

## Nuclear terrorism

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Three members of International Physicians for the Prevention of Nuclear War and Physicians for Social Responsibility discuss the threat of nuclear terrorism and conclude that the only effective way to tackle it is to abolish nuclear weapons

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The attack on the World Trade Center in New York clearly showed that there are terrorists who are willing to inflict civilian casualties on the scale that would be expected with the use of a weapon of mass destruction. In this article we consider the form that nuclear terrorism could take and estimate the casualties that would occur if a nuclear bomb the size of that dropped on Hiroshima was detonated in a large urban area. The enormous casualties to be expected from such an attack argue strongly for a strategy of primary prevention.

### Nuclear power plants and “dirty bombs”

Nuclear terrorism might take several forms. An attack on a nuclear power plant or other nuclear installation could result in a massive release of radioactive material. Despite initial statements by the US Nuclear Regulatory Commission that commercial power plants could withstand an aircraft crashing into them, it seems likely these plants are highly vulnerable. As early as 1982 a study by the Argonne National Laboratory of the US Department of Energy found that, if a jet aircraft crashed into a nuclear reactor and only 1% of its fuel ignited after impact, the resulting explosion could compromise the integrity of the containment building, with possible release of radioactive material.<sup>1</sup> In the aftermath of 11 September, David Kyd, spokesman for the International Atomic Energy Agency, confirmed this view, stating: “[Reactors] are built to withstand impacts, but not that of a wide bodied passenger jet full of fuel. . . . These are vulnerable targets, and the consequences of a direct hit could be catastrophic” (*Moneyline*, CNN, 18 Sep 2001).

In addition to the reactors themselves, nuclear power plants harbour enormous quantities of radioactive materials in spent fuel pools. On average these spent fuel pools contain five times as much radioactive material as the reactor core, and they are housed in simple corrugated steel buildings even more vulnerable to attack than the reactor containment buildings.<sup>2</sup>

The vulnerability of nuclear power plants is highlighted by reports that 47% of US nuclear power plants failed to repel mock terrorist attacks conducted by the Nuclear Regulatory Commission during the 1990s.<sup>3</sup> The results of an attack on either a reactor or a spent fuel pool could equal or exceed the effects of the 1986 Chernobyl disaster, which led to 30 acute deaths from radiation sickness, at least 1800 excess cases of childhood thyroid cancer, the evacuation of 100 000 people, and the radioactive contamination of vast tracts of land in several countries (figure).<sup>4</sup>

Terrorists could also attack a city with a “dirty bomb” in which radioactive material is dispersed by conventional explosives. The Nuclear Regulatory Commission has estimated that such an attack could cause more than 2000 immediate and long term deaths

### Summary points

In the aftermath of 11 September 2001 nuclear terrorism has emerged as a real threat

Nuclear terrorism could take several forms, from an attack on nuclear power plants and reactors to the detonation of a nuclear bomb in an urban area

The international community urgently needs to expand its efforts to secure existing stockpiles of nuclear weapons and materials, particularly in Russia, Pakistan, and India

The elimination of nuclear weapons should be high on the global public health agenda

and billions of dollars in property damage if a cask of spent fuel rods were dispersed in Manhattan at midday.<sup>5</sup>

The ultimate nightmare remains an attack involving a nuclear explosion in a densely populated urban area. Terrorists could achieve this by acquiring an intact nuclear weapon or by obtaining highly enriched uranium or plutonium and building a bomb themselves.

### The threat of nuclear terrorism

There is clear evidence that some terrorist groups have been trying to obtain nuclear materials, primarily from the enormous stockpiles of the former Soviet Union. In December 1994 Czech police seized 4 kg of highly enriched uranium. During that same year German police seized more than 400 g of plutonium.<sup>6</sup> In October 2001 Turkish police arrested two men with 1.16 kg of weapons grade uranium.<sup>7</sup> Also in October 2001 the Russian Defence Ministry reported two recent incidents when terrorist groups attempted to break into Russian nuclear storage sites but were repulsed.<sup>8</sup> Since 1993 the International Atomic Energy Agency has reported 175 cases of nuclear trafficking, 18 involving highly enriched uranium or plutonium.<sup>9</sup> Even more alarming are reports that small fully built nuclear weapons are missing from the Russian arsenal. In 1996 the Russian general Alexander Lebed claimed that 40 of these so called suitcase weapons were unaccounted for. He subsequently retracted the claim but in a manner that failed to reassure many experts.<sup>8</sup>

Even before the attack on the World Trade Center, the threat of nuclear terrorism was well recognised by the US Department of Energy, which warned: “The most urgent unmet national security threat to the United States today is the danger that weapons of mass destruction or weapons useable material in Russia could

be stolen and sold to terrorists or hostile nation states and used against American troops abroad or citizens at home.”<sup>10</sup>

The efforts of the al-Qaeda network to obtain nuclear weapons or weapons grade nuclear materials are particularly worrying. Al-Qaeda agents have tried to buy uranium from South Africa, and have made repeated trips to three central Asian states to try to buy weapons grade material or complete nuclear weapons.<sup>9</sup> Sultan Bashiruddin Mahmood, a leading Pakistani nuclear engineer, made repeated visits to the Taliban stronghold of Kandahar between 1998 and 2001, leading the Pakistan government to place him and two other nuclear scientists under house arrest.<sup>11</sup> More recently there have been speculative reports that al-Qaeda has purchased 20 of the Russian suitcase weapons from Chechen sources for a reported \$30m plus two tonnes of opium.<sup>11</sup> In addition, Russian nuclear experts have raised concerns that terrorists could gain control of a Russian nuclear missile facility and initiate an attack against the United States using strategic nuclear missiles (B Blair, remarks delivered to National Press Club, 14 Nov 2001).

### The potential impact of a major nuclear Attack

Using the CATS (Consequences Assessment Tool Set) software created by the US Federal Emergency Management Agency and the Defense Threat Reduction Agency, we have calculated the expected casualties from a 12.5 kiloton nuclear explosion at ground level in New York City. We placed the explosion in the port area to reflect concerns that a nuclear device could most easily enter a US city smuggled in a commercial cargo container. The blast and thermal effects of such an explosion would kill 52 000 people immediately, and direct radiation would cause 44 000 cases of radiation sickness, of which 10 000 would be fatal. Radiation from fallout would kill another 200 000 people and cause several hundred thousand additional cases of radiation sickness.<sup>12</sup>

In the wake of such an attack the ability to aid survivors would be very limited. About 1000 hospital beds would be destroyed by the blast, and 8700 more would be in areas with radiation exposures high enough to cause radiation sickness.<sup>12</sup> The remaining local medical facilities would quickly be overwhelmed, and even with advance preparation outside help would be delayed. After the 1995 earthquake in Kobe, Japan, in which 6500 died and 34 900 were injured, there were long delays before outside medical assistance arrived,<sup>13</sup> and this disaster had few of the complicating factors that would accompany a nuclear attack with extensive radioactive contamination.

### Security and prevention

Security measures to prevent nuclear attacks must be continued, but we cannot rely on efforts to block terrorists from detonating nuclear devices. More effort must be directed at preventing their acquiring nuclear weapons in the first place. The large Russian arsenal contains tens of thousands of tactical nuclear warheads and 603 metric tonnes of weapons grade nuclear material stored at 53 different sites.<sup>14</sup> Although the United States is currently spending over \$900m annually to try to secure these stockpiles,<sup>15</sup> this is less than a seventh of the amount spent



Pripyat, city of 48 000 before the Chernobyl disaster, remains deserted 16 years later, providing a stark warning of the vulnerability of nuclear power stations and the potential impact of a nuclear terrorist attack

annually trying to develop a national missile defence system. The United States and other Western states urgently need to expand their efforts to help the Russian government secure these nuclear weapons and materials.

Increased attention must be directed at the dangers posed by Pakistan's and India's newly acquired nuclear arsenals and the possible danger of further nuclear proliferation. The Non-Proliferation Treaty should be vigorously supported and the Comprehensive Test Ban Treaty brought into force (see box).

### Conclusion

As long as there are stockpiles of nuclear weapons in the world, the possibility of nuclear terrorism remains. Ultimately, the only way to eliminate this danger is to eliminate these weapons and establish strict international control of all fissile materials that could be used to make new weapons. In the international medical community many medical associations have joined Physicians for Social Responsibility in the United States and International Physicians for the Prevention of Nuclear War in calling for

#### Preventing nuclear proliferation

The Non-Proliferation Treaty remains a cornerstone of efforts to prevent the spread of nuclear weapons. Its effectiveness is substantially undermined, however, by the refusal of the existing nuclear weapons states to fulfil their obligations under article VI to move to the complete elimination of their nuclear weapons. Similarly, the Comprehensive Test Ban Treaty could play an important role in preventing additional countries from acquiring nuclear weapons, but the refusal of the United States and several other actual or potential nuclear weapons states to ratify the treaty prevents it from coming into force. Further information is available on the websites of the Physicians for Social Responsibility ([www.psr.org](http://www.psr.org)) and the International Physicians for the Prevention of Nuclear War ([www.ippnw.org](http://www.ippnw.org)).

the abolition of nuclear weapons.<sup>16</sup> Achieving this goal must be among the most urgent of all global public health priorities.

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