored glazes and wall tiles.

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