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# NATIONAL RESEARCH COUNCIL

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DIVISION OF MEDICAL SCIENCES

COMMITTEE ON GROWTH
Acting for
THE AMERICAN CANCER SOCIETY

30 December 1946

MEMORANDUM

To: Executive Committee, Committee on Growth
Section on Physics
Dr. A. K. Solomon
Dr. Robert T. Nieset

From: Philip S. Owen, M. D.

I enclose for your information a letter of 27 December 1946 from Dr. Paul C. Aebersold, Chief, Isotopes Branch, Research Division, Manhattan District, to Dr. D. Wright Wilson, University of Pennsylvania, concerning health precautions in the handling of radioactive materials.

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WAR DEPARTMENT
Corps Of Engineers
Office Of The District Engineer
Manhattan District
Oak Ridge, Tennessee

27 December 1946

Dr. D. Wright Wilson
The School of Medicine
University of Pennsylvania
Philadelphia, Pennsylvania

Dear Dr. Wilson:

This office has not hastened to answer your letters of November 26 and December 13 concerning health protection in the use of S 35 and C 14, because it has been aware of efforts being made to answer this type of question through other channels, namely through Dr. Owen of the Committee on Growth.

You no doubt received through Dr. Owen the memorandum of November 27 by Dr. A. K. Solomon concerning the suggested health protection measures to be instigated at Harvard Medical School. A copy of this memorandum was referred by this office to Dr. K. Z. Morgan, Director of the Health Physics Department, Clinton Laboratories, who in a letter of December 17 to Dr. Solomon added a considerable number of comments and suggestions. Dr. Owen received a copy of Dr. Morgan's letter and will no doubt make copies for limited distribution. You have probably received also from Dr. Owen a copy of a letter from Dr. J. E. Rose, Director of the Health Physics Division, Argonne National Laboratory, to Dr. Rittenberg concerning health precautions to be used with C 14 and similar beta-emitting isotopes. You will note that these memoranda are in agreement with the remarks on health safety with C 14 contained in our memorandum IB-52 of September 18, Subject: C 14 Information, copy of which was previously sent to you.

All the memoranda are in agreement that an amount of C 14 greater than approximately 30 microcuries should not become fixed in the body. It is impossible to state, however, how much C 14 would have to be taken into the body in order to have this amount become fixed. The percentage intake that becomes fixed will depend on a great many factors, such as the form of the material, its method of intake and its rate of elimination. Fixation in the body by the inhalation of $CO_2$ is not considered large, consequently the ordinary inhalation hazard in working with C 14 in millicurie quantities is not great. Any radioactive materials should of course be kept off the skin, hence the laboratory procedures employed in handling them should be similar to those employed in handling dangerous bacteria or viruses.

In the case of S 35, the greatest absorption is expected to be in the skin, in which case around 150 microcuries fixed in the organ is calculated to give rise to a tolerance dose at the time of deposition. Due to the decay of S 35 (not significant in the case of C 14), the number of microcuries that would have to be initially fixed in the organ to produce an average tolerance dose over the period of a whole year, would be approximately 2470. The amount of S 35 that would have

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Dr. D. Wright Wilson 27 December 1946

to be taken into the body to fix the above amounts in the skin is not known, but it would certainly be 10 to 20 times greater, even in the case of the most readily absorbed compounds.

As long as tracer doses are kept below the amounts which would be expected to result in the fixation of the amounts noted above, the subject should not receive more than tolerance irradiation of any organ. The most satisfactory procedure, however, is to administer to experimental animals some of the radioactive material in the form in which its absorption may occur in the intended use. By assaying the percentage uptake in various organs of the actual compound under consideration in a few well-performed animal experiments, you can readily establish tracer doses that will be in the safe range for use in humans.

The subject of disposal of radioactive wastes is a large one. Disposal methods depend upon how much long half-life radioactive material the laboratory expects to handle over a long period of time. It is possible for long half-life material to accumulate in plumbing over a long period, and become hazardous to laboratory workers or to an unwitting plumber. If you can be assured of dilution of the radioactive material in waste water so that the final concentration is less than $10^{-6}$ microcuries per cc, there would be no hazard involved. Disposal by deep burial, unless extremely large quantities are involved, can generally be assumed to be safe. The suggestion of Dr. Allen Reid concerning this subject as well as that of wearing of rubber gloves, appear to be in order.

It is expected that in the next 6 months a number of the groups now considering health protection matters will come forward with a satisfactory set of rules for the ordinary isotope tracer laboratory. Eventually some Government agency such as the Atomic Energy Commission or the National Institute for Health, may furnish monitoring service and protection advice by visiting health protection representatives. In the meantime the preliminary correspondence from Dr. Morgan and Dr. Rose will suffice for the quantities of radio materials now being issued from the Manhattan Project.

It is difficult to answer the question concerning the relative merits of the vibrating reed electrometer and a thin window Geiger counter. The vibrating reed electrometer can be made to give more efficient measurement of C 14 but (1) the preparation of samples for use in an ionization chamber will in some cases require more effort, (2) it is two to three times more expensive, and (3) it will not be commerically available probably for 6 months or more. You are probably aware of the meeting being sponsored by the Committee on Growth on techniques of working with C 14. You have probably also heard some of the details concerning this from Dr. E. A. Evans of the University of Chicago, who is arranging the meeting. At this meeting, to which only those actively working with C 14 are to be invited, there will no doubt be ample discussion of the relative merits of various measurement and handling techniques. It is because of my awareness of the great need for dissemination of information on such techniques that I suggested to the Committee on Growth several months ago that such a meeting be held.

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