The UK Health Protection Agency's response to the polonium-210 incident in London 2006

Phil Tattersall

Head, Operational Protection Department

HPA Radiation Protection Division

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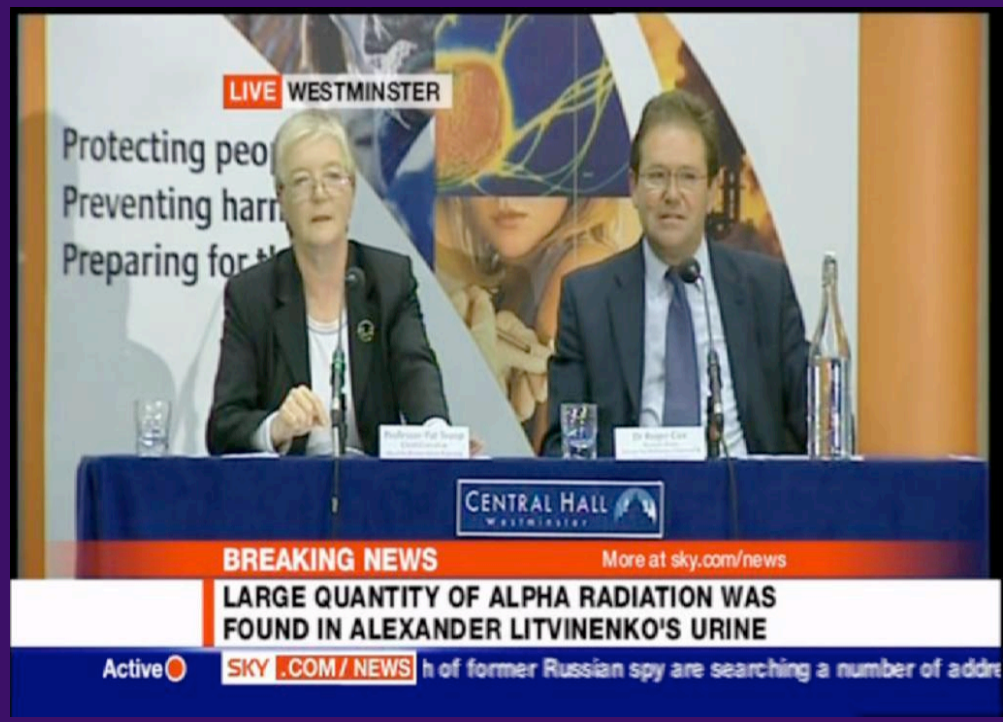
Centre for Radiation, Chemical and Environmental Hazards
Radiation Protection Division

What happened ?

- On 23 November 2006 Alexander Litvinenko died in a London hospital

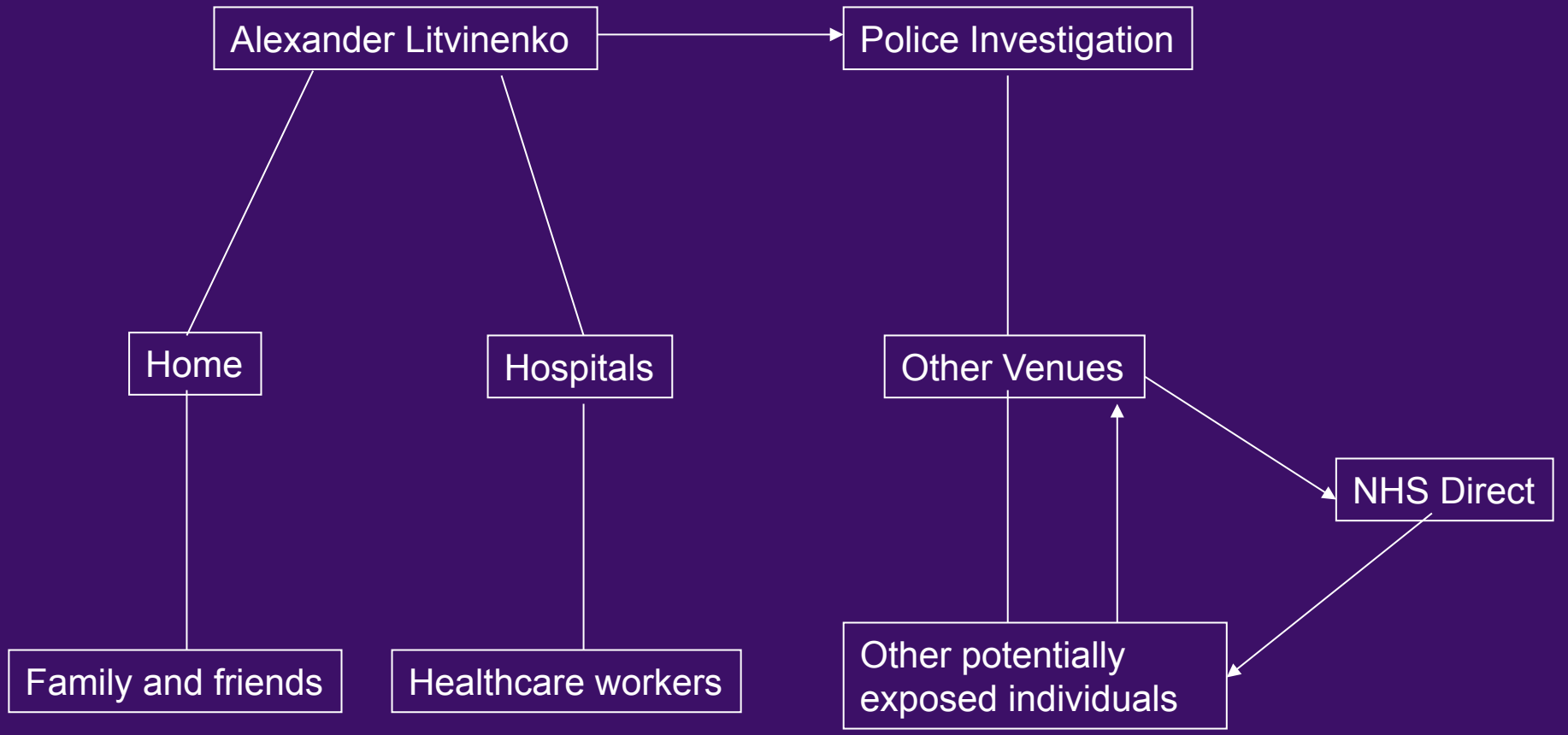
- Cause of death : poisoned with radioactive Polonium-210

- Case became a criminal investigation



- Radioactive contamination was found to be present at places he and "persons of interest" had visited across London

Public Health Investigation



Polonium 210 – Just the Facts

- Normally a solid metal at room temperature
- Dissolves readily in dilute acids to form salts
- Decays by emission of alpha particles
  - Not an external hazard
  - Hazard only if taken into the body
  - Ingestion, inhalation and through cuts
- Physical Half-life 138 days
- Biological Half-life 50 days
  - Excreted in faeces, urine and sweat
- Very high activity per unit of mass – 170 $GBq.mg^{-1}$
- Disperses readily through alpha recoil

Potential Public Health Hazard

100 MBq in body.

- ~1 kBq per gram body tissue
- ~0.3 kBq per millilitre urine (less in sweat)

To give annual dose limit for workers of 20 mSv:

- 80 kBq by ingestion
- 9 kBq by inhalation

Conclusion:

Intake to give 20 mSv from secondary contamination unlikely, but cannot be excluded.

Source material a greater potential hazard.

Confirm by individual monitoring?

Initial response

- Preparation and deployment of teams to hospitals
  - Existing generic plans, reference levels, dose constraints – reviewed for Po-210
- Objectives
  - identify significantly contaminated areas
  - simple remediation or closure
  - record and report results
- Joint approach with HPA London (LARS)
- Monitoring completed within a few hours
- First interaction with police investigation

Triage questionnaire (hospitals)

Health Care staff

Some of the questions asked:

1. Were you involved in the care of the patient ?
2. Did you come into direct contact with urine, faeces, vomit, blood, or other body fluids ?
3. Were there occasions when you did not wear the standard personal protective equipment for the work you undertook ?
4. Were there occasions when you did not follow the prescribed hygiene rules ?
5. Have you been ill ? If YES, have you had any of the following: Nausea, vomiting, diarrhoea, fever, sore throat, bleeding gums, unusual bleeding from cuts

Answers determined whether urine samples were requested. All those answering YES to Q2 were asked to provide a urine sample.

Derivation of Reference Level

Clear early need for clearance/ remediation reference level

Based on cautious assessment

- Range of scenarios
- Different age groups
- Not greater than 1 mSv

All mobile contamination to be removed where possible

Recommended 10 Bq.cm^{-2} for fixed contamination on hard surfaces

Soft furnishings to be treated as if mobile activity

Variety of remediation actions.

Conclusions

- UK and HPA response plans were flexible and adapted well to this unprecedented incident.
- Doses to monitoring teams were low
- Co-ordination of environmental and individual monitoring enabled effective use of finite resources

Sources of information

http://www.hpa.org.uk and search for polonium

http://www.londonprepared.gov.uk/londonsplans/litvinenko/

http://www.cabinetoffice.gov.uk/ukresilience.aspx