Chemical and Biological Agents, Nuclear Events

Chemical Agents: **Mustard Gas; Sarin; Tabun; VX**
Biological Agents: **Plague; SmallPox; Tularemia; Anthrax; Botulism; Ricin; Viral Hemorrhagic Fevers**
Nuclear Events: **Radiation; Explosion; Dirty Bomb, Potassium Iodide**

Chemical Agent: Mustard Gas

Description and Guidance

What It Is
Mustard gas is a colorless, oily, odorless liquid that can be vaporized to form a gas. When mixed with other chemicals, it has a brownish tint and develops a pungent, garlicky odor. Mustard gas enters the body through inhalation or skin contact, and it damages any tissue that comes into contact with it. It is more harmful to the skin on hot, humid days or in tropical climates.

Mustard gas was used in chemical warfare in World War I and World War II. It was so powerful that only small amounts had to be added to explosives for it to be effective. Once in the soil, mustard gas remains active for several weeks.

It was also used at one time in the topical treatment of psoriasis.

Symptoms
Mustard gas burns the skin and causes blisters within a few days. The blisters may grow quite large and may be yellowish-brown in color. The parts of the body that are sweaty are the most likely to be harmed. It makes a person's eyes burn, eyelids swell and causes blinking. It attacks the corneas and can cause blindness. If inhaled, it can cause coughing, bronchitis and long-term respiratory disease. It can cause cancer in a person's airways and lungs later in life. Some of the chemicals that are formed when mustard gas is burned or spilled into water can also be irritating to the skin.

Testing
There is no effective medical test to determine exposure to mustard gas. One of the chemicals it makes in the body can be found through a urine test, but that chemical can also be found in people who have not been exposed to mustard gas.

Prevention/Treatment
Treatment has traditionally involved rapid decontamination and symptomatic treatment. Victims should be moved into an area with fresh air as soon as possible. Contaminated clothing should be removed as soon as possible. If a person's eyes are exposed, they must be flushed with lukewarm water for at least 15 minutes. Exposed skin should be washed thoroughly with water. Blisters should be treated as burns. If a person does not have a pulse, CPR will be administered. If a person is not breathing, artificial respiration will be provided. If breathing is labored, oxygen or other respiratory support is administered. Mustard gas changes into other chemicals in the body and those

chemicals mostly leave the body in the urine within a few weeks.

Recovery Potential
If a person is exposed to a very large amount of mustard gas or exposed for a prolonged period of time, he could die.

Environmental Cleanup
The gas changes its form very quickly in water, so it is very unlikely that a person would ever drink it. Any possibility of exposure of the general population by way of water (drinking, cooking, bathing, swimming) is therefore very small. If it is accidentally released, it will stay in the air or on the ground for about a day. Workers wear protective suits and masks to decontaminate affected areas and people. If contained, mustard gas must be disposed of in a controlled environment. If not contained, mustard gas loses its toxicity in a few weeks.

The information was compiled from the following sources:
Agency for Toxic Substances and Disease Registry
http://www.atsdr.cdc.gov/tfacts49.html
Ben-Gurion University
Bristol University
http://www.bris.ac.uk/Depts/Chemistry/MOTM/mustard/mustard.htm
Congressional Research Service

From the Washington Post's Personal Preparedness Guide:
http://www.washingtonpost.com/wp-srv/health/specials/preparedness/

Chemical Agent: Sarin

Description and Guidance

What It Is
Sarin is a manufactured compound that is toxic to humans. It is colorless, odorless and tasteless; it also is highly volatile and highly lethal, occurring both as a liquid and vaporized as a gas. The gas, which is 26 times more deadly than cyanide gas, causes severe damage to the respiratory system, and difficulty breathing may render the victim unconscious. Sarin is rapidly absorbed through the skin, but vaporized sarin is mainly absorbed through the respiratory tract and conjunctiva. Most victims encounter vaporized sarin, which affects the eyes and the respiratory system. Six-tenths of a milligram of sarin is enough to kill an adult.

Sarin was developed by Nazi scientists in Germany in the 1930s. It was named for its four discoverers: Schrader, Ambrose, Rudriger and Van der Linde.

The United States began producing sarin in the early 1950s; production ceased in 1956. It was produced and stockpiled in large quantities by both the United States and the Soviet Union.

In 1995, the Aum Shinrikyo sect released sarin in the Tokyo subway, killing 12 and injuring 5,500 people. In that attack, sarin was transported as a liquid, in packages that resembled lunch boxes or bottled drinks. The packages were then punctured with umbrellas and began to leak a thick liquid containing sarin.

Vaporized, sarin is slightly heavier than air, so it hovers near the ground. Humidity causes sarin to degrade, but warmer temperatures increase sarin's lethal duration, despite humidity.

Symptoms
Early symptoms include difficulty breathing, nausea, drowsiness, convulsions and miosis (pupils in the eye shrink to the size of pinpoints). Exposure can also result in bleeding from orifices – witnesses in the Tokyo attack said that victims had blood gushing from their noses and mouths.

The pupils narrow to pinpoints, harming vision. Drooling, runny nose, tears, tightness in chest, difficulty breathing, nausea, vomiting, headache and convulsions are among other symptoms.

Death does not always come with a warning and may be caused by cardiac arrhythmia and respiratory arrest.

Testing
No information available.

Prevention/Treatment
If sarin is released in the air, a person should try to hold his breath until a protective mask is put on. Those displaying severe symptoms would receive intravenous treatment with an antidote. If a person's breathing has stopped, CPR would be performed but not mouth-to-mouth resuscitation if the facial skin has been contaminated. If a person has difficulty breathing, oxygen would be administered. If a person's eyes have been exposed, they should be flushed with water for 10 to 15 minutes. If a person's skin has been exposed, he should don a protective mask and remove clothing, then wash the skin with copious amounts of soap and water or a solution of 5 percent household bleach. Medical attention should be sought under any of the above circumstances.

Recovery Potential
Those infected with sarin can be treated, but a potentially fatal dose requires swift treatment with injected antidotes. Recovery depends on degree of exposure to sarin and how rapidly medical treatment is provided. Death may occur within one to 10 minutes of inhalation exposure to a minute amount of sarin.

Environmental Cleanup
Because sarin is highly volatile, people involved in its disposal wear protective suits and masks. The Army has been destroying its cache of sarin by detonating bomblets in large, open chambers, then using a caustic chemical to neutralize the nerve gas.

The information was compiled from the following sources:
Southern Medical Association
http://www.sma.org/smj2001/decsmj01/smith.pdf

U.S. Army Soldier and Biological Chemical Command
http://www.sbccom.army.mil/services/edu/sarin.htm
Council on Foreign Relations
http://www.terrorismanswers.com/groups/aumshinrikyo_print.html
Centers for Disease Control
http://www.cdc.gov/niosh/scbacert.html
CDC Fact Sheets on Agents
http://www.state.sd.us/doh/Bioterrorism/chemical%20agents.pdf

From the Washington Post's Personal Preparedness Guide:
http://www.washingtonpost.com/wp-srv/health/specials/preparedness/

Chemical Agent: Tabun

Description and Guidance

What It Is

Tabun is classified as a nerve agent that interrupts the transmission of nerve impulses in the body. For example, it binds to nerves in the spine, muscles or central nervous system depending on the manner of ingestion. It was developed in Germany in 1936 as an insecticide. Like a number of widely used insecticides, tabun is an organic compound containing phosphorus (organophosphorus compounds). It is a tasteless liquid that ranges from colorless to brown and has a somewhat fruity odor. It is volatile at room temperature and can be absorbed through the eyes or skin or inhaled as vapor.

Symptoms

The symptoms depend on how tabun is ingested. If inhaled or absorbed through the eyes, the first symptom to appear is usually miosis, or constriction of the pupils, and visual blurriness, combined with shortness of breath, wheezing, runny nose and tightness of the chest. If swallowed or absorbed through skin not near the eyes, pupil constriction may not occur, and nausea is the first symptom to appear. Tabun's effects also include vomiting and diarrhea, urinary and fecal incontinence, loss of muscle control, convulsions, coma, and death. Vomiting and diarrhea are symptoms of a serious exposure that must be treated immediately.

Testing

The level of tabun exposure is determined by testing the activity of the enzyme cholinesterase in the blood. Tabun also causes fluctuations in the levels of gases in the blood. A chest X-ray and EEG monitoring may also help determine the level of exposure.

Prevention/Treatment

Do not induce vomiting. A person exposed to tabun should immediately don a respiratory mask. If eye contact has occurred, the patient should rinse the eyes with water for 10 to 15 minutes before putting on the mask; in the case of skin contact, wash the affected area with lots of water and soap, sodium carbonate or bleach, but not hot water, as this will speed tabun absorption. At the

emergency room, medical personnel should administer a nerve agent antidote. The patient may need an IV or to be placed on a ventilator to restore breathing. A person exposed to Tabun or other nerve gases should remain in the emergency room for at least 24 hours. Chances of long-term survival are high, but effects such as miosis, blurred vision and balance problems can persist for months.

Recovery Potential
Although skin absorption great enough to cause death may occur in one to two minutes, death may not occur for one to two hours. Respiratory lethal dosages kill in one to 10 minutes, and liquid in the eye kills almost as rapidly. In most cases, by the time the patient arrives at the emergency room, the agent has already taken effect. If the exposure is mild to moderate, recovery is possible if treated immediately.

Environmental Cleanup
It quickly dissipates when mixed with water in any form. Under average weather conditions, it can persist for one to two days. Contaminated clothing should be removed, bagged and sealed. Secondary exposure can occur from contact with contaminated clothing; it can also occur when tabun evaporates from contaminated clothes. Basic solutions, such as bleach, ammonia and ethanol, also are effective against tabun.

The information was compiled from the following sources:
CDC Fact Sheets on Agents
http://www.state.sd.us/doh/Bioterrorism/chemical%20agents.pdf
U.S. Army Soldier and Biological Chemical Command
http://www.sbccom.army.mil/services/edu/tabun.htm
Federation of American Scientists
http://www.fas.org/nuke/intro/cw/agent.htm
Nerve Agents, G-series: Tabun, Sarin, Soman By Jeffrey L Arnold, MD, FACEP, FAAEM, Assistant Clinical Professor, Department of Emergency Medicine, Baystate Medical Center
http://www.emedicine.com/emerg/topic898.htm
A Short History of the Development of Nerve Gases
http://www.mitretek.org/home.nsf/EnvironmentEnergy/HistoryNerveGases

From the Washington Post's Personal Preparedness Guide:
http://www.washingtonpost.com/wp-srv/health/specials/preparedness/

Chemical Agent: VX

Description and Guidance

What It Is
VX is a nerve agent that disrupts the transmission of nerve impulses in the body. It is an amber-colored, oily liquid that will remain in the environment until it has been properly cleaned through decontamination methods. It can be similar in appearance to motor oil. VX can enter the body

through ingestion, inhalation or through the eyes or skin. VX is the most potent of all nerve agents and the least volatile, meaning it is slower to evaporate. It's approximately 50 times more toxic than cyanide gas.

It was developed by the United States and Britain in the 1950s.

Symptoms
Symptoms of overexposure may occur within minutes or hours, depending on the dose. The symptoms of VX exposure take longer to show up than with other nerve gases, but are similar. They include nausea, vomiting, diarrhea, constriction of the pupils or blurred vision, runny nose, chest tightness, difficulty breathing, disorientation, loss of muscle control, loss of consciousness, convulsions and eventually respiratory failure and death.

Testing
VX exposure is often indicated by several patients presenting with the same symptoms. Testing levels of the enzyme acetylcholinesterase, AchE, in the blood is the best indicator of VX exposure, and droplets often can be seen on the skin. Doctors can also test for arterial blood gases and electrolytes or perform a chest X-ray or EEG to find abnormal breathing activity or irregular heart rhythms.

Prevention/Treatment
Do not induce vomiting. A person exposed to VX should immediately don a respiratory mask. The person should be thoroughly decontaminated by washing with large amounts of water and soap, sodium carbonate or bleach. This should be done gently as scrubbing will increase absorption. Emergency personnel should administer antidote. The patient may need an IV or to be placed on a ventilator to restore breathing. If there are seizures, a sedative such as Valium may help. Because symptoms may take up to 18 hours to appear, the person should be kept in the emergency room.

Recovery Potential
The dose that would be lethal to 50 percent of the people exposed is about 10 milligrams, a tiny amount that could be held on the end of a straight pin. Because the agents act slower than other nerve agents, successful treatment is possible. Once a person recovers, the symptoms are not likely to return, but the patient may suffer from the effects of oxygen deprivation for days or weeks.

Environmental Cleanup
Contaminated clothing should be removed, bagged and sealed. Because of VX’s persistent characteristics, it is important to avoid secondary contamination from clothing, the ground, vegetation or equipment. Once VX dissipates, which can take several days, it is not a long-term threat to the environment.

The information was compiled from the following sources:
Centers for Disease Control and Prevention
http://www.cdc.gov/nceh/demil/articles/fr031588.htm
CDC Fact Sheets on Agents
http://www.state.sd.us/doh/Bioterrorism/chemical%20agents.pdf
U.S. Army Soldier and Biological Chemical Command

http://www.sbccom.army.mil/services/edu/vx.htm
Fernando L Benitez, MD, Assistant Medical Director, Dallas Metro BioTel (EMS) System, Clinical Instructor of Emergency Medicine, Department of Surgery, Division of Emergency Medicine, University of Texas Southwestern Medical Center
http://www.emedicine.com

From the Washington Post's Personal Preparedness Guide:
http://www.washingtonpost.com/wp-srv/health/specials/preparedness/

Biological Agent: Plague

Description and Guidance

What It Is
Plague is an infectious disease of animals and humans caused by a bacterium named Yersinia pestis. People usually get plague from being bitten by a rodent flea that is carrying the plague bacterium or by handling an infected animal. Millions of people in Europe died from plague in the Middle Ages, when human homes and places of work were inhabited by flea-infested rats.

There are three types of the plague: bubonic, pneumonic, and septicemic. Bubonic plague is the most common form of plague. It occurs when an infected flea bites a person or when materials contaminated with the bacteria enter through a break in a person's skin. This form of plague does not spread from person to person. Septicemic plague occurs when the bacteria multiply in the blood. It can be a complication of the pneumonic or bubonic plague or can occur by itself. When it occurs alone, it is caused in the same way as bubonic plague. Pneumonic plague occurs when the bacteria infect the lungs. Transmission can take place if someone breathes in aerosolized bacteria or breathes in the respiratory droplets of a person or animal with the disease. It may occur if bubonic or septicemic plague is untreated and the bacteria spread to the lungs.

Plague's history as a biological weapon dates to World War II, when a secret branch of the Japanese army was reported to have dropped plague-infected fleas over China causing outbreaks. Both the United States and the Soviet Union then developed techniques to aerosolize plague. The U.S. program was terminated in 1970.

Symptoms
The sign that plague is present is a very painful, usually swollen and often hot-to-the touch lymph node, called a bubo. Onset of bubonic plague is usually two to six days after a person is exposed. Symptoms of bubonic plague are muscular pain, high fever, chills, headaches, and swelling of lymph glands (called buboes) in the armpits, neck, groin and other areas. In some cases, seizures can occur. Symptoms for septicemic plague can include nausea, vomiting, fever, low blood pressure, chills, abdominal pain, shock and bleeding into skin and other organs. The incubation period of primary pneumonic plague is one to three days and is characterized by development of an

overwhelming pneumonia with high fever, cough, bloody sputum and chills.

Testing
A patient diagnosed with suspected plague should be hospitalized and medically isolated. Laboratory tests should be done, including blood cultures for plague bacteria and microscopic examination of lymph gland, blood, and sputum samples.

Prevention/Treatment
Attempts to eliminate fleas and wild rodents from the natural environment in plague-infected areas are impractical. However, controlling rodents and their fleas around places where people live, work, and play is very important in preventing human disease. Eliminate sources of food and nesting places for rodents; remove brush, rock piles, junk, cluttered firewood, and potential food supplies, such as pet and wild animal food. If you anticipate being exposed to rodent fleas, apply insect repellents to clothing and skin to prevent fleabites.

Health authorities advise that antibiotics be given for a brief period to people exposed to someone with pneumonic plague. They also suggest treating people who have been exposed to the bites of potentially infected rodent fleas (for example, during a plague outbreak) or who have handled an animal known to be infected with the plague bacteria. People who must be present in an area where a plague outbreak is occurring can protect themselves for two to three weeks by taking antibiotics, such as the tetracyclines or the sulfonamides. Plague vaccine has very limited use and is administered to scientists who routinely work with the plague bacteria and people in plague-infested areas who handle or have close contact with potentially infected animals as part of their routine work (such as rodent biologists).

Recovery Potential
If treated immediately, a full recovery is possible. The risks of death become higher the longer symptoms go untreated. For plague pneumonia patients, the death rate is more than 50 percent.

Environmental Cleanup
Plague is best prevented by controlling rat populations in both urban and rural areas. This goal has been reached in the cities, towns, and villages of most developed countries. It has not been achieved in either the rural or urban areas of many developing countries where the threat of epidemic plague continues to exist. If you live in areas where rodent plagues occur, treat pet dogs and cats for flea control regularly and do not allow them to roam freely. Health authorities may use appropriate chemicals to kill fleas at selected sites during animal plague outbreaks.

The information was compiled from the following sources:
Plague as a Biological Weapon
http://jama.ama-assn.org/issues/v283n17/ffull/jst90013.html
Plague
http://www.bt.cdc.gov/Agent/Plague/PlagueGen.asp
CDC:
http://www.cdc.gov/ncidod/dvbid/plague/qa.htm
Johns Hopkins Center for Civilian Biodefense Strategies:
http://www.hopkins-biodefense.org/pages/agents/agentplague.html

NIH American College of Physicians-American Society of Internal Medicine:
http://www.acponline.org/bioterro/plague.htm

From the Washington Post's Personal Preparedness Guide:
http://www.washingtonpost.com/wp-srv/health/specials/preparedness/

Biological Agent: SmallPox

Description and Guidance

What It Is

Smallpox is a deadly disease caused by a virus known as variola, a Latin word meaning "speckled." The virus, which can cause red lesions and pustules on the skin, is spread most often by an infected person releasing saliva droplets from their mouth into the air. Those droplets are then inhaled by a susceptible person in close contact with the ill person. Contamination is also possible through bed linens and clothing. People are most infectious to others during the first week of the illness, but the disease can still be transmitted to others through scabs that have separated from the skin. It is not known to be spread by animals or insects.

Outbreaks involve either variola minor or the more deadly variola major. Those suffering from variola major become bedridden during the eruption of the rash and remain so throughout the illness. Spread of infection is limited to close contacts. Variola minor, however, can be so mild that patients can remain ambulatory during the infectious phase of their illness and thus spread the virus far more widely.

Smallpox likely was first used as a biological weapon during the French and Indian Wars. British soldiers distributed blankets that had been used by smallpox patients to initiate outbreaks among American Indians. Epidemics occurred, killing more than 50 percent of many affected tribes.

Smallpox was eradicated in 1977. In 1980, the World Health Assembly recommended that all countries cease vaccination and that all laboratories destroy their stocks of the virus or transfer them to one of two World Health Organization reference labs. All countries reported compliance.

Symptoms

The incubation period is seven to seventeen days following exposure. Symptoms include high fever, fatigue, headaches and backaches, which are followed by a rash with lesions that develops within two to three days on mostly the face, arms and legs. Those lesions are round, tense and deeply embedded in the skin. They fill with pus and begin to crust early in the second week of the rash. Scabs eventually develop and fall off after three to four weeks. Lesions in the mouth and throat that appear early in the illness ulcerate and release large amounts of the virus in saliva. Severe abdominal pain and delirium are other symptoms that are sometimes present.

Testing

In some instances, the virus can be detected in swabs taken from the pharynx five to six days before

the rash develops. The disease is commonly identified by the distinctive rash it causes on the face, hands and other readily visible portions of the body.

Prevention/Treatment
The vaccine against smallpox is a live virus vaccine that contains a related virus called vaccinia virus that provides immunity against infection. The vaccine does not contain the smallpox virus. If the vaccine is given within four days after exposure to smallpox, it can lessen the severity of the illness or even prevent it.

Routine vaccination against smallpox ended in 1972. The level of immunity, if any, among those who were vaccinated before 1972 is uncertain. Prior infection with the disease provides lifelong immunity.

Patients with smallpox could benefit from supportive therapy, such as intravenous fluids and medicine to control fever or pain, and antibiotics for secondary bacterial infections.

Recovery Potential
The majority of patients with smallpox recover, but death occurs in up to 30 percent of the cases. Most of those deaths occur during the first or second week of illness. Sixty-five percent to eighty percent of survivors are marked with deep-pitted scars. Blindness is another possible complication for survivors of smallpox.

Environmental Cleanup
Symptomatic patients are placed in medical isolation so that they will not continue to spread the virus. In addition, people who have come into close contact with smallpox patients should be vaccinated immediately and closely watched for symptoms. Vaccine and isolation are the strategies for stopping the spread of smallpox.

Special precautions need to be taken to ensure that all bedding and clothing of patients are cleaned appropriately with bleach and hot water. Contaminated surfaces are cleaned with disinfectants such as bleach and quaternary ammonia, which has additional surfactant (detergent) action that removes excess mucus containing parasites and bacteria.

Various agencies are currently validating procedures designed to test for the smallpox virus in the environment. In the event of an aerosol release of smallpox, all viruses will be inactivated or dissipated within one to two days. Therefore, buildings exposed to the initial aerosol release of the virus do not need to be decontaminated. By the time the first cases are identified, typically two weeks after the release, the virus in the building will be gone.

Suspected cases of smallpox or suspected intentional release of smallpox should be reported to a local health department, which is responsible for notifying the state health department, the FBI and local law enforcement. The state health department will notify the CDC.

The information was compiled from the following sources:
JAMA
http://jama.ama-assn.org/issues/v281n22/ffull/jst90000.html#a12

Centers for Disease Control and Prevention
http://www.bt.cdc.gov/DocumentsApp/FAQSmallpox.asp?link=2&page=bio
http://www.bt.cdc.gov/DocumentsApp/FactSheet/SmallPox/About.asp

From the Washington Post's Personal Preparedness Guide:
http://www.washingtonpost.com/wp-srv/health/specials/preparedness/

Biological Agent: Tularemia

Description and Guidance

What It Is
Tularemia is a bacterial disease that is associated with both animals and humans. Also known as "Rabbit Fever" and "Deer's Fly Fever," Tularemia in animals is caused by the bacteria Francisella tularensis. It is spread to humans via ticks and infected animal tissue and in some cases from contaminated food and water. Tularemia is not spread from person to person. The bacteria are highly infectious: a small number of bacteria (10-50 organisms) can cause the disease.

If tularensis were used as a bioweapon, the bacteria would likely be made airborne for exposure by inhalation. Persons who inhale an infectious aerosol would generally experience severe respiratory illness, including life-threatening pneumonia and systemic infection, if they were not treated. The bacteria that cause tularemia occur widely in nature and could be isolated and grown in quantity in a laboratory, although manufacturing an effective aerosol weapon would require considerable sophistication.

Symptoms
The incubation period for tularemia is typically three to five days, with symptoms occurring from one to 14 days.

Depending on the route of exposure, the tularemia bacteria may cause skin ulcers, swollen and painful lymph glands, inflamed eyes, sore throat, oral ulcers, or pneumonia. If the bacteria were inhaled, symptoms would include the abrupt onset of fever, chills, headache, muscle aches, joint pain, dry cough and progressive weakness. Persons with pneumonia can develop chest pain, difficulty breathing, bloody sputum, and respiratory failure.

Testing
To determine whether Tularemia is present, blood or sputum may be tested or a chest X-ray may be taken.

Prevention/Treatment
Tularemia is often treated with antibiotics. To prevent Tularemia, several precautions should be taken. Wear light-colored long-sleeved shirts and long pants when in wooded areas to avoid being bitten by ticks and be sure to keep the lawn around homes mowed and weeds cut. In the past, a vaccine for tularemia was available, but it is currently under review by the Food and Drug

Administration.

Recovery Potential
If untreated, Tularemia is fatal in about 5 percent to 15 percent of all cases. Forty percent or more of the people with the lung and systemic forms of the disease may die if they are not treated with appropriate antibiotics.

Environmental Cleanup
The bacteria are capable of surviving for weeks at low temperatures in water, moist soil, hay, straw or decaying animal carcasses. In circumstances of a laboratory spill or intentional use in which authorities are concerned about an environmental risk, decontamination can be achieved by spraying the suspected contaminant with a 10 percent bleach solution (1 part household bleach and 9 parts water). After 10 minutes, a 70 percent solution of alcohol can be used to further clean the area and reduce the corrosive action of the bleach. Soap water can be used to flush away less hazardous contamination. Persons with direct exposure to powder or liquid aerosols containing the bacteria should wash body surfaces and clothing with soap water. Standard levels of chlorine in municipal water sources should protect against waterborne infection. Following an urban release, the risk to humans of acquiring tularemia from infected animals or arthropod bites is considered minimal and could be reduced by educating the public on simple avoidance of sick or dead animals and on personal protective measures against biting arthropods.

The information was compiled from the following sources:
Johns Hopkins Center for Civilian Biodefense Strategies
http://www.hopkins-biodefense.org/pages/agents/agenttularemia.html
Tularemia as a Biological Weapon
http://jama.ama-assn.org/issues/v285n21/ffull/jst10001.html#a11
American College of Physicians-American Society of Internal Medicine:
http://www.acponline.org/bioterro/tularemia.htm
MEDLINEplus Medical Encyclopedia:
http://www.nlm.nih.gov/medlineplus/ency/article/000856.htm#prevention
CDC
http://www.bt.cdc.gov/DocumentsApp/FAQTularemia.asp?link=3&page=bio
http://www.bt.cdc.gov/DocumentsApp/FactSheet/Tularemia/about.asp

From the Washington Post's Personal Preparedness Guide:
http://www.washingtonpost.com/wp-srv/health/specials/preparedness/

Biological Agent: Anthrax

Description and Guidance

What It Is
Anthrax is a potentially fatal infection caused by bacteria called Bacillus anthracis. The bacteria

occur mostly in warm-blooded animals and can infect humans. Naturally occurring anthrax spores live in the soil throughout Asia, Africa and Great Britain and in U.S. locations such as Texas, Oklahoma and the Mississippi Valley. Spores can survive in adverse conditions and still remain capable of causing disease. Research on anthrax as a biological weapon began more than 80 years ago. Today, at least 17 nations are believed to have offensive biological weapons programs; it is uncertain how many are working with anthrax.

The three types of anthrax infections are cutaneous anthrax, gastrointestinal anthrax and inhalation anthrax – the most deadly. People can be infected with anthrax through skin contact, by drinking contaminated water, eating contaminated meat, or by inhaling the bacteria or spores.

Symptoms

Symptoms of the disease vary depending on how the disease was contracted but usually occur within seven days. Cutaneous anthrax could result in lesions, black ulcers, headaches, muscle aches, fever and vomiting. Symptoms of gastrointestinal anthrax include nausea, loss of appetite, vomiting and fever followed by abdominal pain, vomiting of blood and severe diarrhea. Initial symptoms of inhalation anthrax may resemble the common cold or flu -- fever, coughing and chest pains. After several days, the symptoms may progress to severe breathing problems and shock. Symptoms can develop two days to eight weeks after exposure.

Testing

Early diagnosis of inhalation anthrax would be difficult and would require a high index of suspicion. The disease is diagnosed by isolating the bacteria from the blood, skin lesions or respiratory secretions or by measuring specific antibodies in the blood. Testing for inhalation anthrax involves taking swabs of the nasal passages that are examined for evidence of spores.

Prevention/Treatment

The CDC states that there are no scientifically proven recommendations for preventing exposure from the mail. However, there are some commonsense steps people can take, such as not opening suspicious mail, keeping mail away from the face when opening, not blowing or sniffing mail contents, avoiding vigorous handling of mail, such as tearing or shredding, and washing hands after handling mail. Anthrax is generally not transmitted from person to person.

If contact with anthrax is suspected, health officials recommend isolating the area where the exposure is believed to have occurred, removing garments that may have had contact with the bacteria, washing any potentially contaminated body parts with soap and water, and contacting law enforcement officials immediately.

Early antibiotic use is essential – a delay even in hours may lessen the chances for survival. For those treated with antibiotics, the risk of recurrence remains for at least 60 days. Doctors can prescribe effective antibiotics. Penicillin, tetracycline, erythromycin, cloramfenicol, doxycyclin and ciprofloxacin, known as Cipro, are some of those approved treatments.

A human vaccine for anthrax was first developed in 1954. There are limited supplies of a human vaccine for anthrax, and it is generally limited for military personnel, hospital and public safety workers.

Recovery Potential
About 20 percent of untreated cases involving cutaneous anthrax are fatal, and 25 percent to 60 percent of untreated cases of gastrointestinal anthrax are fatal. In the case of untreated inhalation anthrax, about 90 percent of such cases are fatal.

Environmental Cleanup
In areas where the presence of anthrax is suspected, hazardous materials crews wear protective suits with a self-contained breathing apparatus while they gather swabs and adhesives that will later be tested in a lab for the presence of anthrax. The crews use several chemicals, including sandia foam, nanoemulsion, formaldehyde fumigation and sodium hypochlorite to destroy anthrax spores.

The information was compiled from the following sources:
Anthrax as a Biological Weapon
http://jama.ama-assn.org/issues/v281n18/ffull/jst80027.html
Centers for Disease Control and Prevention
http://www.bt.cdc.gov/Agent/Anthrax/AnthraxGen.asp
The Department of Defense
http://www.anthrax.osd.mil/
The Johns Hopkins University
http://www.hopkins-biodefense.org/pages/agents/agentanthrax.html
The Washington Post
http://www.washingtonpost.com/health/conditioncenter/anthrax/

From the Washington Post's Personal Preparedness Guide:
http://www.washingtonpost.com/wp-srv/health/specials/preparedness/

Biological Agent: Botulism

Description and Guidance

What It Is
Botulism is a muscle-paralyzing disease caused by a nerve toxin produced by a bacterium called Clostridium botulinum. Botulinum toxin in solution is colorless, odorless and, as far as is known, tasteless. Spores of Clostridium botulinum are found in the soil worldwide. The bacteria poses a major bioweapons threat because of its extreme potency and lethality; its ease of production, transport and misuse; and the potential need for prolonged intensive care in affected persons. Botulinum toxin is the single most poisonous substance known. There are three main types of botulism: infant, food borne and wound.

Infant botulism occurs when living bacteria or the spores are ingested by an infant, and become planted in the infant's gastrointestinal tract. Honey and corn syrup, food products tolerated well by adults, have been associated with the disease in infants.

Food-borne botulism usually occurs when a person consumes food that has been improperly preserved or canned. Outbreaks from commercial products and foods prepared in restaurants have also occurred.

Wound botulism is caused by the growth of living botulism bacteria in a wound, with ongoing secretion of toxin that causes the paralytic illness. In the United States, this syndrome is seen almost exclusively in injecting drug users.

Although no instances of waterborne botulism have ever been reported, the potency of the toxin has led to speculation that it might be used to contaminate a municipal water supply. However, botulinum toxin is rapidly inactivated by standard water treatments such as chlorination and aeration. In addition, the slow turnover time of large-capacity reservoirs would require a comparably large amount of the toxin, which would be technically difficult to produce and deliver. Botulinum toxin cannot be spread from person to person.

Symptoms

Symptoms of exposure to the toxin may include blurred or double vision, drooping eyelids, slurred speech, difficulty swallowing, dry mouth and muscle weakness which always descends the body: first shoulders, then upper arms, lower arms, thighs, calves, etc. For food-borne botulism, symptoms begin from six hours to two weeks after eating toxin-containing food. Most commonly the delay is about 12 to 36 hours. Infants with botulism appear lethargic, feed poorly, are constipated and have a weak cry and muscle tone.

Testing

The most common tests given to determine the presence of botulism are taking a stool sample and a blood test to locate any trace of the toxin. Sometimes an analysis of food that a person has consumed is performed as well.

Prevention/Treatment

To prevent infant botulism, it is recommended that honey and corn syrup not be fed to infants less than one year old. Because high temperatures destroy the botulism toxin, persons who eat home-canned foods should consider boiling the food for 10 minutes before eating it to ensure safety. Any food that has a foul odor should not be opened or consumed.

A person suffering from respiratory failure or paralysis may require a ventilator for weeks, plus intensive medical and nursing care. The paralysis slowly improves, usually over several weeks. If diagnosed early, food-borne and wound botulism can be treated with an antitoxin from horse serum that blocks the action of toxin circulating in the blood. That can prevent the patient from worsening, but recovery may still take many weeks.

Recovery Potential

With prompt medical treatment, the risk of death can be significantly reduced. Most paralysis slowly goes away with time and treatment. The length and intensity of treatment varies for each individual based on the amount of toxin with which one has been infected. In some cases, a victim may have to go through several months of therapy and remain on respirators.

Environmental Cleanup

If botulism is suspected, medical care should be sought immediately. If botulism is detected, public health agencies will investigate, obtain antitoxin if necessary and determine if a commercial product was involved. If used as a biological weapon, the results could be extremely dangerous.

The information was compiled from the following sources:
Botulinum Toxin as a Biological Weapon
http://jama.ama-assn.org/issues/v285n8/ffull/jst00017.html
Botulinum Toxin
http://www.hopkins-biodefense.org/pages/agents/agentbotox.html
NIH
http://www.nlm.nih.gov/medlineplus/botulism.html
http://www.nlm.nih.gov/medlineplus/ency/article/001384.htm
Michigan Department of Community Health
http://www.michigan.gov/mdch/1,1607,7-132-2945-12994--,00.html#Botulism
CDC
http://www.cdc.gov/ncidod/dbmd/diseaseinfo/botulism_g.htm#How%20is%20botulism%20diagnosed
http://www.bt.cdc.gov/DocumentsApp/FactSheet/Botulism/about.asp
Virginia Department of Health
http://www.vdh.state.va.us/epi/botuf.htm
Johns Hopkins
http://www.hopkins-biodefense.org/pages/agents/agentbotox.html

From the Washington Post's Personal Preparedness Guide:
http://www.washingtonpost.com/wp-srv/health/specials/preparedness/

Biological Agent: Ricin

Description and Guidance

What It Is
Ricin is a naturally occurring substance that can be isolated and used as a toxin. It is found in the castor plant, which is grown agriculturally worldwide and grows in the wild in parts of the United States. Castor beans are used to make castor oil, a digestive agent as well as a component of brake and hydraulic fluids. When castor beans are made into castor oil, the ricin is discarded.

Ricin can be easily and inexpensively produced. It must be inhaled, ingested or injected to be an effective toxin.

Ricin enters cells and prevents them from making needed proteins, leading to organ and system failure.

A stable substance not affected by extremely hot or cold temperatures, ricin can be used to contaminate food or water supplies.

In the case of injection, ricin detection is difficult. In 1978, it was used to kill Bulgarian dissident Georgi Markov. A ricin-coated pellet was injected into his leg using a specially equipped umbrella. He died three days later.

Even a tiny amount of ricin is toxic. Seventy micrograms - the amount of a grain of salt - is enough to kill an adult. It is said that just one castor bean can kill a child.

Symptoms
Symptoms may appear in less than an hour or may not appear for several days after exposure.

Inhaled or injected ricin may cause respiratory problems, chest pain weakness, fever, cough, cyanosis (blue skin) and pulmonary edema within 24 hours of exposure. Severe respiratory distress and death may occur in 36 to 72 hours.

Ingested ricin may cause diarrhea, nausea, vomiting, abdominal cramps, internal bleeding, liver and kidney failure, and gastroenteritis. The heart rate may be rapid.

Injected ricin may cause tissue damage near the injection site as well as multiple organ failure. Ricin also can affect the central nervous system, causing seizures.

Testing
There are no reliable tests to determine environmental ricin exposure.

Prevention/Treatment
Using a respiratory mask may help prevent inhalation of ricin. It is not contagious and cannot be spread from person to person.

Because no antidote exists for ricin, the most important factor is avoiding ricin exposure in the first place. If exposure cannot be avoided, the most important factor is then getting the ricin off or out of the body as quickly as possible. Ricin poisoning is treated by giving victims supportive medical care to minimize the effects of the poisoning.

Recovery Potential
All methods of exposure are dangerous and may be fatal. After five days without complications, an exposed person will probably not die.

Environmental Cleanup
If available, use a 0.5 percent sodium hypochlorite solution (1 part bleach to 9 parts water) for a contact time of 15 minutes. Do not pour this solution into the eyes or use it for spinal cord injuries. It can be poured onto non-cavity wounds and then removed via suction into disposable containers.

As an alternative, hot water and large amounts of soap may be used to decontaminate skin surfaces.

The information was compiled from the following sources:
Centers for Disease Control and Prevention
http://www.bt.cdc.gov/agent/ricin/faq/index.aspBritish Broadcasting Corporation

http://news.bbc.co.uk/1/hi/health/2636105.stmCornell University
http://www.ansci.cornell.edu/plants/toxicagents/ricin/ricin.html

From the Washington Post's Personal Preparedness Guide:
http://www.washingtonpost.com/wp-srv/health/specials/preparedness/

Disease Information: Viral Hemorrhagic Fevers

Description and Guidance

Disease Information
Viral Hemorrhagic Fevers: Fact Sheets

Viral Hemorrhagic Fevers
What are viral hemorrhagic fevers?
The term viral hemorrhagic fever (VHF) refers to a group of illnesses that are caused by several distinct families of viruses. While some types of hemorrhagic fever viruses can cause relatively mild illnesses, many of these viruses cause severe, life-threatening disease.
The Special Pathogens Branch (SPB) primarily works with hemorrhagic fever viruses that are classified as biosafety level four (BSL-4) pathogens. A listing of these viruses appears in the SPB fact sheet index. The Division of Vector-Borne Infectious Diseases, also in the National Center for Infectious Diseases, works with the non-BSL-4 viruses that cause two other hemorrhagic fevers, dengue hemorrhagic fever and yellow fever.

How are hemorrhagic fever viruses grouped?
VHFs are caused by viruses of four distinct families: arenaviruses, filoviruses, bunyaviruses, and flaviviruses. Each of these families share a number of features:
• They are all RNA viruses, and all are covered, or enveloped, in a fatty (lipid) coating.
• Their survival is dependent on an animal or insect host, called the natural reservoir.
• The viruses are geographically restricted to the areas where their host species live.
• Humans are not the natural reservoir for any of these viruses. Humans are infected when they come into contact with infected hosts. However, with some viruses, after the accidental transmission from the host, humans can transmit the virus to one another.
• Human cases or outbreaks of hemorrhagic fevers caused by these viruses occur sporadically and irregularly. The occurrence of outbreaks cannot be easily predicted.
• With a few noteworthy exceptions, there is no cure or established drug treatment for VHFs.
In rare cases, other viral and bacterial infections can cause a hemorrhagic fever; scrub typhus is a good example.

What carries viruses that cause viral hemorrhagic fevers?
Viruses associated with most VHFs are zoonotic. This means that these viruses naturally reside in an animal reservoir host or arthropod vector. They are totally dependent on their hosts for replication and overall survival. For the most part, rodents and arthropods are the main reservoirs

for viruses causing VHFs. The multimammate rat, cotton rat, deer mouse, house mouse, and other field rodents are examples of reservoir hosts. Arthropod ticks and mosquitoes serve as vectors for some of the illnesses. However, the hosts of some viruses remain unknown -- Ebola and Marburg viruses are well-known examples.

Where are cases of viral hemorrhagic fever found?

Taken together, the viruses that cause VHFs are distributed over much of the globe. However, because each virus is associated with one or more particular host species, the virus and the disease it causes are usually seen only where the host species live(s). Some hosts, such as the rodent species carrying several of the New World arenaviruses, live in geographically restricted areas. Therefore, the risk of getting VHFs caused by these viruses is restricted to those areas. Other hosts range over continents, such as the rodents that carry viruses which cause various forms of hantavirus pulmonary syndrome (HPS) in North and South America, or the different set of rodents that carry viruses which cause hemorrhagic fever with renal syndrome (HFRS) in Europe and Asia. A few hosts are distributed nearly worldwide, such as the common rat. It can carry Seoul virus, a cause of HFRS; therefore, humans can get HFRS anywhere where the common rat is found.

While people usually become infected only in areas where the host lives, occasionally people become infected by a host that has been exported from its native habitat. For example, the first outbreaks of Marburg hemorrhagic fever, in Marburg and Frankfurt, Germany, and in Yugoslavia, occurred when laboratory workers handled imported monkeys infected with Marburg virus. Occasionally, a person becomes infected in an area where the virus occurs naturally and then travels elsewhere. If the virus is a type that can be transmitted further by person-to-person contact, the traveler could infect other people. For instance, in 1996, a medical professional treating patients with Ebola hemorrhagic fever (Ebola HF) in Gabon unknowingly became infected. When he later traveled to South Africa and was treated for Ebola HF in a hospital, the virus was transmitted to a nurse. She became ill and died. Because more and more people travel each year, outbreaks of these diseases are becoming an increasing threat in places where they rarely, if ever, have been seen before.

How are hemorrhagic fever viruses transmitted?

Viruses causing hemorrhagic fever are initially transmitted to humans when the activities of infected reservoir hosts or vectors and humans overlap. The viruses carried in rodent reservoirs are transmitted when humans have contact with urine, fecal matter, saliva, or other body excretions from infected rodents. The viruses associated with arthropod vectors are spread most often when the vector mosquito or tick bites a human, or when a human crushes a tick. However, some of these vectors may spread viruses to animals, livestock, for example. Humans then become infected when they care for or slaughter the animals.

Some viruses that cause hemorrhagic fever can spread from one person to another, once an initial person has become infected. Ebola, Marburg, Lassa and Crimean-Congo hemorrhagic fever viruses are examples. This type of secondary transmission of the virus can occur directly, through close contact with infected people or their body fluids. It can also occur indirectly, through contact with objects contaminated with infected body fluids. For example, contaminated syringes and needles have played an important role in spreading infection in outbreaks of Ebola hemorrhagic fever and Lassa fever.

What are the symptoms of viral hemorrhagic fever illnesses?

Specific signs and symptoms vary by the type of VHF, but initial signs and symptoms often include marked fever, fatigue, dizziness, muscle aches, loss of strength, and exhaustion. Patients with severe cases of VHF often show signs of bleeding under the skin, in internal organs, or from body orifices like the mouth, eyes, or ears. However, although they may bleed from many sites around the body, patients rarely die because of blood loss. Severely ill patients' cases may also show shock, nervous system malfunction, coma, delirium, and seizures. Some types of VHF are associated with renal (kidney) failure.

How are patients with viral hemorrhagic fever treated?
Patients receive supportive therapy, but generally speaking, there is no other treatment or established cure for VHFs. Ribavirin, an anti-viral drug, has been effective in treating some individuals with Lassa fever or HFRS. Treatment with convalescent-phase plasma has been used with success in some patients with Argentine hemorrhagic fever.

How can cases of viral hemorrhagic fever be prevented and controlled?
With the exception of yellow fever and Argentine hemorrhagic fever, for which vaccines have been developed, no vaccines exist that can protect against these diseases. Therefore, prevention efforts must concentrate on avoiding contact with host species. If prevention methods fail and a case of VHF does occur, efforts should focus on preventing further transmission from person to person, if the virus can be transmitted in this way.
Because many of the hosts that carry hemorrhagic fever viruses are rodents, disease prevention efforts include
• controlling rodent populations;
• discouraging rodents from entering or living in homes or workplaces;
• encouraging safe cleanup of rodent nests and droppings.

For hemorrhagic fever viruses spread by arthropod vectors, prevention efforts often focus on community-wide insect and arthropod control. In addition, people are encouraged to use insect repellant, proper clothing, bednets, window screens, and other insect barriers to avoid being bitten. For those hemorrhagic fever viruses that can be transmitted from one person to another, avoiding close physical contact with infected people and their body fluids is the most important way of controlling the spread of disease. Barrier nursing or infection control techniques include isolating infected individuals and wearing protective clothing. Other infection control recommendations include proper use, disinfection, and disposal of instruments and equipment used in treating or caring for patients with VHF, such as needles and thermometers.
In conjunction with the World Health Organization, CDC has developed practical, hospital-based guidelines, titled Infection Control for Viral Hemorrhagic Fevers In the African Health Care Setting. The manual can help health-care facilities recognize cases and prevent further hospital-based disease transmission using locally available materials and few financial resources.

What needs to be done to address the threat of viral hemorrhagic fevers?
Scientists and researchers are challenged with developing containment, treatment, and vaccine strategies for these diseases. Other goals are to develop immunologic and molecular tools for more rapid disease diagnosis and to study how the viruses are transmitted and exactly how the diseases affect the body (pathogenesis). A third goal is to understand the ecology of these viruses and their hosts in order to offer preventive public health advice for avoiding infection.

Special Pathogens Branch
Division of Viral and Rickettsial Diseases, National Center for Infectious Diseases Centers for Disease Control and Prevention
Public Health Service, U.S. Department of Health and Human Services

Emergency Response for a Nuclear Event

Description and Guidance

Emergency Response for a Nuclear Event
If a significant quantity of radiation is released, a national emergency-response plan that includes federal, state, and local agencies will be activated. For many years CDC has participated in emergency-response drills and has worked closely with other federal, state, and local agencies to develop, test, and implement extensive national radiological emergency-response plans. CDC has the experience and training necessary to respond to a wide variety of terrorist nuclear attacks.
In a radiological emergency, some basic protective measures include the following:
• Seek shelter in a stable building and listen to local radio or television stations for national or local emergency-alert information.
• Follow the protective-action recommendations from state or local health departments. Reduce your potential exposure and adverse health consequences by getting away from the radiation source, increasing your distance from the source, or keeping behind a physical barrier such as the wall of a building.
• If an event involves a nuclear power plant, a national emergency response that has been planned and rehearsed by local, state, and federal agencies for more than 20 years will be initiated. If you live near a nuclear power plant and have not received information that describes the emergency plan for that facility, contact the plant and ask for a copy of that information. You and your family should study the plan and be prepared to follow instructions from local and state public health officials.

Local authorities will issue public health and safety statements advising precautions to take to avoid potential exposure to radiation. Until the amount of contamination is determined, the following precautionary measures are recommended to minimize risk:
• Remain inside and avoid opening doors and windows.
• Keep children indoors.
• Turn off fans, air conditioners, and forced air heating units that bring in fresh air from the outside. Use them only to recirculate air already in the building.
• Go to the nearest building if you are outside. If you must go outside for critical or lifesaving activities, cover your nose and mouth and avoid stirring up and breathing any dust. Remember that your going outside could increase your exposure and possibly spread contamination to others.

• Be aware that trained monitoring teams will be moving through the area wearing special protective clothing and equipment to determine the extent of possible contamination. These teams will wear protective gear as a precaution and not as an indication of the risks to those indoors.
• Avoid eating fruits and vegetables grown in the area until their safety is determined.

In the event of a terrorist nuclear attack, people may experience two types of exposure from radioactive materials: external exposure and internal exposure. External exposure occurs when a person comes in contact with radioactive material outside the body. Internal exposure occurs when people eat food or breathe air that is contaminated with radioactive material. Exposure to very large doses of external radiation may cause death within a few days or months. External exposure to lower doses of radiation and internal exposure from breathing or eating radioactive contaminated material may lead to an increased risk of developing cancer and other adverse health effects. These adverse effects range from mild, such as skin reddening, to severe effects such as cancer and death, depending on the amount of radiation absorbed by the body (the dose), the type of radiation, the route of exposure, and the length of time of the exposure.

If there is a nuclear detonation, bodily injury or death may occur as a result of the blast itself or as a result of debris thrown from the blast. People may experience moderate to severe skin burns, depending on their distance from the blast site. Those who look directly at the blast could experience eye damage ranging from temporary blindness to severe retinal burns.

A dirty bomb, or radiological dispersal device (RDD), combines conventional explosives, such as dynamite, with radioactive material, such as spent nuclear reactor fuel rods. The device is designed to kill or injure by creating a zone of intense radiation that could extend several city blocks. People in the immediate vicinity of the blast would be killed. It is unlikely that the radioactive material contained in a dirty bomb would kill anyone. The radioactive material would be dispersed into the air and reduced to relatively low concentrations, resulting in low doses to people exposed. A low-level exposure to radioactive contamination could slightly increase the long-term risk of cancer. However, exposure to radiation at higher levels could result in radiation sickness or radiation poisoning.

In addition, dirty bombs have a significant psychological impact - causing fear, panic and disruption.

Symptoms
The extent of radiation contamination depends on a number of factors including the size of the explosive, the amount and type of radioactive material used, and weather conditions. The symptoms of radiation sickness include nausea and vomiting; diarrhea; skin burns (redness, blistering); weakness; fatigue; exhaustion; fainting; dehydration; inflammation of areas (redness, tenderness, swelling, bleeding); hair loss; ulceration of the mouth; ulceration of the esophagus and the remainder of the gastrointestinal system; vomiting blood, bloody stool; bleeding from the nose, mouth, gums, and rectum bruising; sloughing of skin; and open sores on the skin.

Other Sources of Information about Radiation
The Environmental Protection Agency Counterterrorism Programs
The Nuclear Regulatory Commission Radiation Protection and Emergency Response Program can

be reached at (301) 415-8200.
The Federal Emergency Management Agency (FEMA) can be reached at (202) 646-4600.
Radiation Emergency Assistance Center/Training Site (REAC/TS) can be reached at (865)-576-3131.
The U.S. National Response Team.
The U.S. Department of Energy (DOE) can be reached at 1-800-dial-DOE.
The state radiation control director can be found by contacting The Conference of Radiation Control Program Directors (CRCPD) at (502) 227-4543.
The Radiation Emergency Assistance Center/Training Site (REAC/TS) can be reached at (865) 576-3131 (ask for REAC/TS).
The U.S. Department of Energy (DOE) can be reached at 1-800-dial-DOE.

This information was provided by the National Center for Environmental Health.
On the web at: http://www.cdc.gov/nceh/radiation/response_nuclear.htm

Additional information from the Washington Post's Personal Preparedness Guide:
http://www.washingtonpost.com/wp-srv/health/specials/preparedness/

Potassium Iodide

Description and Guidance

What People Need to Know About Potassium Iodide (KI)
Recent terrorist events have many people concerned about potential future attacks using radioactive materials. Taking potassium iodide (KI) tablets after an incident involving radioactive materials may or may not limit the risk of damage to a person's thyroid gland from ionizing radiation. The Centers for Disease Control and Prevention (CDC) has prepared this fact sheet to further explain when KI might be appropriate and what people should consider before making a decision to take KI.

When to take KI
Local emergency management officials will tell people when to take KI. If a nuclear incident occurs, officials will have to find out which radioactive substances are present before recommending that people take KI. If radioactive iodine is not present, then taking KI will not protect people. If radioactive iodine is present, then taking KI will help protect a person's thyroid gland from the radioactive iodine. Taking KI will not protect people from other radioactive substances that may be present along with the radioactive iodine.
The Food and Drug Administration (FDA) recommends that KI be taken as soon as the radioactive cloud containing iodine from the explosion is close by. KI may still have some protective effect even if it is taken 3 to 4 hours after exposure to radioactive iodine. Because the radioactive iodine will be present in the initial blast and decays quickly, a single dose of KI may be all that is required.
The FDA recommendations on KI can be reviewed on the Web at http://www.fda.gov/cder/guidance/4825fnl.htm.

Forms of KI and how much should be taken

KI comes in tablets of 130 mg. A one-time dose at the levels recommended in this fact sheet is usually all that is required. However, if a person expects to be exposed to radioactive iodine for more than 24 hours, another dose should be taken every 24 hours. People should listen to emergency management officials for recommendations after an incident. According to the FDA,
Adults should take one 130-mg tablet.
Children between 3 and 18 years of age should take one-half of a 130-mg tablet (65 mg).
Children between 1 month and 3 years of age should take one-fourth of a 130-mg tablet (32 mg).
Infants from birth to 1 month of age should be given one-eighth of a 130-mg tablet (16 mg).
Women who are breastfeeding should take the adult dose, and their infants should receive the recommended infant dose.
Children who are approaching adult size (greater than or equal to 150 pounds) should take the adult dose regardless of their age.
KI tablets can be stored for at least 5 years without losing their potency.
People should remember that taking a higher dose of KI or taking KI more often than recommended, will not offer more protection and can cause severe illness and death due to allergic reaction.

How a nuclear incident might cause thyroid damage

Some types of radioactive incidents release radioactive iodine. The thyroid gland, which will use any iodine that is in a person's bloodstream, cannot tell the difference between radioactive and nonradioactive forms of iodine. Because of this, the thyroid would rapidly absorb radioactive iodine just as it does iodine from a person's diet. The radioactive iodine releases energy (radiation) that, in high concentrations, can damage the cells of the thyroid gland. In some people, especially young children, this damage can cause thyroid cancer or other diseases of the thyroid within a few years of the exposure.

What KI is

KI is a salt of iodine. It is one of several ingredients that can be added to table salt to make it iodized. KI has also been approved by the FDA as a nonprescription drug for use as a "blocking agent" to prevent the human thyroid gland from absorbing radioactive iodine. However, KI may not provide people with 100% protection against all radioactive iodine. Its effectiveness will depend on a variety of factors, including when a person takes it, how much iodine is already in the person's thyroid, how fast the person's body processes it, and the amount of radioactive iodine the person is exposed to. Iodized table salt will not provide enough iodine to protect the thyroid and should not be used as a substitute.

Why KI would be important in the event of a nuclear incident

Because the thyroid will rapidly absorb any iodine that is in the body, people may need to take KI tablets soon after an incident that involves radioactive iodine. The KI will saturate the thyroid gland with iodine and help prevent it from absorbing radioactive iodine. However, KI does not prevent the effects of other radioactive elements. Using KI will only protect the thyroid gland from radioactive iodine. It will not protect other parts of the body from radioactive iodine, and it will not protect a person from other radioactive materials that may be released.

Who should or should not take KI when the public is told to do so

Children are the most susceptible to the dangerous effects of radioactive iodine. The FDA and the World Health Organization (WHO) recommend that children from newborn to 18 years of age all take KI unless they have a known allergy to iodine.

Women who are breastfeeding should also take KI, according to the FDA and WHO, to protect both themselves and their breast milk. However, breastfeeding infants should still be given the recommended dosage of KI to protect them from any radioactive iodine that they may breathe in or drink in breast milk.

Young adults between the ages of 18 and 40 have a smaller chance of developing thyroid cancer or thyroid disease from exposure to radioactive iodine than do children. However, the FDA and WHO still recommend that people ages 18 to 40 take the recommended dose of KI. This includes pregnant and breast-feeding women, who should take the same dose as other young adults.

Adults over the age of 40 have the smallest chance of developing thyroid cancer or thyroid disease after an exposure to radioactive iodine, but they have a greater chance of having an allergic reaction to the high dose of iodine in KI. Because of this, they are not recommended to take KI unless a very large dose of radioactive iodine is expected. People should listen to emergency management officials for recommendations after an incident.

Medical conditions that make it dangerous to take KI

The high concentration of iodine in KI can be harmful to some people. People should not take KI if they:

- have ever had thyroid disease (such as hyperthyroidism, thyroid nodules, or goiter).
- know they are allergic to iodine (as in x-ray dye or shellfish).
- have certain skin disorders (such as dermatitis herpetiformis or urticaria vasculitis).

People should consult their doctor if they are unsure whether or not to take KI.

Facts about the thyroid gland

The thyroid is a small gland located in a person's neck on either side of the breathing tube (trachea). The thyroid has two parts, a right lobe and a left lobe, that are connected by a small strip of tissue called the isthmus. The main function of the thyroid gland is to create, store, and release thyroid hormones. These hormones regulate the body's metabolism.

Why iodine is important to the thyroid gland

The thyroid gland takes iodine from the bloodstream and uses it to make thyroid hormones. Without the required amounts of iodine, the thyroid will not be able to make these hormones. Most of the iodine in people's bodies comes from the food they eat.

The Centers for Disease Control and Prevention (CDC) protects people's health and safety by preventing and controlling diseases and injuries; enhances health decisions by providing credible information on critical health issues; and promotes healthy living through strong partnerships with local, national, and international organizations.

This information was provided by the National Center for Environmental Health.
On the web at: http://www.cdc.gov/nceh/radiation/ki.htm