Before the creation of the secret cities of Los Alamos, Oak Ridge and Hanford, the Manhattan Project hired the Mallinckrodt Chemical Works of St. Louis to refine the first uranium used in the atomic bomb dropped on Hiroshima. For the next two decades, Mallinckrodt continued its classified work for the Atomic Energy Commission during the Cold War. The resulting radioactive waste contaminated numerous locations in the St. Louis area some of which have not been cleaned up 70 years after the end of World War II. Told through the eyes of an overexposed worker, the story expands through a series of interviews that careen down a toxic pathway leading to a fiery terminus at a smoldering, radioactively-contaminated landfill. The First Secret City is a feature-length documentary that reveals a forgotten history and its continuing impact on the community in the 21st Century, uncovering past wrongdoing and documenting the renewed struggles to confront the issue. For more on the First Secret City click here.
The incredible story of the young women of Oak Ridge, Tennessee, who unwittingly played a crucial role in one of the most significant moments in US history.

At the height of World War II, Oak Ridge, Tennessee, was home to 75,000 residents, consuming more electricity than New York City. But to most of the world, the town did not exist. Thousands of civilians—many of them young women from small towns across the South—were recruited to this secret city, enticed by solid wages and the promise of war-ending work. Kept very much in the dark, few would ever guess the true nature of the tasks they performed each day in the hulking factories in the middle of the Appalachian Mountains. That is, until the end of the war—when Oak Ridge’s secret was revealed.

Drawing on the voices of the women who lived it—women who are now in their eighties and nineties—The Girls of Atomic City rescues a remarkable, forgotten chapter of American history from obscurity. Denise Kiernan captures the spirit of the times through these women: their luck, their desire to contribute, and their enduring courage. Combining the grand-scale human drama of The Worst Hard Time with the intimate biography and often troubling science of The Immortal Life of Henrietta Lacks, The Girls of Atomic City is a lasting and important addition to our country’s history. Check out the full video here. (Cont. on pg. 3)
THE MANHATTAN PROJECT’S SECRET CITY: (cont.)

1) Oak Ridge, Tennessee, was the headquarters of the Manhattan Project

2) Thousands were recruited to live and work in secret cities, unaware of the project’s scope

3) Women workers were essential to the success of this project

4) Secrecy and security dominated the landscape

5) An unexpected community blossomed

Smoke Detectors

It’s hard to believe, but people sometimes ask if smoke detectors are safe. Let’s be clear about this, it is unsafe not to have one!

There are two types of smoke detectors: optical smoke detectors (OSDs) and ionization chamber smoke detectors (ICSDs). The former perform best with smoldering fires that generate relatively large airborne particulates. The latter work best with fast burning fires that generate comparatively small particulates (0.01 to 1.0 um).

The ionization chamber smoke detector was invented in the early 1940s in Switzerland, and introduced into the U.S. in 1951.

The sensitive component of the ICSD is an ionization chamber that is open to the atmosphere. A radioactive source inside the chamber emits radiation that ionizes the air in the chamber and makes it conductive.

If smoke particles enter the chamber, some of the ions combine with the particles and the flow of the current decreases. The smoke detector works by monitoring the electrical current flowing through the chamber. When the current drops, it is assumed that this decrease is due to smoke and an alarm is activated. The details of the mechanism by which the smoke particles reduce the chamber current is described in NUREG-1717 as follows. Under normal operating conditions, the room air currents cause some of the ions moving towards the electrodes to be swept out of the chamber. This causes the electrical current to be slightly lower than what would exist in the absence of air flow, but unless the rate of loss of ions from the chamber changes, the electrical current is stable. When smoke particles get into the chamber and combine with these ions, the particles become charged and they move to the electrodes. Since the charged smoke particles are larger than free ions, their mobility is lower and their drift time to the electrodes is longer. This increased drift time means that a greater fraction of the charge will be swept out of the chamber volume by the room air currents. The reduction in the collected charge means a reduced current. (cont. pg. 5)
Dental X-rays are a useful diagnostic tool when helping your dentist detect damage and disease not visible during a regular dental exam. How often X-rays should be taken depends on your present oral health, your age, your risk for disease, and any signs and symptoms of oral disease. For example, children may require X-rays more often than adults because their teeth and jaws are still developing and their teeth are more likely to be affected by tooth decay than those of adults. Your dentist will review your history, examine your mouth and then decide whether or not you need X-rays.

If you are a new patient, the dentist may recommend X-rays to determine the present status of your oral health and have a baseline to help identify changes that may occur later. A new set of X-rays may be needed to help your dentist detect any new cavities, determine the status of your gum health or evaluate the growth and development of your teeth. If a previous dentist has any radiographs of you, your new dentist may ask you for copies of them. Ask both dentists to help you with forwarding your X-rays.

Dental X-ray exams are safe; however, they do require very low levels of radiation exposure, which makes the risk of potentially harmful effects very small. Dental X-ray tools and techniques are designed to limit the body’s exposure to radiation and every precaution is taken to ensure that radiation exposure is As Low As Reasonable Achievable (the ALARA principle). A leaded apron minimizes exposure to the abdomen and may be used when it will not interfere with acquisition of the dental radiograph. Also, a leaded thyroid collar can protect the thyroid from radiation, and should also be used whenever possible. The use of a leaded thyroid collar is recommended for women of childbearing age, pregnant women and children.

Are you pregnant? Make sure to tell your dentist. During your pregnancy, you may need to have X-rays taken as part of your treatment plan for a dental disease. Use of the leaded apron and thyroid collar will protect you and your fetus from radiation exposure. Dental X-rays do not need to be delayed if you are trying to become pregnant or are breastfeeding.

Do you have questions about dental X-rays and children? Talk to your child’s dentist. Image Gently, a campaign designed to make conversations with dental and medical professionals easier, has developed this brochure to help answer some common questions you may have.
Smoke Detectors (cont.)

Production Data

In 1973, only 250,000 ionization type smoke detectors were sold. Most of these went to public and commercial buildings. Relatively few were installed in homes. This number increased dramatically over the next five years - in 1978, approximately 14 million ICSDs were sold, mostly for use in homes. Over this period, the percentage of homes with smoke detectors rose from 10% to 77%. At present, over 80% of homes are believed to have one or more ICSDs.

Radioactive Source

Ionization chamber smoke detectors almost always use alpha emitters as the source because of the high density of the ionization that they produce.

Most ICSDs sold today use an oxide of americium-241 (Am-241) as the radioactive source. The typical activity for a modern residential ICSD is approximately 1 uCi, while the activity in one used in public and commercial buildings might be as high as 50 uCi. In 1980, the average activity employed in a residential smoke detector was approximately 3 uCi, three times higher than it is today:

Am-241 is an alpha emitter, but it also emits a low energy (59.5 keV) gamma ray. The Am-241 is mixed with gold and incorporated into a composite gold and silver foil sandwich. The source is 3 to 5 mm in diameter, and either crimped or welded into place inside the chamber.

Other nuclides have also been used. NRC records indicate that approximately 124,000 ICSDs were sold between 1971 and 1986 that employed nickel-63 (Ni-63). These units averaged approximately 10 microcuries of Ni-63 each.

Radium-226 (radium sulfate) was the first radioactive source used in smoke detectors. According to NUREG/CP-0001, U.S. producers stopped making Ra-226 containing smoke detectors in 1963 when they switched to Am-241. Nevertheless, according to NCRP 95, it would seem that radium-containing ICSDs continued to be sold in the U.S. at least until 1978. A typical residential smoke detector contained 0.05 uCi of Ra-226, but some contained up to 0.1 uCi. Commercial smoke detectors employed considerably higher activities.

Apparently the U.S. Army at one time purchased smoke detectors using uranium as the source but I have no details concerning this.

Dose Estimates

Based on data reported by the manufacturers, Belanger et al estimated that the exposure rate at 1 meter from a bare 1 uCi Am-241 source was 0.011 urem/hr, while the exposure rate for an assembled detector would be approximately 0.007 urem/hr. A measurement by Schmidt-Hannig et al indicated that the exposure rate at one meter from a bare 1 uCi Am-241 source was 0.009 urem/hr. This was quite similar to Belanger et al’s estimate. To obtain an accurate estimate of such an exposure rate, it would be necessary to account for the attenuation of Am-241’s very low energy photons in the source, the smoke detector housing and the air. Because they did this, the following estimate of O’Donnel et al, is assumed to be one of the most accurate available: 0.0013 urem per hour at one meter from an ICSD containing a 1 uCi Am-241 source.

NUREG-1717 estimated an annual effective dose equivalent of 0.001 mrem to an individual who purchase and installs two smoke detectors, and sleeps 8 hours per day in a bedroom in which an ICSD is located at a distance of two meters.

To estimate the doses that an individual might receive as a result of the inhalation of Am-241 released during a fire, NUREG-1717 assumed that 0.01% of the source material would become airborne. Given this assumption, they estimated that someone escaping a residential fire might receive 0.004 mrem. Similarly, a firefighter wearing a respirator was estimated to receive < 0.001 mrem fighting a residential fire, 0.3 mrem fighting a transportation fire (7,200 smoke detectors), and 0.3 mrem fighting a warehouse fire (36,000 smoke detectors). (cont. on pg. 6)
Laboratory and Radiation Safety are updating training programs and migrating them to blackboard. DOT Hazmat Training and OSHA Laboratory safety training are currently live and will be joined by Radiation Safety Training in the near future. Please contact Dave Schleter for Laboratory Safety, Crystal Brooks for DOT Hazmat, and Alan Watts for Radiation Safety enrollment. The courses were made in coordination with the Office of Instructional Design in the Department of Instructional Innovation.

• The following courses are now available to be taken in Blackboard:
  • OSHA Bloodborne Pathogens Initial
  • OSHA Bloodborne Pathogens Annual Refresher
  • DOT HAZMAT
  • Ohio University Research and Lab Safety Overview
  • Laboratory Accident Review
  • Safe operation of Fume Hoods
  • Fire Safety and the Safe use of Fire Extinguishers
  • OSHA GHS and Hazardous Communications

If you are interested in exploring or taking these courses, or if you would like to sing up your employees you may contact the Laboratory and Radiation Safety Office at brooksc3@ohio.edu or schleted@ohio.edu

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