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R. C. THOMPSON

Battelle
Pacific Northwest Laboratories
P.O. Box 999
Richland, Washington U.S.A. 99352
Telephone (509) 375-2421
Telex 15-2874

August 17, 1984

Mr. Edward T. Lessard
Brookhaven National Lab.
Upton, NY 11973

and

Dr. William L. Robison
Lawrence Livermore National Lab.
P. O. Box 808
Livermore, CA 94550

Dear Ed and Bill:

A major problem in determining whether there is, indeed, a discrepancy between your estimates of the radiation doses from plutonium (and americium) to the people who lived at Bikini for about seven years is that you use different methods and calculate different doses to different tissues. For example (see pages 44, 45, 48 and 49 in UCRL-53225 and page 68 in NCRP Annual Meeting Proceedings No. 5), Bill calculated 30-year and 50-year integral dose equivalents to mineral bone and divides by 4 to obtain the bone marrow dose equivalent (Table 28 on page 45 - the inhalation values appear to have decimal point error). It is not clear whether a quality factor of 10 or 20 was used. These are estimates of the dose equivalents that would be received if people lived on Eneu or Bikini the next 30 and 50 years.

On the other hand, Ed calculated 50-year committed dose equivalents to bone surfaces (not average doses to mineral bone), red marrow, liver and gonads and also calculates the effective committed dose equivalent. I assume a Q of 20 was used. These values also include weighting factors. These 50-year committed dose equivalents appear to be based on the assumption that the rate of plutonium intake experienced by the people who lived on Bikini for about seven years would continue for the next 50 years.

It is clear that there could be some problems in comparing these estimates of dose equivalent. An immediate indication that we are probably comparing apples and oranges occurs if you look at your calculated bone marrow doses. Page 68 of NCRP Proceedings 5 gives a value of about 0.06 rem for Bikini and 0.03 for Eneu while page 7 of Ed's August 8 letter gives values of 1 to 13 rem depending upon the model used. I couldn't begin to account for such a large difference.

Therefore, I would like to propose that you attempt to estimate the same dose using similar models. Use a quality factor of 20 for alpha radiation and assume 45% of the body burden is in bone equally distributed between cortical and trabecular bone surfaces; 25% of energy from the Pu on bone surface is absorbed by bone surface cells which have a mass of 120 grams; and 50% of the energy from Pu on surfaces of trabecular bone is absorbed in red marrow with mass of 1500 grams (see ICRP-30, page 45).

Calculate

1. Annual dose equivalent to bone surface and bone marrow at end of about seven years residence on Bikini.

2. 50-year committed dose equivalent to bone surfaces and to bone marrow resulting from continuous intake at same rate experienced by people who lived on Bikini for seven years.

3. The Pu burden at the end of seven years residence on Bikini.

If these pose serious problems for you, please feel free to get on the phone with each other and agree upon what doses you will calculate and the models to be used. I believe it is important to establish that dose equivalents calculated on the basis of estimates of food and air intake are comparable to those calculated from bioassay data. If this cannot be done then we will have to look for serious errors in our models.

I look forward to seeing you the 29th.

Sincerely,

W. J. Bair, Ph.D.
Manager
Environment, Health and Safety
Research Program

WJB:gm

cc: KF Eckerman
JW Healy
R Ray
RC Thompson

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Reviewed by DJ Kreider Date 5/1/97