

# Card 1: Radiation

Date:

## Emergency Response

Has a Major Incident been declared? Yes  No  Standby

HPA 'Radiation on-call' 24-hour contact number: 01235 834590

Ensure the following have been alerted			
HPA		NHS	Other
Local HPU (out-of-hours relevant public health on-call) - request internal cascade to:	<input type="checkbox"/>	Hospital Emergency Department	<input type="checkbox"/> Police <input type="checkbox"/>
ERD	<input type="checkbox"/>	Director of Public Health	<input type="checkbox"/> Fire & Rescue <input type="checkbox"/>
CRCE	<input type="checkbox"/>	Emergency Planner	<input type="checkbox"/> Ambulance Service <input type="checkbox"/>
Regional HEPA	<input type="checkbox"/>		
Communications	<input type="checkbox"/>		

Incident	Details
Location (including postcode)	
Date and time	
Population affected: places	
Population affected: groups	
Wind direction and speed	
CHEMET requested	
Topography	

Have Police, Fire & Rescue or Ambulance Service detected radiation? Yes  No

If Yes, then which service? \_\_\_\_\_ What level of radiation? \_\_\_\_\_ (units) Where? \_\_\_\_\_

## Health Protection

**Emergency plans** Follow advice from applicable specific plan, eg nuclear sites, submarines, nuclear weapons transport ('LAESI') or RADS SAFE (transport). Advice may include 'No need to take precautions/protection'.  
If airborne hazard is suspected, the police/fire services should use FireMet/CHEMET to identify downwind hazard sector. If no specific plan, seek local radiation support through the police using the NAIR scheme (tel: 0800 834153) and, if an extended or dispersed hazard is suspected, the default public health message is 'Go In, Stay In, Tune In'.

**Reducing radiation exposure** Remember: Time, Distance, Shielding. Minimise time near source, maximise distance from source, shield people from the source. 'No hands to mouth' if contamination is suspected.

**Stable iodine tablets** Only protect against radioactive iodine intake – only likely to be necessary for operating nuclear reactors. Specific arrangements are in place in relevant locations.

**Contamination on skin/clothing** If there are concerns about people who have gone home with radioactive contamination on skin/clothing they should be advised to place clothes in a sealed plastic bag, seal in a second bag and take a shower as normal to remove most external contamination.

**Personal Protective Equipment** Depends on type of work undertaken. Emergency services should have their own equipment and consult their occupational health service. PPE should only be used by trained personnel. Normal infection control measures (disposable gloves, aprons and masks depending on circumstances) should prevent personal contamination and intake. PPE does not protect against external beta/gamma radiation.

Urgent protection measures	Dose (millisieverts 'mSv')		Notes	
	Lower	Upper		
Below the lower level the protective action is not recommended; above the upper level the protective action is worthwhile in most cases.	Sheltering indoors	3	30	Whole body dose
	Evacuation	30	300	Whole body dose
	Stable iodine tablets	30	300	Thyroid dose ASAP (within 6 hours)

## Radiation and its Health Effects

Radiation exposure pathways	
<b>External</b>	From direct contact with or proximity to radioactive material or other radiation source (eg X-ray generator)
<b>Internal</b>	From radioactive material entering the body through inhalation, ingestion or wound contamination

Radiation types	
<b>Alpha</b>	Internal hazard only – stopped by a sheet of paper
<b>Beta</b>	External and internal hazard – stopped by thin sheet of plastic
<b>Gamma</b>	External and internal hazard – shielded by dense material

Risks from radiation exposure
Radiation is carcinogenic – in general, there is a fatal cancer risk of 1 in 20,000 (0.005%) per millisievert (mSv) of ‘effective dose’ with no lower threshold. Effective dose is a measure of radiation-induced harm. It takes into account exposure of different body tissues to different types of radiation. Natural radiation exposure is typically a few millisieverts every year.

High whole body radiation exposures delivered rapidly – effects in dose ranges			
Less than 1 sievert <i>Usually asymptomatic</i>	1–8 sievert <i>Haematopoietic syndrome</i>	6–20 sievert <i>Gastrointestinal syndrome</i>	More than 20 sievert <i>CNS/CV syndrome</i>
<ul style="list-style-type: none"> <li>• Symptoms mild or absent</li> <li>• Episodic nausea, vomiting in first 48 hours in 1%–10%</li> <li>• Mildly depressed WBC at 2–4 weeks</li> <li>• No foetal effects if effective dose less than 100 mSv</li> <li>• Counselling needed if pregnant and effective dose more than 100 mSv</li> </ul>	<ul style="list-style-type: none"> <li>• Anorexia, nausea, vomiting, fatigue: 1–4 hours after exposure, timing and severity dose related</li> <li>• Latent period: 2 days – 4 weeks</li> <li>• Bone marrow depression: leucopenia – infection; low platelets – bleeding, bruising</li> <li>• Serial lymphocyte counts in first 48 hours predict severity</li> <li>• 3–4 sievert: hair loss at 2–3 weeks</li> <li>• LD<sub>50/60</sub> is around 4.5 sievert without treatment</li> </ul>	<ul style="list-style-type: none"> <li>• Early nausea, vomiting, diarrhoea, anorexia, fatigue</li> <li>• Latent period: hours – 1 week</li> <li>• Severe gastrointestinal symptoms (fever, abdominal pain, cramps, watery diarrhoea, haemorrhage, electrolyte imbalance, dehydration) coupled with bone marrow depression</li> <li>• LD<sub>100</sub> is about 10 sievert, death usually within 2 weeks</li> </ul>	<ul style="list-style-type: none"> <li>• Almost immediate projectile vomiting, explosive bloody diarrhoea, headache, collapse, confusion, loss of consciousness, agitation, burning sensation on skin</li> <li>• May be lucid interval (hours)</li> <li>• Neurological and cardiovascular symptoms predominate: convulsions, coma, hypotension, shock</li> <li>• Death within 2–3 days</li> </ul>

<b>Whole body doses less than 0.5 sievert are unlikely to cause acute symptoms.</b>
<b>Partial body exposure may occur and lead to reduced or localised effects (eg skin damage, burns, ulcers).</b>

Assessing radiation exposure
High exposures (over 100 mSv) can be assessed by biodosimetry (chromosomal aberration, blood cell counts etc). Doses from intakes can be assessed through direct body measurement (gamma emitters) or analysis of excreta coupled with bioassay. Dose can often be assessed from modelled or measured environmental conditions. The HPA will assess doses to the public.

## Further Information

Topic	Website	Search terms
DH emergency planning guidance	<a href="http://www.dh.gov.uk">www.dh.gov.uk</a>	Emergency planning, major incidents
Effects of radiation	<a href="http://www.hpa.org.uk">www.hpa.org.uk</a>	CBRN incidents radiation
CBRN incidents	<a href="http://www.hpa.org.uk">www.hpa.org.uk</a>	CBRN incidents
Incident recovery	<a href="http://www.hpa.org.uk">www.hpa.org.uk</a>	Recovery handbook