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Report of the ad hoc committee convened
May 22, 1974 to the Division of
Biological and Environmental Research,
U.S. Atomic Energy Commission

Respectfully submitted,

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Report of Ad Hoc Committee convened on May 22, 1974, to provide recommendations on the scientific merit of studying the fate of plutonium in deceased persons who had received injections of plutonium years earlier.

This report is intended only to be an evaluation of the scientific merit of a proposed program to exhume the bodies of those few persons who received intravenous injections of plutonium during the period 1945 - 1947. We are aware of the fact that there are a number of related aspects which are of an ethical, medical, or public opinion nature. This report is not intended to give our evaluation of these aspects.

The unanimous, but qualified, opinion of this committee is that the proposed program of exhumation proceed in an orderly manner. However, if permissions can be obtained for only a few exhumations, the scientific value of the program will be severely limited. This decision is based on the following considerations:

1. The "Langham equation" that attempts to relate urinary (and fecal) excretion rates to the amount of plutonium present in the exposed person was derived from data obtained from <u>this</u> small group of persons that were given plutonium intravenously. This equation, which was developed mainly from early data, one measurement at 1 1/2 years, and two at 5 years after injection, is interpolated and extrapolated almost <u>universally</u> by health physicists and radiation protection specialists in estimating body burdens of occupationally exposed persons. Thus it is highly desirable that an effort be made to obtain a material balance by analyzing the content and distribution of plutonium remaining in the bodies of those persons who were injected with a (small) known amount of plutonium. The results will provide a means of evaluating the validity of estimating

burdens by the Langham equation or a modification thereof.

2. Knowledge of the distribution of plutonium in soft tissues, including bone marrow, of humans is also of importance. Results obtained in the exhumation program could give a much more complete accounting of plutonium metabolism in man and its distribution other than in bone. This information is greatly needed for comparison with the distribution of plutonium in laboratory animals.

3. Material obtained by exhumation will provide the unique opportunity of identifying and quantifying the microscopic distrubution of plutonium with respect to age at the time of injection and to the duration of exposure. For example, data can be obtained that will aid in determining the role of surface deposits of a known dose of plutonium as they may have affected the subsequent activities of adjacent bone forming systems. Such information will be exceedingly useful in determining the local effects of plutonium in terms of radiation dose rates.

4. The fact that there is only a small number of persons in the injected group is considered to be a handicap, but it is realized that thorough study of the limited material available should provide very useful data. The plutonium exhumation program, however limited, has as one of its main goals the determination of certain relationships useful in interpreting extensive animal experimentation on plutonium metabolism and toxicity as they may relate to man. The exhumation program and continued excretion studies in the living members of this group are essentially the only mechanism available to the AEC for relating animal studies to man.

There are some limitations and problems associated with the proposed exhumation project as follows:

1. The total number of injected persons is small and, if all the tissues

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were to be analyzed, the ability to perform extensive statistical analyses would be minimal.

2. The population consisted of persons of mixed ages at exposure and all had serious medical-health problems at the time of injection, which somewhat limits the interpretation of data as representing the "normal" population sample.

3. The integrity, completeness, and condition of the bodies to be exhumed may not be adequate for a satisfactory recapitulation of the plutonium present at death. In particular the ravages of chemical reactions in the grave may lead to some incorrect interpretations.

4. There appears to be little to be gained by recovery of cremated bodies.

In conclusion, the potential usefulness of the results that could be obtained by a carefully planned and conducted exhumation program far outweighs the limitations that can be anticipated in the results. Ideally the results could make possible the comparison of the initial macro- and micro-distribution of plutonium, given by intravenous injection of a known amount of a known solution, in humans and in laboratory animals, and the comparison of the differences in the temporal effects on these macro- and micro-distributions that result from the inter-species differences in life-spans and in the kinetics of basic biological processes. Further, the results could provide a basis for a more accurate estimation of occupational exposures to plutonium. However, if the exhumation program is limited to those few persons who were essentially moribund at the time of injection and died shortly thereafter, the results that could be obtained would not fulfill the goals of the program. Further, they could lead to serious misinterpretations. With this qualification it appears to the committee that the AEC should complete these studies that were begun in 1945.

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