bones was assumed to have occurred and to be a primary cause of the observed bone necrosis.

One consequence of the disruption of the flow of blood through bone was the death of osteocytes, the cells in bone lacunae that are assumed to provide the mechanism for the flow of fluids through compact bone and thus to play a role in the exchange of minerals between bone and blood. Rowland et al. (1959b) found that often many lacunae in bone containing high levels of radium were filled with mineral, obliterating the osteocytes and thus eliminating the blood-bone exchange processes in these regions.

Keane et al. (1983) described a study of X-ray scores of 201 women who had been radium dial workers and were exposed primarily to ^{226}Ra and 159 similar women who were exposed primarily to ^{228}Ra. The authors considered the severity of the changes to be related to the numerical scores as follows: scores of 0.5-8 indicated minimal changes; 8.5-16, mild changes; 16.5-25, moderate changes; above 25, advanced changes. This study had 120 matched controls, 16 of whom had scores in the minimal-change range (0.5-8). For those exposed primarily to ^{226}Ra, only one case (out of 164) with initial systemic intake under 50 μCi of ^{226}Ra had a score greater than 8, and no case under 100 μCi had a score greater than 16. Similarly, for those exposed primarily to ^{228}Ra, no case with an intake less than 50 μCi of ^{228}Ra had a score greater than 8, and no case under 100 μCi had a score greater than 16. Above 100 μCi of either radium isotope, scores above 16 were quite common.

These results indicate that intake levels as large as 50 μCi of either radium isotope produce bone changes that cannot be distinguished from changes sometimes appearing in unexposed individuals. Only when the intake levels are significantly larger do bone changes appear that clearly indicate the presence of radium within the body.

As mentioned previously, all of the values of initial systemic intake and skeletal dose have been recalculated. This recalculation became necessary upon the discovery that low-level radium cases lost radium more rapidly than predicted by the Norris retention function (Norris et al. 1955). All of the references to values of initial systemic intake or skeletal dose in this manuscript refer to the newly calculated values. However, the values published by Keane et al. (1983) and quoted above are examples of the old values. To compare them with the new values, ratios of new values to old values were calculated. For example, 85 dial workers with intake values greater than 5 μCi and less than 15 μCi of ^{226}Ra yielded a new-to-old ratio of 2.4. Thus, a case with an old intake of 10 μCi of ^{226}Ra would now be listed as having about 24 μCi. Similar calculations at other intake levels