U.S.NRC
Protecting People and the Environment

FACT SHEET

Office of Public Affairs
Phone: 301-415-8200
Email: opa.resource@nrc.gov

Dirty Bombs

Background

A "dirty bomb" is one type of a radiological dispersal device (RDD) that combines conventional explosives, such as dynamite, with radioactive material. The terms dirty bomb and RDD are often used interchangeably in the media. Most RDDs would not release enough radiation to kill people or cause severe illness - the conventional explosive itself would be more harmful to individuals than the radioactive material. However, depending on the situation, an RDD explosion could create fear and panic, contaminate property, and require potentially costly cleanup. Making prompt, accurate information available to the public may prevent the panic sought by terrorists.

A dirty bomb is in no way similar to a nuclear weapon or nuclear bomb. A nuclear bomb creates an explosion that is millions of times more powerful than that of a dirty bomb. The cloud of radiation from a nuclear bomb could spread tens to hundreds of square miles, whereas a dirty bomb's radiation could be dispersed within a few blocks or miles of the explosion. A dirty bomb is not a "Weapon of Mass Destruction" but a "Weapon of Mass *Disruption*," where contamination and anxiety are the terrorists' major objectives.

Impact of a Dirty Bomb

The extent of local contamination would depend on a number of factors, including the size of the explosive, the amount and type of radioactive material used, the means of dispersal, and weather conditions. Those closest to the RDD would be the most likely to sustain injuries due to the explosion. As radioactive material spreads, it becomes less concentrated and less harmful. Prompt detection of the type of radioactive material used will greatly assist local authorities in advising the community on protective measures, such as sheltering in place, or quickly leaving the immediate area. Radiation can be readily detected with equipment already carried by many emergency responders. Subsequent decontamination of the affected area may involve considerable time and expense.

Immediate health effects from exposure to the low radiation levels expected from an RDD would likely be minimal. The effects of radiation exposure would be determined by:

- the amount of radiation absorbed by the body;
- the type of radiation (gamma, beta, or alpha);
- the distance from the radiation to an individual;
- the means of exposure-external or internal (absorbed by the skin, inhaled, or ingested); and the length of time exposed.

The health effects of radiation tend to be directly proportional to radiation dose. In other words, the higher the radiation dose, the higher the risk of injury.

Protective Actions

In general, protection from radiation is afforded by:

- minimizing the time exposed to radioactive materials;
- maximizing the distance from the source of radiation; and
- shielding from external exposure and inhaling radioactive material.

More detailed guidance is provided in the questions and answers at the end of this Backgrounder.

Sources of Radioactive Material

Radioactive materials are routinely used at hospitals, research facilities, industrial activities, and construction sites. These radioactive materials are used for such purposes as diagnosing and treating illnesses, sterilizing equipment, and inspecting welding seams. The Nuclear Regulatory Commission together with 37 "Agreement" States, which also regulate radioactive material, administers more than 22,000 licenses of such materials. The vast majority of these materials are not useful as an RDD.

Control of Radioactive Material

NRC and state regulations require owners licensed to use or store radioactive material to secure it from theft and unauthorized access. These measures have been greatly strengthened since the attacks of September 11, 2001. Licensees must promptly report lost or stolen risk-significant radioactive material. "Risk-significant" refers to radioactive sources that may pose a significant risk to individuals, society and the environment if not properly used, protected, or secured. Local authorities also assist in making a determined effort to find and retrieve such sources. Most reports of lost or stolen material involve small or short-lived radioactive sources that are not useful for an RDD.

Past experience suggests there has not been a pattern of collecting such sources for the purpose of assembling an RDD. It is important to note that the radioactivity of the combined total of all unrecovered sources over the past 8 years (when corrected for radioactive decay) would not reach the threshold for one high-risk radioactive source. Unfortunately, the same cannot be said world-wide.

The U.S. Government is working to strengthen security for high-risk radioactive sources both at home and abroad. The NRC and its 37 Agreement States—states who have been given authority to regulate nuclear materials within its borders—have worked together to create a strong and effective regulatory safety and security framework that includes licensing, inspection, and enforcement.

NRC also works with other Federal agencies, the International Atomic Energy Agency, and licensees to protect radioactive material from theft and unauthorized access. The agency has made improvements and upgrades to the joint NRC-DOE (Department of Energy) database that tracks the location and movement of certain forms and quantities of special nuclear material. In addition, in early 2009, NRC deployed its new National Source Tracking System, designed to track high-risk sources in the United States on a continuous basis.

Risk of Cancer

Just because a person is near a radioactive source for a short time or gets a small amount of radioactive dust on himself or herself does not mean he or she will get cancer. Any additional risk will likely be extremely small. Doctors specializing in radiation health effects will be able to assess the risks and suggest what medical treatment, if any, is needed, once the radioactive source and exposure levels have been determined.

There are some medical treatments available that help cleanse the body of certain radioactive materials following a radiological accident. Prussian blue has been proven effective for ingestion of cesium-137 (a radioactive isotope). In addition, potassium iodide (KI) can be used to protect against thyroid cancer caused by iodine-131 (radioactive iodine). However, KI, which is available "over the counter" offers no protection to other parts of the body or against other radioactive isotopes. Medical professionals are best qualified to determine how to best treat symptoms.

Other Contact Information

A number of federal agencies have responsibilities for dealing with RDDs. Their public affairs offices can answer questions on the subject or provide access to experts in and out of government. Their web sites are:

Center for Disease Control and Prevention: www.bt.cdc.gov/radiation.
Department of Homeland Security: www.dhs.gov.
Department of Energy: www.energy.gov/.
Environmental Protection Agency: www.epa.gov.
Nuclear Regulatory Commission: www.nrc.gov.
Federal Emergency Management Agency: www.fema.gov.
Department of Justice: www.usdoj.gov.
Federal Bureau of Investigation: www.fbi.gov.
Department of Health and Human Services: www.hhs.gov.
Transportation Security Administration: www.tsa.gov/public/.
National Nuclear Security Administration: www.nnsa.doe.gov/.

FREQUENTLY ASKED QUESTIONS ABOUT DIRTY BOMBS & RDDs

What is an RDD or "Dirty Bomb"?

A "dirty bomb" is one type of a "radiological dispersal device" (RDD) that combines a conventional explosive, such as dynamite, with radioactive material that may disperse when the device explodes. It is not the same as a nuclear weapon. If there are casualties, they will be caused by the initial blast of the conventional explosive. The radioactive particles that are scattered as a result of the explosion cause the "dirty" part. The explosives in such a bomb would still be more dangerous than the radioactive material.

What is radiation?

Radiation is a form of energy that is present all around us. Some of the Earth's background radiation comes from naturally occurring radioactive elements from space, the soil, and the sun, as well as from

man-made sources, like x-ray machines. Different types of radiation exist, some of which have more energy than others, and some of which can be more harmful than others. The dose of radiation that a person receives is measured in a unit called a "rem." A rem is a measure of radiation dose, based on the amount of energy absorbed in a mass of tissue. For example, an average person gets about 1/3 of a rem from exposure to natural sources of radiation in one year, and approximately 1/100th of a rem from one chest x-ray.

Are Terrorists Interested In Radioactive Materials?

Yes, terrorists have been interested in acquiring radioactive and nuclear material for use in attacks. For example, in 1995, Chechen extremists threatened to bundle radioactive material with explosives to use against Russia in order to force the Russian military to withdraw from Chechnya. While no explosives were used, officials later retrieved a package of cesium-137 the rebels had buried in a Moscow park.

Since September 11, 2001, terrorist arrests and prosecutions overseas have revealed that individuals associated with al-Qaeda planned to acquire materials for a RDD. In 2004, British authorities arrested a British national, Dhiren Barot, and several associates on various charges, including conspiring to commit public nuisance by the use of radioactive materials. In 2006, Barot was found guilty and sentenced to life. British authorities disclosed that Barot developed a document known as the "Final Presentation." The document outlined his research on the production of "dirty bombs," which he characterized as designed to "cause injury, fear, terror and chaos" rather than to kill. U.S. federal prosecutors indicted Barot and two associates for conspiracy to use weapons of mass destruction against persons within the United States, in conjunction with the alleged surveillance of several landmarks and office complexes in Washington, D.C., New York City, and Newark, N.J. In a separate British police operation in 2004, authorities arrested British national, Salahuddin Amin, and six others on terrorism-related charges. Amin is accused of making inquiries about buying a "radioisotope bomb" from the Russian mafia in Belgium; and the group is alleged to have linkages to al-Qaeda. Nothing appeared to have come from his inquiries, according to British prosecutors. While neither Barot nor Amin had the opportunity to carry their plans forward to an operational stage, these arrests demonstrate the continued interest of terrorists in acquiring and using radioactive material for malicious purposes.

Will an RDD make me sick?

The effects of an RDD can vary depending on what type of radioactive material is used and how much material is scattered. It is very difficult to design an RDD that would deliver radiation doses high enough to cause immediate health effects or fatalities in a large number of people. For the most part, an RDD would most likely be used to:

- contaminate facilities or places where people live and work, disrupting lives and livelihoods,
- cause anxiety in those who think they are being, or have been, exposed to radiation.

How can I protect myself in a radiation emergency?

If an explosion occurs, it may not be known immediately that radioactive material is involved. If you are made aware that you are near the site of an RDD or potential release of radioactive material, you should:

- Stay away from any obvious plume or dust cloud;
- Walk inside a building with closed doors and windows as quickly as possible and listen for information from emergency responders and authorities;

- If there is dust in the air, cover your mouth and nose with a tissue, filter, clothing or damp cloth to avoid inhaling or ingesting radioactive material;
- Remove contaminated clothing as soon as possible and place them in a sealed plastic bag. The clothing could be used later to estimate a person's exposure; and
- Gently wash skin to remove any possible contamination, making sure that no radioactive material enters the mouth or is transferred to areas of the face where it could be easily moved to the mouth and swallowed.

If you are advised to take shelter, whether it is at home or in an office, you should:

- Close all the doors and windows.
- Turn off ventilation, air conditioners, and forced air heating units that bring in fresh air from the outside. Only use units to re-circulate air that is already in the building.
- Close fireplace dampers.
- Move to an inner room.
- Keep your radio tuned to the emergency response network.

Questions such as when it's safe to leave a building or return home, what is safe to drink and when, along with how children will be cared for if they are separated from their parents, will be answered by authorities who will be making decisions on a case-by-case basis depending on the information available at the time.

If I'm told NOT to take public transportation when evacuating from an RDD attack, what about using my personal vehicle?

Depending on where you are with respect to the location of the explosion, if you drive a car or truck, some radioactive material may get inside your vehicle, and will have to be cleaned out. Listen to emergency broadcasts for instructions about cleaning your vehicle. If you drive a private vehicle, do not run the heater or air conditioner.

I was a mile from the explosion – am I going to be sick?

Listen to the emergency broadcast information. Instructions will be given based on the size of the attack, direction of the wind, and the components of the explosion. It is extremely unlikely that anyone who survives the explosion will become sick from radiation. In addition, your ability to have children will not be affected.

Will it be safe to clean my home and continue to live in it during and after such an RDD explosion?

Yes. Cleaning up the radioactive material (called decontamination) is certainly possible, and with reasonable effort and care, you should be able to return to a normal, safe life in your home or work

Should I buy a radiation detector?

No. Unless you have been trained, you won't be able to interpret the readings. Many of the Geiger counters available commercially are uncalibrated and worthless.

Should I purchase potassium iodide tablets for protection against radiation?

Potassium iodide (KI), which is available over the counter, protects people from thyroid cancer caused by radioactive iodine, a type of radioactive material that can be released in nuclear explosions, and depending on the amount released, can later cause thyroid cancer. KI should only be taken in a radiation emergency that involves the release of radioactive iodine. Since the use or release of radioactive iodine from an RDD is highly unlikely, KI pills would not be useful.

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