# BLAST INJURIES

## Radiological Dispersal Devices and Radiation Injury

### Background

Radiological Dispersal Devices (RDDs) or "dirty bombs" consist of radioactive material combined with conventional explosives. Their force is so powerful they can disperse such material over an area as large as multiple city blocks. People in the immediate area may be killed or injured initially from the effects of the blast and not from radioactivity. RDDs are primarily used to produce psychological rather than physical harm by inducing panic and terror in the target population. The clinical presentation of exposed casualties will mostly resemble conventional injuries. This is because the clinical effects of all but the most severe radiation exposures are delayed.

A survey conducted with specialized radiological equipment is the only way to confirm the presence of radiation. If radioactive material is used in a terrorist bombing, victims must be assessed for both exposure and contamination. People exposed to radiation can suffer radiation illness if their dose is high enough, but they do not become radioactive. Contamination occurs externally when loose particles of radioactive material are deposited on surfaces, skin, or clothing. Internal contamination occurs when radioactive particles are inhaled, ingested, or lodged in an open wound. Contaminated patients should be decontaminated as soon as possible after being treated for life-threatening injuries. The radioactivity levels of contaminated patients should not pose a health risk to care providers. Guidelines for protection and treatment are provided below.

### Triage and Staff Protection

- Establish an ad hoc triage area in a location based on the hospital's disaster plan and the anticipated number of casualties. Stock a sufficient quantity of hospital-supplied gowns to replace contaminated clothing.
- Establish both a contaminated area and a clean area and separate them by a buffer zone.
- Remove contaminated outer garments when leaving the contaminated area.
- Using a radiation meter, survey the bodies of persons when they exit a contaminated area.
- Follow standard guidelines for protection from microbiological contamination.
- Ensure surgical masks are adequate; N95 masks, if available, are recommended.
- Survey hands and clothing with a radiation meter at frequent intervals.

### Decontaminating the Injured

- Survey the patient with a radiation meter using a consistent technique and trained personnel.
- Note exceptionally large amounts of surface or imbedded radioactive material.
- Handle easily-removable radioactive objects with forceps and store them in lead containers.
- Use a standardized form to record location and level of any contamination found.
- Remove patient clothing by carefully cutting and rolling it away from the face toward the feet to contain the contamination.
- Double-bag clothing using radioactive hazardous waste guidelines and then label the bag.
- Repeat the patient survey and record contamination levels.
- Wash wounds with saline or warm water first. Gently cleanse intact skin with soap and water, starting outside the contaminated area and washing inward; do not irritate or abrade.
- Flush eyes, nose, and ears, and rinse mouth if facial contamination occurred.
- Survey and note radiation level again; repeat washing until survey indicates radiation level is no more than twice background or the level remains unchanged.

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## Decontaminating the Injured (continued)

- Cover wounds with waterproof dressing.
- For mass casualties, consider establishing separate shower areas for ambulatory and non-ambulatory patients.

## Diagnosis and Treatment

- Perform sequential CBCs with differential to assess declines in lymphocyte levels.
- Monitor for fluid and electrolyte balance and for evidence of hemodynamic instability.
- Treat symptomatically and focus on preventing infection; use antibiotics.
- Consider cytokines, e.g., Neupogen® and hematopoietic growth factors.
- Perform surgical interventions within 48 hours or delay them until after hematopoietic recovery.

## Radiation-related Illness/Injury

**Acute Radiation Syndrome (ARS)** is caused by high doses of radiation that are rapidly delivered to large portions of the body. A dirty bomb will likely generate low levels of radiation exposure.

Symptoms can be immediate or delayed, mild or severe, based on radiation dose.

- Nausea or vomiting may occur minutes to days after exposure. The rapid onset of vomiting is a major factor in diagnosis and dose estimation of radiation.
- Early onset of vomiting followed by symptoms of bone marrow suppression, gastrointestinal destruction, and cardiovascular/central nervous system effects are signs of acute illness.
- Depending on the stage of illness, a patient may be asymptomatic.

**Cutaneous Radiation Injury** is acute radiation injury to the skin.

- Transient itching, tingling, erythema, or edema may be seen within hours or days, and is usually followed by a latent period; lesions may not be seen for weeks to months post exposure.
- The delay in occurrence differentiates these lesions from thermal burns.
- Treat localized injuries symptomatically, focusing on pain and infection control.

**Internal Contamination** should be considered if persistently high survey readings are noted following decontamination. It generally does not cause early symptoms. Nose or mouth contamination may indicate inhalation or ingestion.

- Assessment may include analyzing urine, blood, and fecal samples or whole body counts.
- Radiation experts may recommend early administration of radionuclide-specific decorporation agents such as Prussian Blue, DTPA, or Bicarbonate.
- Gastric lavage, antacids, and cathartics assist in clearing ingested contaminants.

### Psychosocial Issues

- In urban areas, hundreds to thousands may seek care. Many may seek radiological screening, many will need decontamination, and many will simply seek reassurance.
- Psychogenic illness symptoms, such as nausea or vomiting, may manifest.
- Vomiting due to radiation exposure is usually recurrent rather than episodic.
- Include mental health professionals on the response team.

*This fact sheet is part of a series of materials developed by the Centers for Disease Control and Prevention (CDC) on blast injuries. For more information, visit CDC on the Web at:* ***www.emergency.cdc.gov/BlastInjuries****.*

*For more information about radiation emergencies, visit:* ***www.bt.cdc.gov/radiation.***

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