but sometimes also thorium in the form of ^{228}Th (radiothorium, RdTh). Was thorium, like radium, absorbed through the gut after oral uptake? Indeed, the absorption of radium itself from dial paint was not well known. If thorium was well absorbed, it would deliver a relatively large dose in spite of its short half-life (1.9 years), because elimination of thorium from the body was thought to be very slight after entry into the bloodstream. However, the short half-life precluded measurement of unsupported ^{228}Th or its daughters 20 or more years after acquisition, so no estimate of the dose contributed in a given case by the unsupported component of this isotope could be made from a whole-body measurement.

To resolve this question, Dudley (1960) proposed an experiment with mock dial paint containing tracer doses of short-lived radium and thorium isotopes. He suggested using ^{224}Ra (half-life 3.6 days) and ^{234}Th (half-life 24 days) as the tracer isotopes. The actual experiment, which employed elderly volunteers (aged 63-83 years), was reported in great detail in the *MIT Annual Report* (Maletskos et al. 1966) and was later presented at the symposium on the Delayed Effects of Bone-Seeking Radionuclides, at Sun Valley, Idaho, in September 1967 (Maletskos et al. 1969). The experiment showed that the absorption of radium from dial paint was on the order of 20%, while that of thorium was only 0.02%, lower by a factor of 1,000. Thus, the thorium content of the dial paint could reasonably be ignored, because almost all the subsequent dose was due to the radium isotopes and their decay products. Further, the absorption of radium was now quantified, an achievement that had considerable importance for several other studies.

Evans and Dudley (1960), in testimony before the Joint Committee on Atomic Energy (JCAE), drew attention to the fact that the standard for ^{226}Ra, namely 0.1 μCi retained in the skeleton, was based on direct observations on humans. The standard involved no assumptions about values of relative biological effectiveness, nonuniform distributions, retention, or extrapolation from one species to another. It was, Evans and Dudley concluded, the basic standard for the chronic effects on humans of bone-seeking radionuclides.

Subsequently, Evans (1966) elaborated on this idea, suggesting that this basic standard provided the "pivot point" for the establishment of rational radiation protection guides for ^{90}Sr, ^{239}Pu, and other bone-seeking radionuclides. Because no human experience was available for these radioisotopes, the protection guides would have to be established from animal experiments. Evans continued:

> Here the central requirement is to measure the ratio of the toxicity of, for example, plutonium to the toxicity of radium in an experimental animal. If these toxicity ratios . . . are found to be