Supplement to *Hospital Infection Control* and *Hospital Employee Health*

BIOTERRORISM WATCH

Preparing for and responding to biological, chemical and nuclear disasters

THOMSON AMERICAN HEALTH CONSULTANTS™

IN THIS ISSUE

MAY/JUNE 2004

VOL. 3, NO. 3 • (pages 17-24)

The sum of all fears: Know history, consequences of nuclear terrorism

Awesome destruction, the shroud of radiation

Though nuclear weapons are one of the few potential bioterrorism agents that have actually been used against human populations, in many ways, the Cold War's ultimate weapon remains as poorly understood as some emerging, exotic pathogen.

Nuclear terror would cause massive panic and social disruption — among the public and even health care workers — because radiation essentially would function like an unknown agent, according to new hospital response guidelines by the Centers for Disease Control and Prevention (CDC).[1] The most likely psychological consequence is fear, "primarily because many people know a little about the effects of radiation and assume that radiation is more dangerous than it actually might be," the CDC emphasized. But before we move on to radiation, it is sobering to underscore the sheer destructive power of the worst-case scenario: a nuclear explosion. A recent study estimated that a bomb with the explosive power of 10,000 tons of TNT (smaller than that dropped on Hiroshima) — if set off in midtown Manhattan on a typical workday — could kill half a million people and cause over $1 trillion in direct economic damage.

"It is worth remembering just how awesome the power of nuclear weapons is: 10,000 metric tons of TNT is over 20 million pounds of high explosive — enough to fill a cargo train 100 cars long," the paper concluded.[1]

Beyond the actual physical destruction of a bomb blast, much of the terror in this weapon centers on the unknowns of radiation. What is nuclear radiation, and how does it cause harm to health?

Radiation 101

"Radiation is essentially energy that is transported in the form of particles or waves," said **James Smith**, PhD, assistant director for radiation in the CDC's division of environmental hazards and health effects. "Also, keep in mind that the type of radiation we are talking about here is nuclear or ionizing radiation. We are not talking about

microwaves, radiation from cell phone towers, or things like that."

The principle author of new CDC hospital guidelines for responding to a nuclear incident, Smith outlined the terrorism threat recently during a CDC satellite training broadcast for clinicians and public health officers. In a nutshell, radioactive materials contain disintegrating atoms.

The number of atoms disintegrating per second measures the "radioactivity" of something.

Disintegrating atoms emit different forms of radiation — alpha particles, beta particles, gamma rays, or X-rays. As radiation waves move through the body, they in turn dislodge electrons from atoms, disrupting molecules and possibly causing short- or long-term damage.

"When we are looking at exposure to radiation, what we are speaking of is irradiation of the body," Smith said. "The body has been exposed to a source of radiation. The energy from that radiation can be absorbed by the body. This leads to an absorbed dose, which is measured in units of 'grays' or 'rads.' With very high absorbed doses, one can get severe effects."

The most severe effect of radiation exposure is acute radiation syndrome (ARS). ARS is a serious illness that usually occurs when the body receives a high dose of radiation over a short period of time. Many survivors of the Hiroshima and Nagasaki atomic bombs in 1945 and many of the firefighters who first responded after the Chernobyl Nuclear Power Plant accident in 1986 became ill with ARS, the CDC reported.

The first symptoms typically are nausea, vomiting, and diarrhea. These symptoms may come and go, lasting for minutes or several days. Then the victim usually looks and feels healthy for a short time, but typically relapses and suffers loss of appetite, fatigue, fever, nausea, vomiting, diarrhea, and possibly seizures and coma. This seriously ill stage may last from a few hours up to several months, the CDC stated.

"The chance of survival for people with ARS decreases with increasing radiation dose," the guidelines explained. "Most people who do not recover from ARS will die within several months of exposure. The cause of death in most cases is the destruction of the person's bone marrow, which results in infections and internal bleeding."

While radiation is much feared and little understood, the risk of an attack is more clearly defined than with most bioterror agents. There is real concern that terrorist groups may gain access to existing nuclear weapons, acquire the raw materials necessary to build a crude device, or unleash radiation upon the public through a variety of possible attack modes. Indeed, some consider nuclear terror as a more plausible and immediate threat than the use of biological or chemical agents. **(See related story, p. 19.)**

"It is possible that radiation could be used as an agent of harm to terrorize communities," Smith said. "There could be a direct attack or some kind of sabotage on a nuclear power plant [for example]. That could result in a release of

Bioterrorism Watch (ISSN #1543-0243) is published bimonthly by Thomson American Health Consultants, 3525 Piedmont Road, Building Six, Suite 400, Atlanta, GA 30305. Telephone: (404) 262-7436. Periodicals postage paid at Atlanta, GA 30304. POSTMASTER: Send address changes to **Bioterrorism Watch**, P.O. Box 740059, Atlanta, GA 30374.

Subscriber Information

Customer Service: (800) 688-2421 or fax (800) 284-3291. Hours of operation: 8:30-6. Monday-Thursday, 8:30-4:30 Friday EST. World Wide Web: http://www.ahcpub.com. E-mail: customerservice@thomson.com.

Subscription rates: Free to subscribers of *Hospital Infection Control* and *Hospital Employee Health*. For nonsubscribers, the price is $149. U.S. possession and Canada, add $30 plus applicable GST. Other international orders, add $30. (GST registration number R128870672.) One to nine additional copies, $119; 10 to 20, $104. Missing issues will be fulfilled by customer service free of charge when contacted within one month of the missing issue date. **Back issues**, when available, are $50 each.

This continuing education offering is sponsored by Thomson American Health Consultants, which is accredited as a provider of continuing education in nursing by the American Nurses Credentialing Center's Commission on Accreditation. Thomson American Health Consultants is an approved provider by the California Board of Registered Nursing for approximately 6 contact hours per year (provider #CEP10864).

Thomson American Health Consultants is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to sponsor continuing medical education for physicians. Thomson American Health Consultants designates this educational activity for approximately 6 hours in Category 1 credit toward the Physicians' Recognition Award. Each physician should claim only those credits that he or she actually spent in the activity This activity was planned and produced in accordance with the ACCME Essentials.

This education activity is intended for nurses and physicians with a special interest in bioterrorism, particularly in the acute-care setting.

To reveal any potential bias in this publication, and in accordance with Accreditation Council for Continuing Medical Education guidelines, we disclose that Ball (editorial advisory board member) is a consultant and stockholder with the Steris Corp. and is on the speaker's bureau for the Association of periOperative Registered Nurses. Grant, Joseph, Schaffner, and West (board members) report no consultant, stockholder, speaker's bureau, research, or other financial relationships with companies having ties to this field of study.

Opinions expressed are not necessarily those of this publication. Mention of products or services does not constitute endorsement. Clinical, legal, tax, and other comments are offered for general guidance only; professional counsel should be sought for specific situations.

This publication does not receive commercial support.

Editor: **Gary Evans**, (706) 742-2515.
Vice President/Group Publisher: **Brenda Mooney**, (404) 262-5403, (brenda.mooney@thomson.com).
Editorial Group Head: **Coles McKagen**, (404) 262-5420, (coles.mckagen@thomson.com).
Senior Production Editor: **Ann Duncan.**

THOMSON
AMERICAN HEALTH CONSULTANTS

Editorial Questions

For questions or comments, call **Gary Evans** at (706) 742-2515.

radioactive material [and] produce significant radiation exposure."

The much-publicized threat of a dirty bomb — the use of a conventional explosive to disperse radioactive material — is but one of several possible attack scenarios. "A dirty bomb is a conventional type of explosive device that is laced with or contains a radioactive substance," Smith said.

"When the bomb goes off, it spreads the radioactive substance over a large area — perhaps several city blocks, depending on the size of the blast. This would not only kill and injure people, but it would irradiate victims. It would also expose people like the first responders and continue to expose people

Radioactivity instills fear and trauma in patients, workers

A terrorist attack involving a nuclear blast or dispersement of radioactive material will cause significant mental health problems in both patient and health care workers, the Centers for Disease Control and Prevention (CDC) warns.[1]

"There will be a significant psychological effect, particularly if it were a terrorist situation," says **Fun Fong**, MD, a CDC consultant and former director of radiation medicine at the medical sciences division of Oak Ridge (TN) Associated Universities. "Both victims and health care professionals will be under tremendous psychological stress. It is important to debrief people right after the event and identify those in need of counseling."

The initial reaction of many will be one of shock, immobilization, and fear, according to new CDC guidelines for hospitals. Most people will exhibit higher levels of anxiety rather than psychotic behavior, and some also will experience post-traumatic stress disorder (PTSD). Long-term psychological effects, which could arise from 48 to 72 hours after the incident, include anxiety disorders, PTSD, depression, traumatic neurosis, insomnia, and acute stress disorder.

Since the situation is frightening to most people, hospitals should be proactive in reassurance and communication to reduce psychological issues. Hospitals should dispense timely and accurate information, including an accurate description of the incident and its location to the public, the CDC recommends. This will allow them to take appropriate actions before they come to the hospital. Counsel patients on both acute and potential long-term physical and psychological effects. Include this information in patient discharge sheets.

Hospitals also should ensure that trained counselors are on site, and screen persons who may be at higher risk for PTSD (i.e., people who have been previously traumatized or have been in other disasters). These individuals will require follow-up.

The CDC warns that health care providers — particularly those working outside of their areas of expertise — may experience a similar array of mental health effects. Health care workers also may have concerns about long-term risk of cancer and carrying radiation home to their families. Hard decisions may have be made about who to try to save and who not to save. "Providers are likely to have a real sense of guilt when they cannot treat everyone and are not able to do as much as possible for each patient," the CDC notes. "This concern could result in anger, feelings of helplessness, depression [potentially long term], and sleep disturbances. All of these will be aggravated by fatigue and exhaustion from response demands."

Possible physical signs that staff may be experiencing psychological effects include vomiting, diarrhea, nausea, and headaches. Unfortunately, these also are physical signs associated with acute radiation exposure.

"Psychological effects are most likely to occur among staff who have the greatest amount of contact with the deceased and/or dying and those dealing with children or pregnant women," the CDC warns. "These effects are more likely to occur with staff who are severely fatigued by being on duty for a long period of time."

The critical incident stress management strategies should include having credentialed mental health providers in place at each facility. Hospitals should have mental health providers who can dedicate time to staff support. Hospitals should screen for those who are at higher risk of psychological complications. Provider education and training are key components.

"Do not assume that practitioners know more about radiation than the general public," the CDC advises.

Staff will be concerned about their own families, so hospitals should establish a communication liaison for them. Provide for rotation of staff to reduce fatigue. Hospitals should conduct tiered levels of debriefing after a mass-casualty event to gather data and address mental health concerns. The debriefing groups should not be cross-discipline (physicians with nurses, etc.). This allows participants to express concerns more freely, the guidelines advise.

Reference

1. Smith JM, Spano MA. *Interim Guidelines for Hospital Response to Mass Casualties from a Radiological Incident.* Atlanta: Centers for Disease Control and Prevention; 2003. Web site: www.bt.cdc.gov/radiation/pdf/MassCasualtiesGuidelines.pdf. ■

in the aftermath of the explosion," he noted.

While it effectively would terrorize people and pose long-term health effects for exposed survivors, the radiation levels created by a dirty bomb would not likely be sufficient to cause ARS in those exposed. However, an attack on a nuclear power plant, (i.e., a plane crash into the structure) could result in sufficiently severe exposures of those in the immediate vicinity. More insidiously, a source of radioactive material could be hidden in a public place, causing a range of potentially severe exposures for as long as it remained undetected, Smith noted.

"A hidden source of radiation — that is a source of radiation stolen from an industrial or medical facility — could be hidden in a public place, like a city park, and expose people without their knowledge," he said. "It could even give potentially lethal doses of radiation to people."

Of course, the aforementioned worse-case scenario would be the actual denotation of a nuclear device. The physical devastation would not only dwarf the scenes of 9/11, but also create airborne clouds of highly radioactive dust and debris.

"There will be thousands of people in a large area potentially extending many miles outward from the initial point of attack with serious radiation exposures, although they may have no obvious physical injury or contamination," the CDC guidelines stated.

"Radioactive fallout with potential for long-term health effects will extend over a large region far from ground zero. There would likely be many persons experiencing symptoms related to acute radiation syndrome."

Such an event is "highly unlikely," Smith said, but he added that "the consequences would be so devastating that it is simply prudent of us in the medical community and public health to take them into consideration as we plan." Whether via an improvised device or an obtained bomb, "if successfully detonated, it would be an actual nuclear blast similar to Hiroshima and Nagasaki," he added.

A small nuclear device designed to fit inside a suitcase could have the power of about one-tenth of the blast of the Hiroshima bomb, he said.

The challenge of mass triage

If a nuclear terrorism attack occurs, the CDC projects that large numbers of patients — including both the injured and those concerned about potential exposure — would seek medical care. Thus hospitals and public health agencies must prepare for the unique features of radiological terrorism, such as mass casualties with blast injuries combined with burns, radioactive contamination, and acute radiation syndrome, the CDC advises.

Triage will be conducted at the scene and at the hospital, but communities and responders should attempt to do as much as possible at the scene or in a designated area outside the emergency department.

"If you bag the patients clothing and personnel belongings at the scene, that would typically remove about 80% to 90% of the contamination," said **Fun Fong**, MD, a speaker on the CDC training

Nuclear terror: Tips for training hospital staff

To prepare for the possibility of nuclear terrorism, every hospital employee should receive training, according to the Centers for Disease Control and Prevention (CDC).[1] That said, ensure that hospital staff who most likely will respond to a radiological incident or those at highest risk for radiation exposure receive the most training.

Since the hospital will not be able to train the entire staff in all scenarios, it should create easy access to radiological experts, beginning with the hospital radiation safety officer, but including medical physicists, health physicists, and radiation protection technologists. According to the CDC, the following components should be included in training programs:

- ❒ The basic principles of radiation protection and the realities of treating contaminated patients.
- ❒ A clear definition of the roles and responsibilities of all staff members involved in a response to a mass-casualty incident.
- ❒ Radiation survey meter use and interpretation for those who will test individuals for contamination.
- ❒ Decontamination training for those who will most likely decontaminate patients.
- ❒ Setting up control zones and a global perspective for head nurses in the emergency department.
- ❒ Equipment decontamination for maintenance and cleaning staff.

Reference

1. Smith JM, Spano MA. *Interim Guidelines for Hospital Response to Mass Casualties from a Radiological Incident.* Atlanta: Centers for Disease Control and Prevention; 2003. Web site: www.bt.cdc.gov/radiation/pdf/MassCasualtiesGuidelines.pdf. ■

program and former director of radiation medicine at the medical sciences division of Oak Ridge (TN) Associated Universities. "The remaining contamination would usually be on the head and feet."

Under the triage process outlined by the CDC, patients with life-threatening conditions would be directed to emergency department staff to be stabilized and treated for physical symptoms according to standard procedures. Patient wounds are a decontamination priority because they pose a potential entry point for internal radiation contamination.

"You decontaminate much the way you decontaminate any trauma wound," Fong said. "But you want to do [radiological instrument] surveys in between debridement and irrigation attempts. It is not necessary to remove the last little bit of radiation. [You want] to debride but not to mutilate tissues. You want to gently decontaminate and rinse these wounds. Also, changing dressing frequently will remove [more] contamination."

The patient should be washed with water and soap, taking care not to abrade or irritate the skin. Ambulatory patients can be washed easily; however, nonambulatory patients must be on gurneys that can be washed, the CDC advises.

Staff trained in using survey instruments should resurvey the patient after washing. "A good rule of thumb is that one can stop when the decontaminated area is less than twice the level of background radiation," Fong said.

The threat of contamination to the worker from the patient generally is considered minimal if proper precautions are taken, and thus it should

Nuke containment only as strong as weakest link

With nuclear terror, there is every reason to hope but very much to fear. Consider these findings of an analysis of the current situation by a scholar at Harvard University in Cambridge, MA:

- A nuclear bomb cannot be made without the necessary nuclear materials, and these materials are beyond the plausible capabilities of terrorists to produce. Thus, if the existing stockpiles of nuclear weapons and materials can be secured effectively and prevented from falling into terrorist hands, nuclear weapons terrorism can be effectively prevented: no material, no bomb.
- But in dealing with terrorists who have proven their ability to search out and strike weak points on a global basis, security from nuclear terrorism only is as good as its weakest link — insecure bomb material anywhere is a threat to everyone, everywhere. That means homeland security begins abroad — wherever insecure nuclear material is to be found. Strengthening or eliminating the weakest links in nuclear security is a big job, but a finite one — and one that technology is available to accomplish. Here are four challenges to our future security:
  1. Terrorists want to get a nuclear bomb, as both Osama bin Laden's public statements and the documents outlining al Qaeda's nuclear program recovered in Afghanistan make clear.
  2. If terrorists could get hold of the highly enriched uranium (HEU) or plutonium that are the essential ingredients of a nuclear bomb, making a bomb might well be within the capabilities of a large and sophisticated group such as al Qaeda. Making a "gun-type" bomb — the type that obliterated Hiroshima — from HEU involves little more than slamming two pieces of HEU together fast enough. (The Hiroshima bomb was a cannon barrel that fired a shell of HEU into rings of HEU.)
  3. Hundreds of tons of nuclear material in dozens of countries around the world today remain dangerously vulnerable to theft. Many of the more than 130 civilian research reactors using HEU fuel (which are scattered in some 40 countries, on every inhabited continent) have no more security than a night watchman and a chain-link fence. Most of the nuclear facilities in the world — including many in the United States — would not be able to provide a reliable defense against attacks as large and coordinated as terrorists have already proved they are capable of.
  4. If terrorists could steal, buy, or make a nuclear bomb, there can be little confidence that the U.S. government could stop them from smuggling it into the United States. After all, thousands of tons of illegal drugs and millions of illegal immigrants cross U.S. borders every year, despite massive efforts to stop them. The essential ingredients of a nuclear bomb can fit easily into a briefcase — and can be made quite difficult to detect. And unlike the situation with drugs or illegal immigrants, nuclear terrorists only have to succeed once to cause a terrifying catastrophe.

Reference

1. Bunn M. *Preventing Nuclear Terrorism: A Progress Update.* Cambridge, MA: Project on Managing the Atom, Harvard University, and the Nuclear Threat Initiative; 2003. ■

not delay patient treatment for serious medical conditions, he strongly emphasized. "Never, never delay critical care just because the patient is contaminated," Fong said. "That is the source of extra morbidity and mortality. Indeed, according to the Radiation Emergency Assistance Center/Training Site (REAC/TS) in Oak Ridge, TN, no health care worker in the United States responding to a contamination accident has ever received a medically significant exposure to radiation.

Still, while patient care is a top hospital priority, it is vital that hospital personnel are protected. During a mass-casualty radiological event, it is likely that hospital personnel will be concerned about radiation contamination. To alleviate their concern, they should be educated about the potential health effects resulting from radiation exposure, learn what personal protective equipment they will need for precautionary measures, and be trained so they can respond effectively, the CDC stated. Plans should include a decontamination and cleaning area for workers. In addition, hospitals must prepare for potential psychological effects resulting from such a stressful event. **(See related stories, pp. 20, 21.)**

Staff should use standard precautions when making direct contact with contaminated patients. "Use the same gear you would be using for trauma response," Fong said. "That is body fluid isolation, barrier protection and, if particulates are a concern, use an N95 mask." Some data suggest that if N95 respirators are not available, surgical masks should provide adequate protection if other precautions are observed, the CDC added. The CDC recommends wearing double gloves, with the inner one taped and the outer glove removed after each patient contact.

"There should be no delay in the response," Fong said. The radiation dose rate of most contamination is very low, but while it remains on the patient, it will continue to expose the patient and the staff and it is a theoretical hazard for transferable contamination and poses a hazard to both responders and patients."

The other main stream of the triage process is for patients with nonlife-threatening conditions: For those patients, if contamination is detected (by radiological monitoring devices) or suspected, remove the patient's clothing, give the patient a shower, then treat physical symptoms according to standard procedures, the CDC recommended. Localized contamination can be rinsed off with premoistened wipes or washed with soap and water as opposed to showering the individual. If radiation still is detected after washing, admit the patient if medically warranted and arrange for further evaluation and decontamination.

When possible, trained staff should survey all patients for radioactive contamination using devices such as radiation survey equipment to measure beta and gamma rays. Radiation survey equipment to detect contamination includes a Geiger counter to detect beta and gamma radiation. Although not specifically designed to quantify alpha radiation, pancake probes that are available for Geiger counters will detect the presence of most alpha radiation sources, as well as beta and gamma radiation, the CDC guidelines suggested.

But if staff are being overwhelmed by a large volume of incoming patients, a two-stage screening process can be used to separate out patients with high readings and designate them to another area for more evaluation. Fong suggested the use

CE/CME *questions*

9. The number of atoms disintegrating per second measures the radioactivity of something. Disintegrating atoms emit different forms of radiation, including which of the following?
   A. alpha particles
   b. beta particles
   C. gamma rays
   D. all of the above
10. The typical cause of death in most cases of acute radiation syndrome is the destruction of the person's bone marrow, which results in infections and internal bleeding.
   A. true
   B. false
11. According to Fun Fong, MD, how much of the radioactive contamination on a given patient is removed by removing his or her clothing?
   A. close to zero
   B. 10% to 20%
   C. 20% to 30%
   D. 80% to 90%
12. The CDC warns that health care providers may experience a similar array of mental health effects as patients during a nuclear incident. This particularly applies to health care workers who are:
   A. physicians and nurses
   B. working in burn units
   C. working outside their areas of expertise
   D. in security or crowd control

Answer Key: 9. D; 10. A; 11. D; 12. C

of Geiger counters to quickly detect those highly contaminated and send them for more thorough radiological surveys.

"Ideally, it would be nice to survey absolutely everybody," Fong said. {But] we have to [periodically] in medicine take a quick look around the room and see if anyone's dying on us. In similar fashion, we can also look quickly with the survey meter. Are we dealing with a significant radiation level, or is it a lower radiation level that we might not be as concerned about? On those, we can wait a little bit to do a more thorough exam, so radiation surveys can be done in two stages."

References

1. Smith JM, Spano, MA. *Interim Guidelines for Hospital Response to Mass Casualties from a Radiological Incident*. Atlanta: Centers for Disease Control and Prevention; 2003. Web site: www.bt.cdc.gov/radiation/pdf/MassCasualties Guidelines.pdf.

2. Bunn M. *Preventing Nuclear Terrorism: A Progress Update*. Cambridge, MA: Project on Managing the Atom, Harvard University, and the Nuclear Threat Initiative; 2003. ■

Q&A for education on nuclear terror

The Centers for Disease Control and Prevention (CDC) provides these answers to frequently asked questions about nuclear terrorism:

Question: What is a nuclear blast?

A nuclear blast, produced by explosion of a nuclear bomb (sometimes called a nuclear detonation), involves the joining or splitting of atoms (called fusion and fission) to produce an intense pulse or wave of heat, light, air pressure, and radiation. The bombs dropped on Hiroshima and Nagasaki, Japan, at the end of World War II, produced nuclear blasts. When a nuclear device is exploded, a large fireball is created. Everything inside of this fireball vaporizes, including soil and water, and is carried upward. This creates the mushroom cloud that we associate with a nuclear blast, detonation, or explosion. Radioactive material from the nuclear device mixes with the vaporized material in the mushroom cloud. As this vaporized radioactive material cools, it becomes condensed and forms particles, such as dust. The condensed radioactive material then falls back to the earth; this is what is known as fallout. Because fallout is in the form of particles, it can be carried long distances on wind currents and end up miles from the site of the explosion. Fallout is radioactive and can cause contamination of anything on which it lands, including food and water supplies.

Question: What are the effects of a blast?

The effects on a person from a nuclear blast will depend on the size of the bomb and the distance the person is from the explosion. However, a nuclear blast likely would cause great destruction, death, and injury, and have a wide area of impact. In a nuclear blast, 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 burns on the retina. Individuals near the blast site would be exposed to high levels of radiation and could develop symptoms of radiation sickness (called acute radiation syndrome, or ARS). While severe burns would appear in minutes, other health effects might take days or weeks to appear. These 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.

People may experience two types of exposure from radioactive materials from a nuclear blast: external and internal. External exposure occurs when people are exposed to radiation outside of their bodies from the blast or its fallout. Internal exposure would occur when people eat food or breath air that is contaminated with radioactive fallout. Both internal and external exposure from fallout could occur miles away from the blast site. Exposure to very large doses of external radiation may cause death within a few days or months.

COMING IN FUTURE MONTHS

- Polio eradication: A path to bioterror?
- Who you gonna call? Communication hierarchy for bioterrorism
- Tabletop drills: Useful or almost useless?
- FYI? When threat discussion is mired by threat disclosure
- Pediatric preparedness: Children and bioterrorism

External exposure to lower doses of radiation and internal exposure from breathing or eating food contaminated with radioactive fallout may lead to an increased risk of developing cancer and other health effects.

Question: How can I protect my family and myself from during a nuclear blast?

In the event of a nuclear blast, a national emergency response plan would be activated and would include federal, state, and local agencies. Here are some steps recommended by the World Health Organization if a nuclear blast occurs:

If you are near the blast when it occurs:

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

If you are outside when the blast occurs:

- Find something to cover your mouth and nose, such as a scarf, handkerchief, or other cloth.
- 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.
- Move to a shelter, basement, or other underground area, preferably located away from the direction that the wind is blowing.
- 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 already are in a shelter or basement:

- Cover your mouth and nose with a face mask or other material (such as a scarf or handkerchief) until the fallout cloud has passed.
- 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.
- Stay inside until authorities say it is safe to come out.
- 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.
- If you must go out, cover your mouth and nose with a damp towel.
- Use stored food and drinking water. Do not eat local fresh food or drink water from open water supplies.
- Clean and cover any open wounds on your body. ■

CE/CME instructions

Physicians and nurses participate in this CE/CME program by reading the issue, using the provided references for further research, and studying the questions. Participants should select what they believe to be the correct answers, then refer to answer key to test their knowledge.

To clarify confusion surrounding any questions answered incorrectly, please consult the source material. After completing this semester's activity **with this issue,** you must complete the evaluation form that is provided and return it in the reply envelope to receive a certificate of completion. When your evaluation is received, a certificate will be mailed to you. ■

CE/CME objectives

After reading each issue of *Bioterrorism Watch*, the infection control professional will be able to do the following:

- identify the particular clinical, legal or educational issue related to bioterrorism;
- describe how the issue affects health care providers, hospitals, or the health care industry in general;
- cite solutions to the problems associated with bioterrorism, based on guidelines from the federal Centers for Disease Control and Prevention or other authorities, and/or based on independent recommendations from clinicians and bioterrorism experts. ■