The Medical Research Center

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MEMORANDUM

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BOX No. 1

FOLDER COHN-Whole Body Studies

TO: E. P. Cronkite, M.D.

FROM: S. H. Cohn, Ph.D. SHC

SUBJECT: RBE from fast neutrons

1. There are a number of questions on the extrapolation of RBE values derived from the rat-breast tumor data to man. It seems to me that the problem is very similar to that which we discussed when we considered Bateman's - RBE studies with lens opacification as the end point. We concluded at that time, that we could not justifiably extrapolate these data on the radiosensitive mice lens to man. This conclusion was reinforced by ICRP 14 (1969) which reviews experimental data and concluded "an accumulated dose of 75-100 rads is likely to approach the threshold for cataract formation in man".

   The relevance of data obtained on one strain of rat to man is the first question.

2. There are also well known difficulties in determining RBE using the same biological end-point: time distribution of tumor appearance, uncertainties implicity in extrapolating from smaller animals, shorter life span and different disease pattern etc., (Bond - Report of Subcommittee 4, 1967)

3. There is also the question of the significance of RBE calculated for low energy neutrons at low doses using x-rays as the standard. When a threshold exists for gamma-rays but not for neutrons, the RBE can be infinite or erroneously large.

4. Purely on physical grounds, only a small fraction of the energy spectrum of Pu,Be neutrons is in the range of 0.43 MeV. Less than 25% of the low energy neutrons are below 1.0 MeV and considerably less at 0.5 MeV (see Figs. 111.3 and 111.4 - Tables III. IV in ICRU 13 (1969). The 0.43 MeV neutrons had the highest LET used in the reported studies (Bond, V.P. "Lens opacification in mice-Implications for RBE and OF").

   The LET (Kev/μc) for 0.5 and 5 MeV Pu,Be neutrons is reported to be 53 and 35 respectively at 3 mm and 30 and 35 at 5 cm depth (Bond, M-4 RBE report).

SHC:mas

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