INTRODUCTION
Chemical, biological, radiological and nuclear incidents (CBRN) materials are all very different and each present unique difficulties for ambulance crews. However, chemical, biological and radioactive agents present four main types of hazard, depending on the physical properties and characteristics of the agent released:

1. Contact Hazards – are created by chemical, biological or radioactive agents which can be absorbed into the skin. These agents can be in solid, liquid or vapour form. Most biological agents do not pose contact hazards, unless the skin is cut or abraded.

2. Inhalation Hazards – are created by vapour, aerosols or contaminated dust that can be inhaled into the lungs.

3. Injection Hazards – result from chemical, biological or radiological agents being injected – either by the agent moving from the injection site into the blood stream or being injected directly into a vein or artery.

4. Ingestion Hazards – result from chemical, biological or radiological agents being ingested.

In addition to these four types of hazards, radioactive agents present a significant additional hazard that result from the radiation they emit.

Nuclear Hazards – will be those resulting from a nuclear explosion. These will include extensive blast and fire damage, direct radiation effects and widespread radiological contamination.

PERSONAL SAFETY

- On identification of a CBRN incident advise Ambulance Control immediately.
- Do not put yourself at risk.
- Park uphill and upwind.
- Do not put yourself at risk; do not enter the site or deal with casualties unless appropriately trained and protected in NHS standard chemical protective personal protective equipment.
- Put on a high visibility jacket and safety helmet, or personal protective equipment (PPE) only if trained in its use.
- Close all vehicle windows and vents.
- Switch off air conditioning in vehicle.
- Obey all cordons and safety advice.
- Where possible, avoid contact with contaminated casualties.

If you come into contact with affected or contaminated casualties, you must consider yourself contaminated and a casualty! Remain at scene, commence self-decontamination (see additional information) and isolate yourself until given further instructions (see Appendix 1).

Conscious casualties (contact only if protected with appropriate PPE):
- re-assure them constantly
- minimise handling
- if necessary provide modesty blankets.

Encourage them to:
- face into the wind at a point where the wind is unlikely to cause further contamination.
- not to leave the site
- remove their contaminated clothing
- control any haemorrhage with direct pressure
- assist other casualties
- commence self decontamination.

Unconscious casualties (treat only if protected with appropriate NHS Standard PPE):
- check ABC

If breathing present:
Place in recovery position facing the wind

If not breathing:
- DO NOT attempt mouth to mouth – use bag-valve-mask.

TO BE USED WHEN CAUSE IS UNKNOWN AND SYMPTOMS ARE CONSISTENT WITH A CBRN INCIDENT

Approach to collapsed casualties: STEP 1-2-3 (Safety Triggers for Emergency Personnel)

Step 1 – One collapsed casualty:
- approach using normal procedures – CBRN contamination unlikely.
Step 2 – Two collapsed casualties at one location – CBRN contamination possible:
• approach with caution. Consider all options
• if CBRN possible or suspected follow the advice for STEP 3.

Step 3 – Three or more collapsed casualties at one location:
• DO NOT approach the scene – CBRN contamination likely

IF POSSIBLE:
• withdraw
• contain
• report
• if contaminated, isolate yourself and commence self-decontamination
• send for specialist help
• (M)ETHANE / CHALETS assessment to be provided as soon as possible (see below).

NOTE: Do not compromise your safety or that of your colleagues or the public.

MNEMONICS FOR RAPID INCIDENT ASSESSMENT

METHANE
M My call sign, or name and appointment. Major incident, STANDBY or DECLARED.
E Exact location – where possible, map reference.
T Type of incident – e.g. chemical, explosion, road traffic collision (RTC).
H Hazards – present and potential.
A Access – best routes for access and egress to scene and rendezvous point(s) (RVP).
N Number of casualties – approximate numbers and types of casualties (P1, P2, P3, DEAD and whether contaminated.)
E Emergency services – report on emergency services already on site and if further services required.

CHALETS
C Casualties – approximate number and type, call sign
H Hazards – present or potential
A Access – safest route
L Location
E Emergency Services – on scene or required
T Type of Incident – chemical, biological, radiological, blast etc.
S Safety – PPE's

CHEMICAL INCIDENTS
Managing the Consequences of a Deliberate Chemical Release:

Characteristics of a Chemical Incident:
Rapid action producing mass casualties.
Persistent liquid contact and downwind vapour hazards.
Casualties can contaminate first responders.
Decontamination will probably be necessary and needs to start quickly.
Most effective in confined spaces where there are lots of people.

Casualties from a Chemical Incident
Lots of casualties (hundreds) probably at scene.
Injury occurs very rapidly (minutes).
Must be treated rapidly if they are to survive.
Very few casualties will occur more than two or three days later.

Decontamination issues:
Most contamination will be on clothing which should be removed early.
Skin must be decontaminated rapidly – wet decontamination is advised.
**BIOLOGICAL INCIDENTS**

**Managing the Consequences of a Deliberate Biological Release:**

**Characteristics of a Biological Incident**
Slow action producing mass casualties over time.
Could go undetected until people become ill and attend their GP or Emergency Departments.
Potential for epidemic with some diseases.
Need for decontamination will depend on agent used.
Most effective in confined spaces where there are lots of people.

**Casualties from a Biological Incident**
Unlikely to be any casualties at the scene.
Window for treatment in first 12 to 24 hours.
Cannot tell who has been exposed.
First casualties will start to appear two to three days later.
It may be very difficult to be sure the incident is over.

**Decontamination Issues**
Washing skin and clothing should be effective.
Surgical masks, gowns, eye protection and gloves should be worn when dealing with any infectious patient.

**RADIOLOGICAL AND NUCLEAR INCIDENTS:**

**Managing the Consequences of a Deliberate Radiological Release:**

**Characteristics of a Radiological Incident**
Few immediate casualties.
Some may have blast injuries.
Need to monitor those present for contamination.
Persistent radiation hazard.
Persistent contact and downwind hazards.
Casualties can contaminate first responders.
Decontamination will be necessary and needs to start quickly with removal of clothing and wet decontamination.

**Casualties from a Radiological Incident**
Few casualties at scene.
Damage is dosage related and cumulative.
Casualties will become ill over a period of days to weeks.
Casualties will need reassurance.

**Decontamination Issues (see Appendix 2)**
Most contamination on clothing.
Skin must be decontaminated rapidly.
Need to provide shielding from radiation.

**ADDITIONAL INFORMATION**

**Decontamination**

**Equipment:**
- ID tags
- scissors
- large plastic bags (for clothing)
- small clear bags (for personal belongings)
- buckets
- sponges/soft brushes/wash cloths
- warm water source
- disposable towels.

**Decontamination technique:**

**CBRN Detection**
There are a wide range of products available to aid with the detection of Chemical and Radiological incidents.

Emergency departments have been supplied with Toxi-Boxes (Toxicological Analytical Sampling Kits).
These are to be used for toxicological sampling.

Other products available include electronic personal dosimeters for detection of radiation exposure; toxic vapour analyser for detection of organic/non-organic vapours.
Also available are pre-filled syringes for use as antidotes in the release of chemicals, particularly organophosphorus agents.

Each local service should be consistent with regards to equipment, including PPE, in case of a CBRN incident.
Key Points – Chemical, Biological, Radiological and Nuclear incidents

- Steps 1, 2 and 3
- Early METHANE / CHALETS call once a chemical incident is identified
- Stay away from the scene unless protected in appropriate PPE
- Encourage walking casualties to disrobe and self-decontaminate where possible
- Once contaminated, you become a casualty.

REFERENCES


SELECT BIBLIOGRAPHY


METHODOLOGY

Refer to methodology section.
Appendix 1 – CBRN (SPECIAL AGENT) TRIAGE SIEVE: For use before and during decontamination

NOTE: Triage may be modified on specialist medical advice after receipt of information about the contaminating agent.

Where the nature of the contaminating agent is unknown (e.g. white powder), treat initially as for chemical contamination until advised otherwise.

[Diagram of the triage sieve with decisions and signs of toxicity]

1Where resources permit, resuscitation may be attempted on cases of respiratory arrest with early use of antidote (e.g. atropine for nerve agent toxicity).
## Appendix 2 – CBRN SORT: For use after decontamination at a casualty clearing station or in hospital

### CBRN SORT (for use after decontamination)

<table>
<thead>
<tr>
<th></th>
<th>PLEASE CIRCLE</th>
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</thead>
<tbody>
<tr>
<td><strong>RESPIRATION</strong></td>
<td></td>
</tr>
<tr>
<td>10-29 per minute</td>
<td>+4</td>
</tr>
<tr>
<td>&gt;30 per minute</td>
<td>+2</td>
</tr>
<tr>
<td>&gt;30 per minute + cyanosis</td>
<td>+0</td>
</tr>
<tr>
<td>&lt;9 per minute</td>
<td>+0</td>
</tr>
<tr>
<td><strong>RESPIRATORY ARREST</strong></td>
<td>Immediate OR Expectant</td>
</tr>
<tr>
<td><strong>HEART RATE</strong></td>
<td></td>
</tr>
<tr>
<td>60-100 per minute</td>
<td>+4</td>
</tr>
<tr>
<td>41-59 OR 100-120 per minute</td>
<td>+2</td>
</tr>
<tr>
<td>&lt;40 per minute</td>
<td>+0</td>
</tr>
<tr>
<td>&gt;120 per minute</td>
<td>+0</td>
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<tr>
<td><strong>CARDIAC ARREST</strong></td>
<td>DEAD</td>
</tr>
<tr>
<td><strong>SYSTOLIC BLOOD PRESSURE</strong></td>
<td></td>
</tr>
<tr>
<td>&gt;90mmHg</td>
<td>+4</td>
</tr>
<tr>
<td>70-89 mmHg</td>
<td>+3</td>
</tr>
<tr>
<td>50-69 mmHg</td>
<td>+2</td>
</tr>
<tr>
<td>1-49 mmHg</td>
<td>+1</td>
</tr>
<tr>
<td><strong>CARDIAC ARREST</strong></td>
<td>DEAD</td>
</tr>
<tr>
<td><strong>GLASGOW COMA SCORE</strong></td>
<td></td>
</tr>
<tr>
<td>13-15</td>
<td>+4</td>
</tr>
<tr>
<td>9-12</td>
<td>+3</td>
</tr>
<tr>
<td>6-8</td>
<td>+2</td>
</tr>
<tr>
<td>4-5</td>
<td>+1</td>
</tr>
<tr>
<td>3 OR CONVULSIONS</td>
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</tr>
<tr>
<td><strong>FASCICULATION</strong></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>+4</td>
</tr>
<tr>
<td>Local/intermittent</td>
<td>+2</td>
</tr>
<tr>
<td>General/continuous</td>
<td>+0</td>
</tr>
<tr>
<td>Flaccidity</td>
<td>+0</td>
</tr>
</tbody>
</table>

### TOTAL SCORE OUT OF 20

<table>
<thead>
<tr>
<th>EVACUATION SCORE</th>
<th>EVACUATION PRIORITY</th>
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<tr>
<td>20</td>
<td>DELAYED T3</td>
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<tr>
<td>18-19</td>
<td>URGENT T2</td>
</tr>
<tr>
<td>0-17</td>
<td>IMMEDIATE T1</td>
</tr>
</tbody>
</table>

**Chemical, Biological, Radiological and Nuclear Incidents**

Page 6 of 7 October 2006 Specific Treatment Options
Appendix 3 – GLOSSARY OF TERMS: COUNTER-TELELIONISM

ACPO(TAM) Association of Chief Police Officers (Terrorism and Allied Matters)
ATO Ammunition Technical Officer
ATSAC ACPO(TAM) Strategic Advice Centre (normally established at Scotland Yard)
AWE Atomic Weapons Establishment, Aldermaston
(CB)IED (Chemical or Biological) Improvised Explosive Device
CCC Civil Contingencies Committee
CCCG Chief Constable’s Co-ordinating Group (Strategic Group)
CMLO Consequence Management Liaison Officer
COBR Cabinet Office Briefing Room(s) (Central Govt co-ordinating group)
Dstl Defence, Science & Technology Laboratory, Porton Down – part of the Ministry of Defence
EHO Environmental Health Officer
EOD Explosives Ordnance Disposal
FSC Forward Scientific Controller
FCP Forward Control Point
FMC Forward Medical Controller
GLO Government Liaison Officer
GLT Government Liaison Team
HazMat Hazardous Material
IPE Individual Protective Equipment
JHAC Joint Health Advisory Cell
JIG Joint Intelligence Group
JMC Joint Military Commander
MACA Military Aid to the Civil Authorities
MACC Military Aid to the Civil Community
MACP Military Aid to Civil Power
MAGD Military Aid to Govt Departments
NARO Nuclear Accident Response Organisation (MoD)
PIC Police Incident Commander
PMBS Police Main Base Station
POLSA Police Search Adviser
PPE Personal Protective Equipment
SAS Special Air Squadron
SBS Special Boat Squadron
SF Special Forces
SIO Senior Investigating Officer
SMC Senior Military Commander
SO13 Met Police Anti-terrorist Squad
SSA Senior Scientific Authority
TAG Technical Assessment Group, Dstl Chemical and Biological Science
TRF Technical Response Force (specialist military/scientific team)