SPECIAL ARTICLE

Poisoning with polonium-210: Management of a radioactive incident with multiple victims

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Date received:
8-5-2007

Date accpeted:
6-9-2007

Conflict of interests:
None

In 2006 one person died as a consequence of ^{210}Po poisoning. This lethal poisoning resulted in spreading of radioactive contamination which affected thousand people. Health authorities developed a special plan to take control over contamination impact, to assist victims and to provide public information. This case was characterized for delayed detection of release, a huge amount of patients with unknown radiation level and a large geographic area of radiation spreading.
Triage by phone and new computer and information technology resulted useful in the management of this type of event. The present study evaluates several detection characteristics, triage model and public information management. [Emergencias 2008; 20: 54-63]

Key words: Management. Multiple victim incident. Radioactive. Triage. Public information

Introduction

Until recently, all the information that healthcare professionals received about radiological incidents was based on the attention to victims caused by the accidental or intentional release of this type of material. It contaminated many people who were close to the place of exposure and it later spread to adjacent areas following weather patterns and continued to contaminate the environment for long periods of time. On 1 November 2006, a new formula of intentional use of radiological material was established after the possible poisoning of a person with polonium-210 (Po-210).

On that day it was detected that a Russian citizen and resident of the United Kingdom had been poisoned with Po-210. The poisoning caused his death and also the contamination of part of the staff that had had contact with the individual during the time of his disease. In addition, traces of contamination were detected in different parts of the city as well as in other places of the world that were related to the same incident.

This episode obligated the British healthcare authorities to initiate a special plan in order to control the effects of the contamination, to provide attention to those who were possibly affected, both residents and foreigners, and to answer to the public's requirements for information.

The aim of this article is to present the way that the healthcare authorities handled this type of radioactive incident and to review the aspects of management.

Characteristics of polonium-210

Po-210, also known as "Radium F", was discovered in 1898 by Marie Curie and owes its current name to the country of origin of its discoverer, Poland[1,2].

Po-210 has a half-life of 138 days after which the radioactivity released is reduced to the half and it is totally extinguished in 4 years[3]. Inside the human body, the half-life of its elimination has been established as 50 days[4].

Po-210 is a radioactive element with which we coexist in everyday life and that has industrial use. It can also be found in the tobacco of cigarettes as it is used in phosphated fertilisers for tobacco leaves. It has been identified as one of the elements directly responsible for causing lung cancer in smokers[5,6].

Po-210 is a source of alpha radiation, which causes its harmful consequences on health. Alpha radiation produces very damaging effects on the human body but has a poor penetration capacity and is halted by healthy skin. Therefore in order to have any harmful effect, Po-210 must penetrate the human body by inhalation, digestion or solution of continuity of the skin.

As Po-210 is water soluble, once introduced in the human body it may be easily distributed through the circulatory system. It is estimated that 45% of Po-210 introduced in the body is deposited in the spleen, the kidneys and the liver, 10% is deposited in the bone marrow and the rest is distributed throughout the body and it may be detected in urine, sweat and faeces.

Harmful effects of Po-210 normally appear in the long term. Genetic alterations, liver cancer, gastric ulcer, leukaemia and even cardiovascular alterations have been described more often than other type of radiations.

On the other hand, exposure to high doses of this type of radioactive agent may cause acute clinical manifestations that may lead to death. In this sense, the Health Physics Society[4] has described the clinical signs caused by ingestion of several micrograms of Po-210. These include gastrointestinal symptoms within the first 24 hours very similar to those in food poisoning: nausea and vomiting, diarrhoea and asthenia. These symptoms are followed by a latency period and a later worsening of the clinical manifestations that would involve hair loss and a massive reduction in white blood cells. Thereafter, infections and haemorrhage lead to the death of the patient.

It has also been described that the administration of 0.7 micrograms of Po-210 could cause the death of a 70-kilogram person within approximately 20 days[4].

Finally, Tables 1 and 2 show basic concepts used in radiology to quantify the interrelation between the radiation dose and its effect on the human body, as well as a comparison of the doses of radiation received in everyday life.

Table 1. General concepts about radiation measurement

- Radiation and radiological contamination of materials are measured in International Units called Becquerel (Bq).
- **Radiation dose:** It is a generic term used to refer to the effect caused on a material that has been exposed to radiation. It is used to refer to the amount of energy absorbed by a material exposed to radiation (absorbed dose) or also to the potential biological effect on the tissues exposed to radiation (equivalent dose).
- **Absorbed radiation dose (ARD):** It is the amount of energy absorbed by a unit of mass in tissue. The measurement unit is the Gray (1 joule/kg of tissue). One Gray is equivalent to 100 rads (old radiation measurement)
- **Equivalent dose to an organ or tissue (OED):** It is the amount of energy absorbed by unit of tissue depending on the type of radiation. Its measurement unit is the Sievert and is obtained by multiplying ARD with a radiation weighting factor. In the case of radiations to this weighting factor is the unit, so the ARD and the OED would be equal. Therefore 1 Gray would be equivalent to 1 Sievert.
- **Effective dose (ED):** It is the amount of energy absorbed by unit of tissue depending on its radiosensitivity.

Table 2. Reference radiation dose and limit doses
(CBRN incidents: Clinical management & health protection. Acute radiation Syndrome v 1.0 July 2005)

• Average annual dose produced naturally in the United Kingdom	2,2 mSv
• Round trip London – New York	0,1 mSv
• Limit effective annual dose for general public	1 mSv
• Limit effective annual dose for workers	20 mSv
• Chest radiography	0,02 mSv
• Brain CT	2 mSv
• Pelvis CT	10 mSv
• Acute toxic dose (total body only dose)	1 Sv
• Lethal dose 50/60 dose that would kill 50% of people exposed in 60 days without treatment (Total body dose):	≅ 4,5 Sv

Sequential account of the case

Apparently, on November 1, 2006, a 43-year-old Russian male living in London, was given Po-210 by an unknown means and in an as yet unknown amount. That night the patient felt unwell presenting vomiting and abdominal pain, which made him decide to visit his general practitioner the following day. Two days later, the patient was admitted to his local hospital (Barnet Hospital). On 17 November, the patient was transferred to University College Hospital, requiring admission to the Intensive Care Unit on the following day.

At first, it was hypothesised that the patient had been poisoned with a heavy metal, possibly thallium. This hypothesis was ater ruled out, and the possibility of contamination with a radioactive element started to gain weight since the clinical manifestations that the patient presented were compatible with acute radiation syndrome (ARS)[7,8]. It was then considered that the agent could be radioactive thallium. Finally, after different analyses, it was confirmed that the agent causing the process was Po-210.

During his stay in the hospital, the patient developed immunological deficiency which led to his death on 23 November. The mandatory autopsy was carried out in the Royal London Hospital following the appropriate antiradiation measures.

Thereafter, the authorities established that a radioactive element had been released and a contingency plan with different aims was adopted to detect and control the different contamination foci, to identify, assess and treat the people who had possibly been contaminated, and to provide information to the general population about the incident and its risks.

In order to achieve these goals, from the healthcare point of view, the following institutions were designated: the Health Protection Agency (HPA)[3] and the National Health Service (NHS)[9], which based their work on the data provided by the police investigation regarding the locations possibly contaminated and the people affected.

When it was made public that the patient's death had been caused by a radioactive product, a logical preoccupation ensued at different levels of the population: relatives of the people affected, people who had been to the places identified as contamination foci, people who had had any kind of contact with those who were possibly affected and of course, the general population.

On 27 November, the Chief Medical Officer of the Health Department issued a healthcare alert to all hospitals and health centres in Great Britain10 to inform about the possibility of being required to provide care to people related to the incident who were possibly affected by ARS. The internal note, which was sent via e-mail, also included the guidelines for diagnostic suspicion of this type of pathology. These are shown in Table 3.

On 28 November, on the website of Thames Water, the company in charge of water distribution for London, it was notified that no traces of radioactivity had been found in the analyses performed and the population was informed that the company made routine safety controls[11].

On 29 November, traces of Po-210 were discovered on two Boeing 767 airplanes of British Airways stationed in Heathrow Airport (London) as well as in a similar plane belonging to the same company which was located in Moscow. Depending on seat distribution established by the companies, these planes have a capacity for carrying between 230 to 250 passengers,and had performed more than 156 trips between London and different European cities in the period between the 3rd and the 20th of November. This meant that between 37,440 and 46,800 people had possibly been contaminated, all of whom were spread over 10 cities which were the main destinations of the flights, Madrid and Barcelona among them.

Table 3. Clinical suspicion of radioactive exposure

1. Unexpected onset of aplastic anaemia (leukopenia: infection; thrombocytopenia: gingival haemorrhage, epistaxis, haematomas).
2. Burns, erythema or blisters with no history of exposure to heat or chemical products.
3. Sudden and quick loss of hair especially with no relevant occupational history or inexplicable episode of nausea and vomiting with diarrhoea of 2-4 weeks of evolution.
4. History of explosion of bomb or of any explosive device left intentionally.

On 30 November, the public was informed that traces of radioactivity from Po-210 had been found in 14 different locations in London. These are shown in Table 4. Some of these locations had to be closed for different periods of time to carry out the necessary decontamination tasks.

From 4 December to 11 January, more than 3000 calls to NHS Direct were registered and approximately 179 people had required clinical investigation by collecting 24-hour urine samples and 27 people had been referred for specialised attention (Figure 1). Among those testing positive for determination of Po-210, there were relatives of the victim, workers of the hotels and restaurants were the patient had been, healthcare professionals that had provided care to the victim and police officers that had taken part in the investigations.

On 11 January, it was announced that 450 people abroad had tested positive to radioactive exposure, while the healthcare investigations were extended to 48 different countries.

Finally, on 15 March 2006, a total number of 17 people presented signs of irradiation with a risk for their health and the emergence of new cases had not been definitely ruled out.

Description of the Healthcare Contingency Plan

As described above, two institutions were responsible for providing response to the incident in terms of healthcare: the HPA and the NHS. The first was assigned the tasks of informing the public, determining and assessing the doses of radia-

Table 4. Locations in London where Po-210 radioactive remains were found

Hotels	
	Best Western Hotels
	Sheraton Park Lane Hotel
	Parkes Hotel
	Ashdown Park Hotel, E. Sussex
Restaurants	
	Rescatori Restaurante
	Itsu Sushi Bar
Hospitals	
	Barnet General Hospital
	Royal London Hospital (Morgue)
	University College Hospital
Office buildings	
	7, Down Street
	1, Cavendish Place
Other locations	
	Home of the victim
	Emirates Stadium Arsenal CF)
	Heathrow Airport

tion received by the people who were possibly contaminated and providing orientation for treatment. The second was assigned the task of carrying out the triage via telephone of the people who called the healthcare line NHS Direct (NHS-D)[9] in order to detect those who were possibly contaminated and to put them in contact with the HPA.

Therefore, people affected were detected and recruited by the system in two ways: on one hand, by the information provided by the police investigation and on the other hand, by direct access to either of the two agencies, through a call to the healthcare line or via e-mail.

In order to guarantee general information to the population, the HPA started to periodically publish information concerning different aspects of the incident on their website[4]. These aspects included: the formula established so that those affected could contact the system and obtain healthcare, the locations that were being investigated due to suspicion of radioactive contamination and the new locations where radioactive traces were found in police investigation, urging people that were in the contaminated locations on the date of the incident to contact the healthcare system, and finally, the statistical data from the attention that was being provided to the population affected at that time and the risk on health derived from the data obtained.

Once the telephone interview to the people possibly affected calling NHS-D had been done, the patients in whom exposure was suspected were required to provide a urine sample collected over a 24-hour period to carry out the appropriate quantitative analysis of the presence of Po-210. These analyses were carried out by the agency itself through the laboratories of the Radiation Protection Division[3] (RPD).

All the people who in the interview referred to having been in the locations where the presence of Po-210 had been detected during the event and those that had had contact with the patient contaminated during the period previous to the diagnosis of the cause, were considered to have been exposed to radiation and therefore urine analysis was required. As the data from the first investigations pointed to the probability of having to assess, through the analysis with urine samples, a large number of people affected, the HPA had to make a few urgent decisions: in the first place, to adapt the laboratories used for the analyses,

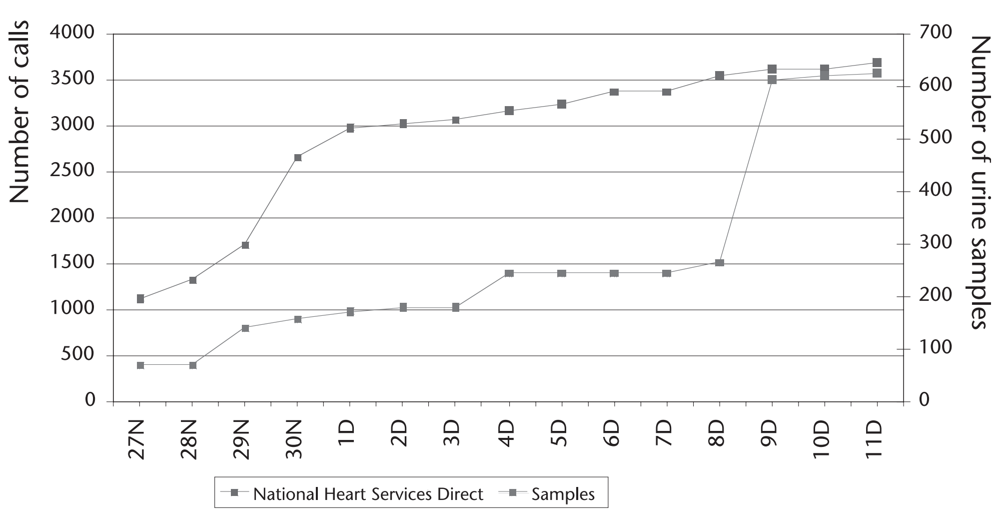

Figure 1. Evolution of calls (Y-axis) and urine samples requested (Y'-axis) in the incident with Po-210 between 27 November and 11 December 2006.

Table 5. Classification of patients according to the results of Po-210 analyses and their consequences

Patient categorisation	Radiation dose detected in urine (milibecquerels)	Equivalent dose (milisieverts)	Probability of contact with Po-210 due to incident	Consequences on health	Follow-up
Category 1	< 30	< 1*	Minimal or Null	Null	None
Category 2	> 30		Certain		
Category 3a		1-6		Δ 0,03% Possibility of cancer #	
Category 3b		> 6		Δ Possibility of cancer	Check after 3 months

Source: Health Protection Agency.
*Limit annual dose accepted for exposure in general population.
#Estimated probability of developing terminal cancer is of 25% in the general population.

quantitatively as well as qualitatively, to the needs of the analyses predicted as a consequence of the incident; in the second place, to establish a specific classification of results which, based on the doses of radiation measured in the samples, could facilitate the earliest possible introduction of the necessary diagnostic or therapeutic measures; and thirdly, the patients in whom the urine determination of Po-210 was higher than the established security ranges were referred to specialist physicians of the HPA for clinical assessment, control and follow-up.

In order to classify the patients, it was considered that Po-210 is present in nature and can be detected in the urine of healthy people, presenting ranges of radioactivity between 5 to 15 mBq per day. Therefore, it was assumed that determinations of Po-210 in urine higher than 30 mBq were due to exposure to the radiation originated by the incident. As explained above, the people affected were classified into categories according to the results of the determination of radioactivity in urine and to the equivalent doses determined later. These are shown in Table 5.

People whose radiation results fell into categories 1 and 2 were informed that the risk for health resulting from exposure was "not worrying" as it was within the limits of acceptable annual radiation for the public in general, according to the recommendations of the International Commission on Radiological Protection (ICRP)[12].

Those people who fell into category 3a (between 1 and 6 mSv) were informed that their situation was considered of low risk of presenting alterations related to the radiation, as they were below the total annual radiation accepted by the ICRP for workers under risk of radiation[13,14]. This group was told that they should have a medical follow-up, similar to that established by law for this type of workers. Finally, for those classified into the category 3b, it was established that as a consequence of the exposure they would have to assume an increase of 0.03% in the risk of developing cancer. This increase was regarded as minimal, considering that the incidence of this condition in the general population is of approximately 25%[3].

Detecting the release of radiological material

Based on their study on the risk of use of radioactive materials by terrorists Barnet et al[15] have classified this type of incidents into two large groups: on one hand, those named "radiological incidents", which include all release of radioactive material of non-nuclear origin and on the other hand, "nuclear incidents", which include those in which nuclear material is used. In the same article, they described the different methods used for release: the "radiological methods" are classified into those known as "radiologic exposure devices" (RED: mechanisms of radiologic dissemination), including detonation, aerosol or spray. While the "nuclear" methods require the use of nuclear weapons. Currently, with the treaties on non-proliferation of nuclear weapons in force, it is accepted that there is a higher probability that the first type of methods are actually used. This belief was increased in developed countries after the events of September 11 in New York and emergency plans were developed for their management[16,17]. All plans have been developed on the basis that the release of radiological material would be done through the detonation of an explosive artefact or a similar device, such as a "dirty bomb"[17], the attack to a nuclear power plant or to the transport of its products, etc.

Poisoning with Po-210 in the present case would fall into the first category of the classification described, with the particularity of using a liberation and dissemination method of the radiation which is different to that described in an event of these characteristics[15]. The method of radiological dispersion through direct contamination of a human being, following a pattern of dissemination similar to that of a biological disease is new and it was unknown before the incident.

The absence of detonation as a liberation method of radiological material complicates its detection and therefore detection should be based on the clinical diagnosis of victims.

Signs of ARS depend on the level of radiation absorbed and they may become apparent within the first hours after exposure. In this sense, Koenig et al[18] have described that the diagnosis of possible radioactive lesions may be made by carrying out a very detailed medical history in up to 85% of the cases. This should resolve the problem of detection. However, the truth is that in most of the cases of radiological incidents studied in which the existence of radiological risk was previously unknown, the average time elapsed between the release of the radiological material and the diagnosis of victims was of 22 days[18]. In this case, this delay was of approximately three weeks.

Logically, the consequences resulting from this type of delay in detection include not taking contention measures for the radiological dispersion during the time of delay. This entails an increase in the risk of exposure for the population that has contact with the radioactive source or with people who are contaminated. In the present case, this entailed the absence of adequate protection for those who had contact with the victim, especially healthcare professionals. In this sense, the most particular aspect in the case of Po-210 was that because of the type of radiation used, it did not require great strategies of personal protection or the use of sophisticated protection material.

The delay in the detection of patients exposed to radioactive agents though clinical data, would be caused by the non-specificity of the symptoms developed in the first stages of ARS[4,15] which reduces its usefulness for suspicion to those cases in which there is previous knowledge of the exposure.

Due to the aspects explained above, the difficulty for suspecting exposure of victims to radiological material has proven to be one of the biggest challenges for healthcare services, including emergency services. This could have negative consequences such as a delay in taking adequate protective measures, in treating the people affected, and in communicating the incident to the healthcare professionals in charge of attention and detection of victims and to the general public. The delay in informing the public would create a situation of insecurity and alarm in the population, which constitutes one of the targets for terrorists.

In an attempt to prevent these situations and their consequences, which are now increasingly feared in developed countries due to the terrorist attacks in recent years, different strategies have been proposed and rehearsed. The two most important involve the use of dosimeters by the prehospital emergency services[15] that provide attention in the incident and placement of permanent detectors of ionizing radiations in hospital emergency departments, in order to detect the patients exposed on their arrival. Nonetheless, the results of these strategies have been unsatisfactory[19].

Therefore, as a method for detection and transmission of the alert, in those cases where there is no previous knowledge of the release of radioactive material, it is very important for emergency services to be familiar with the symptoms produced by radiological contamination. This requires the existence of an adequate training programme for healthcare professionals[20] and a healthcare information chain that is both agile and effective.

Triage in radioactive incidents

Harmful effects of radioactivity can be classified into two types depending on whether people have been injured by the release of the radioactive material.

In the first type – with injured people – the aim of triage would be double: to prioritise the attention to injuries and to identify the possible radioactive contamination of those affected. As in the present case no people had been injured, and thus, this hypothesis was not included in the aims of our study.

In the case described, the aim was to use a triage methodology that is able to identify the level of exposure in the individuals who had contact with the radioactive sources during the incident. As there is no specific methodology for this, in the first stage it would be adequate to classify victims into three logical categories: a) non-affected, b) exposed and c) contaminated.

Cone et al[21] base the differences between exposure and contamination on the concept of capacity for transmission ("transmissibility") of the radiation after exposure. In exposure, this capacity would be null similar to what would be found in a person after undergoing a radiodiagnostic test such as computerised tomography. In this case, there would be no risk of transmitting radiation to people around the subject or to the healthcare professionals providing care to them. Therefore, the goal of decontamination (internal) would be to decrease the radiation level of the individual in order to reduce its effect. "Contamination", would involve the individual affected becoming a new source of transmission of the radiation, having the capacity to affect people who have contact with them, requiring decontamination methods (internal and external) to also be applied in this sense. It has been described that this type of propagation in radioactive incidents is lower than that expected in secondary contamination caused by chemical agents[21].

Following this system, the first aim of triage in a radioactive incident would be to try to identify the people possibly contaminated in order to transform them into "exposed". In the second place, the aim would be to try to identify the level of radiation absorbed by those affected in order to ensure they receive the appropriate treatment. These two aims would have maximum importance in situations with the characteristics of a catastrophe, that is to say, when there is a real imbalance between victims and resources.

In the present case, of all those affected by Po-210, only the victim of poisoning met the criteria for the definition of "contaminated", while the rest of victims met those for exposure.

A direct relation between the doses of radiation absorbed and the time elapsed until the onset of symptoms[8,18,20,22] has been defined. In this case, as the use of radioactive material was detected three weeks after the release of the product and there were no similar new cases declared, it was easily deducible that those possibly affected would have received a radiation dose lower that that required to present clinical manifestations of ARS.

Besides, considering the type of radioactive agent involved (that presents low capacity of penetration) and the methodology used for release (ingestion or inhalation) it was also deducible that those affected were "exposed" and did not require any active decontamination measures.

Therefore, considering these two assumptions, the aim of triage in this case would be to detect the possible "exposed" to the radiation in order to, once identified, introduce them into the healthcare system to determine the level of radiation absorbed and to apply the adequate treatment.

Use of the healthcare information line (NHS Direct) as a means for the possibly affected to contact the healthcare system and at the same time identifying and selecting those individuals who were possibly contaminated would cover the established triage needs.

The election of the healthcare line in this type of situations is determined by its characteristics such as versatility, accessibility, confidentiality, professionalism, etc. that favour rapid and easy access to the healthcare system by those affected.

This may lead to a doubt between using the emergency telephone numbers or those of healthcare information. In our case, and as in England the model of emergency call management is the "office", without any kind of support by physicians, the election of this type of triage would have been of dubious effectiveness, as it would not cover the expectations established. Therefore, we preferred the designation of the 24 hours a day healthcare information line, handled by nursing professionals and with the only inconvenience of not being free.

In Spain, the management of these situations could be covered by emergency telephone lines such as 061, as healthcare information is included among the functions assigned to this service by the act Real Decreto 1030/2006 that establishes the common services portfolio of the national health system Sistema Nacional de Salud[23]. Besides, they would benefit from the experience acquired by these services in the performance of medical regulation, which is a type of triage. The only problem that can be attributed to their use in this sense could arise in the communities in which this telephone number coincides with that of the healthcare emergencies. The high number of calls received as a consequence of the incident could make access difficult for calls related to medical emergencies. In this case, the creation of a specific telephone number for healthcare information or the use of technological means to divert the calls would be a possibility to consider.

Information in radioactive incidents

In incidents involving radiological material, it is very important that the information given to the population meets the requirements of clarity, veracity and temporality in order to strengthen the credibility of the authorities responsible for handling the incident and the trust in the fact that the emergency situation is under control. By achieving this, psychological sequelae[24] resulting from the incident could be attenuated. Among other effects these sequelae could cause massive attendance of the population to healthcare centres in search of a treatment that is very often unnecessary and that would result in a consequent higher overcrowding of the services[18,25].

Among the multiple ways described to inform the population about the incident, the use of new information technologies such as Internet has achieved a notorious boom.

The usefulness of technological means in the information field in general is based on various aspects such as the following: on one hand, their capacity for collecting, storing and transmitting data, which has been proven in different catastrophe situations[26]; on the other hand, their accessibility and universality, facilitating the transmission of existing data to healthcare professionals, to the media and to the general population; also their versatility, as the information could be published with different aims and functions.

In this sense, there are multiple experiences and publications on the use of Internet as the means for providing general information on radiological, chemical or biological incidents through the creation of generic data sources with information about the risks caused by different types of agents, symptoms developed, adequate treatment and the general management of any type of incident. They can also be used to diffuse information about the specific case[26-28].

In our case, the websites[3] of the institutions involved and notification channels proved to be very useful to inform the population about the evolution of the incident, both in terms of quality and quantity of people affected, about the emergence of new contamination foci and, on a healthcare level, about the transmission of the alert and of the clinical and therapeutic data of ARS through e-mail chains[10].

The effectiveness of these means were justified by the virtually generalised presence of Internet in health centres and hospitals and by their capacity to quickly and effectively disseminate information on pathologies that are unusual in everyday practice or those with which healthcare professionals are not very familiar, such as those in this type of incident.

The important role played by the media in the transmission of information in catastrophe situations and the controversy they generate has been described. In a study about the existing communication problems between public institutions and the media in the management of information in catastrophe situations, Lowrey et al[29] detected that these problems were mainly based on a lack of coordination in spreading the information with the people responsible in the institutions, the multiplicity of information sources, the different perceptions of the incident among journalists and among those responsible in institutions and the lack of knowledge of many journalists, in general, about the complexity of catastrophe situation management.

In the case of Po-210, although the adoption of specific measures concerning the media was not described, the use of the website as a unified means for transmission of information, obtained satisfactory results[3,28].

Finally, the management of information, as it has been defined, should be integrated in the response plans for this type of events prior to the incident. These plans must clearly identify the source appointed as responsible for communication, the means that will be used for information transmission to the different levels involved, and the contents that should be included in the information30. Recommendations also include the need for information managers to be familiar with information transmission methods and to carry out drills together with the media[29,30].

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Envenenamiento con Polonio-210: Manejo de un evento radiactivo con múltiples afectados

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En 2006 se detectó el envenenamiento mortal con Polonio-210 (Po-210) de un ciudadano, causando una dispersión de la contaminación que afectó a miles de personas. Las autoridades sanitarias pusieron en marcha un plan especial para controlar los efectos de la contaminación, atender a los posibles afectados y responder a las necesidades de información de la opinión pública. El caso se caracterizó por un retraso en la detección de la liberación, por la suposición de un gran número de afectados con niveles de contaminación desconocidos y por una gran dispersión geográfica de los afectados. Se utilizo con éxito el *triaje* telefónico y las nuevas tecnologías de la información para el manejo de la situación. En el trabajo se revisan las diferentes características de la detección, del modelo de *triaje* y del manejo de la información en este tipo de sucesos. [Emergencias 2008; 20: 54-63]

Palabras clave: Manejo. Múltiples víctimas. Radiactivo. *Triaje.* Comunicación pública.