

OFFICE MEMORANDUM

401055

TO : Dr. T. L. Shipman - H-DO
FROM : C. C. Lushbaugh
SUBJECT: ADMINISTRATION OF Cr⁵¹ TO VOLUNTEERS
SYMBOL : H-4

DATE: May 23, 1957

APPROVED: *[Signature]*
DATE: *5-23-57*
BY: *G. S. E. 228*
FOR: *Human Studies*

As you know, we are planning this summer to make an extensive study of the use of radioactive chromium as a tag upon the living circulating red cell in man and experimental animals. In particular, we wish to study the applicability of the whole-body counter to this technique. The only method available at the present time requires withdrawing multiple blood samples, which require extensive technical manipulation and give a decay curve which is extremely difficult to interpret in the sick person. Since the whole-body counter would measure the entire body's retention of chromium and since the evidence indicates that the retained chromium is on the red cell, the whole-body counter should be able to make a determination in 100 seconds that at the present time requires a technician several hours to complete. For this purpose, we plan to tag the red cells of about ten normal persons and about ten patients. Dr. Murray Friedman of Santa Fe, whose son Harold will be working with us, is trying to obtain patients from all over the state with various blood dyscrasias.

Dr. DeBriere of the Los Alamos Medical Center assures me that the Hospital Bed Fund of the Los Alamos Medical Center Women's Auxiliary will attempt to defray the hospitalization costs of the out-of-town patients. The Special Studies Laboratory of the Los Alamos Cancer Clinic will perform the controlling hematological studies, so there should be no clinical costs accruing from this study. Drs. Robert Grier, Paul Lee, Charles Shafer, and Sidney DeBriere have agreed to help me with these

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patients without charge.

We would like to obtain your permission at this time to put radioactive chromium on the red cells of the following persons:

_____ (Health Division); _____ (summer employee); _____ (summer consultant); and _____ (Los Alamos Cancer Clinic).

We have plans to label the cells of two men with chronic lymphatic leukemia, 1 man with acute lymphatic leukemia, 1 man with aplastic anemia probably secondary to carcinoma of the stomach, 1 man with bleeding duodenal ulcers, 1 woman with polycythemia vera, and 1 man with infectious mononucleosis.

In addition to your approval of this study and of the labeling of the normal persons mentioned above, it is planned to secure from each person, whether or not he is a hospital patient, a personally signed permission (properly witnessed) to cover me as a practicing physician.

Handbook 52 gives the maximum permissible amount of Cr⁵¹ in the total body as 390 microcuries. This amount is computed on the basis of oral ingestion and the kidney is assumed to be the critical organ. The present experiment involves a rather different type of exposure, since the activity is administered as tagged blood cells. The life of Cr⁵¹ in the body is reported to be short after it is separated from the cell. The critical organ in this case is therefore whole body, and it is necessary to recompute the dosimetry on this basis.

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Cr^{51} decays by electron capture, a process that involves the emission of no absorbable energy. Following this event, a $V K_{\alpha}$ X-ray is emitted with an energy of 5 Kev. Ten per cent of the time a 320-Kev gamma ray is emitted. The latter has an effective absorption coefficient of 0.35 in the body, so the energy deposition is 112 Kev per gamma. The total energy per disintegration is, therefore, 16 Kev. With this energy, the dose rate is 0.082 mrad/wk or a total body burden of 1 μc . The proposed dose of 500 μc would, therefore, involve an initial dose rate of 40 mr/wk, which is a factor of 10 below the maximum permissible level.

Because of the short biological and physical half-life of Cr^{51} in this experiment (13 days), even this dose rate will not continue for long. The total integrated dose to infinity will be only 100 mr, which is still less than a single week's permissible exposure.

Enclosed is an extra copy of this memo, which should be returned to the Group Office with your approval in the event you concur in this experiment.

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C. C. Lushbaugh, M.D.

CCL:ES
Enc. 1 Copy

Approved:


Group Leader - H-4

Approved:


Health Division Leader