16.1: Vulnerability to Terrorist Attack

Terrorist attacks upon human targets have become a constant fear in modern times. In the United States, vulnerability to such attacks were illustrated in horrifying detail by the suicide attacks by hijacked commercial aircraft on the New York World Trade Center on September 11, 2001. Other nations have long lived in the shadow of threats from groups that would cause them harm. Throughout the world, the possibility of deliberate attacks upon people, their support systems, and the anthrospheric infrastructure have come to be the greatest concern facing large numbers of people.

Chemicals and chemistry figure prominently in considerations of terrorist actions. The sudden release of a huge amount of chemical energy from a mixture of ammonium nitrate (a common agricultural fertilizer) and diesel fuel brought down the Alfred P. Murrah Oklahoma City Federal Building in 1995 with the loss of dozens of lives. Powerful explosives strapped to the bodies of suicide bombers have killed 20 or more people at a time in attacks in Afghanistan, Iraq, Pakistan, and Israel. The extreme toxicity of military poison nerve gases is a constant concern in subways and other locations where large numbers of people are packed into small spaces. Biochemistryapplied to recombinant DNA science may enable production of particularly virulent disease pathogens, such as vaccine-resistant smallpox. The accidental release of methyl isocyanate in an industrial chemical accident in Bhopal, India, in 1984 killed more people than even the 2001 attack on the World Trade Center. At least 243 people died from hydrogen sulfide contained in natural gas released from a pressurized deposit of this lethal mixture penetrated by a drilling operation in the Chuandongbei natural gas field of southwestern China in December, 2003. Hundreds of people were made ill and thousands were evacuated. A massive fire resulted when the escaping gas was ignited to convert the hydrogen sulfide (H_2S) to toxic, but much less lethal sulfur dioxide, SO_2.

Terrorist activities are not confined to direct attacks upon humans. The environment is susceptible to terrorist activities and may be severely damaged by them. For example, a major nuclear war — arguably the ultimate form of terrorism — could contaminate large areas of land and other parts of the environment with radioactive materials and, in the worst case scenario, could do substantial harm to the global climate resulting in a “nuclear winter.”

So, what can green chemistry do to prevent terrorist attacks and mitigate their effects? Actually, green chemistry is a key discipline in such endeavors. For example, one of the basic tenets of green chemistry is to use the safest possible chemicals as safely as possible. When particularly dangerous chemicals are not made or used, they are not available to cause mischief. The practice of green chemical manufacturing calls for minimizing the accumulation of hazardous chemicals and seeks to eliminate hazardous chemical wastes. Safer materials made under the practice of green chemical technology minimize hazards from more dangerous substances. Highly sensitive analytical techniques developed by chemical science can be used to detect minuscule quantities of explosives or toxic substances slated for use in terrorist attacks. Biochemistry and recombinant DNA science have the potential to enable the development of better vaccines against pathogenic biological warfare agents and antidotes to chemical and biological toxins. More subtly, the use of green chemistry and chemical technology to produce effective substitute materials can reduce potential for “resource blackmail” that can lead to vulnerability to terrorist activity. A prime example is the substitution of biomass alternatives for petroleum feedstocks that to a certain extent many nations must obtain from potentially unfriendly nations.

This chapter addresses potential terrorist threats with emphasis upon those that employ chemical and biological agents. Having identified threats that may occur, it then discusses ways in which chemistry, especially the proper practice of green chemistry, can minimize such threats.