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

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1. Introduction

On the 23 November 2006, Alexander Litvinenko died in London, allegedly from poisoning by ^{210}Po, an alpha particle emitter. The spread of radioactive contamination, arising from the poisoning and the events leading up to it, involved many locations in London. The potential for intakes of ^{210}Po arising from the contamination posed a public health risk and generated considerable public concern. The scale of the event required a multi-agency response, including top level Government emergency response management arrangements. The Health Protection Agency (HPA) had a leading role in co-ordinating and managing the public health response.

To address the hazards associated with the incident, the Agency developed key objectives for the public health response: in brief:

- To prevent further exposure of the public:
  - identify sites and individuals that may be contaminated;
  - develop an environmental monitoring strategy to support this;
  - assess and advise on public access and remediation of contaminated sites.
- To assess risks to those potentially exposed:
  - develop and implement risk assessment criteria ;
  - offer, implement and report on personal monitoring through urine analysis.
- To provide advice and reassurance to those exposed and the public.

Polonium-210 contamination was found in tens of locations, including hospitals, hotels, offices, restaurants, bars and transportation. In some cases it was possible to carry out simple decontamination procedures at the time of monitoring and release the location as being safe for public access. However there were some locations where this was not possible and the levels of contamination were such that public access had to be prohibited until appropriate remediation or decontamination work had been undertaken. The acute phase of the response lasted into January 2007, with the recovery phase lasting into the summer of that year.

2. Initial response and assessment

The Radiation Protection Division of HPA maintains an Emergency Response Plan which has its origins in accidental releases from nuclear power plants but has been extended to also address 'newer' threats. The Division may also be expected to respond to 'lesser' incidents such as those associated with unshielded sources and contaminated laboratories.

This plan contains generic risk assessments and procedures for those involved in environmental monitoring in response to an incident including a reference level for surface contamination of 100Bqcm^{-2} supported by a dose constraint of 10mSv. Monitoring teams would not be expected to remain in areas where contamination was above this level but it would be acceptable for relatively short periods with good standards of personal contamination control.

This approach was also consistent with the objectives of the monitoring to be undertaken in this incident namely:

- To identify and, where possible, remediate by simple cleaning any areas/items which were not significantly contaminated leaving them safe for continued use or return to normal usage.
- To identify those areas/items that were significantly contaminated and required additional remediation before they could be released for access.
- To record the results of the monitoring and cleaning activities so that others could easily identify where additional remediation was required and/or be reassured that previously contaminated areas/items were now safe; or had confirmation that no significant contamination was present.
- To report the results of the monitoring and recommendations for release/remediation to the owner/occupier, through the local authority.

The initial monitoring 'targets' were those places where Mr Litvinenko had been cared for since becoming ill and consisted of his home (which was monitored by the Police and their scientific advisers) and areas of two hospitals (which was undertaken by HPA).
Monitoring at the hospitals was completed within a few hours and levels of contamination, where detected, were generally low and fixed. It was therefore concluded that any further exposure associated with these areas would not be significant and that they could be released for normal use. Exposures already received by those working in the areas when contamination levels were higher could be assessed by individual urine analysis.

3. 10 Bq.cm^{-2} reference level

It became clear at an early stage in the incident that guidance was needed on the likely relationship between contamination levels and health risk posed. This was required both by the monitoring teams and those involved in decisions on the remediation of contaminated areas and objects. Since contamination was being found in a wide range of places and on many different types of surfaces and objects, and also because future exposures depend partly on people's future behaviour, it was not possible to determine a simple relationship between contamination level and future health risk. Therefore, a two step approach was developed. The first step was to identify a level of contamination that would not lead to a future public health risk, regardless of people's behaviour in the future or the location of the contamination. Any locations with no contamination found above this level could then be declared safe for public access without further action. If contamination was found that exceeded this level, then the second step would be to undertake a more comprehensive survey/risk assessment in order both to determine

whether a public health risk was posed, and to consider whether remediation activities were warranted.

In order to develop this first 'screening' contamination level, conservative but plausible assumptions were made concerning the time individuals would spend in the vicinity of the contamination, the amounts transferred from surfaces onto hands or into the air by the actions considered, and of the amounts of contamination taken into the body. These different calculations, taken together, indicated that if patchy (not widespread), but fixed, contamination up to 10 Bq cm^{-2} on hard surfaces was left in situ, it was very unlikely that any individual would receive a dose exceeding 1 mSv (i.e. the annual dose limit for members of the public).

4. Key thoughts and conclusions

- The use of simple personal protective equipment was sufficient to keep doses received by monitoring teams low in this incident.
- Relationship between environmental and individual monitoring
  - Environmental monitoring identified places where people could have been exposed
  - Risk assessment of those places identified those most at risk and who should be offered individual monitoring
  - Individual monitoring provided reassurance of the environmental monitoring strategy and the reference level of 10 $Bq.cm^{-2}$.