STANDARD FORM NO. 64

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TO : FILE

DATE: February 10, 1953

FROM : Gordon M. Dunning, Biophysics Branch
Division of Biology and Medicine

SUBJECT: RELATIONSHIP BETWEEN GAMMA DOSE AND BETA COUNTS FROM FALLOUT MATERIAL

SYMBOL: BMBP:GMD

(455)

Extrapolation of beta counts in units of $d/m/ft^2$ taken from gummed paper during TUMBLER-SNAPPER indicated that on January 1, 1953 the activities at three localities would be as follows:

Groom Mine - 19.5×10^6 $d/m/ft^2$
Lincoln Mine - 3.6×10^6 $d/m/ft^2$
Pioche - 21×10^6 $d/m/ft^2$

If one assumes a ratio of 2 to 1 for beta vs. gamma emissions from fission products, then one $d/m/ft^2$ β should be equivalent to about 2.5×10^{-8} mr/hr gamma dose rate at 3 ft. above an infinite slab. Based on such a conversion factor, the corresponding gamma dose rate Jan 1, 1953 at 3 ft. above the ground for the above localities would be approximately:

Groom Mine - 0.5 mr/hr
Lincoln Mine - 0.1 mr/hr
Pioche - 0.5 mr/hr

To check on the actual situations I requested that surveys be made of the three localities with a GM counter such as a Beckman MX-5 held 3 ft. above the ground. These surveys were made on the 14th and 15th of January, 1953 (the time interval between January 1 and January 15 is insignificant here). All three locations were found to be of normal background, i.e., 0.02 - 0.03 mr/hr.

COMMENTS

1. It is extremely difficult to evaluate the above data until the β/γ ratio is better known. Some very limited data supplied by Lt. Col. Philip Gwynn indicates that one $d/m/ft^2$ β may yield a higher dose rate than 2.5×10^{-8} mr/hr. If so, the predicted gamma dose rate, based on radioactive decay alone, would be that much higher than stated in the paragraphs above. Of course, weathering and penetration of the radioactive particles into the ground with subsequent shielding of the soil above might account for some reduction. With the types of soils and climatic

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conditions to be found near the test site, winds may account for an appreciable amount of scattering and, thus, reduction of activity at the relatively high "hot spots." This was believed to have happened to two "hot spots" found after BUSTER-JANGLE.

2. In the past we have made certain calculations of gamma dose from fallout based on radioactive decay alone. It would now appear that the prediction from these calculations could be too high by an appreciable factor. We have also made other calculations on the accumulative activity to be found in soils following several series of tests. These calculations and predictions may not be so much in error since they are based on large areas such as several states where the over-all average activity would not be so greatly influenced by climatic factors.

3. I have made certain recommendations to Kermit Larson concerning some relatively simple studies that might be done to gain a better understanding of the β/γ ratio. In addition, I plan to discuss with him other simple experiments on the fate of fallout material after it has been deposited in the soils.

GMD:mlh

CC: Dr. Bugher
Dr. Claus