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NATIONAL NUCLEAR ENERGY SERIES
Manhattan Project Technical Section

Division IV — Plutonium Project Record
Volume 22 E

EFFECTS OF EXTERNAL BETA RADIATION

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John E. Wirth, M. D. (Clinton), and James J. Nickson, M. D. (Chicago). Health Physics was developed under the supervision of Herbert M. Parker (Chicago, Clinton, Hanford), Ernest O. Wollan (Chicago), Karl Z. Morgan (Clinton), and John E. Rose (Chicago). Research in radiobiology was directed by Kenneth S. Cole (Chicago), Joseph G. Hamilton, M. D. (California), Howard J. Curtis (Clinton), and Egon Lorenz (National Cancer Institute). The investigations in uranium toxicology were carried out at Michael Reese Hospital, Chicago, under the direction of Albert Tannenbaum, M. D., as part of the program of the Metallurgical Laboratory.

Practically all the work described in the Health Volumes was done between Sept. 1, 1942, and June 30, 1945. It was subject to the usual disadvantages of wartime research and development—chiefly haste and security regulations. On the other hand, it proceeded under very advantageous financial support. Moreover, the security regulations often had the advantageous effect of preventing publication of research until experiments had been verified by collateral work.

Most of the writing was necessarily done rather hastily because, in the early postwar period, many of the authors were returning to their regular positions in universities and elsewhere. Editing has been done in more leisurely fashion but with a severe shortage of competent manpower. With unlimited editorial personnel, much of the material could have been substantially shortened. Since this seemed impracticable, most of the editorial effort has gone into the correction of major errors and inconsistencies. We hope that not too many of these have eluded us.

Raymond E. Zirkle
Editor, Health Volumes

The work reported in the Health Volumes was done at the Metallurgical Laboratory, Oak Ridge, Tennessee, under the supervision of J. Curtis. As evidence of the work done in this volume, the actual work was done by Raper, whose work was done much with a very detailed editing by Miss Sophia Price.

May, 1951

**PREFACE TO THE HEALTH VOLUMES IN DIVISION IV OF THE
NATIONAL NUCLEAR ENERGY SERIES (MPTS)**

The health volumes of Division IV contain reports of work done during World War II, under the Manhattan District, as part of the activities of the Metallurgical Project (known as the Plutonium Project after the bombing of Nagasaki). The material is distributed among the various volumes as follows:

- Vol. 20 "Industrial Medicine on the Plutonium Project"
(Survey and Collected Papers; published 1951)
- Vols. 22 B-22 I Radiobiology (Collected Papers)
- Vols. 22 B-22 C "Effects of X and Gamma Rays"
- Vol. 22 D "Effects of Fast and Slow Neutrons"
- Vol. 22 E "Effects of External Beta Radiation"
- Vols. 22 F-22 H "Metabolism and Effects of Internal
Emitters"
- Vol. 22 I "Histopathology of Irradiation from
External and Internal Sources"
(published 1948)
- Vol. 23 "Toxicology of Uranium" (Survey and Collected
Papers; published 1951)

It will be noted that the foregoing outline includes no survey of radiobiology. This was planned as Vol. 22 A. Also, it was originally planned to include two volumes on health physics, one a survey (Vol. 21 A), the other a set of collected papers (Vol. 21 B). These three volumes have been abandoned because personnel who completed the subject research are not presently available as authors.

The work reported in the volumes just listed was mostly done at the Metallurgical Laboratory, University of Chicago; the Crocker Laboratory, University of California, Berkeley; Clinton Laboratories, Oak Ridge, Tenn.; the National Cancer Institute, Bethesda, Md.; and the Hanford Engineer Works, Richland, Wash. It was all under the general supervision of Robert S. Stone, M. D., Associate Director for Health of the Metallurgical Project. Dr. Stone's introduction to this entire set of health volumes appears in Vol. 20.

The medical work was directly supervised by Simeon T. Cantrel, M. D. (Chicago, Clinton, Hanford), Leon O. Jacobson, M. D. (Chicago),