Disaster Risk Management for Health
RADIATION EMERGENCIES

Key Points

- Radiation emergencies have health risks to those directly affected.
- People can be exposed to a radiation source with or without necessarily becoming contaminated with radioactive materials.
- They cause a high level of public concern which may often be disproportionate to the actual potential risk to health from the level of radiation exposure.
- Effective risk communication is essential to both the public and emergency responders.
- Strict controls are used to manage risks of radiation, including various safety standards (for facilities, equipment, waste disposal, medical and industrial use, occupational and personal protection.
- Plans for the effective management of radiation emergencies include emergency procedures at the site, safe evacuation, and shelter, access to nuclear and radiation specialists, decontamination capabilities, treatment of affected people, and risk communication strategy in place.
- Procedures should be put in place for monitoring the health of the high-risk groups and the environment over time (food, water, air, soil, etc).
- The treatment of life threatening injuries should always take precedence over decontamination where the only contaminant is radioactive material.

Why is this important?

On a worldwide basis, both nuclear and radiological incidents are infrequent when compared with events involving other hazardous materials such as chemicals.[1]

Despite their low frequency, nuclear and radiological events generate high levels of public concern and political engagement at local, national and international levels. [2]

Significant incidents at nuclear installations include Windscale, UK (1957), Three Mile Island, USA (1979), Chernobyl, Ukraine (1986), Tokaimura, Japan (1999), and Fukushima, Japan (2011). Incidents involving significant radiation exposures to radioactive sources include exposure of people to abandoned sources (New Delhi, India, 2010), occupational accidents (Chile, 2005), and medical overexposures (Epinal, France, 2004)

Concerns regarding potential malicious uses of radioactive and nuclear materials have increased with the heightened awareness of international terrorism where a variety of radiation and nuclear scenarios can be postulated.

The poisoning of Alexander Litvinenko with Polonium-210 in London in 2006 emphasized the need for radiation emergency planning to be developed using a cross-sector flexible approach, so that response mechanisms can be adapted easily and quickly to enhance public health protection and maintain public confidence.

Lead radioactive source container with source holder removed (HPA)

What are the health risks?

Health effects from exposure to radiation include one or more of the following effects:

i) in the short term, effects such as skin burns or acute radiation syndrome at high doses of radiation.

ii) in the long run, an increased risk of effects such as certain types of cancer has been reported at doses above 100 mSv.

iii) psychological effects even where little or no radiation exposure has occurred.

How can people be exposed to radiation?

Any source of radiation has the potential to expose an individual and give a radiation dose through external or internal routes as follows:

External Routes

Individuals can be exposed to radiation from radioactive material in the environment:

- Directly from a radioactive source or from radioactive material deposited on the ground or other surfaces.
- Dispersion of a radioactive material in gaseous or vapour form in the atmosphere.

Internal Routes

Individuals can be exposed to radiation from radioactive material within the body by:

- Inhaling radioactive material in the atmosphere from the incident or re-suspended from the ground.
- Ingesting food/water that has been contaminated with radioactive material.
- Absorbing radioactive contamination through the skin or open wounds into the body.

Radiation Monitoring Unit – Screening for radioactive contaminated persons (HPA)

Risk management considerations

Safe siting, design and construction of nuclear power plants as well as controls and back up measures for their safe operation and waste management.

Controls, equipment and training to protect personnel working with radioactive sources in health facilities and other environments.

Biosecurity measures to control access to supply, and use of radiation sources.

Facility, local and national multisectoral radiation emergency response plans to address the health risks from of range of scenarios from low-level exposure to a significant release of radioactivity.

Effective risk communication is essential to the public and emergency responders.

Protective measures to reduce exposure and respond to an emergency situation include:

- taking shelter.
- evacuation from an affected area.
- restriction of consumption of contaminated food or water.
- sometimes decontamination of individuals.
- appropriate treatments administered to people affected by radiation.

National and international radiation specialists have a vital role in providing radiation dose and risk estimates, and ongoing monitoring of the environment and the health of people, including delayed or long-term effects.

Clean-up and monitoring of the incident site for persistent radiological materials, in exceptional circumstances, may take many years.

References and further reading

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3. Thompson, N J, Youngman, M J, Moody, J and Prosser S L. Radiation monitoring units: planning and operational guidance. Health Protection Agency (2011).
4. Rojas-Palma, C, Lilan, A, Jerstad, A N, Etherington, G, Perez, M R, Rahola, t AND Smith, K. TMT Handbook: Triage, monitoring and treatment of peo*ple exposed to ionising radiation following a* malevolent act. SCK-CEN, NRPA, HPA, WHO, Enviros, CLOR (2009).
5. IAEA. Generic procedures for medical response during a nuclear or radiological emergency. EPR-Medical (2005)

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