LOOSE NUKES ON MAIN STREET: THE NEW TERROR THREAT

FACT BOOK

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I. Nuclear Weapons

WHICH COUNTRIES HAVE NUCLEAR WEAPONS?

There are five "declared" nuclear powers: China, France, Russia, the United Kingdom and the United States.

- The nuclear status of the five nuclear powers is established under the 1970 Nuclear Non-Proliferation Treaty (NPT), which codifies a type of bargain between the five countries and the rest of the NPT's signatories (189 as of September 2005).
- Simply put, the five nuclear powers promise to take steps toward nuclear disarmament and to share nuclear technology for peaceful purposes with other Treaty members. In exchange, all other countries promise not to acquire nuclear weapons.

India, Pakistan and Israel are not members of the NPT and are considered "undeclared" nuclear powers.

- Both **India** and **Pakistan** have tested nuclear devices and declared themselves to be in possession of nuclear weapons.
- Although **Israel** officially maintains a policy of "nuclear ambiguity" experts estimate its arsenal includes between 100 and 200 weapons.[1]

WHICH COUNTRIES ARE TRYING TO DEVELOP NUCLEAR WEAPONS?

North Korea and Iran are two prominent examples of countries working to acquire a nuclear bomb or at least the technology necessary to make one. Diplomatic efforts are underway with both countries to resolve these issues.

North Korea

- North Korea has stated on numerous occasions that it already possesses a nuclear weapon. U.S. intelligence estimates that as of September 2005, North Korea may have at least one or two bombs and sufficient plutonium for five or six.[2]
- Negotiations with North Korea takes place within a "six-party" framework, including China, Japan, Russia, South Korea, and the United States.
- On September 19, 2005, the six parties issued a statement of principles, in which North Korea committed to give up its nuclear weapons program and rejoin the NPT. A timetable for North Korea's commitments, and a pledge by the other states to discuss the provision of a light water reactor to North Korea, has not been established. The talks will continue in November 2005.

Iran

- Iran is in the process of building a **nuclear power infrastructure** that would allow it both to acquire the nuclear material for a bomb and master the technologies necessary for designing a weapon.
- Inspectors for the International Atomic Energy Agency (IAEA) have found no evidence yet that Iran has acquired a nuclear weapon, though Iran's concealment of uranium enrichment and related facilities, revealed in August 2003, raised suspicions about its intentions.
- Britain, France and Germany are working to persuade Iran to "suspend permanently" its uranium enrichment program in exchange for their help in building a nuclear energy program under international supervision.
- **For now, Iran maintains that it has no intention of either building a bomb or giving up the technology necessary to enrich uranium.**

Countries That May Still Want Them…

The nuclear ambitions of other countries are less clear. Syria, Egypt, and Saudi Arabia are sometimes mentioned by experts as harboring nuclear ambitions though no strong evidence has publicly emerged recently to support such claims. Iraq and Libya were members of this group until recently.

- **Libya** announced in December 2003 that it would give up the nuclear program it had built with the assistance of A.Q. Khan, the father of the Pakistani bomb. Libya's nuclear material and technology, including hundreds of components for the manufacturing of high speed uranium enrichment centrifuges, are in the custody of the U.S. Department of Energy and under seal by the IAEA.
- **Iraq's** nuclear weapons aspirations ended for the most part in 1991 following the first Iraq war and the beginning of a lengthy period of inspections by the United Nations.

Countries That Gave Them Up…

There are also examples of countries that have given up their nuclear weapons or weapons ambitions. These include South Africa, Brazil, Argentina, Ukraine, Kazakhstan and Belarus and yes, Sweden.

- In 1990 **South Africa** famously dismantled six nuclear weapons it had produced indigenously using highly enriched uranium, and was declared nuclear weapons-free by the International Atomic Energy Agency in 1994.[3]
- **Brazil** and **Argentina** jointly gave up nuclear weapons programs in the 1990s, adhered to the NPT and a regional treaty promoting a nuclear weapons free zone.
- Following the break-up of the Soviet Union, **Ukraine, Kazakhstan** and **Belarus** all joined the NPT as non-nuclear weapons states.
- **Sweden** chose to abandon its own nuclear weapons program in the 1960s.[4]

HOW CLOSE HAVE TERRORISTS COME TO ACQUIRING NUCLEAR WEAPONS?

Al Qaeda

Al Qaeda has made it clear that it wants nuclear weapons, but to date, there is no evidence that it has made substantial progress toward that goal. Following is a summary of what we know about Al Qaeda's and Osama Bin Laden's attempts to acquire a nuclear weapon or materials.

- **Bin Laden's Nuclear Mandate:** In an interview with *ABC News* on December 24, 1998, Bin Laden confirmed **"If I seek to acquire such weapons, this is a religious duty. How we use them is up to us."**[5] He responded similarly one day prior in an interview with *Time Magazine* saying that **"Acquiring weapons for the defense of Muslims is a religious duty. If I have indeed acquired these weapons, then I thank God for enabling me to do so."**[6] In March 1998, he stated **"The United States is the biggest terrorist and rogue and it is the duty of every Muslim to struggle for its annihilation."**

- **Bin Laden's "Point Man":** Bin Laden named **Mamdouh Mahmud Salim** his point man for acquiring or developing nuclear and other weapons of mass destruction. Salim was arrested in September 1998 near Munich, Germany and later extradited to the United States. He was formally charged in connection with the 1998 U.S. Embassy bombings in Kenya and Tanzania, his affiliation with Al Qaeda, and **attempting to obtain nuclear materials for Bin Laden.**

- **Quest for Uranium:** Jamal Ahmad Al-Fadl, a former Al Qaeda operative, testified in February 2001 that he met with a Sudanese official in late 1993 to discuss the **acquisition of a cylinder of uranium for $1.5 million**. Eventually, Al Qaeda was successful in obtaining canisters of low-grade reactor fuel, which would not have been usable in a nuclear weapon. A recent study by the RAND Corporation notes that Al Qaeda operatives were the victims of several scams in which they were duped into paying for material which they believed to be weapons-usable but turned out to be "fictitious or radiological waste."[7]

- **Trying to Buy a "Suitcase Bomb":** In August 1998, Israeli military intelligence sources reported that Bin Laden arranged an exchange with a middle-man in Kazakhstan for a **suitcase nuclear bomb to be delivered within two years**. Bin Laden agreed to pay over 2 million pounds sterling for the bomb. Ayman al Zawahiri stated in an interview with Australian television that operatives had been sent to central Asian states and successfully purchased suitcase bombs. Reports of such suitcase bombs, usually of Russian origin, continue to surface. Russia denies that they were ever manufactured.

- **Dirty Bomb Design:** British intelligence officials found documents in Heart, Afghanistan indicating that Al Qaeda had built a small "dirty bomb" using medical isotopes provided by the Taliban.

- **Talent Search:** Al Qaeda operatives reportedly tried unsuccessfully to recruit a nuclear weapons expert from the former Soviet Union "but the plot was disrupted by Russian authorities."[8]

- **Pakistani Nuclear Scientists:** According to published reports, from 2000 to as late as July 2001 former nuclear scientists of Pakistan's Atomic Energy Commission, **Sultan Bashiruddin Mahmoud** and **Chaudhry Abdul Majid,** met with Al Qaeda leaders to discuss nuclear and radiological weapons. Some experts believe that the Pakistanis could have given Al Qaeda advice on black market suppliers of technology and expertise.[9] According to Sultan Bashiruddin's son, Azim Mahmoud, his father refused Bin Laden's request to help Al Qaeda develop a nuclear weapon.
- **Bin Laden's Second Strike Option:** In November 2001, Pakistani journalist Hamid Mir, conducted the first interview with Bin Laden after the attacks of 9/11. According to the English translation in Pakistani daily *Dawn*, Bin Laden avowed that "**if America used chemical and nuclear weapons against us, then we may retort with chemical and nuclear weapons. We have the weapons as a deterrent**."[10] However, in the Urdu language version of the same interview in Pakistani newspaper *Ausu*, Bin Laden made no such claim regarding the possession of nuclear weapons.[11]

Aleph (**Formerly Known As Aum Shinrikyo**)

Al Qaeda is not the only terrorist group to seek nuclear material and expertise. The Japanese cult, formerly known as **Aum Shinrikyo**, which launched a successful sarin attack on Tokyo's subway in 1995, killing 12 people, also had nuclear ambitions.

A senior Aum official traveled to Russia eight times, cultivating ties to political officials and scientists at the Kurchatov Institute, a prestigious scientific research institution. A RAND study examining Aum's attempts to acquire WMD concluded that Russian officials "exercised caution" in responding to Aum's overtures, perhaps fearing that they were working for a foreign intelligence service, or fearing the implications of such cooperation.[12]

HOW DO YOU MAKE A NUCLEAR BOMB?

There are two significant hurdles to building a nuclear weapon: acquiring the necessary quality and quantity of nuclear material, and fashioning that material into a workable weapon.

Nuclear bombs are generally made according to one of two designs—a gun-type assembly or an implosion design.

- The **gun-type** weapon is the simpler of the two to construct, and works by quickly bringing together two pieces of fissile material, which alone are not sufficient to reach "criticality"—that is sustain a nuclear chain reaction—but together form a supercritical mass.
- **An implosion device** uses an arrangement of high explosives to create a shockwave that compresses the nuclear material. It is more difficult technically to build but requires less fissile material, and can be built from either plutonium or highly-enriched uranium.[13] The gun-type assembly works only with a uranium core. The bomb dropped on Hiroshima was a gun-device; Nagasaki's used an implosion design and contained plutonium.

What Is Fissile Material?

- **Nuclear material is "fissile" if its nuclei can be split by neutrons in a self-sustaining chain reaction.** The splitting or "fission" of each nucleus releases additional neutrons, which go on to split the neighboring nuclei. Each nuclear fission releases a large amount of energy.
- **In a nuclear reactor this process is controlled and the energy is used to make electricity. In a nuclear bomb the energy is released in an instant producing a devastating explosion.**

Uranium

- Uranium is found in the earth's rock and mined much like any other ore. Raw, unenriched uranium is 99.3 percent **U-238** and 0.07 percent **U-235**. These are two of several "**isotopes**" or forms that uranium can take, and the two most common isotopes found in nature. Uranium has 92 protons in its nucleus. **The isotope number, 238, refers to the sum of the number of protons and neutrons** (146), in the atom's nucleus. U-238 is not fissile and will not sustain a chain reaction.
- **U-235 is fissile**. Because of the different number of neutrons in its nucleus (143 versus 146), some properties of U-235 differ significantly from those of U-238. In particular, when an external neutron reacts with or "captures" a U-235 nucleus, the nucleus splits or "fissions." This releases energy.
- **A self-sustaining chain reaction results when a neutron causes the nucleus of a U-235 atom to split, releasing energy and in turn releasing more neutrons which fission neighboring atoms and so on.** It is the energy caused by the fissioning U-235 atoms that can be used to generate electricity in a nuclear reactor or cause a nuclear explosion.

How to Enrich Uranium

The process of separating U-235 from U-238 is known as enrichment. One commonly used method involves spinning a gaseous form of uranium at high speed in a centrifuge. This causes the lighter U-235 to separate from the heavier U-238.

- In practice, one centrifuge can produce only a modest amount of separation, so large numbers of centrifuges are employed. A centrifuge cascade gradually increases the concentration of U-235 to various levels of enrichment.
- **Highly Enriched Uranium** (HEU) is defined by the International Atomic Energy Agency as uranium containing greater than 20 percent U-235. "**Weapons grade**" uranium is defined as uranium enriched to greater than 90% U-235. Modern weapons in the U.S. and Russian arsenals contain HEU that is greater than 90 percent enriched, however, it is possible to make a weapon from HEU containing lower levels of enrichment (as in the case of the Hiroshima bomb or the South African nuclear weapons).

Plutonium

- Unlike uranium, plutonium is found in nature in only trace amounts. **It is produced primarily in reactors by bombarding U-238 with neutrons.** The uranium absorbs those neutrons, decaying into an element know as neptunium, and later into plutonium.
- Nuclear weapons are made with plutonium-239, the most fissile of the plutonium isotopes, though all types of plutonium are considered weapons-usable.
- Plutonium is extracted from the fuel rods of reactors via a complex process known as **"reprossessing."** Some reactors known as **"breeder reactors"** are designed to yield more plutonium than they consume. Plutonium can also be used as fuel for a reactor.
- A **"closed fuel cycle"** occurs when plutonium is reprocessed from spent fuel and recycled for use as a reactor fuel. Reprocessing plutonium on a commercial scale is expensive, and poses both environmental waste challenges and proliferation risks. It is pursued by a small number of countries, primarily Japan, France, the United Kingdom and Russia, who argue that notwithstanding the risks, their economies could benefit from technologies that reduce their dependence on oil.[14] (See Joseph Cirincione and Jon Wolfsthal, "Proliferation Analysis: A Plutonium Primer," Carnegie Endowment for International Peace. Available at: http://www.carnegieendowment.org/npp/publications/index.cfm?fa=view&id=15709)

HOW MUCH NUCLEAR MATERIAL DO YOU NEED FOR A BOMB?

Approximately 4-5 kgs of plutonium (some experts say even less) and about 15-20 kgs of 90 percent enriched HEU would be necessary to construct a nuclear weapon.

The Union of Concerned Scientists has produced a chart showing the necessary quantities of fissile material by weapons type:

Amount of fissile material needed to build an atomic bomb		
HEU (enriched to 90 percent U-235	Simple gun-type nuclear weapon	90 to 110 lbs (40 to 50 kg)
	Simple implosion weapon	33 lbs (15 kg)
	Sophisticated implosion weapon	20 to 26 lbs (9 to 12 kg)
Plutonium	Simple implosion weapon	14 lbs. (6 kg)
	Sophisticated implosion weapon	4.5 to 9 lbs (2 to 4 kg)

Source: Union of Concerned Scientists Factsheet: Fissile Material Basics
http://www.ucsusa.org/global_security/nuclear_terrorism/page.cfm?pageID=1387

- The point at which a fissile material reaches "criticality" or is able to sustain a nuclear chain reaction is a function of many factors, including the type of fissile material, either plutonium or highly enriched uranium, and the shape and density of the material. "Fat Man," the bomb dropped on Nagasaki contained a sphere of 6 kilos of plutonium.
- Nuclear weapons of more advanced designs use less fissile material. Some advanced designs "boost" the yield of a weapon using tritium, a hydrogen isotope

WHERE IS FISSILE OR NUCLEAR MATERIAL FOUND?

HEU and Plutonium are strictly controlled materials which, as described above, require special means of production using technology that is not readily available to individuals.

Outside of military stockpiles, however, **one key source of plutonium is in the spent fuel for nuclear reactors and occasionally in the fresh fuel**. Special technology is necessary to extract the plutonium from the reactor's fuel, but the presence of large and growing stockpiles of such material is worrisome to experts.

- U.S. reactors generally do not use plutonium as fresh fuel. However, some plutonium deemed surplus to the U.S. nuclear stockpile may eventually be burned in U.S. reactors as "mixed-oxide fuel."
- According to the IAEA, there are 446 nuclear power reactors in operation world-wide and approximately 70 countries maintaining at least one nuclear research reactor. The United States has the most power reactors of any single country, with 104, followed by France (59), Japan (54), Russia (39) and the United Kingdom (31).

- **Nuclear power reactors are not sources of bomb-grade uranium**. These reactors run on uranium of low-level enrichment, typically between 4 and 5 percent U-235 (uranium must be enriched to 20 percent U-235 to be classified as high-enriched uranium).

HOW SECURE ARE THE MATERIALS THAT COULD BE USED TO MAKE A BOMB?

The plutonium and highly enriched uranium (HEU) in the U.S. weapons stockpile are subject to strict controls and standards of accounting. However, the security of potential nuclear bomb material in civilian use in the United States, and nuclear stockpiles in the rest of the world, varies greatly.

- There are roughly 130 research reactors in approximately 40 countries worldwide that still use HEU for fuel, the easiest material in the world for terrorists to use to make a nuclear bomb.[i] Many of these facilities have enough HEU for a bomb. [ii] In the United States there are very few research reactors that use HEU—approximately 11 according to the NRC—and there is a program to convert them to reactors that run on low enriched uranium (LEU). Again, we note that reactors used for generating power do not use HEU.
- In the states of the former Soviet Union, while security has been substantially improved since the Soviet collapse, nuclear security budgets remain far less than needed. According to a May 2005 report by Matthew Bunn and Anthony Wier of Harvard University's Managing the Atom project, there continue to be "guards patrolling without ammunition in their guns, workers propping open security doors for convenience and guards turning off intrusion detectors when they become annoyed by the false alarms." [15]
- The threats that security systems in Russia must be prepared to defeat are high. According to Matt Bunn in "Preventing a Nuclear 9-11," "Russian officials confirm that terrorist teams have actually carried out reconnaissance at Russian nuclear warhead storage sites."[16] On October 14, 2003, two residents of the Russian town of Sarov were convicted of falsely posing as employees of an unidentified nuclear facility and offering to sell a Russian businessman stolen weapons-grade plutonium for sale to a foreign client. They were offered $750,000 for the plutonium.[17]
- The CIA's National Intelligence Council reported to Congress in December 2004 that while security for nuclear stockpiles in Russia had been "slowly improving," "risks remain." [18] The report also found it **"highly unlikely that Russian authorities would have been able to recover all the material reportedly stolen" and judged that "undetected nuclear smuggling has occurred.**"[19]
- In Pakistan, while the nuclear stockpile is believed to be small and heavily guarded, it faces threats from both remnants of al Qaeda operating in the country, and nuclear blackmarketeers, such as A.Q. Khan, now under house arrest. [20]
- The U.S. Departments of Energy and Defense have initiated a range of programs aimed at securing nuclear weapons and weapons-usable materials in the former Soviet Union and around the world. These are discussed in more detail in Section III.
- These programs have made substantial progress in improving security, but 14 years after the collapse of the Soviet Union, more remains to be done. The U.S. National Nuclear

Security Administration (NNSA) and an independent analysis by Matthew Bunn and Anthony Wier of Harvard University agree that, as NNSA puts it, **"the best measure of risk reduction is the number of buildings secured. A building with one ton of nuclear material in storage is as great a threat as a building with 10 tons—assuming a goal quality of 25 kilograms or less**."[21] According to a forthcoming NNSA release, by the end of fiscal year 2005, security upgrades are expected to have been completed on 75% of approximately 200 buildings accommodating weapons-usable material in the former Soviet Union. Because huge amounts of nuclear material are located in a few buildings, however, it remains the case that comprehensive U.S.-funded security upgrades have been completed for less than half of the potentially vulnerable nuclear material in Russia.[22]

- In the rest of the world, efforts to upgrade security for nuclear stockpiles are only beginning – though NNSA's Global Threat Reduction Initiative has removed potential bomb material entirely from several research reactor sites, and hopes to convert most of the reactors that use HEU to use low-enriched fuel that cannot be used in nuclear weapons.

HOW VULNERABLE ARE REACTOR SITES TO AN ATTACK?

The terrorist attacks of September 11 prompted an immediate review of the vulnerability of nuclear reactors to a similar assault by an aircraft by the Nuclear Regulatory Commission. The NRC subsequently concluded that the likelihood of such an attack "both damaging the reactor core and releasing radioactivity" to be low.[23]

- The NRC and other experts point out that **nuclear power plants are difficult targets to hit from the air, being relatively small and low to the ground**, and the radioactive material in a reactor is encased within a "vessel" which is housed in a concrete "containment" structure several feet thick. They determined it would be difficult for an aircraft to penetrate the reactor's core in a manner that would create an uncontrolled fire or explosion of radiation.

- Of greater concern is a terror attack that results in a **"melt down"** of the reactor core. **This happens when the heat produced by the fission taking place inside the reactor is not properly moderated or cooled.** The Chernobyl and Three Mile Island accidents are examples of this, though in the case of Three Mile Island there was no fire and the reactor's containment structure prevented a large, uncontrolled release of radioactivity. The design of the Chernobyl reactor, which lacked redundant containment structures, contributed to the severity of the accident.

HOW VULNERABLE ARE SPENT FUEL PONDS TO AN ATTACK?

When a reactor's fuel can no longer sustain a chain reaction, it is removed to a "cooling pond" or other form of storage until it has cooled sufficiently for either long term storage or reprocessing. This can take up to four years. In that time, there is a risk, judged unlikely by the NRC, of a terrorist breaching the concrete walls of a cooling pond, draining the water, and igniting a fire.

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II. Dirty Bombs

WHAT IS A "DIRTY BOMB"?

A "dirty bomb" is an explosive radiation dispersal device (RDD) that uses a conventional weapon such as dynamite as its means of dispersing radioactive material.

Whereas a nuclear weapon uses fission to provoke an enormous explosion of radiation, a dirty bomb **scatters radioactive material** in a manner that is likely to contaminate an area but not cause mass casualties from fire or radiation poisoning.

WHAT KINDS OF RADIOACTIVE MATERIALS COULD BE USED IN MAKING A DIRTY BOMB?

There are many types of radioactive material with industrial or medical applications, known as **"nuclear sources"** that could be used in the construction of a dirty bomb. **These include elements such as cesium-137 and cobalt-60 (both used in cancer treatments) and americium-241 (found in smoke detectors) or strontium-90, found in certain batteries manufactured in the former Soviet Union.**

WHAT IS THE POTENTIAL IMPACT OF A DIRTY BOMB?

The local contamination impact of a dirty bomb depends on 1) the size of the bomb, 2) the type and amount of radioactive material 3) the amount and type of conventional weapon and 3) the weather conditions at the time the device is detonated and the physical surroundings.

Immediate deaths and injury are more likely to stem from the explosion than from any radiation. However, even low level radioactive contamination of a city building or few blocks could take months to clean up. In certain cases, buildings may be more costly or difficult to decontaminate than to tear down and rebuild.

REAL LIFE AND HYPOTHETICAL EXAMPLES

Cesium-137

Cesium-137 is a talc-like metallic powder found in cancer treatment radiation machines. It is dangerous even in small amounts and has a half-life of 33 years.[24]

Goiania Brazil, September 1987

Two men entered an abandoned medical clinic looking for scrap metal and found an old radiation machine. They transported it to a junkyard, dismantled the machine and extracted a stainless-steel cylinder. They managed to break open the cylinder and extract a **small platinum capsule**. They sawed open the capsule and found approximately **100 grams of material, only a third of which was the radioactive cesium**. **Eventually, 250 people**

were exposed; 28 suffered radiation burns and 4 died. [25] **85 homes had to be destroyed in efforts to decontaminate the area.** The capsule was fabricated in 1971.[26]

The economic impact was devastating: "**within two weeks of the event (i.e. the announcement of the contamination), the wholesale value of the entire state's agricultural production fell by 50 percent.**"[27] In addition, "The aggregate losses to local farmers during this period, compared to the same period in 1986, have been estimated at 23 percent of total export value."[28]

Cobalt-60

Cobalt-60 is a solid metal that is commercially produced for use in medical radiation therapy, food irradiation and linear accelerators.[29] Its half-life is approximately 5 years. The cobalt used in food irradiation takes the form of **small, radioactive "pencils."** They are shipped in special hardened steel canisters that have been designed and tested to survive crashes without breaking.

The Federation of American Scientists (FAS) modeled a dirty bomb attack in lower Manhattan using **a single piece of cobalt from a food irradiation plant of one inch in diameter and one foot long**.

> No immediate evacuation would be necessary, but in this case, an area of approximately one-thousand square kilometers, extending over three states, would be contaminated. Over an area of about three hundred typical city blocks, there would be a one-in-ten risk of death from cancer for residents living in the contaminated area for forty years. The entire borough of Manhattan would be so contaminated that anyone living there would have a one-in-a-hundred chance of dying from cancer caused by the residual radiation. It would be decades before the city was inhabitable again, and demolition might be necessary.[30]

Americium-241

Americium-241 is a man-made radioactive material that is used in oil drilling and surveying equipment and in very small amounts in household smoke detectors. It has a half-life of 432 years.[31]

- In October 2004, **a UK terror cell reportedly attempted to harvest sufficient Americium from roughly 2,000 smoke detectors to fabricate a crude bomb**. Experts at the time doubted that enough could be obtained to cause radiation sickness, but others argued that panic and economic damage could have been easily achieved.[32]

- **In 1994 a teenager in Michigan** learned how to extract Americium from smoke detectors (he obtained 100 broken detectors for $1 each) and made a rudimentary reactor in his parents' backyard, in the process creating more than 1000 times the normal background radiation and necessitating a full-scale hazmat cleanup.[33]

- **A hypothetical attack** using an Americium source typically found in oil well surveying was modeled by the Federation of American Scientists. Their study concluded that if a single Americium source were blown up with one pound of TNT:

  > People in a region roughly ten times the area of the initial bomb blast would require medical supervision and monitoring…[An area] one kilometer long and covering

twenty city blocks would have to be evacuated within half an hour. After the initial passage of the cloud, most of the radioactive materials would settle to the ground…A ten-block area contaminated in this way would have a cancer death probability of one-in-a-thousand. A region two kilometers long and covering sixty city blocks would be contaminated in excess of EPA safety guidelines. If the buildings in this area had to be demolished and rebuilt, the cost would exceed fifty billion dollars.[34]

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The Heritage Foundation: "Dealing with Dirty Bombs: Plain Facts, Practical Solutions"
http://www.heritage.org/Research/HomelandDefense/bg1723.cfm

Peter D. Zimmerman with Cheryl Loeb, "Dirty Bombs: The Threat Revisited," Defense Horizons, January 2004, Number 38.
http://hps.org/documents/RDD_report.pdf

FAS Public Interest Report: "Dirty Bombs: A Response to a Threat"
http://www.fas.org/faspir/2002/v55n2/dirtybomb.htm

Simulated Scenario-Based Exercise

U.S. Department of Homeland Security, "Planning Scenarios, Scenario 11: Radiological Attack—Radiological Dispersal Devices," July 2004.
http://www.globalsecurity.org/security/library/report/2004/hsc-planning-scenarios-jul04_11.htm.

Radioactive Material:
Cesium-137

U.S. Environmental Protection Agency
http://www.epa.gov/radiation/radionuclides/cesium.htm

U.S. Centers for Disease Control and Prevention
http://www.bt.cdc.gov/radiation/isotopes/cesium.asp

U.S. Agency for Toxic Substances and Disease Registry
http://www.atsdr.cdc.gov/tfacts157.html

Cobalt-60

U.S. Environmental Protection Agency
http://www.epa.gov/radiation/radionuclides/cobalt.htm

U.S. Centers for Disease Control and Prevention
http://www.bt.cdc.gov/radiation/isotopes/cobalt.asp

U.S. Agency for Toxic Substances and Disease Registry
http://www.atsdr.cdc.gov/toxprofiles/tp33-c3.pdf

Americium-241

U.S. Environmental Protection Agency
http://www.epa.gov/radiation/radionuclides/americium.htm

U.S. Agency for Toxic Substances and Disease Registry
http://www.atsdr.cdc.gov/tfacts156.html

III. Preventing Terrorism: U.S. and International Community Efforts

WHAT IS THE UNITED STATES DOING TO PREVENT NUCLEAR TERRORISM?

U.S. government programs to detect, prevent and respond to nuclear terrorism involve the full spectrum of executive branch agencies, from the intelligence community to homeland security to federal emergency management.

At the tip of the spear is a cadre of highly trained nuclear weapons experts who make up Nuclear Emergency Search Teams (NEST). Their mission is to locate and disarm a nuclear device before it explodes.[35]

Nunn-Lugar Threat Reduction Program

The Nunn-Lugar Act was signed by President Bush in 1991 to help reduce the threat posed by weapons of mass destruction—initially to help safeguard against former Soviet Union weapons and materials following the country's dissolution.

- As of February 2005, Nunn-Lugar programs have led to the deactivation or destruction of roughly 6,564 nuclear warheads, 568 ICBMs, hundreds of missile silos, launchers, bombers, and submarine-based missiles, in addition to helping remove all nuclear weapons from Ukraine, Belarus, and Kazakhstan.

Global Threat Reduction Initiative (GTRI)

Nunn-Lugar initiatives have evolved into a set of wide-ranging programs aimed at preventing nuclear terrorism. These fall under a set of initiatives known as Global Threat Reduction, administered jointly by the Departments of Energy and Defense, and targeting a broad array of nuclear and terrorism related threats. Major programs launched under GTRI include the Megaports Initiative, Radiation Portal Monitors, the Container Security Initiative, and the Domestic Nuclear Detection Office (DNDO).

MegaPorts Initiative

- In 2003, the National Nuclear Security Administration of the U.S. Department of Energy (DOE) initiated the MegaPorts Initiative to coordinate with the Counter Security Initiative.
- The goal of the Initiative is to deploy radiation portal monitors and detection equipment at foreign ports deemed *high priority* based on DOE's Maritime Prioritization Model.
- On August 12, 2003 the first of the MegaPorts agreements was signed between the US and the Netherlands regarding coordination with the Port of Rotterdam, the largest shipping port in the world.

- As of September, 2005, eight countries have signed onto the MegaPorts Initiative.[36] Despite such progress, the U.S. General Accountability Office (GAO) noted the Initiative has had "limited success [since 2003] in initiating work at key ports identified as high priority…[and that] Gaining the cooperation of foreign governments has been difficult in part because some countries have concerns that screening large volumes of containers will create delays that could inhibit the flow of commerce at their ports."[37]

Radiation Portal Monitors

- A radiation portal monitor is a detection device, used by U.S. Customs and Border Protection (CBP) equipped with a "passive, non-intrusive means to screen trucks and other conveyances for the presence of nuclear and radiological materials."[38]
- In March 2005, Robert Bonner, Commissioner of U.S. Customs and Border Protection (CBP), testified before the Homeland Security Subcommittee that the first two phases of the deployment of radiation portal monitors at international mail facilities had been completed. According to Bonner, "you can have a fair degree of confidence in the fact that you are going to detect radiation" with such portal monitors.[39]
- At the time of the hearing, over 200 monitors had been deployed along the US-Canadian border, efforts to install monitors and other such technology at *all* border ports of entry with Canada and Mexico were well underway.

Container Security Initiative (CSI)

- The Container Security Initiative was initiated by U.S. Customs and Border Protection (CBP) in January 2002 to help protect the international trading system and to help prevent shipped cargo containers with any radiological material from entering U.S. ports. As of September 2005, there were 37 CSI operational ports.
- According to the CBP, the Initiative was established in response to the 9/11 attacks and was founded on four main elements:[40]
    1) using intelligence and automated information to identify and target containers that pose a risk for terrorism
    2) pre-screening those containers that pose a risk at the port of departure before they arrive at US ports
    3) using detection technology to quickly pre-screen containers that pose a risk
    4) using smarter, tamper-evident containers[41]

- In April 2005, the U.S. Government Accountability Office reported that while some success has been duly noted, the CSI has *not* been as successful as expected due to what the GAO deems to be "staffing imbalances."[42]

Domestic Nuclear Detection Office (DNDO)

According to U.S. Department of Homeland Security (DHS) Secretary Michael Chertoff, the DNDO was established, on April 15, 2005 by a National Security Presidential Directive (NSPD) within the DHS to "develop and deploy the next generation of systems that will allow us [the DNDO] to intercept a nuclear threat" particularly at US borders and within the country.[43]

- According to Secretary Chertoff, next generation systems are those that "cannot be defended by shielding the nuclear material; systems that reduce false positives, systems are mobile and not merely fixed…Creating this kind of nuclear defense is a reverse Manhattan Project for the 21st century, one that will diminish the nuclear threat."[44]
- The DNDO is expected to be staffed with members of several federal, state and local government agencies.

Proliferation Security Initiative

The Proliferation Security Initiative, announced by President Bush in May 2003, seeks to interdict potentially dangerous shipments of WMD at sea, land or air.

Eleven countries including Australia, France, Germany, Italy, Japan, the Netherlands, Poland, Portugal, Spain, the United Kingdom, and the United States, signed a Statement of Interdiction Principles, which calls for heightened monitoring of ports and the willingness to search and seize suspect cargo, even at the request of another country. According to the U.S. State Department, over 60 countries have expressed some degree of support for the PSI.[45]

Department of Energy: "Protecting America" Discretionary Budget 2006

The DOE 2006 Discretionary Budget provides the following for the prevention of the spread of weapons of mass destruction:[46]

1) $526 million in NNSA [National Nuclear Security Administration] programs that support programs to secure, remove, or eliminate weapons-usable material from vulnerable sites in Russia and other former Soviet States;

2) $416 million in DOD Cooperative Threat Reduction programs that provide assistance in dismantling nuclear weapons and provide transport and storage security; and

3) $71 million in Department of State programs that support export control programs and other nonproliferation efforts to include those targeted at preventing the spread of WMD expertise.

The budget provides the following for nonproliferation programs that "detect, prevent, and reverse nuclear proliferation":[47]

1) $246 million for the International Nuclear Materials Protection and Cooperation program to secure nuclear material in Russia and the Newly Independent States. These

programs fund critical activities, such as installation of intrusion detection and alarm systems and construction of fences around exposed nuclear sites.

2) $74 million for the MegaPorts Initiative to deploy radiation detection equipment at key overseas ports to pre-screen U.S.-bound cargo containers for nuclear or radioactive materials.

3) $98 million for a new initiative for expanded and accelerated efforts to secure and /or remove at-risk, nuclear and radioactive material in the world's most dangerous regions.

4) $272 million for the Nonproliferation Research and Development program to develop technologies needed to detect nuclear proliferation, such as radiation detection sensors, monitor nuclear explosions, and verify treaty adherence.

5) $132 million to eliminate weapons-grade plutonium production in Russia.

6) $653 million to support a program to dispose surplus weapons-usable plutonium.

U.S. Energy Policy Act of 2005

The U.S. Energy Policy Act of 2005 was signed by President Bush on August 8, 2005. Many experts have expressed concern that the Act contradicts established GTRI initiatives—specifically in regard to inhibiting civilian use of highly enriched uranium (HEU) exports.

- The Energy Policy Act includes provisions to relax restrictions on HEU export controls for medical isotope production. This law will essentially "permit the export of US HEU to medical isotope producers even if they refuse to convert to LEU" and in turn is "certain to complicate ongoing efforts to reduce the risk of nuclear terrorism."[48]

This law will essentially allow highly-enriched uranium to be exported to medical isotope producers even if they refuse to convert to low-enriched uranium. According to Scott Parish of the Center for Nonproliferation, this is "certain to complicate ongoing efforts to reduce the risk of nuclear terrorism."[49]

WHAT IS THE INTERNATIONAL COMMUNITY DOING TO PREVENT NUCLEAR PROLIFERATION AND NUCLEAR TERRORISM?

A web of treaties, regimes and norms attempts to regulate, sometimes imperfectly, the flow of nuclear technology and material around the world. At its core is the Nuclear Nonproliferation Treaty (NPT) and the International Atomic Energy Agency (IAEA), its implementing body. Beyond the NPT, the international community comes together in numerous ways to cooperate in the prevention of nuclear proliferation and terrorism.

The Nuclear Non-Proliferation Treaty and the International Atomic Energy Agency

The NPT is the world's most widely adhered-to arms control treaty, with 189 signatories. Pakistan, India, Israel and for now, North Korea, are the only countries possessing nuclear weapons remaining outside the Treaty's framework.

- The NPT seeks to prevent the spread of nuclear weapons by providing access to nuclear technology in exchange for a country's assurances that it will not possess nuclear weapons. It also commits the five nuclear states to work toward "general and complete" disarmament of nuclear weapons.
- The **International Atomic Energy Agency** (IAEA) was established in 1957 under the **"Atoms for Peace Program"** established by President Eisenhower to both control and promote the peaceful use of atomic energy. Though the IAEA's establishment predates the NPT, part of its mandate is to enforce the agreements that countries enter into with the IAEA for the monitoring of their civil nuclear programs which are required by the NPT.
- The IAEA concludes **safeguards agreements** with member states to allow for routine inspection of civil nuclear facilities. The **Additional Protocol**, signed by most NPT members, is intended to help the IAEA detect clandestine nuclear programs by expanding the IAEA's access to nuclear facilities. **Noncompliance with safeuards agreements is reported by the IAEA to the U.N. Security Council after a decision by the IAEA's Board of Governors.**
- The IAEA also promotes the peaceful use of nuclear science in **medicine, environmental management and agriculture, in particular in the developing world** where access to such technologies would otherwise be limited. Examples of work in the area of food and agriculture include the use of isotopes and radiation for pest control, soil fertility research, irrigation and food preservation.

United Nations

As of September 1, 2005, the U.N. has issued 12 major conventions and protocols related to member-state's responsibilities when it comes to preventing and combating terrorism. The latest initiatives are Security Council Resolution 1540 and the International Convention for the Suppression of Acts of Nuclear Terrorism.

Security Council Resolution 1540

- Resolution 1540 requires member-states to establish legal barriers to prevent terrorists from acquiring weapons of mass destruction. It was adopted by the U.N. Security Council on April 28, 2004 under Chapter VII of the U.N. Charter, which allows the use of military force in cases where there is a threat to "international peace and security." Security Council resolutions are binding under international law.
- UNSCR 1540 is a follow-on to UNSCR 1373, passed shortly after September 11, which forbids member-states from allowing the transit, training or financial transactions of terrorists.

International Convention for the Suppression of Acts of Nuclear Terrorism

- After seven years of negotiations, on April 13, 2005 the U.N. General Assembly (GA) adopted unanimously the Convention for the Suppression of Acts of Nuclear Terrorism (Nuclear Terrorism Convention). It opened for signature on September 14, 2005 and will enter into force upon the ratification by 22 countries.
- The Convention is the first counter-terrorism treaty adopted by the GA since the attacks of 9/11 and is expected to help safeguard against terrorist's access to weapons of mass destruction and strengthen the international legal framework for preventing and combating nuclear terrorism by expecting signatories to help develop effective frameworks for criminalizing nuclear terrorism related crimes.

The Group of Eight (G-8)

Beyond its traditional focus on economic and financial issues, the G-8 (Canada, France, Germany, Italy, Japan, the U.K. and U.S.) sponsors a **"Global Partnership Against the Spread of Weapons and Materials of Mass Destruction."** This Partnership includes a series of initiatives to address security concerns common to its membership. Programs to alert members quickly to reported cases of nuclear smuggling, dispose of plutonium deemed surplus to military requirements and improve the safety of nuclear reactors are some examples of G-8 initiatives.

Zangger Committee (ZC) and Nuclear Suppliers Group (NSG)

- The **Zangger Committee** is an informal group of countries that focus on interpreting nuclear "export control" policies and IAEA safeguards to nuclear exports for member-states of the Nuclear Non-Proliferation Treaty (NPT). As of September 1, 2005 there were 35 member-states.

- The group maintains a regularly updated **"trigger list"** of non-nuclear materials and equipment that may "trigger" IAEA safeguards.
- The **Nuclear Suppliers Group** is an informal group of nuclear-supplier countries that seek to control the exportation of nuclear materials and nuclear-related materials, equipment and technology through its established "NSG Guidelines."

Missile Technology Control Regime (MTCR)

- The **Missile Technology Control Regime** is an association of governments with a common goal of promoting the nonproliferation of unmanned delivery systems for weapons of mass destruction.
- The MTCR relies on "adherence to common export policy guidelines applied to a common list of controlled items in the MTCR Guidelines for Sensitive Missile-Relevant Transfers and the Equipment, Software and Technology Annex.
- The MTCR does not take export licensing decisions as a group, but expects individual member states to take responsibility for implementing the Guidelines and Annex in accordance with national legislation and practice.

FOR MORE INFORMATION

Preventing Nuclear Terrorism

The Nunn-Lugar Threat Reduction Program
http://www.lugar.senate.gov/nunnlugar.html

U.S. Government Accountability Office
"Report to Congressional Requesters: Preventing Nuclear Smuggling," March 2005.
http://www.gao.gov/new.items/d05375.pdf

The National Security Advisory Group, "Worst Weapons in Worst Hands: U.S. Inaction On Nuclear Terror Threat Since 9/11, And A Path of Action," July 2005.
http://www.carnegieendowment.org/static/npp/NSAG.pdf

Patrick Cronin, "Preventing Nuclear Terrorism," CSIS, April 4, 2005.
http://www.csis.org/dos/050401_nuclear.pdf

Matthew Bunn and Anthony Weir, "Securing the Bomb: The New Global Imperatives," Harvard School of Government, Commissioned by the Nuclear Threat Initiative (NTI).
http://www.nti.org/e_research/report_cnwmupdate2005.pdf

Graham Allison, Charles Ferguson and Leonard S. Spector, "The Four Faces of Nuclear Terror and the Need for a Prioritized Response," Foreign Affairs, May/June 2004.
http://www.foreignaffairs.org/20040501faresponse83313/william-c-potter-charles-d-ferguson-leonard-s-spector/the-four-faces-of-nuclear-terror-and-the-need-for-a-prioritized-response.html

Graham Allison, "How to Stop Nuclear Terror," Foreign Affairs, January/February 2004.
http://www.foreignaffairs.org/20040101faessay83107/graham-allison/how-to-stop-nuclear-terror.html

Global Threat Reduction Initiative

Radiation Portal Monitors
http://www.customs.gov/xp/cgov/border_security/port_activities/rad_portal1.xml

Contained Security Initiative
http://www.customs.gov/xp/cgov/border_security/international_activities/csi/

Domestic Nuclear Detection Office (DNDO)
http://www.dhs.gov/dhspublic/display?theme=43&content=4474&print=true

Treaties and Agreements

U.S. Department of State current treaties on Arms Control
http://www.state.gov/t/ac/trt/

U.S. Department of State current treaties on Nonproliferation
http://www.state.gov/t/np/trty/

International Atomic Energy Agency (IAEA)

International Atomic Energy Agency
http://www.iaea.org/

IAEA: "Promoting Nuclear Security: What the IAEA is doing"
http://www.iaea.org/Publications/Factsheets/English/nuclsecurity.pdf

IAEA: "IAEA Safeguards: Stemming the Spread of Nuclear Weapons"
http://www.iaea.org/Publications/Factsheets/English/S1_Safeguards.pdf

Multilateral Export Control Regimes

Nuclear Suppliers Group (NSG)
http://www.nuclearsuppliersgroup.org/

Zangger Committee (ZC)
http://www.zanggercommittee.org/Zangger/default.htm

Missile Technology Regime (MTCR)
http://www.mtcr.info/english/index.html

United Nations (U.N.)

United Nations Security Resolution 1540
http://daccessdds.un.org/doc/UNDOC/GEN/N04/328/43/PDF/N0432843.pdf?OpenElement

International Convention for the Suppression of Acts of Nuclear Terrorism
http://www.un.int/usa/a-59-766.pdf

Group of 8 (G-8)

The G-8 Partnership Against the Spread of Weapons and Materials of Mass Destruction
http://www.state.gov/e/eb/rls/othr/11514.htm.

The G-8 Action Plan on Nonproliferation
http://www.whitehouse.gov/news/releases/2004/06/print/20040609-28.html

IV. What to Do in the Event of An Attack: Nuclear and Dirty Bomb

WHAT TO DO IN THE EVENT OF A NUCLEAR ATTACK: RECOMMENDATIONS FROM FEDERAL AGENCIES

Before an Attack: Make a plan

The most important thing one can do is to make a plan. According to the U.S. Department of Homeland Security (DHS), families should assemble a supply kit and develop a family communications plan anticipating the different types of terrorist attacks that could occur. Every household should have an emergency kit and a "family" contact plan.

- The Department of Homeland Security offers detailed advice on how to prepare for, and what to do in the event of various terrorist attacks including biological, nuclear, chemical, and radiological.
- In order to best prepare, it is important to have general knowledge about each type of attack and the physical effects caused by such attacks. With increased knowledge, you will be better prepared to assist yourself, your family and others during an emergency.

Emergency Kit

- A sufficient emergency kit should last for at least three days.
- Priorities should be *water***,** *food* and *clean air*. In order to guarantee clean air, you should have *filter masks* or enough *cloth to create a barrier* between you and the contamination.
- Your kit should also include *basic emergency supplies* such as: a flashlight; battery powered radio; extra batteries; a first-aid kit; toilet articles; and, if applicable, any prescription medications.
- Duct tape and garbage bags should be included in the kit in order to help seal windows and doors to create a barrier from potential outside contamination.

Family Contact Plan

- Families should pre-determine the best way to contact each member in the event of an attack. Depending on the circumstances of the attack, *your family should also have a plan in place for "staying put" or "getting away"* according to the DHS.
- Another part of planning ahead is knowing how to create an effective temporary shelter for your family if you do need to "stay put" as the DHS notes. It is also important to be aware of the emergency plan at your place of employment and at your child's school.

Source: DHS, "Ready America" http://www.ready.gov/overview.html

After an Attack: The Immediate Response

Below are comprehensive guidelines from the U.S. Center for Disease Control (CDC) adapted from recommendations of the World Health Organization (WHO) regarding what to do after a nuclear blast depending on the proximity to the attack.

If you are near the nuclear blast when it occurs:

1) Turn away and close and cover your eyes to prevent damage to your sight.
2) Drop to the ground face down and place your hands under your body.
3) Remain flat until the heat and two shock waves have passed.

If you are outside when the blast occurs:

1) Find something to cover your mouth and nose, such as a scarf, handkerchief, or other cloth.
2) Remove any dust from your clothes by brushing, shaking, and wiping in a ventilated area—however, cover your mouth and nose while you do this.
3) Move to a shelter, basement, or other underground area, preferably located away from the direction that the wind is blowing.
4) Remove clothing since it may be contaminated; if possible, take a shower, wash your hair, and change clothes before you enter the shelter.

If you are already in a shelter or basement:

1) Cover your mouth and nose with a face mask or other material (such as a scarf or handkerchief) until the fallout cloud has passed.
2) Shut off ventilation systems and seal doors or windows until the fallout cloud has passed. However, after the fallout cloud has passed, unseal the doors and windows to allow some air circulation.
3) Stay inside until authorities say it is safe to come out.
4) Listen to the local radio or television for information and advice. Authorities may direct you to stay in your shelter or evacuate to a safer place away from the area.
5) If you must go out, cover your mouth and nose with a damp towel.
6) Use stored food and drinking water. Do not eat local fresh food or drink water from open supplies.
7) Clean and cover any open wounds on your body.

If you are advised to evacuate:

1) Listen to the radio or television for information about evacuation routes, temporary shelters, and procedures to follow.
2) Before you leave, close and lock windows and doors and turn off air conditioning, vents, fans, and furnace. Close fireplace dampers.
3) Take disaster supplies with you (such as a flashlight and extra batteries, battery operated radio, first aid kit and manual, emergency food and water, nonelectric can opener, essential medicines, cash and credit cards, and sturdy shoes.
4) Remember your neighbors may require special assistance, especially infants, elderly people, and people with disabilities.

Source: CDC, "Emergency Preparedness and Response"
http://www.bt.cdc.gov/radiation/nuclearfaq.asp

WHAT TO DO IN THE EVENT OF A DIRTY BOMB ATTACK: RECOMMENDATIONS FROM FEDERAL AGENCIES

United States Nuclear Regulatory Commission[50]

1) Move away from the immediate area—at least several blocks from the explosion—and go inside. This will reduce exposure to any radioactive airborne dust.
2) Turn on local radio or TV channels for advisories from emergency response and health authorities.
3) If facilities are available, remove clothes and place them in a sealed plastic bag. Saving contaminated clothing will allow testing for radiation exposure.
4) Take a shower to wash off dust and dirt. This will reduce total radiation exposure, if the explosive device contained radioactive material.
5) If radioactive material was released, local news broadcasts will advise people where to report for radiation monitoring and blood and other tests to determine whether they were in fact exposed and what steps to take to protect their health.

Source: U.S. Regulatory Commission, Office of Public Affairs, "Fact Sheet: Dirty Bombs" http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/dirty-bombs.html

United States Centers for Disease and Health Control[51]

If you are outside and close to the incident:

1) Cover your nose and mouth with a cloth to reduce the risk of breathing in radioactive dust or smoke.
2) Don't touch objects thrown off by an explosion—they might be radioactive.
3) Quickly go into a building where the walls and windows have not been broken. This area will shield you form radiation that might be outside.
4) Once you are inside, take off your outer layer of clothing and seal it in a plastic bag if available. Put the cloth you used to cover your mouth in the bag, too. Removing outer clothes may get rid of up to 90% of radioactive dust.
5) Put the plastic bag where others will not touch it and keep it until authorities tell you what to do with it.
6) Shower or wash with soap and water. Be sure to wash your hair. Washing will remove any remaining dust.
7) Turn to the local radio or television news for more instructions.

If you are inside and close to the incident:

1) If the walls and windows of the building are not broken, stay in the building and do not leave.
2) To keep radioactive dust or powder from getting inside, shut all windows, outside doors, and fireplace dampers. Turn off fans and heating and air-conditioning systems that bring in air from outside. It is not necessary to put duct tape or plastic around doors or windows.
3) If the walls and windows of the building are broken, go to an interior room and do not leave. If the building has been heavily damaged, quickly go into a building where the walls and windows have not been broken. If you must go outside, be sure to

cover your nose and mouth with a cloth. Once you are inside, take off your outer layer of clothing and seal it in a plastic bag if available. Store the bag where others will not touch it.

4) Shower or wash with soap and water, removing any remaining dust. Be sure to wash your hair.
5) Tune to local radio or television news for more instructions.

If you are in a car when the incident happens:

1) Close the windows and turn off the air conditioner, heater and vents.
2) Cover your nose and mouth with a cloth to avoid breathing radioactive dust or smoke.
3) If you are close to your home, office, or a public building, go there immediately and go inside quickly.
4) If you cannot get to your home or another building safely, pull over to the side of the road and stop in the safest place possible. If it is a hot or sunny day, try to stop under a bridge or in a shady spot.
5) Turn off the engine and listen to the radio for instructions.
6) Stay in the car until you are told it is safe to get back on the road.

What should I do about my children and family?

1) If your children or family are with you, stay together. Take the same actions to protect your whole family.
2) If your children or family are in another home or building, they should stay there until you are told it is safe to travel.
3) Schools have emergency plans and shelters. If your children are at school, they should stay there until it is safe to travel. Do not go to the school until public officials say it is safe to travel.

How do I protect my pets?

1) If you have pets outside, bring them inside if it can be done safely.
2) Wash your pets with soap and water to removed any radioactie dust.

Should I take potassium iodide?

1) Potassium iodide, also called KI, only protects a person's thyroid gland from exposure to radioactive iodid. KI will not protect a person from other radioactive materials or protect other parts of the body from exposure to radiation. Since there is no way to know at the time of the explosion whether radioactive iodide was used in the explosive device, taking KI would probably not be beneficial. Also, KI can be dangerous to some people.

Will food and water supplies be safe?

1) Food and water supplies most likely will remain safe. However, any unpackaged food or water that was out in the open and close to the incident may have radioactibe dust on it. Therefore, do not consumer water or food that was out in the open.

2) The food inside of cans and other sealed containers will be safe to eat. Wash the outside of the container before opening it.
3) Authorities will monitor food and water quality for safety and keep the public informed.

How do I know if I have been exposed to radiation or contaminated by radioactive materials?

1) People cannot see, smell, fell, or taste radiation; so you may not know whether you have been exposed. Police or firefighters will quickly check for radiation by using special equipment to determine how much radiation is present and whether it poses any danger to your area.
2) Low levels of radiation exposire (like those expected from a dirty bomb situation) do not cause any symptoms. Higher levels of radiation exposure may produce symotoms such as nasea, vomiting, diarrhea, and swelling and redness of the skin.
3) If you have any of these symptoms, youshould contact your doctor, hospital, or other sites recommended by authorities.

Source: CDC, "Radiation Emergencies: Frequently Asked Questions," http://www.bt.cdc.gov/radiation/dirtybombs.asp

FOR MORE INFORMATION

Preparing for a Nuclear Attack

Creating an emergency kit
http://www.ready.gov/overview1.html

Building temporary shelters
http://www.ready.gov/stay_or_go.html#stay.

Developing a family plan
http://www.ready.gov/overview2.html

American Red Cross
"Terrorism: Preparing for the Unexpected"
http://www.redcross.org/services/disaster/0,1082,0_589_,00.html

U.S. Department of Homeland Security
READY America: "Overview"
http://www.ready.gov/overview3.html.

U.S. Federal Emergency Management Agency
"Are you Ready?"
http://www.fema.gov/areyouready/terrorism.shtm

Preparing for a Dirty Bomb Attack

U.S. Centers for Disease Control and Prevention
"Emergency Preparedness and Response: Radiation Emergencies"
http://www.bt.cdc.gov/radiation/index.asp

"Radiation Emergencies: Frequently Asked Questions,"
http://www.bt.cdc.gov/radiation/dirtybombs.asp

U.S. Department of Homeland Security:
READY America: "Be Informed: Radiation Threat"
http://www.ready.gov/radiation.html

"Emergencies and Disasters: Planning and Prevention"
http://www.dhs.gov/dhspublic/display?theme=14&content=446

U.S. Federal Emergency Management Agency (FEMA):
"Are You Ready?: Radiological Dispersion Device"
http://www.fema.gov/areyouready/radiological_dispersion_device.shtm

U.S. Nuclear Regulatory Commission
Office of Public Affairs, "Fact Sheet: Dirty Bombs," March 2003.
http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/dirty-bombs.html.

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[1] Federation of American Scientists (FAS), "Nuclear Forces Guide: Israel." Available at: http://www.fas.org/nuke/guide/israel/nuke/.
[2] Institute for Science and Security (ISIS), "Fast Facts–North Korea's Current and Future Nuclear Weapons Capabilities." Available at: http://www.isis-online.org/publications/dprk/fastfacts.html.
[3] Arms Control Association, "Fact Sheets: The State of Nuclear Proliferation 2001." Available at: http://www.armscontrol.org/factsheets/statefct.asp.
[4] The Nuclear Weapon Archive, "Section 7.0 Nuclear Weapon Nations and Arsenals." Available at: http://nuclearweaponarchive.org/Nwfaq/Nfaq7-4.html.
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