Open Access Library Journal
2026, Volume 13, e15894
ISSN Online: 2333-9721
ISSN Print: 2333-9705

Understanding Acute Radiation Syndrome (ARS) and How to Safely Handle & Dispose of Radioactive Decedents

Dina Lenore Cirigliano

Plaza College, New York City, NY, USA
Email: dcirigliano@plazacollege.edu

How to cite this paper: Cirigliano, D.L. (2026) Understanding Acute Radiation Syndrome (ARS) and How to Safely Handle & Dispose of Radioactive Decedents. *Open Access Library Journal*, **13**: e15894.
https://doi.org/10.4236/oalib.1115894

Received: August 14, 2026
Accepted: September 18, 2026
Published: September 21, 2026

Abstract

A minute number of death care professionals are cognizant of how to handle radioactive decedents properly and lay them to rest. This article resolves to: 1) differentiate between radioactivity and radiation, 2) show a correlation between radiation dosages absorbed and the severity and timing of ARS symptoms prior to one's imminent demise, 3) review the means by which the corpses of three historical individuals became radioactive, 4) clarify the protocol for death care industry professionals when handling and disposing of a single radioactive corpse (not a mass casualty occurrence), and 5) recognize what means of final disposition are permissible for radioactive decedents whose demise was a result of ARS.

Subject Areas

Public Health

Keywords

Radioactive Corpse, Death Care Professionals, Acute Radiation Syndrome Fatality, ARS

1. Introduction

Deathcare industry professionals from medical examiners to undertakers to embalmers to crematorium retort operators to grave diggers are proficient in securely managing and providing final disposition to decedents whose bodies are riddled with microorganisms. They know how to care for safely and lay to rest any individual whose demise was a result of bacterial, viral, fungal, or parasitic pathogens. They are trained in protecting themselves and their colleagues from airborne, bloodborne, and direct-contact-transmitted diseases. They are proficient in how to carry out the dispositions of contagious corpses properly, as not to contaminate the community's air, water, and soil in cases of in-ground burial, above-ground internment, and cremation. However, very few are aware of how to properly and cautiously handle, and lay to rest, a radioactive decedent who has passed away as a result of Acute Radiation Syndrome (ARS).

2. Radioactivity vs. Radiation

Radioactivity is the spontaneous process by which unstable atomic nuclei release energy and subatomic particles to achieve a more stable state. It occurs due to these nuclei having an imbalance of protons and neutrons, such as having too many of one or both, or having ones that are too large. Essentially, energetic particles, including protons, neutrons, electrons, photons, neutrinos, or alphas (two neutrons and two protons bound together), are emitted. These are extremely powerful particles, as they have "enough energy to knock electrons off atoms or molecules" [1].

Radiation is what is emitted, or disseminated, as a result of the process of radioactivity. The radiation released from the process of radioactivity permeates human tissues. When radiation pervades human tissues in small doses or across an expanse of time, as in the use of medical X-rays or cancer treatments, the patient's body does not become radioactive. However, when radiation saturates human tissues at a massive dose in a single incident, or at large doses continuously over time, that individual will become radioactive from external irradiation, radioactive contamination, or induced radioactivity. Medically speaking, they are suffering from ARS.

Throughout history, countless individuals have endured ARS only to succumb to its fatal conclusion, leaving behind their radioactive corpses. Most were individuals who were exposed as a result of wartime nuclear attack, as in the 1945 cases of the "Little Boy" bomb dropped on Hiroshima, which contained Uranium-235, and the "Fat Man" bomb dropped on Nagasaki, which contained Plutonium-239 [2]. Still other cases resulted from accidental workplace exposures, like the 1986 mishap of the Number 4 reactor at the Chornobyl Nuclear Power Plant. This occurrence caused those present to "die within weeks of the accident, six of whom were firefighters tasked with attending the fires on the roof of the turbine building" [3].

3. Radiation Dosages Absorbed in Connection to the Severity and Timing of ARS Symptoms Preceding Death

Named after English physicist Louis Harold Gray, units of ionizing radiation doses are measured in grays (Gy) as per the International System of Units, and are defined as the absorption of one joule of radiation energy per kilogram of matter [4]. Regarding whole-body absorbed doses, individuals who absorb 6 - 8 Gy, individuals who absorb 8 - 30 Gy, and individuals who absorb greater than 30 Gy will all suffer from ARS differently in terms of symptoms, severity of symptoms, and time until death, as shown in Table 1.

Table 1. Whole-body absorbed radiation symptoms (immediate) & onset according to dosage of grays (Gy).

Radiation Dosage in Grays (Gy)	Immediate Symptom/Time Since Exposure	Immediate Symptom & Time Since Exposure	Immediate Symptom & Time Since Exposure	Immediate Symptom & Time Since Exposure	Immediate Symptom & Time Since Exposure
6 - 8 Gy	Nausea and Vomiting/Within 10 - 60 Minutes	Heavy Diarrhea/Within 1 - 3 Hours	Moderate Headache/Within 3 - 4 Hours	Moderate to Severe Fever/Within 1 Hour	Cognitive Impairment/Within 24 Hours
8 - 30 Gy	Nausea and Vomiting/Within 10 Minutes	Heavy Diarrhea/Within 1 Hour	Severe Headache/Within 1 - 2 Hours	Severe Fever/Within 1 Hour	Rapid Incapacitation/Within 24 Hours
30+ Gy	Nausea and Vomiting/Within 2 - 5 Minutes	Heavy Diarrhea/Within 1 Hour	Severe Headache/Within 1 Hour	Severe Fever/Within 1 Hour	Seizures, Tremor, Ataxia, and Lethargy/Within 24 Hours

Regarding the symptoms of nausea and vomiting, ARS sufferers who absorbed 6 - 8 Gy will have an onset of these symptoms between ten and sixty minutes from the time of exposure, those who absorbed 8 - 30 Gy will have an onset of these symptoms within ten minutes from the time of exposure, and those who absorbed more than 30 Gy will have an onset of these symptoms within two to five minutes of exposure [5].

With regard to the symptom of heavy diarrhea, ARS sufferers who absorbed 6 - 8 Gy will have an onset between one and three hours, while those who absorbed 8 - 30 Gy and those who absorbed over 30 Gy will have an onset within the hour of the exposure [5].

As far as the symptom of headache is concerned, ARS sufferers who absorbed 6 - 8 Gy will have a moderate headache between three and four hours after exposure. Those who absorbed 8 - 30 Gy will have a severe headache between one and two hours from the time of exposure. Those who absorbed more than 30 Gy will have a severe headache within an hour of exposure [5].

The symptom of a moderate to severe fever will impact ARS sufferers who absorbed 6 - 8 Gy within the hour of radiation exposure, while the symptom of a severe fever will impact those who absorbed 8 - 30 Gy, and those who absorbed over 30 Gy also within the hour of exposure [5].

Central Nervous System (CNS) function symptoms are also a toll of ARS. Sufferers who absorbed 6 - 8 Gy will experience cognitive impairment within twenty-four hours of the radiation incident. Those who absorbed 8 - 30 Gy will experience rapid incapacitation within twenty-four hours, and those who absorbed greater than 30 Gy will suffer seizures, tremor, ataxia, and lethargy within twenty-four hours [5].

While the previously-mentioned symptoms are considered immediate, the latter are categorized as latent in that they may take up to seven days to manifest, as shown in Table 2. Sufferers who absorbed 6 - 8 Gy will endure severe leukopenia, dizziness, disorientation, hypotension, and electrolyte disturbance, along with continuing high fever, diarrhea, and vomiting until their ultimate demise within two to four weeks from the radioactive incident. Those who absorbed 8 - 30 Gy will endure continued nausea, vomiting, severe diarrhea, and high fever, as well as electrolyte disturbance and shock prior to their expiration between two days and two weeks after the absorption of radiation. Those who absorbed greater than 30 Gy have no latent symptoms, as they expire one to two days post-exposure [5]. There is no way to stop the progression of radiation's lethal effects when 6 Gy or greater is absorbed by a human being. There is no antidote for radiation.

Table 2. Whole-body absorbed radiation symptoms (latent) & onset according to dosage of grays (Gy) and time until expiration.

Radiation Dosage in Grays (Gy)	Latent Symptom/Time Since Exposure	Mortality Time
6 - 8 Gy	Leukopenia, Dizziness, Disorientation, Hypotension, Electrolyte Disturbance, Continuing High Fever, Continuing Diarrhea, and Continued Vomiting/2 - 4 Weeks	2 - 4 Weeks
8 - 30 Gy	Continued Nausea, Vomiting, Severe Diarrhea, High Fever, Electrolyte Disturbance, and Shock/2 Days - 4 Weeks	2 Days - 4 Weeks
30+ Gy	N/A—No Latent Period Exists	Within 48 Hours

4. Noteworthy, Distinct Radioactive Corpses

Not all sufferers of ARS absorbed radiation as a result of a nuclear bomb or an accident at a nuclear power plant where mass casualties occurred. Some absorbed radiation under very unique and individualized circumstances. Radioactive decedents in 2026 have confirmed internal or external radionuclide contamination above a measured regulatory or institutional threshold. However, during earlier times, there was no authoritative medical-historical evidence because advanced testing procedures had not yet been perfected and administered.

The first and best-known radioactive corpse is that of two-time Nobel Prize winner Marie Curie, the chemist and physicist who coined the term "radioactivity" while researching the properties of pitchblende and chalcolite, both of which are uranium ores. In doing so, she discovered radium and polonium, both of which are highly radioactive. "She often carried test tubes containing radioactive isotopes in her pocket and stored them in her desk drawer, remarking on the pretty blue-green light that the substances gave off in the dark" [6]. Unbeknownst to Curie, toxic effects from repetitive, unprotected exposure to radiation resulted in her ARS, succumbing to it finally in the year 1934 (See Figure 1). Her radioactive remains are interred in France in a coffin lined with approximately an inch of lead within a vault to protect the public and the air. Additionally, Curie's laboratory notes remain extremely radioactive and are now stored in lead-lined boxes at France's Bibliothèque Nationale in Paris. Museum visitors may access her notes only if they wear a protective suit and sign a waiver of liability regarding their exposure to Radium-226 [7].

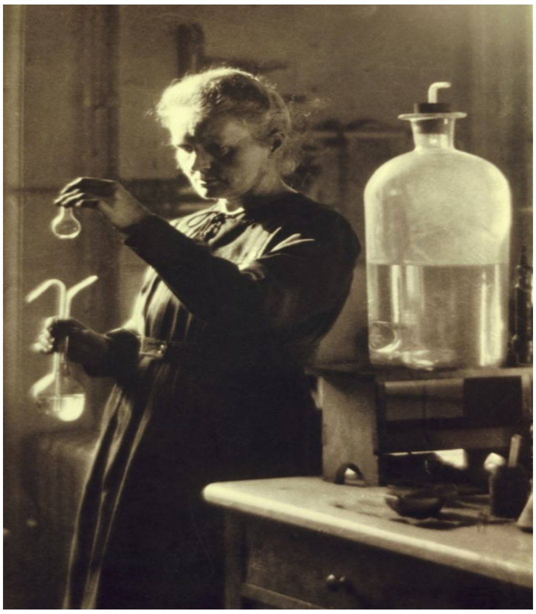

Figure 1. Marie Curie at work with chemicals unknown in her laboratory (Courtesy of the *Wall Street Journal* [13]).

The second prominent radioactive corpse is that of Eben McBurney Byers, a "wealthy American socialite, athlete, and industrialist" [7]. After suffering an arm injury from a fall in the early 1900's, his doctor suggested that he take Radithor, a pain medication containing high concentrations of radium, unaware at that time of the devastating radioactive damage that would ensue (See **Figure 2**). Having persistent pain, Byers consumed nearly 1400 bottles of Radithor. When he died, he had absorbed so much radium that he had already lost most of his jaw, and large holes were forming in his skull. Byers was buried in Pennsylvania's Allegheny Cemetery in a lead-lined coffin within a vault to protect the public, the air, the groundwater, and the soil.

Figure 2. Original corked bottles of Radithor (Courtesy of the *Journal of the American Medical Association* [14]).

The third noteworthy radioactive corpse is that of former KGB Officer Alexander Litvinenko, who managed to escape Russian prosecution and gain political asylum in the United Kingdom. He was a whistleblower in 1998, accusing his superiors publicly of assassinating Russian businessman Boris Berezovsky [8]. Settled in with his family in exile in London, having gained British citizenship, he felt safe enough to meet with two familiar former Russian intelligence contacts, Andrei Lugovoi and Dmitry Kovtun, at a nearby hotel's restaurant for tea (See **Figure 3**). During the meeting, his tea was intentionally contaminated with Polonium-210, a highly radioactive isotope [9]. At the hospital, it was initially assumed that he was suffering from gastroenteritis [10], but his diagnosis of ARS was confirmed after his blood and urine samples were sent to the UK's Atomic Weapons Establishment (AWE), where they were tested for radioactive poison using gamma spectroscopy [11]. He died three weeks later, and on his deathbed, Litvinenko accused Russian President Vladimir Putin of being behind his death. Informally, British authorities declared that they are 100% certain of who poisoned Litvinenko, but they did not reveal their proof in case of a forthcoming trial [12]. The main suspect in the case, Andrei Lugovoi, remains in Russia, and as a member of the Duma, he has full immunity from prosecution. Litvinenko's body is buried in London's Highgate Cemetery, not far from the grave of philosopher Karl Marx, in a lead-lined casket within a vault to protect the public, the air, the groundwater, and the soil.

Figure 3. Pine Bar inside the Millennium Hotel (now operating as The Biltmore Mayfair), where Polonium-210 was slipped into Litvinenko's tea (Courtesy of The Biltmore Hotels [15]).

5. Single Radioactive Corpse Protocol for Deathcare Industry Professionals

Maintaining the safety and health of deathcare professionals is the top priority when it comes to handling and disposing of radioactive decedents. Deathcare professionals must not divert from the strict protocol and order of operations outlined. The protocol in this section does not apply to a mass casualty occurrence, such as a nuclear power plant workplace accident or a nuclear wartime bombing. This would require establishing perimeters for first responders on the scene and launching field morgue operations as specified by the United States Department of Health and Human Services' Radiation Emergency Medical Management (REMM) unit. The protocol in this section applies to handling a single radioactive corpse.

First and foremost, the deathcare industry professional who is receiving the radioactive decedent from hospital quarantine is obligated to inform the state's Radiation Control Officials that they are retrieving a radioactive decedent. This deathcare professional will be the funeral director or undertaker. State contact information is available at https://crcpd.org/ for the Conference of Radiation Control Program Directors, Inc. If the decedent crosses state lines, both states must be notified. If the decedent is to pass through multiple states, all states the decedent passes through must be notified. Additionally, the decedent must be transported in a lead-lined, rigid container, as "standard body bags use flexible, heavy-duty PVC, PEVA, or vinyl to contain fluids and pathogens, not radiation" [16].

Medical Examiners (MEs) and coroners will not be involved whatsoever, as REMM advises the following: "Do not autopsy internally contaminated bodies. Pathologists performing the autopsy may receive significant radiation dose to the hands" [17], even with Personal Protective Equipment (PPE). Upon arrival at the funeral home, all professionals handling the decedent must wear Level A PPE prior to opening the lead-lined, rigid container holding the corpse. It is noteworthy that PPE prevents the transfer of contamination but does not, itself, shield personnel from penetrating radiation. Traditional donning procedures apply and include "Respiratory Protection: positive-pressure, full-face piece Self-Contained Breathing Apparatus (SCBA) or positive pressure Supplied Air Respirator (SAR) with SCBA-type auxiliary escape respirator…. Clothing: Totally encapsulating chemical- and vapor-protective suit, chemical-resistant inner suit (e.g., Tyvek coveralls), long underwear…. Gloves: inner and outer chemical-resistant gloves…. Boots: chemical-resistant boots" [17]. Additionally, a lead apron may be used to cover and shield a contaminated decedent while they await processing after being removed from the lead-lined, rigid container.

A radioactive decedent should never be embalmed, as the embalming process "increases radiation risk to funeral home staff" [17]. In addition, extremely rapid disposition of internally contaminated decedents is adamant, so the funeral director will advise the decedent's family that "conducting a memorial service without the body present minimizes potential radiation exposure to mourners and funeral home staff" [17].

Wooden coffins/caskets are not sealed against elements entering or exiting the container and are never used for a radioactive corpse. This is non-negotiable for public safety reasons. The radioactive decedent will be placed in a lead-lined, metal coffin/casket which has a seal that retards contaminated bodily fluids from escaping and entering groundwater, soil, and eventually air. After the coffin/casket is sealed, doffing of PPE according to traditional protocol can occur for those who handled the decedent.

6. Means of Final Disposition Permissible for Radioactive Decedents

Despite a decedent's previously-expressed wishes to be cremated, cremation cannot occur for an internally-contaminated radioactive corpse under any circumstance. "Radioactive contamination of the crematorium facility and environment surrounding it is highly likely" [17] if a radioactive decedent is cremated. The only options for the radioactive are interment or in-ground burial.

Cemetery employees should be directed by their managers that protocol demands a metal or concrete vault to encase the metal casket, and that optimizing a tight seal is key to effective vault utilization. Additionally, it is mandatory for them to "affix a discrete radiation warning label to the exterior of vault indicating the radiation dose rate from buried decedent and date/time of measurement" [17]. This information can be obtained from hospital records regarding the decedent's labs and includes radionuclide identity, activity, distribution, measured dose rate, contamination surveys, and applicable regulations.

It is pertinent to remember that, with regard to radioactivity, all isotopes have distinct decay rates. For example, Radium-226 has a half-life of 1600 years, which means that Marie Curie's corpse will remain radioactive for approximately 1500 more years. For this reason, exhumation of a radioactive corpse must never occur, and radioactive graves must never be disturbed.

7. Conclusion

It is pertinent for deathcare industry professionals to be trained on how to correctly and guardedly handle, and lay to rest, a decedent who has passed away as a result of ARS. While radioactive corpses are few and far between, the mishandling of them could cost a funeral home worker their own life and the lives of their colleagues. Interment or burial that does not adhere to protocol set by cemetery employees can cost a community its groundwater, soil, and eventually its air. As long as radioactive elements exist, instances of ARS will occur, and as long as instances of ARS occur, deathcare professionals will need to be prepared for the call of a lifetime.

Conflicts of Interest

The author declares no conflicts of interest.

References

[1] United States Department of Energy (2026) DOE Explains… Radioactivity. USDOE Office of Science.
https://www.energy.gov/science/doe-explainsradioactivity#:~:text=These%20particles%20have%20enough%20energy%20to%20knock,matter%20*%20Medi-

cine%20*%20Chemistry%20*%20Energy

[2] Atomic Heritage Foundation (2014) Science behind the Atom Bomb. Nuclear Museum. https://ahf.nuclearmuseum.org/ahf/history/science-behind-atom-bomb/

[3] World Nuclear Association (1995) Chernobyl Accident. World Nuclear Association Information Library. https://world-nuclear.org/information-library/safety-and-security/safety-of-plants/chernobyl-accident

[4] Bureau International des Poids et Mesures (2010) BIPM Technical Services: Radiation Dosimetry. https://www.bipm.org/en/dosimetry

[5] Merck Manual (2017) Radiation Exposure and Contamination. Merck Manuals Professional Edition. https://www.merckmanuals.com/professional/injuries-poisoning/radiation-exposure-and-contamination/radiation-exposure-and-contamination

[6] Hanton, A. (2010) 10 Famous Incidences of Death by Radiation. Listverse Science. https://listverse.com/2010/03/25/10-famous-incidences-of-death-by-radiation/

[7] Moul, R. (2023) Marie Curie's Body Was So Radioactive She Was Buried in a Lead-Lined Coffin. ILF Science. https://www.iflscience.com/marie-curies-body-was-so-radioactive-she-was-buried-in-a-lead-lined-coffin-69080

[8] Harding, L. (2016) A Very Expensive Poison: The Definitive Story of the Murder of Litvinenko and Russia's War with the West. Guardian Faber Publishing.

[9] Gray, R. (2007) Litvinenko Waiter Recounts Polonium Poisoning. Daily Telegraph London. https://www.telegraph.co.uk/news/uknews/1557492/Litvinenko-waiter-recounts-polonium-poisoning.html

[10] Nathwani, A.C., Down, J.F., Goldstone, J., Yassin, J., Dargan, P.I., Virchis, A., *et al.* (2016) Polonium-210 Poisoning: A First-Hand Account. *The Lancet*, **388**, 1075-1080. https://doi.org/10.1016/s0140-6736(16)00144-6

[11] Watson, R. (2015) Litvinenko: A Deadly Trail of Polonium. BBC News. https://www.bbc.com/news/magazine-33678717

[12] Naughton, P. (2006) British Police Arrive in Moscow to Hunt for Spy Death Clues. Times Online. https://web.archive.org/web/20080517044504/http://www.timesonline.co.uk/tol/news/world/article659441.ece

[13] Crumey, A. (2021) Three on Marie Curie: Elements of a Life. *Wall Street Journal*. https://www.wsj.com/arts-culture/books/three-on-marie-curie-elements-of-a-life-11627658176

[14] Macklis, R.M. (1990) Radithor and the Era of Mild Radium Therapy. *JAMA: The Journal of the American Medical Association*, **264**, 614-618. https://doi.org/10.1001/jama.1990.03450050072031

[15] The Biltmore Mayfair (2026) Pine Bar. The Biltmore Hotels. https://www.thebiltmorehotels.com/en/biltmore-mayfair/dining-and-entertainment/Pine-Bar

[16] Classic Plastics Corporation (2026) Cremation Safe Cadaver Bags. https://www.classicplasticscorp.com/product-category/cadaver-bags/cremation-safe-cadaver-bags/

[17] Radiation Emergency Medical Management (REMM) (2026) Management of the Deceased in Radiation Emergencies. United States Department of Health and Human Services. https://remm.hhs.gov/deceased.htm#autopsy