

3 The Postwar Studies of Radium Cases

The Program at the Massachusetts Institute of Technology

Even before the Atomic Energy Commission (AEC) was created, Evans (1981) was asked by the Office of Naval Research to continue his radium studies. After the formation of the AEC in 1946, the laboratory at MIT received continual support from this source for its radium work. Within a few years, a paper was published that reviewed in detail 30 patients who had carried internally deposited radium for many years (Aub et al. 1952).

Among Evans's contributions to this manuscript was a large section on the physical and chemical properties of radium and mesothorium, describing the decay of mesothorium (^{228}Ra) and its daughter products and showing their contributions to the total activity in a patient as a function of the age of the material. At the time the manuscript was written, the half-life of ^{228}Ra was thought to be 6.7 years instead of the presently accepted value of 5.7 years. With this change and with the generally accepted value of 37% for radon retention after long residence times in the body instead of Evans's value of 55%, this work stands today as the best single analysis of the internal decay of radium daughter products in the human body.

During the postwar period, the number of dial workers brought into the study increased markedly. The discovery of an employment list of the Waterbury Clock Company in Waterbury, Connecticut, and the addition of workers from the New England Watch Company (also in Waterbury, Connecticut) and the Standard Chemical Company in Pittsburgh kept the MIT laboratory busy. The laboratory also switched from the Geiger counter to the newly developed thallium-activated sodium iodide, $\text{NaI}(\text{Tl})$, crystal for the detection of gamma rays. This change increased sensitivity and allowed for the first time the detection of ^{228}Ra daughters, specifically the ^{208}Tl gamma ray of 2.62 MeV (if present in sufficient quantity). A shielded whole-body counter, called the "controlled background facility," was built. Ultimately the responsibility for radium cases from the New Jersey Radium Research Project (see below), along with all records, was transferred to the MIT program. When this program at MIT was terminated in 1969, files on nearly 800 measured radium cases were transferred to the Center for Human Radiobiology at Argonne.

A critical and significant study of the relative gastrointestinal absorption of radium and thorium was undertaken at Evans's laboratory at MIT. This study addressed the problem of thorium in dial paint; early dial paint was known to contain not only radium as ^{226}Ra and ^{228}Ra (mesothorium, MsTh),