

Except for the papers in the Schlundt series, no records have ever been obtained of physicians who, in private practice, administered radium to their patients. Thus, the 1933 publication (Schlundt et al. 1933) that documented the quantity of radium given to each Elgin patient was of unique importance. Many of the patients were still at Elgin in the 1950s, and their individual files documented the dates and quantities of their radium injections. The radium body contents of 19 of these patients were measured a number of times in the 1950s by Argonne staff members.

W.P. Norris and his associates reviewed two sets of body content measurements, made six months apart and reported by Schlundt et al. (1933) on the Elgin State Hospital patients, and two sets made by Argonne personnel 233 and 258 months after the original measurements. Norris and associates also acquired from various sources sealed radium ampoules that had been obtained in the 1930s from H.M. Armstrong of the Radium Extension Service of Chicago, the source of the radium used at Elgin and by many Chicago area physicians (and produced by the U.S. Radium Corporation). These ampoules were found in 1953 to contain 10  $\mu\text{Ci}$  of radium, within a few percent, and no more than 0.05% mesothorium ( $^{228}\text{Ra}$ ).

Norris et al. (1955) found that the retention of radium in the Elgin cases could be best fitted by a power function of the form  $R_t = 0.54 t^{-0.52}$ , where  $R_t$  is the fractional retention at time  $t$ , and  $t$  is expressed in days ( $t \geq 1$  day). The Elgin cases were thus of considerable value in determining the pattern of radium loss from the body over a long period.

These groups of radium cases, particularly the larger group receiving radium at the midwestern clinic, might have constituted useful cohorts for epidemiologic studies, but this promise was unfulfilled. Both groups suffered from the common fault that although quantities of radium injected and the dates were usually included in the medical records, other evidence suggested that some individuals received further, unrecorded radium treatments. Thus, in these cases the recorded treatments must be taken as the lower limits of the actual radium injection levels. Even without this problem, the small size of these groups limits their value for epidemiologic studies. A detailed comparison of these two groups is provided in Chapter 3.

Untold numbers of individuals received radium internally from private physicians, from a medical institution, or by medicating themselves with radium waters (Figure 3). Evans (1966) estimated that several thousands of individuals had received radium from physicians and calculated that 400,000-500,000 bottles of Radithor were sold to the public. The small fraction of these cases that are known might provide evidence of the effects of