

FROM:

HASL, NYOO
John Harney

DATE OF DOCUMENT:

6/1/60

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TO:

Dr. E.W. Pfeiffer
cc: Dr. Durham

ORIG:

CC:

OTHER:

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REPLY NECESSARY

DATE ANSWERED:

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703327

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DESCRIPTION: (MUST BE UNCLASSIFIED)

Regarding preliminary data on gassed film.

REFERRED TO

DATE

RECEIVED BY

DATE

~~Dr. Durham~~

6/3

~~Mr. Holland~~

6/3

~~Dr. Knapp~~

6/3

Dr. Knapp

4/3

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ENCLOSURES:

cc: Dr. Knapp
cc: Mr. Holland

REMARKS:

U. S. ATOMIC ENERGY COMMISSION

MAIL CONTROL FORM

FORM AEC-325
(3-52)

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U.S. ATOMIC ENERGY COMMISSION
DIVISION OF BIOLOGICAL MEDICINE

3204

Short - Lived Isotopes

0001548

MEMO ROUTE SLIP Form AEC-98 (Rev. May 14, 1947)		See me about this. Note and return.	For concurrence. For signature.	For action. For information.
TO (Name and unit) <i>N. A. Kniffp, AEC, Wash.</i>	INITIALS	REMARKS		
	DATE <i>6-1-60</i>			
TO (Name and unit)	INITIALS	REMARKS		
	DATE			
TO (Name and unit)	INITIALS	REMARKS		
	DATE			
FROM (Name and unit) <i>J. Harley, AEC N.Y.</i>	REMARKS			
PHONE NO.	DATE			

USE OTHER SIDE FOR ADDITIONAL REMARKS

U. S. GOVERNMENT PRINTING OFFICE : 1957—O-422607

0001549

Refer to: HS:JHH

June 1, 1960

Dr. E. W. Pfeiffer
Assistant Professor of Anatomy
University of North Dakota
Grand Forks, North Dakota

Dear Dr. Pfeiffer:

On October 3, 1958 Dr. Allan Lough of the Health and Safety Laboratory forwarded to you some preliminary data on gummed film. This data has come up again for consideration in connection with some estimates of gamma dose from weapons tests to segments of the population in this country. I would like to indicate to you changes that we believe necessary from this preliminary data.

We have noted in our computations from gummed film that the Sr^{90} values at specific locations receiving fresh fallout from a single weapon are overestimated by the formula used in the preliminary data forwarded to you. We have since been able to check some of these values at locations in the U. S. where radiochemical measurements are available. In the re-computation we find that both the Sr^{90} deposition and gamma dose estimates in the preliminary report are reduced by approximately a factor of 10.

DOE ARCHIVE

For your information, I am enclosing a general description of the original computation formula used in the preliminary estimates. It is obvious that the system described would lead to overestimates of Sr^{90} in fresh fallout, since the formula includes older debris richer in Sr^{90} .

I am passing on this information to you because the data are discussed in a report "The Contribution of Short Lived Isotopes and Hot Spots to Radiation Exposure in the United States from Nuclear Test Fallout", by the Fallout Studies Branch, Division of Biology and Medicine of the AEC. A copy of this report will be forwarded to you directly from Washington.

Sincerely,

John H. Harley, Assistant Director
Health and Safety Laboratory

cc: C.L. Dunham, AEC, Wash.
J.Z. Holland, " "
H.A. Knapp, " "
S. A. Lough, AEC, NY

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GUMMED FILM CALCULATIONS

The gummed film collection procedure has been subject to considerable criticism and there is no doubt that it is an imperfect collector of fallout debris. However, it does allow the simple measurement of daily fallout at a large number of stations at a very low cost per sample. For this reason it is desirable to have a means of correcting gummed film results to give reliable estimates of fallout, particularly Sr^{90} , at participating stations.

It cannot be too strongly emphasized that Sr^{90} results obtained from gummed film are calculated values and are not the result of actual Sr^{90} analyses. Such calculations require a knowledge of the age of the fallout debris. During the initial stages of weapons testing, the relative infrequency of tests and the relatively low yield of the weapons made the calculations very simple. Reliable results were obtained considering the high-walled pot to be an absolute standard.

As tests increased in frequency, it became more difficult to assign bursts to each individual sample. An arbitrary rule was set up that any fallout collected from one day after a given burst to one day after the next burst would be assigned to the former. Overlapping of more than one burst resulted in errors, first, because the total fission products were extrapolated by the $T^{-1.2}$ law and, second, because the Sr^{90} was calculated from the theoretical percentage given by Hunter and Ballou. Both of these quantities are sensitive to the age of the fallout and the period of increased testing gave less reliable results for Sr^{90} .

With the advent of high-yield weapons and the resultant stratospheric retention of fission products, the calculated Sr^{90} values from gummed film became more and more inaccurate when the values were compared to pot collections.

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NEW PROCEDURE FOR CALCULATION

Since the only fallout data available on a continuing basis from 1951 is supplied by the gummed film network, it was felt worthwhile to attempt to salvage as much information as possible. Therefore, a calculating scheme was devised which would allow for the various factors described. While this procedure is still only a method of approximating Sr⁹⁰ fallout, it is probably close enough for the estimates required in the Strontium Program. It would be possible to refine the technique further, but it is believed that a final correction by comparison with pot collections will serve the same purpose and maintain the relative simplicity of the present calculations.

In these calculations, the total β activity and the Sr⁹⁰ activity for each burst are calculated from the known or estimated fission yields. The total β activity is decayed by the T^{-1.2} law, day by day, and the additional activity from further test detonations is added in. This gives a representation of the total quantity of fission product β activity that exists on any day. The β activity of any gummed film sample counted can then be related to the β activity existing in the world at the time of sampling, and the measured activity can be extrapolated backward to the sampling date or forward to some convenient time for summation with other samples.

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The calculated Sr⁹⁰ activity on any particular day can be expressed as a fraction of the total β activity in existence and this factor can be used to estimate the Sr⁹⁰ from the measured β activity of the sample.