

History of Radiation Timeline

(from [Pacific Northwest National Laboratory](http://lowdose.energy.gov/timeline.aspx) under contract with the DOE Low Dose Radiation Research Program -- <http://lowdose.energy.gov/timeline.aspx>)

- 1895** Wilhelm Konrad Roentgen **discovers x-rays**.
- 1896** Antoine-Henri **Becquerel discovers rays produced by uranium**, the first observation of natural radioactivity. Concerns first raised about **possible injuries** from x-ray exposures. Elihu Thomson conducts **experiments on x-ray burns**.
- 1898** Marie and Pierre **Curie discover that thorium gives off "uranium rays,"** which Marie renames "radioactivity." Marie and Pierre Curie discover polonium and announce the existence of another new radioactive element they name radium. Paul Ulrich Villard **discovers gamma rays**.
- 1899** First malpractice lawsuit is awarded for x-ray burns. Ernst Rutherford discovers that radioactivity from uranium has at least two different forms, which he calls **alpha and beta rays**. Fritz Geisel, Antoine-Henri Becquerel, and Marie Curie prove that **beta rays consist of high-speed electrons**.
- 1900** Paul Ulrich Villard is the first to observe that **gamma radiation is more penetrating than x-rays**.
- 1901** Wilhelm Konrad **Roentgen wins the Nobel Prize** in physics for his discovery of x-rays. **X-rays are shown to be lethal to mammals** through experiments conducted by W.H. Rollins.
- 1903** Antoine-Henri **Becquerel and, Pierre and Marie Curie share the Nobel Prize** for physics, Becquerel for his discovery of natural radioactivity, and the Curies for their study of radioactivity. First observation notes that **radioactivity can induce tissue and organ damage**. George Perthes discovers that x-rays can inhibit the growth of tumors and proposes the use of x-rays in the treatment of cancer.
- 1911** **First reports linking x-rays to leukemia and cancer** in physicians is published. Arthritis patient dies from Radium-226 injections.
- 1912** **Hundreds of young women** working in plants in New York and Illinois are accidentally **exposed to a luminous paint containing radium while painting dials for watches and clocks**.
- 1913** Hans **Geiger unveils his radiation detector**.
- 1915** British Roentgen Society **proposes standards for radiation protection of workers**.
- 1920** **First x-ray protection committee** is formed by the American Roentgen Ray Society.
- 1922** Film badges first developed to measure exposures to radiation. Amelia Maggia is first of the "**Radium Dial Painters**" to die from radiation poisoning.
- 1924** **First radiation tolerance dose proposed** by Arthur Mutscheller for use as a guide to limiting exposure of an individual to radiation.
- 1927** H.J. Muller shows that **mutations can be induced in *Drosophila melanogaster*** by low levels of x-rays.
- 1930** Charles Lauritsen develops **high-voltage x-ray machine for radiation therapy**.
- 1936** The "**Martyrs Memorial**" is erected in Hamburg, Germany containing the names of **169 physicians and technicians who died from radiation-induced diseases**.
- 1938** Otto Hahn is the **first to split the atom of uranium**, opening up the possibility of a **chain reaction**.
- 1939** **Lise Meiter**, who worked with Otto Hahn on splitting the uranium atom, leaves Austria as World War II is beginning and goes to Sweden. She publishes a paper on the work she did with Hahn, and **this paper stimulates the drive to produce the atomic bomb**.

- 1941** Glenn Seaborg **discovers plutonium**.
The **U.S. Committee on X-ray Protection** recommends adoption of maximum body burden of **0.1 microCurie** for radium.
L.S. Taylor **recommends lowering the x-ray exposure dose to 0.02 Roentgens/day**.
- 1942** The **Manhattan Project** is formed to secretly build the atomic bomb; Los Alamos, New Mexico, is selected as the site
H.M. Parker **shows that a radiation dose of 4 Roentgens/day is hazardous to humans**.
The **world's first nuclear reactor is activated** Oak Ridge, Tennessee.
- 1943.** Studies exploring the **toxicology of uranium begins** at the University of Rochester.
- 1945** **First atomic bomb is exploded in the desert near Alamogordo, New Mexico**.
"Little Boy," the **second atomic bomb, is dropped on Hiroshima**.
"Fat Man," the **third atomic bomb, is dropped on Nagasaki**.
The **Joint Committee for the Investigation of the Effects of the Atomic Bomb in Japan** formed.
Eighteen human subjects are injected intravenously with plutonium at Los Alamos to determine how it is distributed in the body and what adverse effects are induced.
Nuclear physicist and future Director of the Oak Ridge National Laboratory, Alvin M. Weinberg, tells the Senate's Special Committee on Atomic Energy that "**Atomic power can cure as well as kill. It can fertilize and enrich a region as well as devastate it. It can widen man's horizons as well as force him back into the cave.**"
- 1946** Oak Ridge National Laboratory forms a **Biology Division for the purpose of studying the biological effects of radiation**.
Argonne National Laboratory is **established as the nation's first national laboratory devoted to exploring the applications and effects of radiation**.
Helmuth Ulrich publishes paper showing **leukemia rate among radiologists to be 8 times higher than in other medical doctors**.
Bill and Liane Russell begin their **extensive experiments with mice to study the genetic effects of radiation**
Congress passes Public Law 79-585 (The U.S. Atomic Energy Act) creating the **Atomic Energy Commission (AEC), charged with conducting a comprehensive program of research and development related to the utilization of fissionable and radioactive materials for medical, biological, and health purposes**.
President Truman directs the National Academy of Sciences to initiate studies to determine the long-term effects of the atomic bomb on survivors.
- 1947** Atomic Bomb Casualty Commission (**ABCC**) **created to study the biological effects of radiation on Japanese atomic bomb survivors**.
Ames Laboratory established in Iowa as a result of a project (
- 1949** **USSR explodes its first atomic bomb**.
- 1950** President **Truman calls for atomic testing of nuclear weapons in the continental United States** in addition to testing in the Pacific.
Studies of the **effects of radium on beagle dogs begin** at the University of Utah and the University of California at Davis.
- 1951** **First atomic test occurs in Nevada**; five bombs detonated on successive days. Radioactive fallout reaches the New England area in two days.
- 1955** Several **state health officials** in areas exposed to nuclear fallout from the Nevada bomb tests conducted during the 1951-1954 period **begin speaking out on the possible adverse health effects** of bomb fallout.
- 1956** A National Academy of Sciences Committee issues a **report asserting no safe threshold for radiation exposure**. The report condemns the excessive use of x-rays in medical and dental practices, exposures to pregnant women, and people being fitted for shoes. Former AEC official, John C. Bugher, declares at an American Public Health Association meeting that an atomic power program would present a much greater health threat than nuclear weapons, due to large quantities of radioactive chemicals emitted into the environment during power generation.
Debate begins among scientists and politicians about the hazards of radiation to human populations.
The United States **explodes the first airborne hydrogen bomb over Bikini Atoll in the Pacific**.