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A forgotten radiation pioneer

By John E. Foley

Fifty years ago tomorrow, on April 10, 1945, Ebeneezer Cade, a 53-year-old man injured in an automobile accident, was injected intravenously – without his knowledge or consent – with 4.7 micrograms of plutonium in an experiment conducted at the Manhattan Engineer District Hospital in Oak Ridge, Tenn. This human plutonium experiment, the first of 18 done on U.S. citizens between April 1945 and July 1947, was endorsed by Robert Oppenheimer, director of the Los Alamos Laboratory, to obtain the metabolic conversion factor that was urgently needed to protect the health of workers at Los Alamos who were fabricating the plutonium components for the first atomic bombs during World War II. The experiment was done in Oak Ridge because Oppenheimer felt that Los Alamos lacked the appropriate medical research facilities for animal or human experimentation and that "it is desirable if these can in any way be handled elsewhere not to undertake them here."

By mid-May 1945, the Los Alamos researchers who directed this experiment established that the conversion factor between the amount of plutonium in the 24-hour excretion rate of urine by humans and the total amount of plutonium in the body "seems to be about 0.02 percent." Fortunately, this conversion factor was obtained in time to keep the exposure of Los Alamos workers below or near the tolerance standard of 1.0 microgram of plutonium.

Although three human plutonium experiments were done before the end of the war – a second started by the University of Chicago on April 26 and a third by the University of California-San Francisco on May 14 – it was the experiment on Cade that provided the information so vital to the health of the Los Alamos plutonium workers.

And even though the two dozen workers who received significant exposures to plutonium at Los Alamos during the war have received periodic health check-ups during the past 50 years to see if there are long-term effects from plutonium exposure, Cade's health was not followed after he left the hospital in Oak Ridge. In March 1950, a Los Alamos researcher suggested that Cade be contacted for additional urine samples, but by then he had become lost – and was eventually forgotten.

Fifteen more individuals were injected with plutonium in the two years following the war, 11 of them in a joint project of Los Alamos and the University of Rochester. As with Cade, most of these individuals were lost to researchers by the early 1950s.

However, in the late 1960s medical records of these individuals were rediscovered by a researcher at the Lawrence Berkeley Laboratory, and concerns about the ethics of the human experiments were finally raised, especially about informed consent. And although the evidence of consent is unclear in many of the experiments, it is clear that Cade was

never informed he had been injected with plutonium. In an interview in 1974, the military doctor who performed the injection on Cade "emphatically stated that no consent was obtained from the patient at any time."

Cade, an African-American construction laborer, died of natural causes, not related to plutonium, on April 13, 1953, eight years after the injection. He never knew he had been the subject of the human plutonium experiment that was so important to Los Alamos and to the war effort.

Most of us first became aware of the 18 human plutonium experiments from the Pulitzer Prize winning series of articles in the *Albuquerque Tribune* in November 1993, which told the human story of several of the individuals used in these experiments. This series was followed by a nationwide flood of news reports critical of the experiments because of lack of consent and because some were done on the more vulnerable members of society, such a Cade. At the same time, many medical and nuclear scientists defended the experiments because of the urgency and secrecy of World War II and the Cold War.

Haze O'Leary, the Secretary of Energy, established the Advisory Committee on Human Radiation Experiments in January 1994 to examine the ethics of these and other human radiation experiments. Although this Advisory Committee will not release its findings until later this spring, we can anticipate it will find both good and bad examples of ethical behaviors. For example, the motive for doing the experiments, the protection of plutonium workers, will be found to be ethically sound, whereas some of the means and ends, such as failure to obtain consent or to provide periodic health check-ups, will be ethically weak.

In addition, although the experiments on Cade and others provided important health information, the Advisory Committee will also uncover scientific shortcomings, such as the failure to obtain important long-term metabolic data because of lack of follow-up.

And in the intense heat of the complex political, legal, scientific, and ethical debates that will undoubtedly follow the release of the findings, we should not lose sight of the fact that – when looked at in terms of such basic human values as honesty, caring, responsibility, and respect for others – it is simply wrong that Ebeneezer Cade was never asked if he was willing to participate in the experiment, that his health was never followed, and that he was forgotten.

A tomorrow, on the 50th anniversary of this historic experiment, it is simply right to remember.

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