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James W. Neton, Ph.D., CHP
National Institute for Occupational Safety and Health, MS-R45
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Dear Dr. Neton:

I have carefully reviewed the draft document entitled "Proposed radiation weighting factors for use in calculating probability of causation of cancer". In doing so I have spent approximately 3 days reading the manuscript, examining calculations, and reviewing relevant literature on which their conclusions are based. In particular, I have focused on calculations for neutron RBE values. In general the report is very well done and quite clear. I would however suggest, that the concept of differences in radiation interactions in small mammals versus humans (recoil protons versus gamma rays) and its impact on biological effectiveness, which is carefully stated in the first full paragraph on page 5 be move forward in the manuscript as a general concept on page 1 paragraph 2. Also on page I paragraph 2 line 5 it is stated that values of radiation weighting factors are selected to represent data on RBE-I would rephrase to state "take into account data..." and then discuss in general terms interactions of high let in small versus large animals.

Another concern is the distribution of RBE values for neutrons in the experimental data. The authors state on page 5 lines5 and 6 that more than 60% of the RBE values are below the arithmetic mean of 6. They state that this can be justified by different interactions between small and large animals-however a careful look at the life-shortening and tumor data suggest an alternative explanation that need to be taken into consideration. The low RBE values for life-shortening are mainly related to studies in RF and RFM mice for which the principle cause of death and the greatest contributor to life-shortening are leukemias and lymphomas (myeloid leukemia and thymic lymphoma specifically). All of the tumor induction data suggest low RBE's for leukemias and lymphomas but higher RBE values for solid cancers-this is born out not only by the incidence data for individual tumors but also by the life-shortening data in the B6CF1 data where the causes of death are more often a result of solid tumors rather than leukemia. In all these instances neutron RBE values tend to be higher. The skewing of the RBE values to the lower end is most likely a result of a preponderance of data using RFM mice and their tendency to develop early appearing leukemias and lymphomas rather than solid cancers.

Perhaps differences in RBE values for leukemia/lymphoma versus solid cancers should be considered in this report.

Sincerely,

Robert L. Ullrich
Professor